Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** VERSUCHSGRUPPE 1: **Quadhelix Gruppe** Beschreibung: The QDH appliances were made of 0.9-mm stainless steel wire with stainless steel bands attached with glass ionomer cement to the maxillary first molars. The degree of activation of the appliance was adjusted to allow for the retention of the band on 1 side to pass from the central fossa of the first permanent molar when the other band was placed on the molar. To try to prevent or compensate for rotation and buccal tipping, the arms of the QDH were held parallel to each other when activated, and a crown torque was incorporated into the appliance so that the molar bands were kept parallel. The QDH was activated once a month until the posterior crossbite was corrected. No overcorrection was produced, and each child with the desired crossbite correction had a plate placed for retention of the treatment to be used 24 hours a day for 3 months and, after the first 3 months, for 3 more months just at night. N= 33 (Anfang und Ende) / Alter = 8.0 ± 0.79 Jahre / ♂:♀ =7:26 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung, interzeptiv ---------- VERSUCHSGRUPPE 2: **Dehnplatten Gruppe** Beschreibung: The EP had a midline 10-mm screw, 4 stainless steel clasps on the deciduous and permanent first molars, and an acrylic covering. It was recommended that the screw be opened a quarter rotation every week until the posterior crossbite was corrected. The patient and parents or guardians were instructed to use the EP day and night except for tooth brushing. the patients were evaluated every 4 weeks; no overcorrection was produced, and each child with the desired crossbite correction had a plate placed for retention of the treatment to be used 24 hours a day for 3 months and, after the first 3 months, for 3 more months just at night. N=33 (Anfang und Ende) / Alter = 7.82 ± 0.85 Jahre / ♂:♀ =15:18 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung, interzeptiv
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** KONTROLLGRUPPE: **control group** N=33 (Anfang und Ende) / Alter = 8.09 ± 0.81 Jahre / ♂:♀ =19:14 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung, interzeptiv

Outcome	**Direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) ***PRIMÄRZIELGRÖßE:*** Correction of posterior crossbite ***SEKUNDÄRZIELGRÖßE:*** Maxillary expansion (intermolar und intercanin) ***TERTIÄRZIELGRÖßE:*** Mandibular expansion (intermolar und intercanin)
Studientyp	**RCT**
Schluss-folgerungen der Autoren	Based on our findings, we suggest that children with posterior crossbite could be treated in the mixed dentition period with simple appliances that would enable expansion of the palate. Our study showed that the treatment can be performed in 12 months for posterior crossbite correction and 6 months for retention. 1. The QDH and the EP had equal success in correcting posterior crossbites in the mixed dentition. 6. Posterior crossbites did not spontaneously correct during the transition into the permanent dentition.
Zusammen-fassung der Ergebnisse	**GRUPPE Quadhelix Gruppe VS. GRUPPE Dehnplatten Gruppe** ***PRIMÄRZIELGRÖßE:*** All children treated in this trial with QDH had their crossbite corrected. No self-correction was observed in the untreated group. ***SEKUNDÄRZIELGRÖßE:*** We can see significantly larger amounts of expansion in maxillary intermolar and intercanine distances in the QDH and EP groups than in the control group. ***TERTIÄRZIELGRÖßE:*** In the mandibular arch, however, the QDH group had greater intermolar expansion than did the EP group and the control group. **Dehnplattengruppe VS. Kontrollgruppe** ***PRIMÄRZIELGRÖßE****:* All children treated in this trial with EP had their crossbite corrected. However, 3 patients in the EP group showed crossbite correction only after the 12 months of treatment. No self-correction was observed in the untreated group (control). ***SEKUNDÄRZIELGRÖßE:*** We can see significantly larger amounts of expansion in maxillary intermolar and intercanine distances in the QDH and EP groups than in the control group. ***TERTIÄRZIELGRÖßE:*** In the mandibular arch, however, the QDH group had greater intermolar expansion than did the EP group and the control group.

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign: RCT, gute Studiendurchführung, alle Patienten durch einen Behandler therapiert, Auswertung verblindet durchgeführt, keine genaue Angabe über Auswertung der DropOuts.* *Power der Studie/Patientenzahl:* The sample size calculation established an error of 5% and a power of 95%. To detect any differences in length of treatment between the 2 methods, the means and standard deviations were calculated based on the data from the study of Hermanson et al (8.00 6 3.00 for the QDH; 12.00 6 5.00 for the EP). The sample should include 27 patients per group to show a statistically significant difference. To make up for possible dropouts, we decided to add 20% to the number of children, so we ended up with a total of 99 children, 33 in each group. *Funding:* From the School of Dentistry, University of Pernambuco, Recife, Pernambuco,Brazil + research grant from the Ministry of Education of Brazil (CAPES) *Interessenkonflikte:* The authors report no commercial, proprietary, or financial interest in the products or companies described in this article. *Bias (SIGN/AMSTAR/EinzelstudienRoB – alle negativen Punkte aus Fragebogen auflisten):* *Publikationsbias (Reviews):* Keine.
Schluss-folgerung des Begutachters	methodische Qualität: hoch
	Klinische Aussagekraft: hoch Keine spontane Korrektur des Kreuzbisses. Überstellung des Kreuzbisses innerhalb von 12 Monaten mit Quadhelix und Dehnplatte möglich.
Evidenz-level (SIGN)	**1++**
Qualität **(RoB, SIGN /AMSTAR II)**	**High quality ⊕⊕**

Evidenztabelle Goyenc, Ersoy 2004

European Journal of Orthodontics 26 (2004) 75–81

The effect of a modified reverse headgear force applied with a facebow on the dentofacial structures

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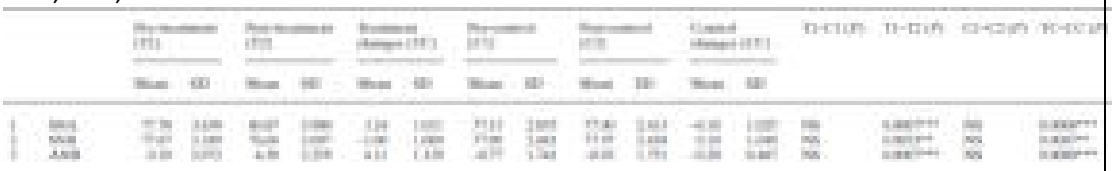
SUMMARY The purpose of this study was to evaluate the effects of a modified reverse headgear force applied with a facebow on the dentofacial structures of patients with skeletal Class III malocclusions characterized by maxillary retrognathism. Thirty individuals before the pubertal peak and in the mixed dentition were selected. Fifteen subjects (seven males, eight females, mean age 9.2 years) who formed the treatment group were compared with a control group comprising seven males and eight females (mean age 8.8 years). Maxillary deficiency and negative overjet were noted in all individuals included in the treatment and control groups. The combination of a full coverage maxillary removable appliance and an embedded facebow was used for treatment. The outer arms of the facebow were bent to deliver the force through the approximate centre of resistance of the maxilla. Extra-oral elastics extended from the reverse headgear to the outer arms of the facebow.

Statistical analysis indicated significant changes in angles SNA, NV–A, SV–ANS, SV–PNS and PP measurements, suggesting that the maxilla moved anteriorly. There was, however, no statistically significant difference in SN–MP, SN–PP and MP–PP measurements between the treatment and control groups. These results suggest that there was no maxillary or mandibular rotation, but that the molars moved mesially in the protraction group. The U6–PP(V) dimension did not display significant differences between the pre- and post-treatment measurements in the treated group. Anterior movement of the maxilla was obtained without rotation of the jaws and upper and lower maxillary heights were unaffected.

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie** Children with skeletal and dental ClassIII malocclusion: Maxillary deficiency and a negative overjet • Turkey
Schweregrad	Nicht spezifiziert
Einschluss-kriterien	Children with: - Maxillary deficiency and a negative overjet
Ausschluss-kriterien	- not fullfilling inclusion criteria

Intervention Versuchsgruppe	**kieferorthopädische Behandlung** **MRHG + FM Del** The intra-oral anchorage system consisted of a full coverage maxillary removable appliance and an embedded facebow. The acrylic extended on the vestibular side to the middle third of the teeth and retention was reinforced with extra clasps. The inner arms of the facebow entered the removable appliance approximately next to the first primary molars and the outer arms were bent to deliver the force through the approximate CR of the maxilla. An average force of 600 g was applied to each side of the maxilla with extra-oral elastics (Dentaurum, Potters Bar, UK) extending from the pre-labial anchorage attachment of the reverse headgear to the outer arms of the facebow. The Delaire-type facemask was used for extra-oral anchorage (Leone, Firenze, Italy). VERSUCHSGRUPPE 1: **MRHG + FM Del** N= 15(Anfang) / N=15 (Ende) / Alter = 9,2; 0,4/ ♂:♀ = 7:8 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **Untreated Class III** N=15 (Anfang) / N=15 (Ende) / Alter = 8,6; 0,5 ♂:♀ = 7:8 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: Skeletal: SNA, SNB, ANB
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	1. Maxillary anterior growth and development were stimulated resulting in anterior translation of the maxilla. 2. No rotations of the maxilla and mandible were observed. 3. Upper and lower face heights were not affected by the treatment. Use of a facebow in combination with a facemask is advantageous, as the direction of force can be adjusted to meet individual need. Use of the present appliance is suggested in Class III high angle patients with an open bite tendency and maxillary retrusion

Zusammen-fassung der Ergebnisse	**GRUPPE MRHG + FM Del VS. GRUPPE Untreated Class III** T1, C1 (pre-treatment): mean age 9,2 years, MRHG + FM Del; 8,6 years, Control T2, C2 (post-treatment): mean age 10,15 vears, MRHG + FM Del, 9,7 years, Control Skeletal SNA, SNB, ANB 
Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN)	**Weitgehend ordentliche Kohortenstudie. Randomisierte Studie mit wenigen Schwächen. Die Äquivalenz der Gruppen war gegeben, die Charakteristika sind angegeben. Die Art der Randomisierung ist adäquat. Eine Power/ Sample Size Analyse wurde durchgeführt. Die Reliabilität der Outcome Messungen ist für die skeletalen und dentalen Parameter überprüft. Die Gruppengröße ist ausreichend. Schwächen zeigen sich in der weniger gut nachvollziehbaren und ungeprüften Methode und Erhebung der psychosozialen Parameter sowie der TMJ Symptome.** *Funding: keine Angabe* *Interessenkonflikte:* keine Angabe *Bias (SIGN): Insgesamt ordentlich. Die Vergleichbarkeit der Untersuchungsgruppen wurde geprüft und ist gegeben. Nachteilig sind die fehlenden Sample Size Berechnungen sowie die kleinen Gruppengrößen*
Schluss-folgerung des Begutachters	methodische Qualität: akzeptabel Klinische Aussagekraft: Gegeben.
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN)	**Akzeptabel** (+)

Evidenztabelle Guest et al. 2010

Improving Class II malocclusion as a side-effect of rapid maxillary expansion: A prospective clinical study

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Introduction: The objective of this prospective clinical study was to evaluate the dentoalveolar and skeletal effects induced by rapid maxillary expansion (RME) therapy in mixed dentition patients with Class II Division 1 malocclusion compared with a matched untreated Class II Division 1 control group. **Methods:** The treatment sample consisted of cephalometric records of 50 patients with Class II malocclusion (19 boys, 31 girls) treated with an RME protocol including an acrylic splint expander. Some patients also had a removable mandibular Schwarz appliance or maxillary incisor bracketing as part of their treatment protocol. Postexpansion, the patients were stabilized with a removable maintenance plate or a transpalatal arch. The mean age at the start of treatment of the RME group was 8.8 years (T1), with a prephase 2 treatment cephalogram (T2) taken 4.0 years later. The control sample, derived from the records of 3 longitudinal growth studies, consisted of the cephalometric records of 50 Class II subjects (28 boys, 22 girls). The mean age of initial observation for the control group was 8.9 years, and the mean interval of observation was 4.1 years. All subjects in both groups were prepubertal at T1 and showed comparable prevalence rates for prepubertal or postpubertal stages at T2. Independent-sample Student *t* tests were used to examine between-group differences. **Results:** Class II patients treated with the described bonded RME protocol showed statistically significant increases in mandibular length and advancement of pogonion relative to nasion perpendicular. The acrylic splint RME had significant effects on the anteroposterior relationship of the maxilla and the mandible, as shown by the improvements toward Class I in the maxillomandibular differential value, the Wits appraisal value, and the ANB angle. Patients treated with the bonded RME showed the greatest effects of therapy at the occlusal level, specifically highly significant improvement of Class II molar relationship and decrease in overjet. Treatment with the acrylic splint RME had no sustainable effects on the skeletal vertical dimension, maxillary skeletal position, or maxillary dentoalveolar dimensions. **Conclusions:** This study suggests that the protocol described including treatment with a bonded rapid maxillary expander used in the early mixed dentition in Class II Division 1 patients can help to improve the Class II malocclusion as a side-effect, both skeletally and dentally. Evidence for this phenomenon was based previously on anecdotal data; the results of this study show that the improvements are far more pervasive than anticipated. (Am J Orthod Dentofacial Orthop 2010;138:582-91)

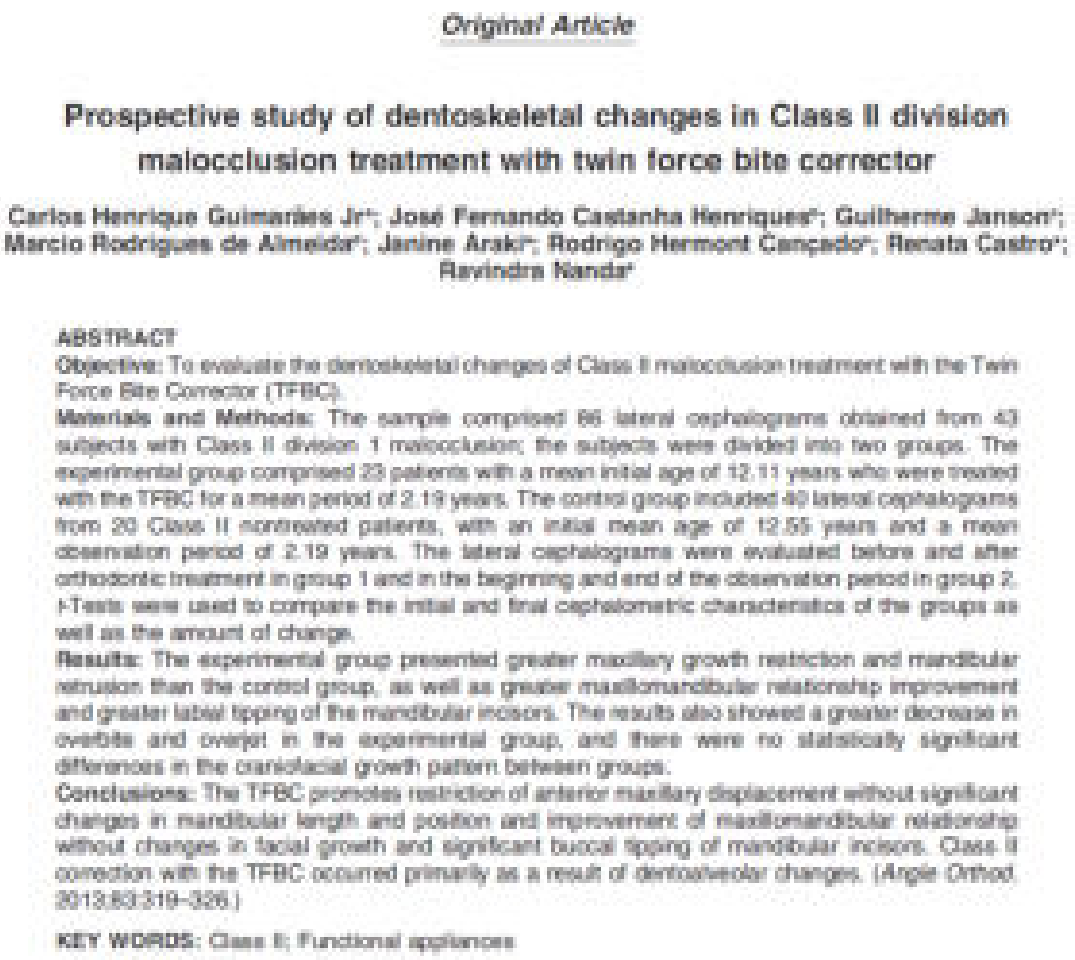
Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** • 50 Patienten mit Klasse II • 50 Patienten als Kontrolle aus historischen Wachstumsstudien • This investigation was a prospective clinical trial that was part of a larger study of RME conducted in a private practice setting.
Schweregrad	RME-Group: OJ = 5,9 ± 1,8 mm; ANB = 5,1 ± 1,8° Untreated Control Group: OJ = 6,1 ± 1,7 mm; ANB = 5,4 ± 2,1°
Einschluss-kriterien *Bei Review: PICOS*	To summarize, the rigorous enrollment criteria were Class II tendency malocclusion (end-to-end first permanent molars) or Class II molar relationship (full-cusp) at T1, early mixed dentition with all 8 first and second deciduous molars at T1 and received a bonded maxillary expander, cephalograms available at 2 observation times (T1 and T2), and early permanent dentition at T2 with all 8 premolars erupted fully.

Ausschluss-kriterien	Cases were not considered if full records were not taken at the time of the second observation just before full braces (phase 2 treatment). Other reasons for initial exclusion from enrollment, or for dropouts from the prospective study, were extracted or congenitally missing teeth, use of a banded expander or additional mechanics (such as a functional appliance or utility arches during the observation period), thus leaving a subsample of 574 subjects. Additional exclusionary criteria were applied, reducing the sample to include only Class II Division 1 patients who met the dentitional criteria of all deciduous molars and permanent first molars and incisors at the start of treatment (T1) and all premolars fully erupted about 4 years later before full-appliance treatment (T2). Moreover, all subjects enrolled in the final treatment sample had maxillary constriction shown by an initial mean transpalatal width measurement of 30 mm or less. This measurement was determined during the initial examination and was measured clinically from the most lingual aspect of 1 maxillary first permanent molar to its antimere.
Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** All patients received a bonded acrylic splint RME after the T1 cephalogram for an average of 6.7 months. The expansion screw was activated until the palatal cusps of the maxillary posterior teeth approximated the lingual cusps of the mandibular posterior teeth. Twenty-nine, or 58%, of the patients wore a removable mandibular Schwarz expansion appliance before the maxillary expansion appliance. Thirty-five patients also had brackets placed temporarily on the maxillary incisors. Forty-eight treated patients received an acrylic palatal plate for retention after removal of the RME; 2 patients were given a transpalatal arch for retention of expansion after RME removal because of the loss of the maxillary second deciduous molars at RME removal. All patients received a transpalatal arch before the cephalogram at T2. Eleven patients received a mandibular lingual arch before the T2 cephalogram. VERSUCHSGRUPPE: **RME Group** N=50 (Anfang) / N= 50 (Ende) / Alter = 8,8 ± 1,1 Jahre / ♂:♀ = 19:31 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Therapie** From a pool of untreated subjects followed longitudinally throughout growth, a control group of 50 subjects with Class II malocclusion was matched with the treatment subjects. The cephalograms of the untreated subjects were obtained from 3 longitudinal growth studies to obtain the best match possible to the treatment group, based on the same inclusion criteria described above. Twenty-three subjects were from the University of Michigan Elementary and Secondary Growth Study (Ann Arbor), 21 subjects were from the Broadbent-Bolton Collection at the Bolton-Brush Growth Study Center (Cleveland, Ohio), and 6 subjects were used from the Denver Growth Study (Colo). KONTROLLGRUPPE: **Untreated Control Group** N=50 (Anfang) / N=50 (Ende) / Alter = 8,9 ± 0,9 Jahre / ♂:♀ = 28:22 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: keine Therapie

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: Cephalometric Treatment Effects
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	1. The bonded RME had its greatest effects at the occlusal level, specifically producing highly significant improvements of Class II molar relationship and decreases in overjet. The Class II molar elationship remained virtually unchanged in the control group, whereas the RME group showed improved molar relationships of over 1 mm in 92% of the expansion patients and over 2 mm in almost 50% of them. 2. The bonded RME had significant effects on the anteroposterior relationship of the maxilla and mandible, as shown by the significant improvements improvements of the maxillomandibular differential, the Wits appraisal, and the ANB angle, once again with improvements between 1 and 2 mm or degrees. 3. Class II patients treated with the bonded acrylic splint RME protocol showed statistically significant increases in mandibular length and advancement of pogonion related to nasion perpendicular, although the increases were of modest magnitude. 4. Treatment with the bonded RME had no sustainable effects on the skeletal vertical dimension, the maxillary skeletal position, or the maxillary dentoalveolar dimension. Treatment with RME showed significant overall positive (toward Class I) changes for Class II malocclusion subjects. Regardless of the magnitude of the mean values of the changes, these improvements were not the consequence of any specific mechanics aimed at Class II correction, and they led to a significant reduction of the distal molar relationship.
Zusammen-fassung der Ergebnisse	**RME Group VERSUS Untreated Control Group** ***PRIMÄRZIELGRÖßE*** From T1 to T2, the RME group had a significant advancement of pogonion (1.1 mm), as measured from nasion perpendicular, when compared with the control group (P 5 0.005). The change in mandibular length, as measured from condylion to gnathion, also was significant between the groups, with a mean increase of 1.3 mm for the treated group relative to the control values. The values for ANB angle (P 5 0.036) and theWits appraisal (P 5 0.001) were decreased significantly in the RME treated group compared with the control group. Also, there was a highly significant difference in the maxillomandibular differential between the 2 groups. The control group measured a mean difference of 1.6 mm less for the difference in midfacial and mandibular lengths compared with the treated group (P 5 0.001). There were no significant differences of vertical skeletal measurements between the 2 groups. The most significant change overall came in the molar relationship measured from the mesial aspect of the maxillary first molar to the mesial aspect of the mandibular first molar along the occlusal plane(P = 0.0001). The mean difference of this measurement was 1.7 mm greater for the treated group compared with the controls. Overjet was decreased significantly in the treated group by 1.0 mm compared with the control group at a significance level of P 5 0.001. Lower 1 to A-pogonion measured 0.5 mm greater in the treated vs control groups. No differences were found between the cephalometric T1-T2 changes for Class II tendency patients and Class II patients in both groups. There were no significant differences among the cephalometric results from the patients in the treated group with respect to the presence of a Schwarz plate, bracketing of the maxillary incisors, palatal plate, or a mandibular lingual arch.

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign:* • *unterschiedliche Geschlechterverteilung in den Gruppen* • *keine Ethikvotum* • *historische Kontrollgruppe* • *keine Aussagen zu Baseline-Imbalance* • *Matching umfassend beschrieben* *Durchführung:* • *Einige unterschiedliche Kointerventionen in der Treatment Group* • *Mehrere Behandler, Relibialität der Intervention fraglich* • *Keine Verblindung vorhanden* *Auswertung:* • *Kein statistische Reliabilitätstest* • *Solide Statistik (Shapiro-Wilk, t-test; in Subgruppen nicht-parametrische Test [Mann-Whitney-U])* • *Keine Angabe von Konfidenzintervallen* *Power der Studie/Patientenzahl: vorhanden* *Funding: keine Angabe* *Interessenkonflikte: keine Angabe* *Bias (SIGN/AMSTAR/EinzelstudienRoB – alle negativen Punkte aus Fragebogen auflisten):* • *Selection bias: Vergleichbarkeit der historischen Kontrollgruppe zur aktuellen Interventionsgruppe fraglich; keine genaueren Angaben zur Rekrutierung* • *Detection bias: keine Verblindung* • *Keine Erhebung von Confounders*
Schluss-folgerung des Begutachters	methodische Qualität: befriedigend
	Klinische Aussagekraft: • Die Kappenschienen-GNE zeigten ihre größten Effekten auf die Molarenrelation und die Verringerung des Overjets. • Es kam zu einer signifikanten Normalisierung der Kieferlagebeziehung (Wits, ANB). • Es kam zu einer signifikanten Vergrößerung der UK-Länge und Vorverlagerung von Pogonion. Die Kappenschienen-GNE erzielte keine vertikalen Effekte, weder dental noch skelettal.
Evidenz-level (SIGN)	**2+**
Qualität **(RoB, SIGN /AMSTAR II)**	⊕ Acceptable

Evidenztabelle Guimaraes, Henriques et al. 2013



Original Article

Prospective study of dentoskeletal changes in Class II division malocclusion treatment with twin force bite corrector

Carlos Henrique Guimarães Jr[a]; José Fernando Castanha Henriques[b]; Guilherme Janson[c]; Marcio Rodrigues de Almeida[d]; Janine Araki[e]; Rodrigo Hermont Cançado[e]; Renata Castro[e]; Ravindra Nanda[f]

ABSTRACT

Objective: To evaluate the dentoskeletal changes of Class II malocclusion treatment with the Twin Force Bite Corrector (TFBC).

Materials and Methods: The sample comprised 86 lateral cephalograms obtained from 43 subjects with Class II division 1 malocclusion; the subjects were divided into two groups. The experimental group comprised 23 patients with a mean initial age of 12.11 years who were treated with the TFBC for a mean period of 2.19 years. The control group included 40 lateral cephalograms from 20 Class II nontreated patients, with an initial mean age of 12.55 years and a mean observation period of 2.19 years. The lateral cephalograms were evaluated before and after orthodontic treatment in group 1 and in the beginning and end of the observation period in group 2. *t*-Tests were used to compare the initial and final cephalometric characteristics of the groups as well as the amount of change.

Results: The experimental group presented greater maxillary growth restriction and mandibular retrusion than the control group, as well as greater maxillomandibular relationship improvement and greater labial tipping of the mandibular incisors. The results also showed a greater decrease in overbite and overjet in the experimental group, and there were no statistically significant differences in the craniofacial growth pattern between groups.

Conclusions: The TFBC promotes restriction of anterior maxillary displacement without significant changes in mandibular length and position and improvement of maxillomandibular relationship without changes in facial growth and significant buccal tipping of mandibular incisors. Class II correction with the TFBC occurred primarily as a result of dentoalveolar changes. (*Angle Orthod.* 2013;83:319–326.)

KEY WORDS: Class II; Functional appliances

Population *Setting* *Komorbiditäten*	**Klasse-II Anomalie** • 43 subjects with Class II division 1 malocclusion • orthodontic department at Bauru Dental School, University of Sao Paulo, Brazil
Schweregrad	*Intervention:* Overjet = 6,72 ± 2,31 mm; ANB = 6,09 ± 2,41° *Kontrolle:* Overjet = 4,71 ± 1,67 mm; ANB = 4,32 ± 1,79 °
Einschluss-kriterien *Bei Review: PICOS*	• all patients should present with at least a bilateral half Class II molar relationship • minimum of 4 mm of overjet (OVJ) • absence of agenesis or loss of permanent teeth up to the first molars • absence of supernumerary teeth • convex facial profile • mandibular arch with minimal (4 mm) or no crowding, • without having undergone any previous orthodontic treatment

Ausschluss-kriterien	Keine Angabe
Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** The TFBC has two plunger/telescopic tube assemblies applied bilaterally, with a total length of 16 mm, with the nickel-titanium coil spring delivering a total protraction force of nearly 210 g (Figure 1). The appliance is attached to the arch by ball-and-socket joint fasteners, which allow free lateral mandibular movements. The plungers' compression reduces the appliance length in 15 mm, and at full compression the TFBC delivers the force that carries the mandible into an anterior edge-to-edge occlusion. Like other fixed intermaxillary appliances, it is used full time because it is not subject to patient compliance. Before delivering the TFBC, the orthodontic mechanics included fixed Roth preadjusted braces with 0.022 3 0.028–inch slots and archwires that were progressively increased until 0.019 3 0.025–inch stainless-steel wires could be used in both arches. In order to counteract the buccal flaring of the maxillary molars with the use of the TFBC appliance, a transpalatal arch was placed, and both archwires ends were cinched back 90u against the distal side of the molar tubes. The mandibular molars, premolars, and canines were connected with 0.010-inch metal ligature before the rectangular archwire placement, and premolars, canines, and incisors were individually tied to the archwire with metal ligatures. Elastic chain was used in the mandibular arch to prevent incisor flaring. After the Class II correction with the TFBC, Class II intermaxillary elastics were used as an active retainer for an additional 3 months. Patients were treated until Class I molar and canine relationships and a satisfactory OVJ were obtained. The total treatment time was 2.19 years (range, 0.58–3.91 years), with a mean period of utilization of the appliance TFBC of 0.24 years (range, 0.08–0.33 years). VERSUCHSGRUPPE: **Twin Force Bite Corrector Group** N= 28 (Anfang) / N=23 (Ende) / Alter = 12,11 ± 1,36 Jahre / ♂:♀ = 10:13 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** The mean observation period was 2.19 years (range, 0.56–6.58 years). The control group was selected from a longitudinal growth study sample from the files of the orthodontic department at Bauru Dental School, University of Sao Paulo, Brazil, with the following characteristics: subjects with Class II division 1 malocclusion, with absence of agenesis or loss of permanent teeth, absence of supernumerary teeth, who had not undergone any previous orthodontic treatment. KONTROLLGRUPPE: **Untreated Control Group** N= 20 (Anfang) / N= 20 (Ende) / Alter = 12,55 ± 0,66 Jahre / ♂:♀ = 10:10 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: keine

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: Cephalometric treatment effects
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	1. The appliance promotes restriction of anterior maxillary displacement without significant changes in mandibular length and position and improvement of maxillomandibular relationship without changes in facial growth and significant buccal tipping of mandibular incisors 2. Class II correction with the TFBC occurred mainly as a result of dentoalveolar changes.
Zusammen-fassung der Ergebnisse	**Twin Force Bite Corrector Group VS. Untreated Control Group** ***PRIMÄRZIELGRÖßE*** During treatment, group 1 had significantly greater maxillary forward displacement restriction (A-NpFHc), greater mandibular retrusion (B-N pFHc and P-N pFHc), and greater maxillomandibular correction (ANB and Wits) than did the control group. This group also presented greater mandibular incisor labial tipping (IMPA and Md1.NB) and greater OVJ, OVB, and molar relation correction than did the control group (Table 3). In the final stage, group 1 showed less maxillary forward displacement and length (A-N pFHc and Co- A), greater mandibular retrusion (B-N pFHc and P-N pFHc), greater maxillary palatal tipping (Mx1.PP), more distal maxillary molar position (Mx6-PTV), greater mandibular incisor labial tipping and protrusion (IMPA, Md1.NB and Md1-NB), and greater mandibular molar vertical development (6-MP). This group also presented greater correction of OVJ, OVB, and molar relationship.

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign:* - *Wenig Daten zu Versuchs- und Kontrollgruppe* - *Keine Angaben zu Randomisierung oder Verblindung* - *Ethikvotum vorhanden* - *Keine Angabe zur Rekrutierung* *Durchführung:* - *Wenig Angaben zu Behandler; Reliablität der Intervention fraglich* - *Keine Angaben zur Compliance* *Auswertung:* - *Test auf Normalverteilung vorhanden* - *Keine Konfidenzintervalle* - *Reliabilitätstestung erfolgt* - *Solide Statistik (Kolmogorov-Smirnov-Test, t-Test)* *Power der Studie/Patientenzahl: vorhanden* *Funding: keine Angaben* *Interessenkonflikte: keine Angaben* *Bias (SIGN/AMSTAR/EinzelstudienRoB – alle negativen Punkte aus Fragebogen auflisten):* • *Selection bias: Kontrollgruppe aus Wachstumsstudie, vermutlich historisch, keine weiteren Angaben; keine Angabe zur Teilnehmerrate* • *Attrition bias: Dropouts zwar angegeben, aber keine statistische Berücksichtigung* • *Detection bias: keine Angaben zur Verblindung in Intervention/Outcome-Erhebung; keine Angaben zur Validität der Outcome-Erhebung* • *Keine Erhebung von Confounders*
Schluss-folgerung des Begutachters	methodische Qualität: gut bis befriedigend
	Klinische Aussagekraft: Die verwendete Apparatur führt zu - einer Wachstumshemmung im Oberkiefer ohne Veränderung der Unterkieferlage. - einer Verbesserung der Kieferrelation ohne Veränderungen im Gesichtswachstum und Labialkippung der unteren Inzisiven. - Die Korrektur der Kl. II Anomalie unter Verwendung des TFBC geschieht hauptsächlich durch dento-alveolare Veränderungen.
Evidenz-level (SIGN)	**2+**
Qualität **(RoB, SIGN /AMSTAR II)**	⊕ Acceptable

Evidenztabelle Hanoun, Al-Jewair et al., 2014

ORIGINAL RESEARCH

A comparison of the treatment effects of the Forsus Fatigue Resistance Device and the Twin Block appliance in patients with class II malocclusions

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Objective: We evaluated the skeletal and dentoalveolar effects of the Forsus Fatigue Resistance Device (FRD) and the Twin Block appliance (TB) in comparison with nontreated controls in the treatment of patients with class II division 1 malocclusion.

Materials and methods: This retrospective study included three groups: TB (n=17, mean age, 11.2 years), FRD (n=30; mean age, 12.9 years), and controls (n=25; mean age, 12.6 years). Lateral cephalograms were evaluated at T1 (pretreatment) and at T2 (postappliance removal/equivalent time frame in controls). Cephalometric changes were evaluated using the Clark analysis, including 27 measurements.

Results: Sagittal correction of class II malocclusion appeared to be mainly achieved by dentoalveolar changes in the FRD group. The TB was able to induce both skeletal and dentoalveolar changes. A favorable influence on facial convexity was achieved by both groups. Significant upper incisor retroclination occurred with the TB (−12.42°), whereas only −4° was observed in the FRD group. The lower incisors proclined more in the FRD group than the TB group. Incisor overjet reduction was 62% in the TB group versus 56% in the FRD group. Molar relation was corrected in both functional groups, resulting in a class I relation, although no change appeared in the control sample.

Conclusions: Both appliances were effective in correcting the class II malocclusion. Both the FRD and the TB induced significant maxillary and mandibular dentoalveolar changes; skeletal changes were induced by TB but not FRD therapy.

Keywords: orthodontics, cephalometry, class II malocclusion, functional appliances

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** • Caucasian healthy class II malocclusion subjects • TB: private practice of the developer of the appliance, Dr William Clark (Scotland, United Kingdom) FRD: one private practive Untreated control: University of Michigan growth study
Schweregrad	• class II division 1 malocclusion, with the canines and molars in at least an end-to-end relationship • A point-Nasion-B point angle ≥4.5° • retrognathic mandible (Sella-Nasion-B point angle ≤76°, Sella-Nasion-A point angle ≥80°)

Einschluss-kriterien *Bei Review: PICOS*	• Caucasian healthy boys and girls who were starting or within the period of their skeletal growth spurt, as indicated by the cervical vertebral maturation method • class II division 1 malocclusion, with the canines and molars in at least an end-to-end relationship • in the late mixed or early permanent dentitions • normal growth pattern (Frankfort to Mandibular plane angle =21°−35°) • A point-Nasion-B point angle ≥4.5° • retrognathic mandible (Sella-Nasion-B point angle ≤76°, Sella-Nasion-A point angle ≥80°) • records of sufficient quality for accurate identification of landmarks on cephalograms • exclusive treatment with FRD or TB for at least 6 months • having the appliance not removed prematurely because of breakage • nonextraction treatment.
Ausschluss-kriterien	• unfavorable growth patterns • craniofacial anomalies • in the early mixed dentition • an anterior open bite of more than 2 mm
Intervention Versuchsgruppe	**kieferorthopädische Behandlung** VERSUCHSGRUPPE 1: **Twin Block (TB)** N=37 (Anfang) / N=37 (Ende) / Alter = 11,2 ± 1,6 Jahre / ♂:♀ = 13:24 • Gebissphase: spätes Wechselgebiss, permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: reguläre Behandlung The TB sample received the original design and treatment protocol suggested by Dr Clark. No brackets were bonded during the TB therapy. The bite registration was taken by advancing the mandible sagittally, with no deviation, by 7 mm, with 3–5 mm interocclusal clearance in the first bicuspid region. The treatment continued until the molars achieved a solid Angle’s class I occlusion VERSUCHSGRUPPE 2: **Forsus Fatigue Resistance Device (FRD)** N=30 (Anfang) / N=30 (Ende) / Alter = 12,9 ± 1,2 Jahre / ♂:♀ = 18:12 • Gebissphase: spätes Wechselgebiss, permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: reguläre Behandlung Although the FRD sample received the clip-on design, before FRD insertion, the maxillary and mandibular arches were bonded with preadjusted edgewise appliances (0.022-inch bracket slot) until the upper and lower 19×25-inch SS wires were reached. The mandibular archwire was cinched distal to the molars. For the maxillary dentition, the archwire management varied according to the individual treatment goals in terms of upper molar distalization. Then the FRD was attached distal to the mandibular first bicuspids. The bracket torques were 17° and 10° in the maxillary central and lateral incisors and −6° in the mandibular incisors. The FRD (3M Unitek Corp, Monrovia, CA, USA) is a semirigid telescoping system incorporating a superelastic nickel-titanium coil spring that can be assembled chair-side and that can be used in conjunction with complete fixed orthodontic appliances. The FRD attaches at the maxillary first molar and onto the mandibular archwire, distal to either the canine or the first premolar bracket.

Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **Untreated control** N=25 (Anfang) / N=25 (Ende) / **Alter = 12,6 ± 0,9 Jahre UND 11,9 ± 1,9 Jahre** CAVE unterschiedliche Altersangaben! / ♂:♀ = 13:12 • Gebissphase: spätes Wechselgebiss, permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: keine 25 untreated class II subjects obtained from the University of Michigan growth study and matched with the experimental groups for skeletal age (at the start or during the growth spurt), sex, and craniofacial morphology.
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) • **Okklusion**, Kaufunktion, Funktion PRIMÄRZIELGRÖßE: Cephalometric skeletal and dentoalveolar effects
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	The FRD and TB are effective in the treatment of patients with class II malocclusion. Both appliances were able to induce favorable changes in the sagittal relation, but the type of change differed significantly between the groups. The TB induced mandibular skeletal correction with much less influence on the maxilla. The FRD induced dentoalveolar changes, and the contribution to the final overjet correction was a result of an equal combination of upper incisor retroclination and lower incisor proclination. *Anmerkung: Es wurden von den Autoren auch Vergleiche zwischen TB und FRD Gruppen gezogen sowie Einzelgruppenanalysen durchgeführt, die für die Leitlinie nicht relevant sind.*
Zusammen-fassung der Ergebnisse	**TB VS. UC** **FRD VS. UC** ***PRIMÄRZIELGRÖßE*** Cephalometric skeletal and dentoalveolar effects The mean change of the Frankfort to Mandibular plane angle when compared by ANOVA was statistically different between the three groups (*P*,0.01). However, Tukey analysis showed no evidence that any of the two experimental groups significantly differed from the controls (Table 3). There was no significant difference between the three groups in many skeletal variables such as cranial base angle, facial depth, facial-axis angle, condyle-axis angle, maxillary plane angle, and mandibular corpus length. The net increases in the mandibular length (Basion-Pogonion) and Ramus height in the FRD group did not differ significantly from the controls. However in the TB group, the increases of both variables were two times larger than in FRD and controls (*P*,001). The Maxillary position to Nasion/Vertical did not show a significant difference (*P*=0.08). Midfacial length (Condylion to A-point) was significantly different between TB and FRD (*P*=0.04); however, neither of the two experimental groups was different from the controls. There is insufficient evidence to support that either of the two appliances had a significant headgear effect. The mean change of the lower incisor angle was significantly different between the three groups (ANOVA *P*=0.042). Statistically significant lower incisors’ proclination has occurred in the FRD group when compared with the controls.

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign:* • Retrospektiv • Ethikvotum vorhanden • Baseline-Imbalancen vorhanden *(“The sex distribution between the three groups did not show statistically significant differences. Although there were more men than women in the FRD group, this 20% difference did not achieve statistical significance (P=0.36).Overall, the groups were comparable at baseline (T1) with the exception of; the incisor overjet, the posterior facial height, the mandibular length, and the ramus height, which showed significant differences between the treatment groups and the untreated controls.”)* • Uneinheitliche Altersangabe bei Kontrollgruppe *Durchführung:* • Matching erfolgt, allerdings keine statistischen Angaben • Standardisiertes Vorgehen gemäß TB-Protokoll • MB als Kointervention in FRD-Gruppe, dadurch Ergebnisse nicht klar der Apparatur zuzuordnen *Auswertung:* • Verblindung der FRS-Auswerter • Reliabilitätsprüfung vorhanden • Keine Überprüfung auf Normalverteilung • ANOVA und post-hoc Analyse vorhanden • Limitationen der Studie ausführlich benannt *Power der Studie/Patientenzahl:* keine Poweranalyse angegeben *Funding:* kA *Interessenkonflikte:* keine Interessenskonflikte *Bias (SIGN/AMSTAR/EinzelstudienRoB – alle negativen Punkte aus Fragebogen auflisten):* • Have confidence intervals been provided?- No (sign)
Schluss-folgerung des Begutachters	methodische Qualität: gut-befriedigend
	Klinische Aussagekraft: Die Behandlung mit TB führt im Vergleich zur Nichtbehandlung zu einer Zunahme der UK-länge sowie einer Verbesserung der Okklusion mit Verringerung des OJs. Die Behandlung mit FRD führt im Vergleich zur Nichtbehandlung zu einer Protrusion der UK-Front sowie einer Verbesserung der Okklusion mit Verringerung des OJs. Eine signifikante WT-Förderung des UK erfolgte nicht.
Evidenz-level (SIGN)	**2+**
Qualität **(RoB, SIGN /AMSTAR II)**	**Acceptable (+)**

Evidenztabelle Hansson, Skold et al 1997

Journal of Orofacial Orthopedics
Fortschritte der Kieferorthopädie

Clinical Investigation

Treatment of Adolescents with Hansaplate/Headgear

Influence on Face in Profile and on Dentition

C. Hansson[1], B. Sköld[2], S. Linder-Aronson[2]

Summary. The treatment effects of Hansaplate/headgear in the course of 1 year were analyzed. Twenty-one girls and 19 boys, 10 and 11 years old, respectively, with postnormal occlusion and an average overjet of 8 mm, made up the treatment group. Forty untreated patients with the same type of malocclusion and dentofacial morphology as the treated children, and paired and matched for sex and age, made up the controls. Measurements were obtained from cephalometric headfilms. Matched-intrapairs analysis of control versus treatment changes after 1 year of treatment was done. This showed that the treatment resulted in inhibited sagittal growth of the maxilla, increased anterior face height and a flattened soft tissue profile with a less protrusive upper lip and a less pronounced sulcus mento-labialis. The overjet decreased by 5 mm on average. Only slight retroclination of the upper incisors without extrusion and retroclination of lower incisors to the mandibular plane occurred. No significant anterior positioning of the mandible as compared with the controls was recorded in this study.

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Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** • children with class II division 1 malocclusions • Setting: Keine genaue Angabe, vermutlich Schweden
Schweregrad	Postnormal occlusion, vergrößerter Overjet (avg. 8mm)
Einschluss-kriterien *Bei Review: PICOS*	• Postnormal occlusion • Vergrößerter Overjet (average overjet of 8mm)
Ausschluss-kriterien	Keine Angabe

Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** The modification of the Hansaplate used in this study consists of an open coil spring for a continuous protruding push to the mandible. This creates a more biological situation than more rigid intermittent force. The design of the modified Hansaplate headgear appliance is shown in Figures l a and lb. Construction bite was taken with the mandible protruded by 5 ram. The mandible was lowered to a distance of 5 mm between the incisal edges of the upper and lower incisors. Continuous protrusion was made until an edge-to-edge position or 1 mm negative overjet was obtained. Tile torque spring according to Bass was activated and the acrylic palatal to the upper centrals was ground away step by step. An expansion screw was activated until the upper jaw fitted the lower in the protruded position, The face-bow of the headgear was extended to the first molars and was bent up by 30° in relation to the occlusal plane. A high-pull force of approximately 400 g was used. The incisal edges in both jaws were covered by acrylic. All children were treated by the same orthodontist (C. H.). They were instructed to wear the appliance 12 h per day and were checked by a using-schedule during treatment. The patients were seen at 6-week intervals, when the overjet was measured. If the distance between the retruded position of the mandible and the position of the mandible in the appliance had diminished, a protrusive activation of 2 mm was made. VERSUCHSGRUPPE: **Ha/He-group (Hansaplate/Headgear)** N=52 (Anfang) / N=40 (Ende) / ♂ Alter = 11J (vor Dropouts) / ♀ Alter = 10J (vor Dropouts) / ♂:♀ = 21:19 (nach Dropouts) • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **untreated control group** N=40 (Anfang) / N=40 (Ende) / Alter = keine Angabe, aber matched for sex and age / ♂:♀ = keine Angabe, aber matched for sex and age • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: keine Therapie
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** • **dentofaziale Ästhetik** PRIMÄRZIELGRÖßE: Cephalometric skeletal, dental and soft tissue treatment effects T0 = at baseline T1 = after one year/1-year follow-up
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**

Schluss-folgerungen der Autoren	Hansaplate headgear can be used effectively in the treatment of children with class II division 1 malocclusions. Its greatest advantage is its favorable effect on the upper and lower incisors.
Zusammen-fassung der Ergebnisse	**Ha/He-group VS. untreated control group** ***PRIMÄRZIELGRÖßE*** Cephalometric skeletal, dental and soft tissue treatment effects Table 4 outlines sagittal skeletal and soft tissue profile changes for treated and control boys. Significant differences were found for both skeletal and soft tissue variables. The ANB angle decreased highly significantly ($p \leq 0.001$) after treatment. The A-point to Y-axis had changed ($p \leq 0.05$) to a more posterior position in the treated than in the nontreated children. The soft tissue profile expressed by the variables NS-SnS/ SnS-PgS and Holdaway angle had become straighter ($p \leq 0.01$) after treatment. The distance SmS⊥ Li-PgS had decreased, indicating a less pronounced sulcus menolabialis ($p \leq 0.01$). Virtually identical changes are shown for the girls in Table 5. In the vertical plane, Table 6 shows for the boys an increased soft tissue total anterior face height (NS-MeS) in relation to the anterior skull base (N-S) after treatment ($p \leq 0.05$). Table 7 shows the same variables for the girls as Table 6. The treated girls showed a more pronounced increase in total anterior face height ($p \leq 0.01$), and even for the lower face height (SnS-MeS/N-S) there was a significant increase after treatment ($p \leq 0.05$). As no sex differences were found for the dental variables, dentoalveolar posttreatment - pretreatment changes for boys and girls together are presented in Table 8. The upper incisors of the treated children had moved to posterior, as expressed by the variables overjet and Is⊥Y-axis. These distances decreased highly significantly ($p \leq 0.001$). Upper incisor inclination to SN (ILs/SN) decreased significantly in the corresponding comparison ($p \leq 0.01$). For the lower incisors, expressed by the variable lower incisor inclination to mandibular line (ILi/ML), a highly significant decrease was found ($p \leq 0.001$). The variable Ii⊥X-axis increased significantly in the treated children compared to the nontreated ($p \leq 0.001$). This can be interpreted as a consequence of the increased total anterior face height. The distance between upper molars and the Y-axis (Ms⊥Y-axis) decreased significantly ($p \leq 0.05$). Correlations: Tables 9 and 10 show significant correlations between differences of second and first registration for hard tissue, soft tissue and dentition respectively. In scattograms (Figures 5 to 7), correlations between some of the variables and the differences between the treated group and the controls are presented. Figure 5 shows a highly significant correlation between ANB angle and soft tissue profile angle (SN-SnS/SnS-PgS) ($R = 0.64$). ANB differences between the treated and nontreated groups are evident. Figure 6 shows a similarly significant correlation between the distances upper incisor⊥Y- axis and upper lip⊥Y-axis ($R = 0.64$). Figure 6 also shows more pronounced retropositioning of the upper incisor edge in the treatment group than in the control group. Like Figure 6, Figure 7 shows a highly significant correlation between overjet and retropositioning of the upper lip ($R = 0.55$). The treatment effect of the overjet is very pronounced.

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign:* - *prospektiv, keine Angaben zur genauen Alters- und Geschlechtsverteilung* - *Randomisierung nicht näher beschrieben, daher Kohortenstudie angenommen* - *Matching bzgl. Alter und Geschlecht* *Durchführung:* - *keine genauen Angaben zum Setting* - *Auswertung und Intervention durch jeweils gleiche Person* *Auswertung:* - *Auswertung und Intervention durch jeweils gleiche Person* - *Keine Angaben zu Daten der Dropouts (ITT/PP-Analyse?)* - *Solide Statistik (Student’s t-Test for paired samples, Dahlberg’s formula for methological error)* - *Zum Teil hoher Methodenfehler (Table 1), aber nicht als relevant eingestuft* *Power der Studie/Patientenzahl:* - *Keine Power-Analyse, aber große Patientenzahl pro Gruppe* *Funding: This study was supported by grants from Örebro County Council Research Committee, Örebro, Sweden.* *Interessenkonflikte: Keine Angaben* *Bias (SIGN):* - *The likelihood that some eligible subjects might have the outcome at the time of enrolment is assessed and taken into account in the analysis. – No* - *The assessment of outcome is made blind to exposure status. If the study is retrospective this may not be applicable. – No* - *Where blinding was not possible, there is some recognition that knowledge of exposure status could have influenced the assessment of outcome. – No* - *Have confidence intervals been provided? – No*
Schluss-folgerung des Begutachters	methodische Qualität: gut-befriedigend
	Klinische Aussagekraft: Verglichen mit dem Behandlungseffekt anderer funktionskieferorthopädischer Geräte, hat die Hansaplatte in einer ähnlichen Weise auf den ANB-Winkel, A-Punkt, Weichteilprofil, H-Winkel, Frontzahnstufe und Oberlippenposition gewirkt (Tabellen 11 und 12); während bei den Patienten, die mit einer Hansaplatte-Headgear- Apparatur behandelt wurden, ein viel günstigerer Einfluß auf die oberen und unteren Inzisivi zu verzeichnen war: weniger Retroinklination und Elongation der oberen Inzisivi sowie keine Proklination der unteren Inzisivi (Tabellen 13 und 14).
Evidenz-level (SIGN)	**2+**
Qualität **(RoB, SIGN /AMSTAR II)**	**Acceptable (+)**

Evidenztabelle Harrison & Ashby 2001

Cochrane Library

[Intervention Review]

Orthodontic treatment for posterior crossbites

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ABSTRACT

Background

'Posterior crossbite' occurs when the top back teeth bite inside the bottom back teeth. When it affects one side of the mouth the lower jaw may have to move to one side to allow the back teeth to meet together. It is unclear what causes posterior crossbites and they may develop or improve at any time from when the baby teeth come into the mouth to when the adult teeth come through. Several treatments have been recommended to correct this problem. Some treatments widen the upper teeth whilst others are directed at treating the cause of the posterior crossbite e.g. breathing problems or sucking habits. Most treatments have been used at each stage of dental development.

Objectives

The aim of this review was to evaluate orthodontic treatments used to expand the maxillary dentition and correct posterior crossbites.

Search methods

All randomised and controlled clinical trials identified from the cochrane oral health group trials register, a MEDLINE search using the Mesh term Palatal Expansion Technique and relevant free text words, handsearching the British, European and American journals of orthodontics and Angle Orthodontist, and the bibliographies of papers and review articles which reported the outcome of orthodontic treatment to expand the maxillary dentition and/or correct a posterior crossbite that were published as abstracts or papers between 1970 and 1999.

Selection criteria

All randomised and controlled clinical trials published as full papers or abstracts which reported quantitative data on the outcomes crossbite correction, molar and/or canine expansion, signs and symptoms of temporomandibular joint dysfunction or respiratory disease.

Data collection and analysis

Data were extracted without blinding to the authors, treatments used or results obtained.
The first named authors of randomised and controlled clinical trials were written to in an attempt to establish the method of randomisation/allocation and identify unpublished studies.
Odds ratio, relative risk, relative risk reduction, absolute risk reduction, the number needed to treat and corresponding 95% confidence intervals, were calculated for event data. The weighted mean difference and 95% confidence intervals were calculated for continuous data.

Main results

Using the search strategy seven randomised and five controlled clinical trials were identified but following correspondence with the authors, three of the randomised and one of the controlled clinical trials were reclassified giving five randomised and seven controlled

Population *Setting* *Komorbiditäten*	**Transversale Anomalie**
Schweregrad	Keine Angaben

Einschluss-kriterien *PICOS*	Population: Children and adults with a posterior crossbite; Studies: RCT and CCT
Ausschluss-kriterien	Population: without a Class III skeletal relationship, cleft lip and/or palate or other syndrome with associated with cranio-facial anomalies.
Intervention Versuchsgruppe	**kieferorthopädische Behandlung** Orthodontic (dental brace) treatments (not surgical) which have been used to correct posterior crossbites and/or expand the top teeth. VERSUCHSGRUPPE: **Grinding with/without expansion using an upper removable explosion plate** N=?? (Anfang) / N=?? (Ende) / Alter = ?? ± ?? Jahre / ♂:♀ = ?:? • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **untreated control group** N=?? (Anfang) / N=?? (Ende) / Alter = ?? ± ?? Jahre / ♂:♀ = ?:? • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: keine Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** • **Okklusion, Kaufunktion, Funktion** PRIMÄRZIELGRÖßE: Correction of the posterior crossbite. SEKUNDÄRZIELGRÖßE: Expansion of the upper jaw/teeth measured as changes in the width between the molars and/or canines. TERTIÄRZIELGRÖßE: Stability of crossbite correction. QUARTIÄRZIELGRÖßE: Signs and symptoms of temporomandibular joint dysfunction e.g. pain, clicking, locking of the jaw joints, problems eating. QUINTÄRZIELGRÖßE: Signs and symptoms of respiratory disease e.g. mouth breathing, nasal airway resistance. SEXTÄRZIELGRÖßE: Quality of life.

Studientyp	**Systematisches Review (ohne Meta-Analyse)** • Inkludierte Studien in Bezug auf PICO: Seven RCT and five CCT were identified but following correspondence with the authors, three of the RCT and one of the CCT were reclassified giving five RCT and seven CCT for inclusion in the review. For the update an additional CCT was found giving five RCTs and eight CCTs for inclusion in this update. **Six clinical trials (included quantitative data on the outcomes of interest and have been analyzed in this review.** - **3 RCT** - **3 CCT**
Schluss-folgerungen der Autoren	The evidence from the trials reported by Thilander 1984 and Lindner 1989 suggests that removal of premature contacts of the baby teeth is effective in preventing a posterior crossbite from being perpetuated to the mixed dentition and adult teeth. When grinding alone is not effective, using an upper removable expansion plate to expand the top teeth will decrease the risk of a posterior crossbite from being perpetuated to the permanent dentition. The comparisons of treatments made in the trials reported by Mossaz-Joëlson 1989; Schneidman 1990; Ingervall 1995; Asanza 1997 and Sandikçioglu 1997 were inconclusive so recommendations for clinical practice can not be made based on the results of these trials. However, these trials were small and inadequately powered so further studies, with appropriate sample sizes, would be required to assess the relative effectiveness of these interventions.
Zusammen-fassung der Ergebnisse	**GRUPPE Grinding with/without expansion using an upper removable expansion plate VS. GRUPPE untreated control group** Correction of the posterior crossbite: The studies by Thilander 1984 and Lindner 1989 favoured the active intervention of grinding of the baby teeth to correct crossbites. Stability of crossbite correction: follow up : In Lindner 1989 active intervention was still favoured at follow up in the mixed dentition but the effectiveness had reduced from immediately post-treatment. In Thilander 1984 the children in the control group went on to receive treatment with an upper removable expansion plate to correct their crossbite if grinding of the baby teeth had not been effective. Long term follow up: No formal analysis of the relative effectiveness of the grinding versus no treatment could be made because none of the 'No treatment' group had been followed up.

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding/Bias (AMSTAR II, Einzelstudien) Publikationsbias?	Generell Review nach den Cochrane-Standards durchgeführt. 6 Studien wurden final analysiert, einzeln Studien grob beschrieben, keine genaue Angaben der Studien, Studien Methode, statistische Auswertung vorhanden. Keine Analyse der Heterogenität der Studien, keine Metaanalyse, die meisten (4/6) Studien wurden isoliert betrachtet. Der Effekt der Interventionen wurde durch den Vergleich zweier Therapiemöglichkeiten evaluiert, bis auf eine Ausnahme (Grinding vs no treatment). Keine Angaben über Blinding/Allocation bei RCT Studien (3/6). Bias Analyse nach der Kriterien des Cochrane Handbook of systematic Reviews of Interventions und Zitat: Jadad 1996. AMSTAR II *Power der Studie/Patientenzahl:* limitierte Studien-/Patientenzahl (6 St., 462 Patienten)
Schluss-folgerung des Begutachters	methodische Qualität: Review gut, Einzelstudien 2/6 Studien gut, 4/2 Studien limitiert
	Klinische Aussagekraft: Selektives Schleifen von Frühkontakten im Milchgebiss ist vorteilhaft um posterioren Kreuzbiss zu verhindern im späteren Wachstum. Sollte diese Maßnahme nicht ausreichend sein, soll die Therapie durch eine Expansion des Oberkiefers unterstützt werden.
Evidenz-level (SIGN)	**1+**
Qualität (Risk of Bias, AMSTAR II)	**Moderat ⊕⊕**

Evidenztabelle, Heinrichs, Shammaa et al. 2014

Progress in Orthodontics

RESEARCH Open Access

Treatment effects of a fixed intermaxillary device to correct class II malocclusions in growing patients

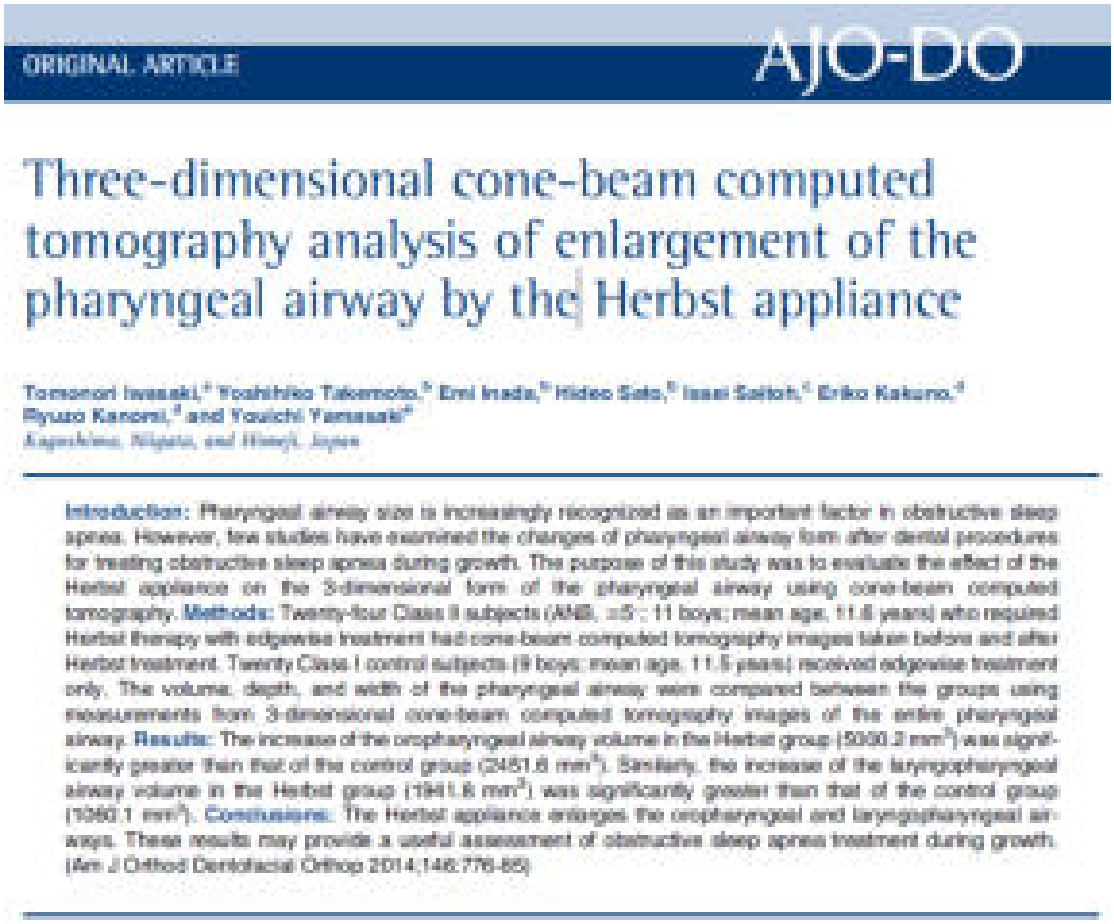
Population *Setting* *Komorbiditäten*	**Klasse-II Anomalie** • Consecutively treated patients treated with the Forsus FRD. • For the control subjects, the Bolton Brush Study were taken. • Setting: The office of one of the authors (I.S.); Charleston WV 26506, USA
Schweregrad	Treatment Group: ANB = 5,1 ± 1,8°; Overjet = 7,8 ± 2,9 mm Control Group: ANB = 4,3 ± 1,3°; Overjet = 5.3 ± 1,6 mm
Einschluss-kriterien *Bei Review: PICOS*	• Patients in the late mixed or early permanent dentition with class II division 1 malocclusion who required FRD and comprehensive non-extraction orthodontic treatment with fixed appliances; • no history of orthodontic treatment before the initial radiograph • acceptable quality radiographs for both time points • remaining growth potential as confirmed by Cervical Vertebral Maturation index (CVM)
Ausschluss-kriterien	• poor quality radiographs • missing radiographs for either time point • no remaining growth potential as confirmed by CVM

Intervention Versuchsgruppe	**kieferorthopädische Behandlung** *The upper and lower molars were banded with Unitek 0.022 slot MBT prescription bands. The upper first molar bands had an occlusal headgear tube which allowed the engagement clip of the pushrod device to secure to it. The upper and lower second premolars to the second premolars were bonded using the Unitek Victory Series 0.022 slot Low Profile MBT brackets. The lower incisor brackets had a −6° inclination to help minimize the anterior proclination of the incisors which was a side effect of class II correction. The teeth were leveled and aligned using an archwire sequence of 0.014 NiTi, 16 × 22 NiTi, 16 × 22 stainless steel (SS), and 19 × 25 SS. The FRD appliance was placed once the upper and lower arches were levelled and aligned and a 0.019 × 0.025 SS wire was in place. The Forsus FRD with EZ clip was attached to the occlusal headgear tube on the upper first molar and the lower 19 × 25 SS wire between the lower first premolar and the lower canine. The maxillary and mandibular arches were colligated from the first molar to the contralateral first molar on a 19 × 25 SS wire to minimize any unwanted proclination of the lower incisors, as per manufacturer's instructions. Overcorrection with the Forsus FRD was achieved where possible to account for relapse. After Forsus FRD removal, the occlusion was finalized using the same 19 × 25 SS wires and then all orthodontic appliances were removed. Once all the appliances were removed, the upper and lower teeth are retained with upper and lower Hawley retainers* VERSUCHSGRUPPE: **Forsus Group** N=24 (Anfang) / N=24 (Ende) / Alter = 10,7 ± 1,5 Jahre / ♂:♀ = ?:? • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Therapie** *For the control subjects (n = 24), the first radiograph from the Bolton Brush Study (t1) was taken at an average age of 10.3 ± 1.1 years, and the second radiograph wastaken at 14.7 ± 1.5 years. No significant differences were found between the treatment and control groups for any of the time periods.* *The control group was matched in age, sex, and craniofacial morphology with the experimental subjects.* KONTROLLGRUPPE: **Untreated Control Group** N=24 (Anfang) / N=24 (Ende) / Alter = 10,3 ± 1,1 Jahre / ♂:♀ = ?:? • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: keine
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: *Cephalometric Treatment Effects*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	1. Patients with mild to moderate class II malocclusion can be corrected with the Forsus FRD appliance in conjunction with comprehensive orthodontic treatment. 2. The change in overjet and correction of molar relationship was attributed to a headgear effect on the maxilla together with a retraction of the maxillary incisors and mesial movement of the mandibular incisors. 3. Unlike treatment with class II elastics, there was no excessive extrusion of the posterior molars and incisors .

Zusammen-fassung der Ergebnisse	**Forsus Group … VERSUS Untreated Control Group** ***PRIMÄRZIELGRÖßE*** *Treatment effects of the FRD were calculated by subtracting growth changes (t2 − t1) from treatment changes (T2 − T1). A total of 29 sagittal, vertical, and angular variables were evaluated for each group. Tables 4 and 5 compare the changes in the treatment group (T2 − T1) vs. the control group (t2 − t1) in the male and female subjects, respectively. Gender differences were found in six variables (Go-Gn minus Co-Apt; Is-OLp, Ii-ML, SNA, SNL-Olf, and Ii/ML). Table 4 shows the comparison of changes in the treatment group (T2 − T1) vs. the control group (t2 − t1) in the pooled subjects. Significant differences were found in 12 out of the 29 variables. The position of the maxillary base (OLp-Apt) came forward 3.9 mm in the treated group and 5.1 mm in the control group, resulting in a net 1.2 mm of restricted forward movement of the maxillary base ($p < 0.1$) by the FRD appliance. During 3.8 years of treatment, the position of the mandibular base (OLp-Pg) came forward 7.3 mm in the treated group and 6.6 mm in the control, resulting in a net forward movement of 0.7 mm by the appliance ($p < 0.5$). The difference between the effective maxillary and mandibular length (Co-Gn minus Co-Apt) was found to be significantly different between the treatment and control groups (1.9 mm, $p < 0.009$). The position of the maxilla relative to the mandible along the functional occlusal plane (Wits) showed a significant difference of −2.7 mm ($p < 0.001$). The position of the maxillary incisor (Is-OLp) came back −1.5 mm with the appliance ($p < 0.02$), and the position of the mandibular incisors (Ii-OLp) came forward 1.3 mm after subtracting the growth ($p < 0.02$). The overjet correction was corrected 4.6 mm after subtracting the growth ($p < 0.0001$). The maxillary molar (Ms-OLp) moved back 0.5 mm with the appliance ($p < 0.09$), and the mandibular molar (Mi-OLp) came forward 1.3 mm after subtracting the growth ($p < 0.04$). The molar relationship was corrected 3.6 mm after subtracting changes due to growth ($p < 0.0001$). Similar findings were observed with the male and female subjects that were analyzed separately (Tables 5 and 6). For vertical changes, the overbite was decrease by 2.0 mm more in the treatment relative to the control group ($p < 0.0001$), and the lower molar (Mic-ML) in the treatment group erupted 1.4 mm more in the treatment relative to the control group ($p < 0.01$). Similar findings were observed with the male and female subjects that were analyzed separately (Tables 5 and 6). For angular changes, SNA was decreased 1.5° more in the treatment relative to the control group ($p < 0.001$), and ANB was decreased 1.8° more in the treatment relative to the control group ($p < 0.0001$). The inclination of the mandibular incisor (Ii/ML) was increased 4.5° more in the treatment relative to the control group ($p < 0.0005$). Similar findings were observed with the male and female subjects that were analyzed separately (Tables 5 and 6).*

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign:* - *Retrospektiv* - *Keine Geschlechterverteilung in den Gruppen angegeben* - *Keine Verblindung* - *Ethikvotum vorhanden* *Durchführung:* - *Wenig Angaben zu Behandler* - *Kein Behandlungsprotokoll; Reliabilität der Intervention fraglich* - *Keine Angaben zur Compliance* *Auswertung:* - *Keine Konfidenzintervalle* - *Normalverteilung getestet* - *Reliablität der Outcome-Erhebung getestet (1 Erheber, intra-rater-Reliabilität getestet)* *Power der Studie/Patientenzahl: keine Angaben* *Funding: keine Angaben* *Interessenkonflikte: keine Angaben* *Bias (SIGN/AMSTAR/Einzelstudien RoB – alle negativen Punkte aus Fragebogen auflisten):* • *Selection bias: historische Kontrollgruppe; keine Angabe über Teilnehmerrate* • *Attrition bias: keine Angabe von Dropouts* • *Detection bias: keine Verblindung* • *Keine Confounders erhoben*
Schluss-folgerung des Begutachters	methodische Qualität: befriedigend
	Klinische Aussagekraft: - Eine milde bis moderate Klasse II Malokklusion kann mit dem Forsus in Kombination mit einer besitzenden Apparatur korrigiert werden - Die Veränderungen des Overjets und die Korrektur der Molarenrelation erfolgten aufgrund des Headgear Effekts und der Retraktion der Oberkieferinzisiven sowie einer Mesialwanderung der Unterkiefermolaren - Im Gegensatz zu einer Behandlung mit Kl. II Elastics gab es keine exzessive Extrusion der Molaren und Inzisiven
Evidenz-level (SIGN)	**2+**
Qualität **(RoB, SIGN /AMSTAR II)**	Acceptable ⊕

Evidenztabelle Iwasaki, Takemoto et al. 2014



ORIGINAL ARTICLE AJO-DO

Three-dimensional cone-beam computed tomography analysis of enlargement of the pharyngeal airway by the Herbst appliance

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Introduction: Pharyngeal airway size is increasingly recognized as an important factor in obstructive sleep apnea. However, few studies have examined the changes of pharyngeal airway form after dental procedures for treating obstructive sleep apnea during growth. The purpose of this study was to evaluate the effect of the Herbst appliance on the 3-dimensional form of the pharyngeal airway using cone-beam computed tomography. **Methods:** Twenty-four Class II subjects (ANB, ≥5°; 11 boys; mean age, 11.6 years) who required Herbst therapy with edgewise treatment had cone-beam computed tomography images taken before and after Herbst treatment. Twenty Class I control subjects (9 boys; mean age, 11.5 years) received edgewise treatment only. The volume, depth, and width of the pharyngeal airway were compared between the groups using measurements from 3-dimensional cone-beam computed tomography images of the entire pharyngeal airway. **Results:** The increase of the oropharyngeal airway volume in the Herbst group (5030.2 mm^3) was significantly greater than that of the control group (2451.8 mm^3). Similarly, the increase of the laryngopharyngeal airway volume in the Herbst group (1941.8 mm^3) was significantly greater than that of the control group (1060.1 mm^3). **Conclusions:** The Herbst appliance enlarges the oropharyngeal and laryngopharyngeal airways. These results may provide a useful assessment of obstructive sleep apnea treatment during growth.
(Am J Orthod Dentofacial Orthop 2014;146:776-86)

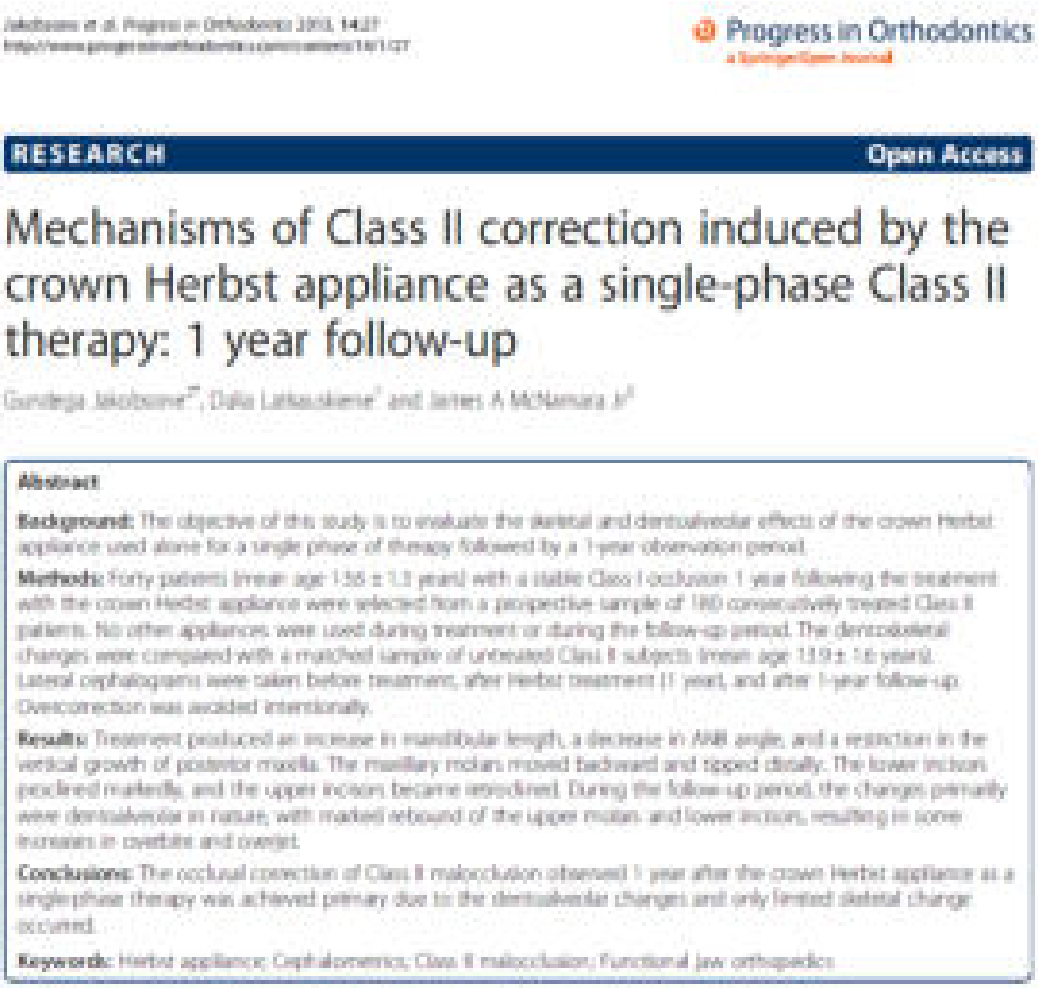
Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** • A total of 44 patients who visited a private orthodontic office (Himeji, Japan) for orthodontic treatment were screened for this longitudinal retrospective study. • Japan
Schweregrad	2° ≤ ANB ≤ 4°
Einschluss-kriterien *Bei Review: PICOS*	**Treatment Group** 1. Class II Division 1 malocclusion, with greater than half-step Class II molar and canine relationships 2. Class II skeletal relationship (ANB ≥ 5°) 3. Growing children (ages 9-14 years) 4. no rapid maxillary expansion or treatment with a quad-helix appliance either before or during Herbst treatment; 5. no previous functional appliance treatment for skeletal disharmony 6. no craniofacial anomalies or other growth disturbances 7. no impacted teeth 8. CBCT data (not routine) that were needed for diagnosis before and after Herbst treatment

	Control Group: 1. Class I malocclusion 2. Class I skeletal relationship (2 ≤ANB ≤ 4) 3. growing children (9-14 years) 4. no use of any adjunctive appliance such as a quad-helix, functional appliance, or rapid palatal expander as part of their orthodontic treatment 5. no craniofacial anomalies or other growth disturbances 6. no impacted teeth 7. CBCT data (not routine)that were needed for a diagnosis of orthodontic treatment at corresponding times (ie, before and after Herbst treatment)
Ausschluss-kriterien	Keine Angabe
Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** *Herbst-Therapie nicht weiter beschrieben* *Both groups were treated consecutively with fixed edgewise appliances and had good occlusion— Class I molar and canine relationships and adequate overbite (2-4 mm) and overjet (1-3 mm) at the end of treatment.* VERSUCHSGRUPPE: **Herbst Group** N=24 (Anfang) / N=24 (Ende) / Alter = 11,6 ± 0,9 Jahre / ♂:♀ = 11:13 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Therapie** *Both groups were treated consecutively with fixed edgewise appliances and had good occlusion— Class I molar and canine relationships and adequate overbite (2-4 mm) and overjet (1-3 mm) at the end of treatment.* KONTROLLGRUPPE: **No-Herbst-Group** N=20 (Anfang) / N=20 (Ende) / Alter = 11,5 ± 0,7 Jahre / ♂:♀ = 9:11 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: keine Herbst-Therapie (MB als Kointervention)
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: *Cephalometric Treatment Effects* SEKUNDÄRZIELGRÖßE: *Pharyngeal Airway*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	Herbst appliance treatment enlarges the oropharyngeal and laryngopharyngeal airway volumes, increases the depth of the oropharyngeal and laryngopharyngeal airways, and increases the width of the oropharyngeal airway.

Zusammen-fassung der Ergebnisse	**Herbst Group** VERSUS **Untreated Control Group** ***PRIMÄRZIELGRÖßE*** *The cephalometric variables in the Herbst and control groups before treatment are compared in Table I. The SNB angle in the Herbst group was significantly smaller than that in the control group. The ANB and SN-FH angles in the Herbst group were significantly larger than those of the control group. The horizontal cephalometric landmarks describing the positions of the maxilla and the mandible did not differ significantly between the groups. The vertical cephalometric landmarks—A(y) and B(y)— were significantly smaller than those of the control group. The cephalometric variables in the Herbst and control groups after treatment are compared in Table I. The SNB angle in the Herbst group was significantly smaller than that of the control group. The ANB angle in the Herbst group was significantly larger than that of the control group. The treatment and growth changes in each group are also compared in Table I. The change of the ANB angle in the Herbst group was significantly greater than that of the control group. The SNB and gonial angles in the Herbst group increased significantly more than those of the control group. The changes in the horizontal position of Point A(x) of the Herbst group were significantly less than those of the control group. The changes in the horizontal position of Point B(x) of the Herbst group increased significantly more than those of the control group. The change in the vertical position of Pog(y) of the Herbst group also increased more than that of the control group.* ***SEKUNDÄRZIELGRÖßE*** *Pharyngeal airway sizes in the Herbst and control groups are compared in Table II. No measurements of pharyngeal airway dimensions or volumes differed between the 2 groups before or after treatment. However, the oropharyngeal airway volume of the Herbst group was smaller than that of the control group before treatment. The treatment and growth changes in the TAv, OAv, and LAv; the depths of OA and LA; and the width of OA in the Herbst group increased significantly more than those of the control group.*

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign:* • *Retrospektives Studien* • *Ethikvotum vorhanden* • *Eigene Kontrollgruppe (jedoch mit MB als Kointervention)* • *Kaum Angaben zur Rekrutierung* *Durchführung:* • *Keine Angaben zur Intervention (Behandlungsprocedere, Behandler etc.)* • *Keine Angaben zur Compliance der Patienten* • *Reliabilität der Intervention fraglich* *Auswertung:* • *Keine Konfidenzintervalle angegeben* • *Reliabilitätstest für die Outcome-Erhebung vorhanden (durch 1 Erheber)* • *Keine genauen Angaben zur Anzahl der tatsächlichen Erheber* *Power der Studie/Patientenzahl: vorhanden* *Funding: keine Angabe* *Interessenkonflikte: keine Angabe* *Bias (SIGN/AMSTAR/EinzelstudienRoB – alle negativen Punkte aus Fragebogen auflisten):* • Selection bias: keine Angabe zur Teilnehmerrate • Detection bias: keine Verblindung (sowohl in der Intervention als auch bei der Outcome-Erhebung); zu wenig Angaben zur Validität der Methode (FRS-Analyse am DVT) • *Attrition bias: keine Dropouts angegeben* • *Keine Confounders erhoben*
Schluss-folgerung des Begutachters	methodische Qualität: befriedigend
	Klinische Aussagekraft: • Die Herbst-Apparatur vergrößert den oro-pharyngealen und laryngo-pharyngealen Luftweg-Volumens. • Die Herbst-Apparatur vergrößert die oro-pharyngealen und laryngo-pharyngealen Tiefe des Luftweges. • Die Herbst-Apparatur vergrößert die oro-pharyngealen Breite des Luftweges
Evidenz-level (SIGN)	**2+**
Qualität **(RoB, SIGN /AMSTAR II)**	⊕ Acceptable

Evidenztabelle Jakobsone, Latkauskiene et al. 2013



Progress in Orthodontics

RESEARCH Open Access

Mechanisms of Class II correction induced by the crown Herbst appliance as a single-phase Class II therapy: 1 year follow-up

Gundega Jakobsone*, Dalia Latkauskiene and James A McNamara Jr

Abstract

Background: The objective of this study is to evaluate the skeletal and dentoalveolar effects of the crown Herbst appliance used alone for a single phase of therapy followed by a 1-year observation period.

Methods: Forty patients (mean age 13.6 ± 1.3 years) with a stable Class I occlusion 1 year following the treatment with the crown Herbst appliance were selected from a prospective sample of 180 consecutively treated Class II patients. No other appliances were used during treatment or during the follow-up period. The dentoskeletal changes were compared with a matched sample of untreated Class II subjects (mean age 13.9 ± 1.6 years). Lateral cephalograms were taken before treatment, after Herbst treatment (1 year), and after 1-year follow-up. Overcorrection was avoided intentionally.

Results: Treatment produced an increase in mandibular length, a decrease in ANB angle, and a restriction in the vertical growth of posterior maxilla. The maxillary molars moved backward and tipped distally. The lower incisors proclined markedly, and the upper incisors became retroclined. During the follow-up period, the changes primarily were dentoalveolar in nature, with marked rebound of the upper molars and lower incisors, resulting in some increases in overbite and overjet.

Conclusions: The occlusal correction of Class II malocclusion observed 1 year after the crown Herbst appliance as a single-phase therapy was achieved primary due to the dentoalveolar changes and only limited skeletal change occurred.

Keywords: Herbst appliance; Cephalometrics; Class II malocclusion; Functional jaw orthopedics

Population *Setting* *Komorbiditäten*	**Klasse II Anomalie** • Treatment Group: Patients with stable Class I occlusion 1 year following treatment with the Herbst appliance were selected from a prospective sample of 180 consecutively treated Class II patients • Control Group: selected from the longitudinal records of the University of Michigan and the Denver Growth Studies
Schweregrad	Intervention: Overjet = 5,5 ± 2,2 mm; Overbite = 5,6 ± 1,3mm; ANB = 4,8 ± 1,9°; Kontrolle: Overjet = 5,5 ± 2,4 mm; Overbite = 4,5 ± 2,0mm; ANB = 4,5 ± 1,5°
Einschluss-kriterien *Bei Review: PICOS*	at least end-to-end Class II molar relationship bilaterally or more severe; permanent dentition; no previous orthodontic treatment or tooth extractions; fair oral hygiene (Aus Ursprungsstudie)
Ausschluss-kriterien	no periodontal problems; no temporomandibular joint complaints and lesions; no tooth size, form and number anomalies • no syndroms (Aus Ursprungsstudie)

Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** (Aus Ursprungsstudie) *cHerbst (Ormco, 1717 West Collins Avenue, Orange, CA) was used as the only tool for 12 months. The standard crowns were cemented with Ketac-Cem glass-ionomer cement (3M Espe Dental Products, St.Paul, MN 55144-1000) while occlusal rests on the lower first molars were secured with composite. At the start of treatment (T1) the appliance was activated to edge-to-edge incisor relationship. Patients were seen once every 4-6 weeks to evaluate the appliance status and the need for activation. The activations were performed by placing collars on pistons to make sure that the cusp of upper first premolar was projecting in between the lower first and second premolars to help natural vertical occlusion settling process.The appliance was removed after 12 months of active treatment (T2). After cHerbst removal, no appliance was provided and the patients were asked to come for a check up visit after 6 months (T3). All patients were treated by the same orthodontist (D.L.) in one private orthodontic office and the laboratory work was performed by the same technician.Patients with Class II division 2 malocclusion received braces on the upper front six teeth to convert the Class II division 2 into a Class II division 1malocclusion* VERSUCHSGRUPPE: **Herbst Group** N=40 (Anfang) / N=40 (Ende) / Alter = 13,6 ± 1,3 Jahre / ♂:♀ = 20:20 • Gebissphase: permanentes Gebiss <18 • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Therapie** (Aus Ursprungsstudie) *Control group: 18 subjects (11 males, 7 females, mean age 13.9±1.6 years) selected from the longitudinal records of the University of Michigan and the Denver Growth Studies and matched to the treated group as to skeletal maturity before and after treatment.* KONTROLLGRUPPE: **Untreated Control Group** N=18 (Anfang) / N=18 (Ende) / Alter = 13,9 ± 1,6 Jahre / ♂:♀ = 11:7 • Gebissphase: permanentes Gebiss <18 • KFO-Behandlung: keine Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: Cephalometric Treatment Effects
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	1. One year after treatment with the stainless steel crown Herbst appliance, the correction of the molar relationships was achieved primary due to dentoalveolar changes (66% dental vs. 34% skeletal). 2. Substantial distalization of the upper molars was achieved without significant effect on the upper incisors; therefore, the appliance could be recommended in dentoalveolar Class II cases, especially with crowding in the upper arch. 3. When clinically significant mandibular advancement is desirable, other treatment protocols or orthognathic surgery should be considered.

Zusammen-fassung der Ergebnisse	**Herbst Group** … VERSUS **Untreated Control Group** ***PRIMÄRZIELGRÖßE*** ***Skeletal changes*** *The Herbst appliance had no effect on the sagittal position of the maxilla. No significant change was found in the horizontal and vertical positions of the maxillary and mandibular landmarks with respect to the stable basic ranial reference system. During active treatment, the total mandibular length (Co-Gn) showed a statistically greater increase (1.3 mm, Table 3) with respect to the controls, an increase that was maintained in the posttreatment period (T1-T3 change, 1.5 mm), though not at a statistically significant level (Table 5). This alteration in the amount of mandibular growth during active treatment was associated with a significantly greater increase in the SNB angle (0.7°) and a significantly greater decrease In the ANB angle (−1.1°) that remained stable in the follow-up (T1-T3 change, 0.9°, and −0.6°, respectively). As for the skeletal vertical parameters, the palatal plane angle (pp to T-FMN) showed a significant clockwise rotation of 1.2° in the treated vs. the control group; this effect was maintained throughout the posttreatment period. No significant change was recorded in the inclination of the mandibular plane to FMN or in theCo-Go-Me angle* ***Dental changes*** *The treatment group showed a significant reduction of overjet (−2.7 mm) and correction of overbite (−2.3 mm) with respect to the controls. Although during the posttreatment period, a slight relapse was recorded for both overjet and overbite, statistically significant corrections were still present when considering the T1-T3 period (−1.4 and −1.0 mm, respectively). The upper first molars moved backward at a statistically significantly amount (2.7 mm) and tipped distally (7.1°) in comparison to the untreated group. Although a major portion of the tipping rebounded during the follow-up (to 2.7°), the Class I relationship of the buccal segments was preserved, and the upper molars remained significantly tipped back by 4.6° in the treated sample with respect to the controls. During treatment, the upper incisors showed a significant uprighting (−2.6°) that was maintained when considering the T1-T3 followup period (−2.3°). During active treatment (T1-T2), the lower first molars moved forward significantly by 2.5 mm and extruded significantly by 1.0 mm with respect to the controls. When considering the overall observation period (T1-T3), the lower molars still showed a significant forward movement of 2.1 mm while the extrusion of the lower molars was not statistically significant in comparison to control values. The lower incisors proclined significantly (4.6°) in the treated sample as opposed to the slight uprighting (−0.8°) in the controls during T1-T2. During the T2-T3 period, the lower incisors uprighted (−3.2°) as did the controls (−0.6°); when considering the overall observation period (T1-T3), the proclination of the lower incisors was still significantly greater in the treated group with respect to the controls by 2.8°. Although the appliance exerted a significant vertical force to the upper molars, no significant change in their vertical position was recorded. Vertical changes of the lower incisors in the study sample could be attributed to their proclination*

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign:* • *Historische Kontrollgruppe, Studiengruppe aus vorheriger Studie extrahiert* • *Keine Angaben zu Randomisierung/Verblindung* • *Suffizientes Matching der Gruppen vorhanden* *Durchführung:* • *Keine Angabe zu Behandler, detailliertem Behandlungsprotokoll* ➔ *Reliabilität der Intervention fraglich* • *Keine Angabe zur Compliance* *Auswertung:* • *Reliabiltiätsprüfung vorhanden (1 Behandler, Test auf Intra-Rater-Reliabilität), Solide Statistik (Shapiro-Wilk, Levene, t-Test)* *Power der Studie/Patientenzahl: Poweranalyse vorhanden* *Funding: keine Angabe* *Interessenkonflikte: angegeben, nicht vorhanden* *Bias (SIGN/AMSTAR/EinzelstudienRoB – alle negativen Punkte aus Fragebogen auflisten):* • *Selection bias: historische Kontrollgruppe, keine Aussage zur Rekrutierung der Patienten, keine Teilnehmerrate angegeben* • *Attrition bias: keine Angabe über Dropouts* • *Detection bias: keine Verblindung; Validität/Reliablität der Outcome-Erhebung fraglich,* • *Keine Confounders*
Schluss-folgerung des Begutachters	methodische Qualität: gut
	Klinische Aussagekraft: • In der Untersuchung 1y nach der Behandlung mit einem Herbst-Scharnier ist die Korrektur der Molarenrelation zu 66% dental, zu 34% skelettal • Eine Distalisation der Oberkiefermolaren wurde erreicht, ohne dass es zu signifikanten Effekten auf die Oberkieferfrontzähne kam • Die Apparatur kann für dentoalveoläre Kl. II Fälle mit Engständen im Oberkiefer empfohlen werden • Sollte eine klinisch signifikante Vorverlagerung des Unterkiefers gewünscht sein, sollten andere Behandlungsprotokolle oder ein kombiniert kieferorthopädisch-kieferchirurgisches Vorgehen angewendet werden
Evidenz-level (SIGN)	**2+**
Qualität **(RoB, SIGN /AMSTAR II)**	⊕ Acceptable

Evidenztabelle Jamilian et al. 1999

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Orthodontic Treatment of Malocclusion and its Impact on Oral Health-Related Quality of Life

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Abstract:

Objectives:

Malocclusion, though not life-threatening, has vast impact on individual's social interactions and self-esteem. Therefore, the aim of the current study was to assess whether orthodontic treatment of adolescents with malocclusion had any association with their oral health-related quality of life (OHRQoL).

Methods:

The subjects for this study were recruited at a state-funded university clinic. Data were collected from 100 participants aged 17 to 21 with moderate to severe malocclusion. Experimental group comprised of 50 subjects who were in the retention phase of their orthodontic treatment and the control group comprised of 50 untreated subjects. The shortened version of the Oral Health Impacts Profile (OHIP-14) as used to assess the subjects' oral health-related impact. T-test, Kruskal-Wallis, and Mann Whitney tests were used to analyze the data and *p*-value was set at $P = 0.05$.

Results:

In general, oral health-related quality of life of all subjects significantly improved after orthodontic treatment. ($p<0.001$) Subjects with moderate malocclusion showed better improvement than severe malocclusion subjects. ($P<0.001$)

Conclusion:

This study showed that oral health-related quality of life improves with the treatment of malocclusion.

Keywords: Malocclusion, OHIP, OHRQoL, Orthodontic treatment, Quality of life.

Population *Setting* *Komorbiditäten*	**„Malokklusion/Dysgnathie“ allg.** The samples were selected from people who were referred to orthodontic department of IAU from February to August 2012. Islamic Azad University of medical sciences (IAU), Tehran. Same socioeconomic factors including sex, race, social class, and level of education.

Schweregrad	IOTN Grade 3 and 4
Einschluss-kriterien *Bei Review: PICOS*	moderate to severe malocclusion using Index of Orthodontic Treatment Need (IOTN) grades of 3 and 4; age range of 17 to 21 years; having the same socioeconomic factors including sex, race, social class, and level of education; none of the patients had undergone orthognathic surgery
Ausschluss-kriterien	Orthognathic surgery
Intervention Versuchsgruppe	**kieferorthopädische Behandlung** **Orthodontic treatment except for orthognathic surgery:** The experimental group consisted of 50 subjects who had undergone orthodontic treatment for 2 years for treatment of their moderate to severe malocclusion. VERSUCHSGRUPPE 1: **Experimental (treated) group IOTN Grade 3-4** N=50 (Anfang) / N=50 (Ende) / Alter = 19.58 Jahre / ♂:♀ = 14:36 • Gebissphase: permanentes Gebiss >18 Jahre, <18 Jahre • KFO-Behandlung: reguläre Behandlung, Spätbehandlung *Versuchsgruppe 1: experimental (treated) group IOTN Grade 3 (moderate): N=25* *N=25 (Anfang) / N=25 (Ende) / Alter=19.96±4.1 /* ♂:♀=8:17 *Versuchsgruppe 2: experimental (treated) group IOTN Grade 4 (severe): N=25* *N=25 (Anfang) / N=25 (Ende) / Alter=19.2±3.64 /* ♂:♀=6:19
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** **No orthodontic treatment:** The control group included 50 untreated patients who had moderate to severe malocclusions. KONROLLGRUPPE: **Control (untreated) group IOTN Grade 3-4** N=50 (Anfang) / N=50 (Ende) / Alter = 18.82 Jahre / ♂:♀ = 19:31 • Gebissphase: permanentes Gebiss >18 Jahre, <18 Jahre • KFO-Behandlung: keine Behandlung *Kontrollgruppe 1: control (untreated) group IOTN Grade 3 (moderate): N=25* *N=25 (Anfang) / N=25 (Ende) / Alter= 18.32 ± 3.66/* ♂:♀*=10:15* *Kontrollgruppe 2: control(untreated) group IOTN Grade 4 (severe): N=25* *N=25 (Anfang) / N=25 (Ende) / Alter= 19.32 ± 4.35/* ♂:♀*=9:16*

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **mundgesundheitsbezogene Lebensqualität (MLQ), psychische Entwicklung** PRIMÄRZIELGRÖßE: effects of malocclusion and its orthodontic treatment on the quality of life of adolescents
Studientyp	**Querschnittsstudie**
Schluss-folgerungen der Autoren	Subjects with moderate to severe malocclusion with no history of orthodontic treatment had more negative OHRQoL than adolescents who had completed orthodontic treatment.
Zusammen-fassung der Ergebnisse	**GRUPPE Experimental (treated) group IOTN Grade 3-4 VS. GRUPPE Control (untreated) group IOTN Grade 3-4** Experimental (treated) group 1 u. 2 VERSUS control (untreated) group 1 u. 2 ***PRIMÄRZIELGRÖßE*** *Subjects with moderate malocclusion who had undergone orthodontic treatment had the lowest mean score of 1.12 ± 1.69; while, the control group subjects with severe malocclusion had the highest mean score of 20.76 ± 6.64. Kruskal-Wallis test showed that mean scores of treated subjects were significantly lower than control group which is indicative of lower OHRQoL in subjects who haven't undergone orthodontic treatment (P<0.001) (Table 3).* *However, in Table 4 Man-Whitney test shows that even after treatment subjects with sever[e] malocclusion had lower OHRQoL than the subjects with moderate malocclusion.*

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	- *Studiendesign: Keine Angabe über genaue Probandenauswahl, Verteilung der unterschiedlichen Fehlstellungen in den Gruppen (Gruppenunterschiede?), Art der Fehlstellung Einfluss auf Veränderung der OHrQoL?; keine longitudinalen Ergebnisse (prä/post treatment)* ***+*** *Schweregrade/Gender/ getestet – keine Baselineunterschiede;* *Auswertung/ Durchführung: 2OHIP14-Fragebogen – „erprobter/anerkannter“ Fragebogen, Vergleichbarkeit – Auswertung eindeutig, hier allerdings auch nur Gesamtwerte angegeben.* *Power der Studie/Patientenzahl:* A sample size calculation was carried out using data of a study investigating effects of malocclusion and its orthodontic treatment on the quality of life of adolescents and other similar studies which used convenient clinical samples for their study [3, 10]. It was estimated that a sample size of 46 subjects was needed to demonstrate a significant change in OHRQoL, with **an 80 per cent probability power at the 5% level of significance**. Considering possible dropouts, the samples size was increased by 10%; resulting in a final sample size of 50 participants. *Funding:* ACKNOWLEDGEMENTS Declared none. *Interessenkonflikte:* The authors confirm that this article content has no conflict of interest. *Bias (SIGN/AMSTAR/EinzelstudienRoB – alle negativen Punkte aus Fragebogen auflisten):* Authors do not indicate the actual participation rate. There is no mention made of the possibility/likelihood that some eligible subjects might have the outcome at the time of enrolment is assessed. Can’t say if there was recognition that knowledge of exposure status could have influenced the assessment of outcome. (- Patient weiß zwangsläufig von vorangegangener KFO-Therapie/ Untersucher hat bei Zusammenrechnen der Scores eigentlich keine Möglichkeit für Befangenheit) Das Fehlen von longitudinalen Daten wird als möglicher Störfaktor benannt, aber nicht weiter berücksichtigt. No confidence intervals are provided.
Schluss-folgerung des Begutachters	methodische Qualität: insgesamt gut, Erhebung des Outcome validiert (OHIP14)
	Klinische Aussagekraft: Es ist zu erwarten, dass Erwachsene mit kieferorthopädischen Fehlstellungen der Schwere 3-4 (IOTN) nach kieferorthopädischer Behandlung allgemein (nicht differenziert nach Art der Fehlstellung) höhere OHRQoL-Werte aufweisen als Erwachsene ohne abgeschlossene KFO-Behandlung.
Evidenz-level (SIGN)	**3**
Qualität **(RoB, SIGN /AMSTAR II)**	+

Evidenztabelle Janson et al., 2000

Eruption guidance appliance effects in the treatment of Class II, Division 1 malocclusions

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Bauru, Brazil, and Winnetka, Ill

The objective of this research was to cephalometrically evaluate the possible effects of the Eruption Guidance Appliance on the craniofacial complex in a sample of 30 patients, over a treatment period of 26 months. The experimental sample consisted of 30 patients (13 females and 17 males), 27 of which presented with a Class II, Division 1 malocclusion and 3 with a Class I malocclusion. The mean initial chronologic age was 9 years; the treatment period lasted 26 months. A control group was used for comparison and consisted of 30 subjects (13 females and 17 males) of similar ages and spanned a similar observation period. Twenty-six subjects of this control group had Class II, Division 1 malocclusions, and 4 had Class I malocclusions. Lateral cephalometric headplates were obtained for the experimental group initially and after 26 months of treatment. The subjects in the control group were randomly selected from a serial growth study sample from the Orthodontic Department at Bauru Dental School, University of São Paulo, for whom cephalometric headplates were obtained annually from 4 to 18 years of age. Comparative statistics were used to assess possible differences between the experimental and control groups during the 26-month period of observation. Results demonstrated statistically significant increases in mandibular growth, degree of mandibular protrusion, lower anterior and total anterior face height, mesial migration of the lower molars, and mandibular posterior dentoalveolar height. There was also lingual tipping and retrusion of the upper incisors, linear protrusion of the lower incisors, improvement in the maxillomandibular relationship and in molar relationship, as well as a significant decrease in the overjet and overbite and an inhibition of the vertical development of the upper incisors. The study demonstrated no significant changes in maxillary growth during the evaluation period. It was concluded from these results that the effects of the Eruption Guidance Appliance during this time period were mostly dentoalveolar, with a smaller, but significant, skeletal effect. (Am J Orthod Dentofacial Orthop 2000;117:119-29)

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0889-5406/2000/$12.00 + 0 8/1/99482

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** • Patients • EGA (Eruption guidance appliance): Bauru Dental School University of São Paulo Untreated control: Orthodontic Department longitudinal growth study at the Bauru Dental School University of São Paulo
Schweregrad	Class II, Division 1, malocclusion with at least an end-to-end Class II molar relationship (1/2 Class II) and 3 presented with a Class I, all with excessive overbites.
Einschluss-kriterien *Bei Review: PICOS*	EGA (Eruption guidance appliance): • Behandlung mit Eruption guidance appliance (EGA) • Excessive overbite Untreated control: • excessive vertical overbites • no previous orthodontic treatment

Ausschluss-kriterien	EGA (Eruption guidance appliance): unzureichende Compliance (This treatment sample of 30 cases was selected from a total sample of 60 that had begun treatment at the same time, based on the best results obtained and compliance level from among the broader sample after 10 months in treatment.)
Intervention Versuchsgruppe	**kieferorthopädische Behandlung** *Bergersen in 1975, developed a prefabricated elastomeric appliance to correct malocclusions. It presents the combined characteristics of a functional appliance and a positioner and is called the Eruption Guidance Appliance (EGA) (ORTHO-TAIN, Inc, Bayamon Gardens, PR). The characteristics attributed to functional appliances are mandibular advancement in order to correct Class II sagittal discrepancies, concurrently with a vertical opening in the anterior region to provide a greater vertical development of the posterior teeth. Positioners usually achieve minor tooth movement after orthodontic treatment as a result of the elastomeric material. The appliance basically consists of a single elastic device with intercuspation for the upper and lower teeth in normal occlusion.* *Each patient was instructed to use the appliance while sleeping and for 4 hours during the daytime. These 4 hours were to be divided into 4 periods of 1 hour each. In each 1 hour period, the patient was to bite into the appliance heavily for 1 minute and gently for the following minute for the first half-hour. During the second half-hour, the patient was instructed to only bite gently into the appliance, always keeping the lips in contact.* *monitored monthly* *Each patient was given a printed form and was asked to keep a daily chart of appliance wear. Patients were asked to bring the forms to each visit for tabulation. An additional check on their cooperation was made with an appearance change in the appliance material, which is made to alter according to the number of hours it is in the mouth actively. It should be emphasized that the results obtained in the study were from selected cases consisting of those with the best results with greater compliance than those of the broader sample.* VERSUCHSGRUPPE: **EGA (Eruption guidance appliance)** N=30 (Anfang) / N=30 (Ende) / Alter = 9 ± ?? Jahre / ♂:♀ = 17:13 • Gebissphase: frühes Wechselgebiss, spätes Wechselgebiss • KFO-Behandlung: Frühbehandlung (interzeptiv), reguläre Behandlung Anmerkung: This treatment sample of 30 cases was selected from a total sample of 60 that had begun treatment at the same time, based on the best results obtained and compliance level from among the broader sample after 10 months in treatment.
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** *obtained from the files of the Orthodontic Department longitudinal growth study at the Bauru Dental School University of São Paulo* KONTROLLGRUPPE: **untreated control (UC)** N=30 (Anfang) / N=30 (Ende) / Alter = 9 ± ?? Jahre / ♂:♀ = 17:13 • Gebissphase: frühes Wechselgebiss, spätes Wechselgebiss • KFO-Behandlung: keine

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: *Cephalometric skeletal and dental effects)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	It seems that craniofacial growth of patients presenting Class II malocclusions can be altered significantly in specific dental and skeletal areas of the craniofacial complex by the EGA, in order to normalize the occlusion. It was concluded that the effects produced by the EGA were as follows: 1. There were no significant changes in maxillary growth. 2. There was a significant increase in mandibular growth and in the degree of mandibular protrusion. 3. There was a significant increase in lower anterior and total anterior face height. 4. Lingual tipping and retrusion of the upper incisors occurred, as well as a protrusion of the lower incisors. 5. There was no labial tipping of the lower incisors. 6. There was increased lower molar mesial drifting and increased lower posterior dentoalveolar height. 7. There was a significant improvement in the maxillomandibulara nd molar relationships. 8. There was a significant decrease in the overjet and overbite and an inhibition of the vertical development of the upper incisors.
Zusammen-fassung der Ergebnisse	**EGA VS. UC** ***PRIMÄRZIELGRÖßE*** *Cephalometric skeletal and dental effects* **Changes in the Maxillary Component** There were no significant changes in any of the 4 maxillary variables measured, namely SNA, SN.ANS, A-Nperp and Co-A. **Mandibular Component** One of the most interesting results of this study was the statistically significant increase in mandibular length (Co-Gn) of the experimental group. There was no evidence of a morphologic change in the mandible, as measured by the angle ArGoMe between the experimental and control groups. The greater increase in mandibular length in the experimental group contributed to the larger increase in the variable Pog-Nperp (Table I), which represents mandibular protrusion, than that present in the control group. **Changes in Maxillomandibular Relations** The improvement in basal relations was the result of relatively small changes in maxillary development in the anterior direction, and mainly by the improvement in the horizontal position of the mandible in the experimental group. **Vertical Component** In this study, the variables SNGoGn and NSGn did not present statistically significant changes in the experimental group as compared to the control group. There were no statistically significant changes in the upper anterior face height (N-ANS). The current study did not show any statistically significant opening of the mandibular plane angle. The lower anterior face height increased at a greater rate in the experimental than in the control group.

	The total anterior face height also presented a statistically significant increase in the experimental group during the evaluation period. **Changes in the Upper Dentoalveolar Component** The EGA presented a similar effect to other functional appliances,* causing lingual tipping (1.PP) and linear retrusion (1-ANSperp) of the upper incisors in the experimental group There was inhibition of the vertical development of the upper incisors in the experimental group. The upper molars experienced a nonstatistically significant restriction of their vertical development. The variable 6-ANSperp demonstrated that the upper molars experienced a distal movement that was not statistically significant, in relation to the control group. **Changes in the Lower Dentoalveolar Component** There was no statistically significant labial tipping of the lower incisors (IMPA, Table I) or any significant restriction of their vertical development (1–MP, Table I). The forward linear movement of the lower incisors has commonly been observed with the use of functional appliances,* and was also observed for the EGA (1–Pogperp, Table I). In the experimental group there was a significant mesial movement of the lower first molars in relation to the control group (6–-Pogperp: -1.93 mm and –1.51 mm) The greater vertical lower molar development observed in the experimental group (6–-MP) **Changes in Incisor Relationship** The changes in the interincisor angle (1.1) were not statistically different between the experimental and control groups. The decrease in overjet was also statistically greater in the experimental group as compared to the control group. The overbite had a statistically significant reduction in the experimental group in relation to the control group. intrusion of the upper incisors. **Changes in Molar Relationship** There was a statistically significant improvement in molar relationship in the experimental group in relation to the control group.
Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign:* • retrospektive Kohortenstudie • keine klar definierten Einschlusskriterien • in beiden Gruppen sowohl Kl.-II als auch Kl-I- Patienten, deswegen Ergebnisse nicht eindeutig auf eine Patientenpopulation übertragbar *Durchführung:* • Matching vorhanden • standardisiertes Vorgehen für Intervention beschrieben • 1 FRS-Auswerter • p-Werte nicht detailliert angegeben • sehr gute Diskussion und Vergleich mit ähnlichen Studien *Auswertung:* • Normalverteilung geprüft • standardisierte und reliable FRS-Analyse *Power der Studie/Patientenzahl:* keine Poweranalyse angegeben *Funding:* kA *Interessenkonflikte:* kA

	Bias (SIGN/AMSTAR/EinzelstudienRoB – alle negativen Punkte aus Fragebogen auflisten): • Have confidence intervals been provided?- No (sign) • EGA: This treatment sample of 30 cases was selected from a total sample of 60 that had begun treatment at the same time, based on the best results obtained and compliance level from among the broader sample after 10 months in treatment. ➔ Ergebnisse nicht auf Gesamtbevölkerung übertragbar
Schluss-folgerung des Begutachters	methodische Qualität: gut
	Klinische Aussagekraft: Die Behandlung mit EGA kann im Vergleich zu ausbleibender Behandlung zu einer Vergrößerung der Mandibula-Länge, einer Verbesserung der Kieferbasenrelation, einer Bisshebung, einer Verringerung des OJ sowie einer Verbesserung der Okklusion führen. Allerdings ist nicht vorhersehbar, ob diese Effekte bei Klasse-II-Ausgangssituation gleichermaßen eintreten wie bei Klasse-I-Ausgangssituation.
Evidenz-level (SIGN)	**2++**
Qualität (RoB, SIGN /AMSTAR II)	**High quality (++)**

Evidenztabelle Janson et al., 2003

Class II treatment effects of the Fränkel appliance

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SUMMARY The objective of this work was to evaluate prospectively and cephalometrically the effects of the function regulator (FR) on dentoskeletal components during a treatment period of 28 months. The subjects consisted of 18 patients presenting with a Class II division 1 malocclusion, with a mean chronological age of 9 years 3 months at the beginning of treatment. The treated group was compared with a compatible control group of 23 untreated subjects observed during the same time period. Lateral cephalometric head films were obtained for the treated group at the beginning and after 28 months of treatment. The subjects in the control group belonged to a serial growth study sample from the Orthodontic Department at Bauru Dental School, University of São Paulo, for whom cephalometric head films were obtained annually from 4 to 18 years of age. The data for the control group were calculated from these head films. A student's *t* test was used to compare the changes observed in the treated group with those in the control group. Differences were considered statistically significant at $P < 0.05$.

The results demonstrated that the FR produced a statistically significant increase in the mandibular body, in the proportional size of the mandible to the maxilla and in lower anterior face height (LAFH); induced greater vertical development of the mandibular molars; reduced the overjet and overbite and produced an improvement in the molar relationship. Retrusion and palatal tipping of the maxillary incisors was also observed. However, the appliance did not produce any changes in maxillary development, in the growth pattern, or any improvement in the basal relationship. Therefore it was concluded that the effects of the FR in the correction of Class II malocclusions are primarily dento-alveolar, with a smaller participation of skeletal changes.

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Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** • Patients/untreated subjects • FR-1: the Orthodontic Department graduate clinic at Bauru Dental School, University of São Paulo, Untreated control: longitudinal growth study at the Orthodontic Department of the same dental school
Schweregrad	at least an end-to-end Class II molar relationship (1/2 cusp Class II)
Einschluss-kriterien *Bei Review: PICOS*	Class II, division 1 malocclusion with at least an end-to-end Class II molar relationship (1/2 cusp Class II).
Ausschluss-kriterien	FR-1: lack of co-operation (The subjects were selected from a total sample of 23 patients who had begun treatment at the same time. Five were excluded because of lack of co-operation, detected after 1 year of treatment.

Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** *The construction, adaptation, and use of the FR-1 were followed according to Fränkel and Fränkel (1989) and McNamara (1982, 1993).* *A maximum initial mandibular advancement of 6 mm was performed in patients with an overjet equal to or larger than this. Therefore, in subjects with an overjet larger than 6 mm, a second advancement was needed (Fränkel and Fränkel, 1989). In patients with an overjet less than 6 mm, the mandible was advanced until an edge-to-edge incisor anteroposterior relationship was obtained (McNamara, 1982, 1993).* VERSUCHSGRUPPE: **function regulator 1 (FR-1)** N=23 (Anfang)/ N=18 (Ende) / Alter = 9J 3M ± ?? / ♂:♀ = 10:8 • Gebissphase: frühes Wechselgebiss, spätes Wechselgebiss (anhand Alter) • KFO-Behandlung: Frühbehandlung (interzeptiv), reguläre Behandlung (anhand Alter)
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Therapie** *obtained from the files of a longitudinal growth study at the Orthodontic Department of the same dental school* KONTROLLGRUPPE: **untreated control (UC)** N=23 (Anfang) / N=23 (Ende) / Alter = 9J 3M ± ?? / ♂:♀ = 13:10 • Gebissphase: frühes Wechselgebiss, spätes Wechselgebiss (anhand Alter) • KFO-Behandlung: keine
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: *Cephalometric skeletal and dental changes*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	FR treatment of Class II malocclusions, after an experimental period of 28 months, produced the following changes: 1. An increase in mandibular body length. 2. A proportionally greater increase in mandibular growth as compared with maxillary growth. 3. An increase in LAFH without altering the facial growth pattern. 4. Pronounced vertical development of the mandibular molars. 5. A reduction in the overbite and overjet, and improvement in the molar relationship. 6. Retrusion and palatal tipping of the maxillary incisors.

Zusammen-fassung der Ergebnisse	**FR-1 VS. UC** ***PRIMÄRZIELGRÖßE*** *Cephalometric skeletal and dental changes* *Maxilla* The results demonstrated no statistically significant influence on maxillary development because the changes in maxillary position and effective length were similar for both groups. *Mandible* The mandibular position variables also did not show any statistically significant differences, similar to the maxillary position variables. No statistically significant difference in the effective mandibular length (Co–Gn). Changes in mandibular body length were statistically significant and 1.63 mm greater in the treated group than in the control group, showing the bone remodeling of the mandibular ramus. Both groups presented a similar tendency for a slight decrease in Co.Go.Me. Although the mandibular protrusion was slightly greater in the treated group than in the control group, it was not statistically significant. *Maxillomandibular relationship* The changes in the angular maxillomandibular variables (ANB and NAP) did not present statistically significant differences between the two groups. The changes in the proportion between maxillary and mandibular effective lengths (Co–A:Co–Gn) were statistically significant between the two groups. *Facial growth pattern* There was no statistically significant difference for the variables FMA, SN.GoGn, SN.PP and SN.OP. The increase in LAFH in the treated group was significantly larger than in the control group. The lower posterior face height (LPFH; S–Go) increased similarly in both the treated and the control groups. However, there was a statistically significant difference in the proportion between the LPFH and LAFH (S–Go/ANS–Me). *Maxillary dento-alveolar component* The treated group had significant palatal tipping and a decrease in protrusion of the maxillary incisors compared with the control group. There was no restriction of the vertical development of the maxillary incisors in the treated group. The dento-alveolar height as well as the anteroposterior position of the maxillary molars did not present statistically significant differences between the two groups. *Mandibular dento-alveolar component* The treated group did not present statistically significant antero-posterior changes in the mandibular incisors, in relation to the control group. The behaviour of the mandibular incisor dentoalveolar height (1-GoMe) was similar in both groups. There was no statistically significant difference in mandibular molar mesial displacement between the two groups (6^{-}-Pogperp). Probably the most interesting finding is the greater vertical development of the mandibular molars in the treated group: on average, almost 1.5 mm greater than in the control group (6-GoMe).

	Dental relationships The changes in dental relationships were all statistically different between the two groups, showing an improvement in the treated group as compared with the control group. In the control group there was even a tendency for the overbite to increase. There was a significant retrusion of the maxillary incisors (1-ANSperp) as well as a nonsignificant protrusion of the mandibular incisors (1-Pogperp) and improvement in the basal relationship (ANB, Wits). For overbite correction, both groups demonstrated a similar increase in the distance from the maxillary and mandibular incisal edges. The molar relationship improved as a result of the statistically non-significant individual changes in the maxillary and mandibular molars to their respective apical bases (6-ANSperp and 6-Pogperp).
Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign:* • retrospektiv • ausführliches Matching > kaum Baseline-Imbalancen *Durchführung:* • Standardisiertes Behandlungsprotokoll *Auswertung:* • PP-Analyse • 1 FRS-Auswerter • Reliabilitätsprüfung vorhanden • Standardisierte FRS-Auswertung • P-Werte im Einzelnen angegeben • Normalverteilung getestet *Power der Studie/Patientenzahl:* keine Poweranalyse vorhanden; Dropouts nicht als solche eindeutig benannt *Funding:* The authors would like to acknowledge CNPQ (Brazilian National Research Foundation) for its support *Interessenkonflikte:* kA *Bias (SIGN/AMSTAR/EinzelstudienRoB – alle negativen Punkte aus Fragebogen auflisten):* • Have confidence intervals been provided? – No (sign) • Ausschluss von 5 Teilnehmern nach Studienbeginn aufgrund mangelhafter Compliance > keine eindeutige Übertragung auf Gesamtbevölkerung mgl.
Schluss-	methodische Qualität: befriedigend

folgerung des Begutachters	Klinische Aussagekraft: Die Behandlung von Kl.II-Patienten mit dem FR über einen Zeitraum von 28 Monaten führt im Vergleich zur Nichtbehandlung zu: • Vergrößerung der UK-Länge • Reduktion von OJ und OB mit Verbesserung der Okklusion • Retrusion und Palatinalkippung der OK-Frontzähne • Ausgeprägte Extrusion der UK-Molaren • Signifikante Zunahme der unteren vorderen Gesichtshöhe
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN /AMSTAR II)	**Acceptable (+)**

Evidenztabelle Javidi, H. et al., 2017

Does orthodontic treatment under the age of 18 years improve the oral health related quality of life of young people? A systematic review & meta-analysis.

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ABSTRACT

Introduction: Orthodontics aims to improve oral health-related quality of life (OHRQoL). This systematic review examined the evidence for changes in OHRQoL following orthodontic treatment.

Methods: Participants: patients aged <18 yrs; Interventions: non-orthognathic/cleft orthodontic treatment; Comparisons: before- and after-orthodontic treatment, and/or non-orthodontic control; Outcomes: validated measures of OHRQoL; Study designs: RCTs, CCTs, prospective cohort studies, cross-sectional or case-control studies. Multiple electronic databases were searched, with no language restrictions, authors were contacted and reference lists screened. The Newcastle-Ottawa scale was used for quality assessments. Screening, data extraction and quality assessments were performed by two investigators independently.

Results: 1590 articles were found and 13 studies were included (9 cohort, 3 cross-sectional and 1 case-control), six in meta-analyses. All were judged low or moderate quality. A moderate improvement in OHRQoL was observed before and after orthodontic treatment (n = 243 participants; SMD = -0.75, 95% CI -1.15 to -0.36) particularly in the dimensions of emotional well-being (n = 213 participants; SMD = -0.61, 95% CI -0.80 to -0.41) and social well-being (n = 213 participants; SMD = -0.62, 95% CI -0.82 to -0.43).

Conclusions: Orthodontic treatment during childhood or adolescence leads to moderate improvements in the emotional and social well-being dimensions of OHRQoL, although the evidence is of low and moderate quality. More high quality, longitudinal, prospective studies are needed.

Population *Setting* *Komorbiditäten*	**„Malokklusion/Dysgnathie“ allg.** • Patients aged 17 years or under at the start of their orthodontic treatment
Schweregrad	Keine Angaben

Einschluss-kriterien *Bei Review: PICOS*	Population: Patients aged 17 years or under at the start of their orthodontic treatment; Intervention: Any form of orthodontic treatment provided in primary, secondary or tertiary care settings. This included orthodontic treatment that involved the use of extractions, surgical exposure of unerupted teeth or surgical removal of teeth; Comparison: comparison group with subjects who had not undergone orthodontic treatment. This could include subjects who were not due to undergo orthodontic treatment, or patients who were on the waiting list but had not yet started treatment. (Before- and after orthodontic treatment nicht LL-relevant); Outcome: PRIMÄRZIELGRÖßE: **OHRQoL)**using a validated measure such as the Child Perception Questionnaire (CPQ)) at any time period following orthodontic treatment. SEKUNDÄRZIELGRÖßE: Secondary outcome measures included the dimensions of OHRQoL comprising, but not limited to, FL, OS, EWB and SWB. – nicht für LL-relevante Studien erhoben; Study type: Randomized and controlled clinical trials, prospective cohort studies, crosssectional or case-control studies, with data collection or follow-up periods following the completion of orthodontic treatment were to be included.
Ausschluss-kriterien	1. patients with craniofacial syndromes and cleft lip or palate; 2. patients who had undergone previous courses of orthodontic treatment; 3. orthognathic surgery
Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** VERSUCHSGRUPPE: **Orthodontic treatment** N=1295 (Anfang) / N=?? (Ende) / Alter = 12,5-30 Jahre / ♂:♀ = ?:? • Gebissphase: frühes und spätes Wechselgebiss, permanentes Gebiss < & ≥ 18. Lebensjahr • KFO-Behandlung: Frühbehandlung (interzeptiv), reguläre Behandlung, Spätbehandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Therapie** KONTROLLGRUPPE: **no treatment** N= 2701 (Anfang) / N=?? (Ende) / Alter = 12,9-30 Jahre / ♂:♀ = ?:? • Gebissphase: spätes Wechselgebiss, permanentes Gebiss < & ≥ 18. Lebensjahr • KFO-Behandlung: keine Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** **und** **medizinischer Schaden, Nebenwirkunge bzw. Zunahme der Anomalie/ Malokklusion/ Dysgnathie** • **mundgesundheitsbezogene Lebensqualität (MLQ), psychische Entwicklung** OHRQoL (using a validated measure such as the Child Perception Questionnaire (CPQ)) - weitere Outcomes nicht für LL-relevante Studien erhoben

Studientyp	**Systematisches Review (mit Meta-Analyse für 2 Studien)** Inkludierte Studien in Bezug auf PICO: 3 cross-sectional, 1 case control, 2 cohort studies N=6 (nur 2 davon mit Meta-Analyse) Gesamt-Teilnehmerzahl in Bezug auf PICO: N=3996 (N = 734 für Meta-Analyse) o.g. Zahlen betreffen die LL-relevanten Studien, insgesamt: N = 13
Schluss-folgerungen der Autoren	***Betrifft gesamtes Review, nicht nur LL-relevante Studien*** On the basis of this review, it is reasonable to conclude that there is some evidence, albeit of low and moderate quality, that orthodontic treatment provided during childhood or adolescence leads to **moderate improvements in OHRQoL following treatment**. This appears to be particularly true for the EWB and SWB dimensions of OHRQoL. There is an urgent need for high quality, prospective studies to explore this further, and to determine whether observed benefits in OHRQoL are short or long-term in nature, and whether specific types or severities of malocclusion are more likely to benefit than others.
Zusammen-fassung der Ergebnisse	**GRUPPE Orthodontic treatment VS. GRUPPE no treatment** **OHRQoL** (using a validated measure such as the Child Perception Questionnaire (CPQ)) *Zeitpunkt des Vergleiches: at any time period following orthodontic treatment* Figure 5 is a forest plot showing the pooling of data from two studies comparing OHRQoL levels in a sample of non-orthodontic subjects and a group of orthodontically treated subjects, based on 442 (21) and 199 subjects18 respectively. This shows **no statistically significant differences** between the two groups (SMD 0.04, 95% CI -0.13, 0.21).

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign: Registrierung a priori, RoB-Analyse berücksichtigt keine Störfaktoren, Messungen können lt. Einschlusskriterien zu jedem Zeitpunkt während der KFO-Behandlung vorgenommen werden, die Art der kieferorthopädischen Therapie ist nicht näher definiert* *Durchführung: umfangreiche Literaturrecherche, Angaben zu eingeschlossenen Einzelstudien z.T. ungenau (v.a. bzgl. Kontroll-/Versuchsgruppe und Outcome), Datenextraktion/ Literatursichtung/ RoB-Bewertung durch zwei unabhängige Auswerter, lt. Einschlusskriterien nur Jugendliche unter 17 Jahren eingeschlossen – aber in 1 Studie (Arrow 2011) liegt das Durchschnittsalter bei 30 Jahren* *Auswertung: keine RCTs, Meta-Analyse nur für 2 Studien möglich, restliche 4 Studien nur in der Tabelle erwähnt –ohne Outcomes und kaum ‘narrative Analyse’, Kontrollgruppe doppelt so groß wie Versuchsgruppe* *Power der Studie/Patientenzahl: 6/3996 (nur LL-relevant)* *Funding:* The source of funding for the review was a National Institute for Health Research Academic Clinical Fellowship for Hanieh Javidi. *Interessenkonflikte:* The authors report no conflicts of interest. *Bias (SIGN/AMSTAR/EinzelstudienRoB – alle negativen Punkte aus Fragebogen auflisten):* **3. Did the review authors explain their selection of the study designs for inclusion in the review?** **9. Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?** **10. Did the review authors report on the sources of funding for the studies included in the** **11. If meta-analysis was performed did the review authors use appropriate methods for st combination of results?** **12. If meta-analysis was performed, did the review authors assess the potential impact of individual studies on the results of the meta-analysis or other evidence synthesis?** **15. If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the resul review?** *Publikationsbias (Reviews):* Publication bias could only be assessed where at least ten studies were included in the metaanalysis. The two statistical measures that would be used for this purpose were the rank correlation of Begg’s test and the Egger’s test. – nicht durchgeführt (n <10)
Schluss-folgerung des Begutachters	methodische Qualität: Review moderat, Einzelstudien (soweit beurteilbar) moderat
	Klinische Aussagekraft: Die mundgesundheitsbezogene Lebensqualität der Jugendlichen unter 18 Jahren, die eine kieferorthopädische Behandlung erfahren, scheint gegenüber der von unbehandelten Heranwachsenden nicht verändert zu sein. Dabei betrifft dies gleichermaßen festsitzende und interzeptive Therapien. Aufrgund der geringen Datenmenge (2 Studien) sollte diese Feststellung aber in weiteren Studien genauer untersucht werden.
Evidenz-level (SIGN)	**2+**
Qualität **(RoB, SIGN /AMSTAR II)**	**Moderat ++**

Evidenztabelle Jena, Duggal et al. 2006

Original Article

Treatment Effects of Twin-Block and Mandibular Protraction Appliance-IV in the Correction of Class II Malocclusion

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ABSTRACT

Objective: To evaluate the treatment effects of twin-block and Mandibular Protraction Appliance-IV (MPA-IV) in the treatment of Class II division 1 malocclusion.

Methods: Fifty North Indian girls with Class II division 1 malocclusion, in the age range of 9–13 years, were chosen. The subjects were divided among a control group ($n = 10$), a twin-block group ($n = 25$), and an MPA group ($n = 15$). Pre–follow-up and post–follow-up lateral cephalograms of control subjects and pretreatment and posttreatment lateral cephalograms of the treatment subjects were traced manually and subjected to a pitchfork analysis.

Results: Neither twin-block nor MPA-IV significantly restricted the forward growth of maxilla. Mandibular growth and improvement in the sagittal skeletal relation were significantly greater in the twin-block subjects. Distal movement of the maxillary dentition and mesial movement of the mandibular dentition were more prominent in the MPA-IV subjects. Molar correction and overjet reductions were significantly greater in the treatment subjects ($P < .001$).

Conclusion: Twin-block and MPA-IV were effective in correcting the molar relationships and reducing the overjet in Class II division 1 malocclusion subjects. However, twin-block contributed more skeletal effects than MPA-IV for the correction of Class II malocclusion. (*Angle Orthod.* 2010;80:485–491.)

KEY WORDS: Treatment effects; Twin-block; MPA; Class II malocclusion

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Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** • North Indian girls with Class II division 1 malocclusion; Orthodontic Department, Centre for Dental Education and Research, All India Institute of Medical Sciences, New Delhi, India (Versuchsgruppen) bzw. Orthodontic Department, RAMA Dental College, Kanpur, India (Kontrollgruppe)
Schweregrad	Unterkieferneigung 20-25°, Overjet 6-10mm

Einschluss-kriterien *Bei Review: PICOS*	Class II division 1 malocclusion with normal maxilla, retrognathic mandible, Angle’s Class II molar relationship bilaterally, FMA in the range of 20–25 degrees, minimal or no crowding or spacing in either arch, overjet of 6–10 mm
Ausschluss-kriterien	Subjects with a history of orthodontic treatment, anterior open bite, severe proclination of anterior teeth, or any systemic disease affecting bone and general growth were excluded from the study.
Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** VERSUCHSGRUPPE 1: **Twin block group** The subjects of the twin-block group were treated with a standard twin-block appliance. Single-step mandibular advancement was carried out during the waxbite registration. An edge-to-edge incisor relationship with a 2- to 3-mm bite opening between the central incisors was maintained for all of the subjects. The patients were instructed to wear the appliance 24 hours/day, especially during mealtimes. All of the subjects were followed once every 4 weeks until the end of active appliance therapy. Interocclusal acrylic was trimmed in all of the subjects, and the labial bow was kept passive during the treatment. Appliance use was discontinued when overjet and overbite were reduced to 1–2 mm. Duration of appliance therapy varied greatly depending on the level of patient cooperation. N=25 (Anfang) / N=25 (Ende) / Alter = 11.40 ± 0.90 Jahre / ♂:♀ = 0:25 • Gebissphase: spätes Wechselgebiss, permanentes Gebiss <18 • KFO-Behandlung: reguläre Behandlung VERSUCHSGRUPPE 2: **MPA-IV group** The mandibular protraction appliance (MPA) is a recently developed noncompliant rigid fixed functional appliance that holds the mandible anteriorly and corrects the Class II anteroposterior discrepancy. The MPAIV is the latest version of an MPA. All subjects in the MPA-IV group were treated with preadjusted edgewise appliance (Roth prescription, 0.0220”). Both of the arches were leveled up to 0.0210”x 0.0250” stainless steel archwire, and then the MPA-IV was ligated for mandibular advancement. The mandible was advanced to an edge-to-edge incisor position. All subjects were reviewed at 4-week intervals for a period of approximately 6 months, when the MPA-IV was removed and the occlusion finished with the same multibonded appliance. N=15 (Anfang) / N=15 (Ende) / Alter = 11.28 ± 0.52Jahre / ♂:♀ = 0:15 • Gebissphase: permanentes Gebiss <18 • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Therapie** KONTROLLGRUPPE: **untreated control group** N=10 (Anfang) / N=10 (Ende) / Alter = 10.97 ± 0.46 Jahre / ♂:♀ = 0:10 • Gebissphase: spätes Wechselgebiss, permanentes Gebiss <18 • KFO-Behandlung: reguläre kieferorthopädische Behandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: Cephalometric skeletal and dental changes T0: before the start of treatment bzw. at the beginning of the observation period T1: at the end of active functional appliance therapy bzw. At the end of the observation period T0-T1: 13.18±3.17 Monate (Versuchsgruppe 1), 6.08±0.61 Monate (Versuchsgruppe 2), 16.37 ± 0.94 Monate (Kontrollgruppe)
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	Early orthodontic treatment with the Twin-block and bionator functional appliances appeared to be effective in correcting molar relationships and reducing overjets in children with Class II Division 1 malocclusions. The following conclusions can be drawn from this study. 1. Neither appliance was efficient in restricting forward growth of the maxilla. 2. MPA-IV caused distalization of maxillary molars; twin-block restricted the forward movement of the maxillary molars. 3. Both appliances produced mesial movement of the mandibular molars. 4. Both appliances caused palatal movements of the maxillary incisors 5. Both appliances were effective in molar correction and overjet reduction.

Zusammen-fassung der Ergebnisse	**Twin Block group vs. Untreated control group** **PRIMÄRZIELGRÖßE:** Cephalometric skeletal and dental changes The results of all the measurements in the pitchfork analysis are shown in Table II and Figures 2 to 4. Positive values are those contributing to the correction of the Class II malocclusion, and negative values are those that aggravated the Class II relationship. *Skeletal changes:* The mandibular position change was significantly greater in twin-block subjects (P < .01) than in control subjects. The ABCH was significantly greater in the twin-block subjects than in the control subjects (P , .001). *Dental changes:* All dentoalveolar changes are shown in Table 2 and Figure 6. The forward movement of the L6 was significantly greater in the treatment subjects (P < .001). Molar correction was significantly greater (P <.001) in the treatment groups. The palatal movements of U1 and the labial movement of L1 were significantly greater (P < .001) in the treatment subjects. The overjet correction was significantly greater in the treatment subjects (P < .001). **Bionator group vs. Untreated control group** **PRIMÄRZIELGRÖßE:** Cephalometric skeletal and dental changes The results of all the measurements in the pitchfork analysis are shown in Table II and Figures 2 to 4. Positive values are those contributing to the correction of the Class II malocclusion, and negative values are those that aggravated the Class II relationship. *Skeletal changes:* keine signifikanten Veränderungen *Dental changes:* All dentoalveolar changes are shown in Table 2 and Figure 6. The forward movement of the L6 was significantly greater in the treatment subjects (P < .001). Molar correction was significantly greater (P <.001) in the treatment groups. The palatal movements of U1 and the labial movement of L1 were significantly greater (P < .001) in the treatment subjects. The overjet correction was significantly greater in the treatment subjects (P < .001).

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign:* - *kein Ethikvotum* - *Keine Angabe zu Baseline-Imbalancen* *Durchführung:* - *unklar, ob gleicher Behandler* *Auswertung:* - *Störgroßen in Auswertung nicht berücksichtigt (Compliance der Patienten)* - *Fehlende Verblindung* - *Keine Angabe zu auswertender Person* - *Keine Reliabilitätsprüfung* *Power der Studie/Patientenzahl: keine Poweranalyse, kleine Kontrollgruppe* *Funding: keine Angabe* *Interessenkonflikte: keine Angabe* *Bias (SIGN):* *Publikationsbias (Reviews):* - *Performance-Bias durch unterschiedliche Behandlungsdauern in den Versuchsgruppen (deutlich kürzere Behandlungsdauer bei MPA-IV group) und durch Kointerventionen (MB parallel zu MPA-IV group)* - *The assessment of outcome is made blind to exposure status. If the study is retrospective this may not be applicable. – NO* - *Where blinding was not possible, there is some recognition that knowledge of exposure status could have influenced the assessment of outcome. – NO* - *Have confidence intervals been provided? - NO*
Schluss-folgerung des Begutachters	methodische Qualität: gut-befriedigend
	Klinische Aussagekraft: Die Behandlung mit einem **Twin-Block** führt im Vergleich mit einer nichtbehandelten Kontrollgruppe zu: - einer signifikanten Ventralverlagerung des UK (skelettal) - Mesialbewegung der unteren 6-Jahr-Molaren - einer signifikant erhöhten Protrusion der Unterkieferfront - einer signifikant erhöhten Retrusion der Oberkieferfront - einer signifikanten Reduktion des Overjet Die Behandlung mit **MPA-IV** führt im Vergleich mit einer nichtbehandelten Kontrollgruppe zu: - keiner singnifikanten Ventralveralgerung des UK (skelettal) - Mesialbewegung der unteren 6-Jahr-Molaren - einer signifikant erhöhten Protrusion der Unterkieferfront - einer signifikant erhöhten Retrusion der Oberkieferfront - einer signifikanten Reduktion des Overjet

Evidenz-level (SIGN)	**2+**
Qualität **(RoB, SIGN /AMSTAR II)**	**Acceptable (+)**

Evidenztabelle Jena, Duggal et al. 2006

ORIGINAL ARTICLE

Skeletal and dentoalveolar effects of Twin-block and bionator appliances in the treatment of Class II malocclusion: A comparative study

Ashok Kumar Jena,[a] Ritu Duggal,[b] and Hari Parkash[c]
New Delhi, India

Introduction: The purpose of this study was to evaluate the skeletal and dentoalveolar effects of the Twin-block and bionator appliances in the treatment of Class II Division 1 malocclusions. **Methods:** Fifty-five girls from North India with Class II Division 1 malocclusion and the same physical growth maturation status were selected for the study. The subjects were divided among a Twin-block group (n = 25), a bionator group (n = 20), and a control group (n = 10). Pretreatment and posttreatment lateral cephalometric radiographs of the treatment group subjects, and prefollow-up and postfollow-up radiographs of the control group subjects, were traced manually and subjected to the pitchfork analysis. **Results:** Statistical software was used for 1-way analysis of variance and multiple comparisons (post-hoc test, Bonferroni). A P value of .05 was considered statistically significant. Neither the Twin-block nor the bionator appliance significantly restricted forward growth of the maxilla (P = .476). Mandibular growth in the Twin-block subjects was significantly greater than in controls (P = .005). Mandibular growth was comparable in the control and the bionator subjects. Molar correction, overjet reduction, and proclination of the mandibular incisors were significantly greater (P = .000) in the treated subjects compared with the controls. **Conclusions:** Both the Twin-block and bionator appliances were effective in correcting molar relationships and reducing overjets in Class II Division 1 malocclusion subjects. However, the Twin-block was more efficient than the bionator in the treatment of Class II Division 1 malocclusion. (Am J Orthod Dentofacial Orthop 2006;130:594-602)

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0889-5406/$32.00

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Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** • girls from North India with Class II Division 1 malocclusion and the same physical growth maturation status • Orthodontic Clinic, Division of Orthodontics, Department of Dental Surgery, All India Institute of Medical Sciences, New Delhi
Schweregrad	Okklusion = 1PBD, Unterkieferneigung <= 25°, Overjet 6-10mm

Einschluss-kriterien *Bei Review: PICOS*	• Class II Division 1 malocclusion with normal maxilla and retrognathic mandible • stage 3 cervical vertebra maturation index (transition stage) • full-cusp Angle Class II molar relationship on either side • mandibular plane angle less than or equal to 25° • little or no crowding or spacing in either arch • overjet of 6 to 10 mm.
Ausschluss-kriterien	Girls with a history of orthodontic treatment, an anterior open bite, a severe proclination of the maxillary and mandibular teeth, or a systemic disease affecting growth were not considered for this study.

Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** VERSUCHSGRUPPE 1: **Twin block group** The subjects in the treatment group were treated with standard Twin-block or bionator appliances. Single- step mandibular advancement was carried out during wax bite registration. An edge-to-edge incisal relationship with 2 to 3 mm bite opening between the central incisors was maintained for all subjects. The Twin-block and bionator appliances were all made by the same operator (A.K.J.). The Twin-block patients were instructed to wear the appliance 24 hours per day, especially while eating; they could be removed for toothbrushing. All subjects in the treatment group were checked every 4 weeks until the end of active functional appliance therapy. Interocclusal acrylic trimming was performed in all patients to allow unhindered vertical development of the mandibular buccal segments. Activation of the labial bow was avoided during treatment. Appliance use was discontinued when overjet and overbite were reduced to 1 to 2 mm or when the patient either was deemed to have finished active appliance therapy or went on to further appliance therapy. Wearing times varied greatly, depending on the level of patient cooperation and the rate at which the deciduous teeth exfoliated. N=25 (Anfang) / N=25 (Ende) / Alter = 11.40 ± 0.90 Jahre / ♂:♀ = 0:25 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung VERSUCHSGRUPPE 2: **Bionator group** The subjects in the treatment group were treated with standard Twin-block or bionator appliances. Single- step mandibular advancement was carried out during wax bite registration. An edge-to-edge incisal relationship with 2 to 3 mm bite opening between the central incisors was maintained for all subjects. The Twin-block and bionator appliances were all made by the same operator (A.K.J.). The patients in the bionator group were instructed to wear the appliance at least 15 hours per day. All subjects in the treatment group were checked every 4 weeks until the end of active functional appliance therapy. Interocclusal acrylic trimming was performed in all patients to allow unhindered vertical development of the mandibular buccal segments. Activation of the labial bow was avoided during treatment. Appliance use was discontinued when overjet and overbite were reduced to 1 to 2 mm or when the patient either was deemed to have finished active appliance therapy or went on to further appliance therapy. Wearing times varied greatly, depending on the level of patient cooperation and the rate at which the deciduous teeth exfoliated. N=20 (Anfang) / N=20 (Ende) / Alter = 11.00 ± 1.30 Jahre / ♂:♀ = 0:20 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung

Kontrolle Kontrollgruppe	**Keine kieferorthopädische Therapie** KONTROLLGRUPPE: **untreated control group** N=10 (Anfang) / N=10 (Ende) / Alter = 10.97 ± 0.46 Jahre / ♂:♀ = 0:10 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre kieferorthopädische Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: Cephalometric skeletal and dental changes T0: before the start of treatment bzw. At the beginning of the observation period T1: at the end of active functional appliance therapy bzw. At the end of the observation period Im Durchschnitt T0-T1: Versuchsgruppe 1: 12.78±4 Monate Versuchsgruppe 2: 16.18±2.52 Monate Kontrollgruppe: 16.37 ± 0.94 Monate
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	Early orthodontic treatment with the Twin-block and bionator functional appliances appeared to be effective in correcting molar relationships and reducing overjets in children with Class II Division 1 malocclusions. The following conclusions can be drawn from this study. 1. Neither appliance was efficient in restricting forward growth of the maxilla. 2. Both appliances increased mandibular growth 3. Both appliances were significantly effective in restricting forward movement of the maxillary molars. 4. Both appliances resulted in mesial movement of the mandibular molars 5. Both appliances helped dramatically in molar correction 6. Forward movement of the maxillary incisors was restricted by the appliances. 7. The Twin-block and bionator appliances caused significant forward movement of the mandibular incisors. 8. Both appliances were effective for overjet reduction in Class II Division 1 malocclusion patients

Zusammen-fassung der Ergebnisse	**Twin Block group vs. Untreated control group** **PRIMÄRZIELGRÖßE:** Cephalometric skeletal and dental changes The results of all measurements in the pitchfork analysisare shown in Table II and Figures 2 to 4. Positive values are those contributing to the correction of the Class II malocclusion, and negative values are those that aggravated the Class II relationship. Skeletal changes: Skeletal changes are shown in Table II and Figure 5. The mean changes in mandibular position were 5.02 mm in the Twin-block group, and 3.37 mm in the control group. The difference between the control and Twin-block groups was large and statistically significant (P = .004). The anteroposterior change in the relationship between the maxillary and mandibular base made a mean positive contribution in all 3 groups. The ABCH between the control and Twin-block groups was statistically significant (P <.001) Dental changes: Dental changes are shown in Table II and Figure 6. In the Twin-block group, U6 was moved distally. The movement of U6 in the Twin-block group was significantly different from the control group (P <.05). In the Twinblock group, total mesial movement of L6 was 1.45 mm, significantly (P <.05) greater than in the controls. Molar correction is the algebraic sum of ABCH + total U6 total L6. Molar correction was significantly greater (P <.001) in the treatment group than in the control group (Twin-block, 5.11 mm; control, 0.48 mm). In the Twin-block group, U1 retroclined 1.45 mm, respectively, indicating the appliances had restraining effects. The difference in incisor change between the control and Twin-block groups was statistically significant (P <.01). In the treatment group, L1 proclined 1.27 mm in the Twin-block group. The difference in L1 change between the control and treatment groups was statistically significant (P <.001). Overjet corrections were 0.24 mm in the control group, 6.31 mm in the Twin-block group. Intergroup comparison showed a statistically significant (P <.001) difference in overjet correction between the control and treatment groups. **Bionator group vs. Untreated control group** **PRIMÄRZIELGRÖßE:** Cephalometric skeletal and dental changes The results of all measurements in the pitchfork analysisare shown in Table II and Figures 2 to 4. Positive values are those contributing to the correction of the Class II malocclusion, and negative values are those that aggravated the Class II relationship. Skeletal changes: Skeletal changes are shown in Table II and Figure 5. The anteroposterior change in the relationship between the maxillary and mandibular base made a mean positive contribution in all 3 groups. Significant change of ABCH between the control and the bionator group (P <.05). Dental changes: The mesial movement of L6 in the bionator group also differed significantly (P <.05) from the control group. Molar correction is the algebraic sum of ABCH + total U6 total L6. Molar correction was significantly greater (P <.001) in the treatment group than in the control group (Bionator, 3.90 mm; control, 0.48 mm). In the treatment group, L1 proclined 1.50 mm in the bionator group. The difference in L1 change between the control and treatment groups was statistically significant (P<.001). Overjet corrections were 0.24 mm in the control group and 4.95 mm in the bionator group. Intergroup comparison showed a statistically significant (P <.001) difference in overjet correction between the control and treatment groups.

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign:* - *kleine Kontrollgruppe* *Durchführung:* - *unterschiedliche Behandlungsdauern zwischen Twin Block und Bionator Gruppe (längere Tragedauer bei Bionator Gruppe)* - *unklar ob gleicher Behandler* *Auswertung:* - *Störgroßen in Auswertung nicht berücksichtigt* - *Fehlende Verblindung* - *Keine Angabe zu auswertender Person* - *Keine Reliabilitätsprüfung* - *Keine Angabe zu Imbalancen* *Power der Studie/Patientenzahl:* - *Keine Poweranalyse* *Funding:* - *Keine Angaben zum Funding* *Interessenkonflikte:* - *Keine Angaben zu Interessenskonflikten* *Bias (SIGN):* *Publikationsbias (Reviews):* - *Performance-Bias durch unterschiedliche Behandlungsdauern in den Versuchsgruppen* - *The assessment of outcome is made blind to exposure status. If the study is retrospective this may not be applicable. – NO* - *Where blinding was not possible, there is some recognition that knowledge of exposure status could have influenced the assessment of outcome. – NO* - *Have confidence intervals been provided? - NO*
Schluss-folgerung des Begutachters	methodische Qualität: gut-befriedigend
	Klinische Aussagekraft: Die Behandlung mit einem Twin-Block führt im Vergleich mit einer nichtbehandelten Kontrollgruppe zu: - einem signifikant erhöhtem Unterkieferwachstum - einer signifikant erhöhten Protrusion der Unterkieferfront - einer signifikanten Reduktion des Overjet Die Behandlung mit einem Bionator führt im Vergleich mit einer nichtbehandelten Kontrollgruppe zu: - einer signifikant erhöhten Protrusion der Unterkieferfront - einer signifikanten Reduktion des Overjet

Evidenz-level (SIGN)	**2+**
Qualität **(RoB, SIGN /AMSTAR II)**	**Acceptable (+)**

Evidenztabelle Julku, Pirila-Parkkinen et al. 2018

Randomized controlled trial

Airway and hard tissue dimensions in children treated with early and later timed cervical headgear—a randomized controlled trial

Johanna Julku[1,2,3], Kirsi Pirilä-Parkkinen[1], and Pertti Pirttiniemi[1,2,3]

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Summary

Background: A Kloehn-type cervical headgear (CH) aims to correct skeletal jaw discrepancy in Class II children. A few studies have reported CH treatment effects on airway dimensions, but none of them have been randomized according to timing.

Objectives: To evaluate related craniofacial structures and pharyngeal airway dimensions in children with a Class II occlusion treated with CH and randomized into early and late treatment groups.

Trial design: Randomized, parallel-group, prospective controlled trial.

Methods: The material comprised 67 seven-year-old children with a Class II occlusion. Sealed-envelope randomization in 1:1 ratio was used to divide the children into two equal groups. In the early group (EG, n = 33), CH treatment was started immediately or after eruption of the first maxillary molars. In the second, late group (LG, n = 34), the active CH treatment was started about one and half year later. The active CH treatment was continued in both groups until normal Class I occlusion on first molars was achieved. Cephalometric radiographs were taken from both groups at the beginning of follow-up (T0), at the beginning of CH treatment of the second group (T1), and at the end of CH treatment of the second group (T2). Changes in cephalometric measurements were used as primary outcomes. Blinding was applicable for outcome assessment.

Results: Fifty-six children completed the study. The posterior change in the position of the maxilla was significant for early treatment males at T0–T1 (SNA; $P < 0.001$, ANB; $P = 0.009$) and T0–T2 (SNA, $P = 0.012$). The palato-mandibular angle (PP:ML) decreased during T0–T1 in early treatment females ($P = 0.018$) and early treatment males ($P = 0.037$). The retroglossal airway increased ($P = 0.010$) in early treatment males at T0–T1. Highly significant positive correlations ($P < 0.001$) between skeletal and upper airway dimensions during early CH treatment were found in males. No harms were encountered.

Conclusions: Despite the effective CH treatment, no harmful upper airway changes were found.

Clinical Registration: NCT02910336.

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** • birth cohorts in three municipalities in northern Finland • healthy seven-year-old schoolchildren
Schweregrad	Overjet > 6mm
Einschluss-kriterien	• Class II occlusion based on the occlusal relationship of the first permanent molars • overjet more than 6 mm • deep bite

Ausschluss-kriterien	1. PL-ML angle (the angle between the palatal line and the mandibular line) over 35° 2. previous orthodontic treatment 3. facial syndrome and severe facial asymmetry 4. symptoms of sleep-disordered breathing (SDB) 5. known chronic or recurrent upper airway infections 6. history of adenoidectomy and/or tonsillectomy were excluded
Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** First maxillary molars were banded with gingival tubes. A Kloehn-type CH with a long outer bow was used. The inner bow was held 5 mm wider than the distance between the CH tubes and the long outer bows were bent 10-degree upwards. To provide orthodontic force to the maxilla and upper dental arch, a force of 500 g was used. Treated between T1 and T2 (24 months), and no active treatment was performed during T0−T1. The mean active treatment time for LG was 1.4 years (SD 0.80). The participants were instructed to wear the CH for 8–10 hours during the night. VERSUCHSGRUPPE: **Early Headgear Group** N=33 (Anfang) / N=26 (Ende) / Alter = 7,8 ± 0,53 Jahre / ♂:♀ = 20:13 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung
Kontrolle Kontrollgruppe	**Kieferorthopädische Therapie zu anderem Zeitpunkt /Zeitraum /Gebissphase** CH therapy started about one and a half years later KONTROLLGRUPPE: Late Headgear Group N=34 (Anfang) / N=30 (Ende) / Alter = 9,5 ± 0,59 Jahre / ♂:♀ = 19:15 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** • **Atmung und Luftraum (Airway space, Schlafapnoe), Schlucken und Sprechen** PRIMÄRZIELGRÖßE: Cephalometric treatment effects SEKUNDÄRZIELGRÖßE: Treatment effects on pharyngeal airway
Studientyp	**RCT**
Schluss-folgerungen der Autoren	1. CH proved to be an effective orthodontic device in correcting Class II malocclusion and skeletal discrepancy. 2. The most significant skeletal effect with CH was obtained in the early treatment group in males. 3. Neither early CH nor late CH had any adverse effects on upper airway dimensions.

Zusammen-fassung der Ergebnisse	**EARLY VS. LATE CERVICAL HEADGEAR TREATMENT** *Cephalometric treatment effects* The skeletal cephalometric comparison of the early and late treatment groups is shown in Table 3. A more posterior movement of the maxilla expressed as a significant decrease in SNA angle was found in the EG males when compared to the LG males at T0–T1 ($P < 0.001$; significant also after Benjamini–Hochberg correction) and T0–T2 ($P = 0.012$). The same effect was found when genders were pooled. SNA angle was significantly decreased in the EG when compared with the LG at T0–T1 ($P < 0.001$; significant also after Benjamini–Hochberg correction) and T0–T2 ($P = 0.002$). Change in SNB angle was significantly larger for the LG compared with the EG at T0–T2 ($P = 0.039$) when genders were pooled. The change inANB angle was significantly larger for the EG males compared with the LG males at T0–T1 ($P = 0.009$), and this was also seen for theEG compared with the LG at T0–T1 ($P = 0.004$) when genders werepooled together. The palato-mandibular angle (PL-ML) decreased significantly at T0–T1 in the EG females compared with the LG females ($P = 0.018$), and correspondingly, in the EG males comparedwith the LG males ($P = 0.037$). Similar effect was found when genders were pooled for the EG compared with the LG ($P = 0.002$) at T0–T1. Angle between Sella-Nasion line and palatal plane (NSL-PL) was significantly larger for the EG compared with the LG at T0–T1 ($P = 0.016$) when genders were pooled. *Treatment effects on pharyngeal airway* The anteroposterior airway diameter at the level of the base of the tongue (rl1-rl2) was significantly increased in males in the EG between time points T0–T1 compared with the LG males ($P = 0.010$). The same effect was found when genders were pooled. The rl1-rl2 value was significantly increased in the EG compared with the LG at T0–T1 ($P = 0.034$). The distance from vallecula epiglottis to posterior pharyngeal wall (va1-va2) was significantly increased in the EG compared with the LG at T0–T1 ($P = 0.030$).

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN)	*Studiendesign:* • *RCT* • *Randomisierung sehr gut beschrieben und suffizient* • *Verblindung dort wo möglich durchgeführt* • *Ethikvotum vorhanden* • *Rekrutierung in verschiedenen Zentren, gut beschrieben* *Durchführung:* • *Keine Angaben zu einzelnen Behandlern; Reliablität der Intervention fraglich* • *Compliance der Patienten nicht beschrieben* • *Behandlungsprotokoll vorhanden* *Auswertung:* • *Gute Statistik* • *Reliabilitätstest vorhanden (1 Auswerter, gute intra-rater-Reliabilität)* • *Konfidenzintervalle angegeben* *Power der Studie/Patientenzahl: Poweranalyse vorhanden* *Funding:* Finnish Dental Society Apollonia. *Interessenkonflikte: none to declare* *Bias (SIGN/AMSTAR/EinzelstudienRoB – alle negativen Punkte aus Fragebogen auflisten):* • *Performance bias: keine Verblindung der Behandlung (bei KFO aber kaum möglich)*
Schluss-folgerung des Begutachters	methodische Qualität: insgesamt sehr gut
	Klinische Aussagekraft: • Der Headgear ist ein effektives kieferorthopädisches Gerät zur Korrektur der Klasse-II-Anomalie und der skelettalen Diskrepanz. • Die stärksten signifikanten skelettalen Effekten mit dem HG konnten in der Early-Treatment-Group bei Jungen festgestellt werden. • Weder die Frühbehandlung noch die reguläre Behandlung mit dem HG hatten einen Effekt auf die Dimensionen des oberen Luftwegs.
Evidenz-level (SIGN)	**1++**
Qualität (RoB, SIGN)	**High Quality ⊕⊕**

Evidenztabelle Kajiyama, Murakami et al. 2000

ORIGINAL ARTICLE

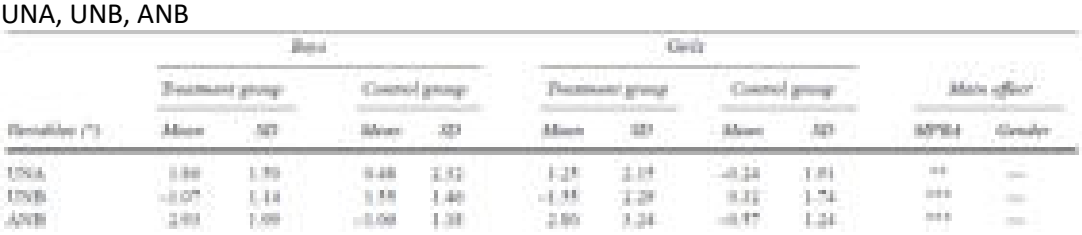
Evaluation of the modified maxillary protractor applied to Class III malocclusion with retruded maxilla in early mixed dentition

Keijirou Kajiyama, DDS, PhD,[a] Teruo Murakami, DDS, PhD,[b] and Akira Suzuki, DDS, PhD[c]
Fukuoka, Japan

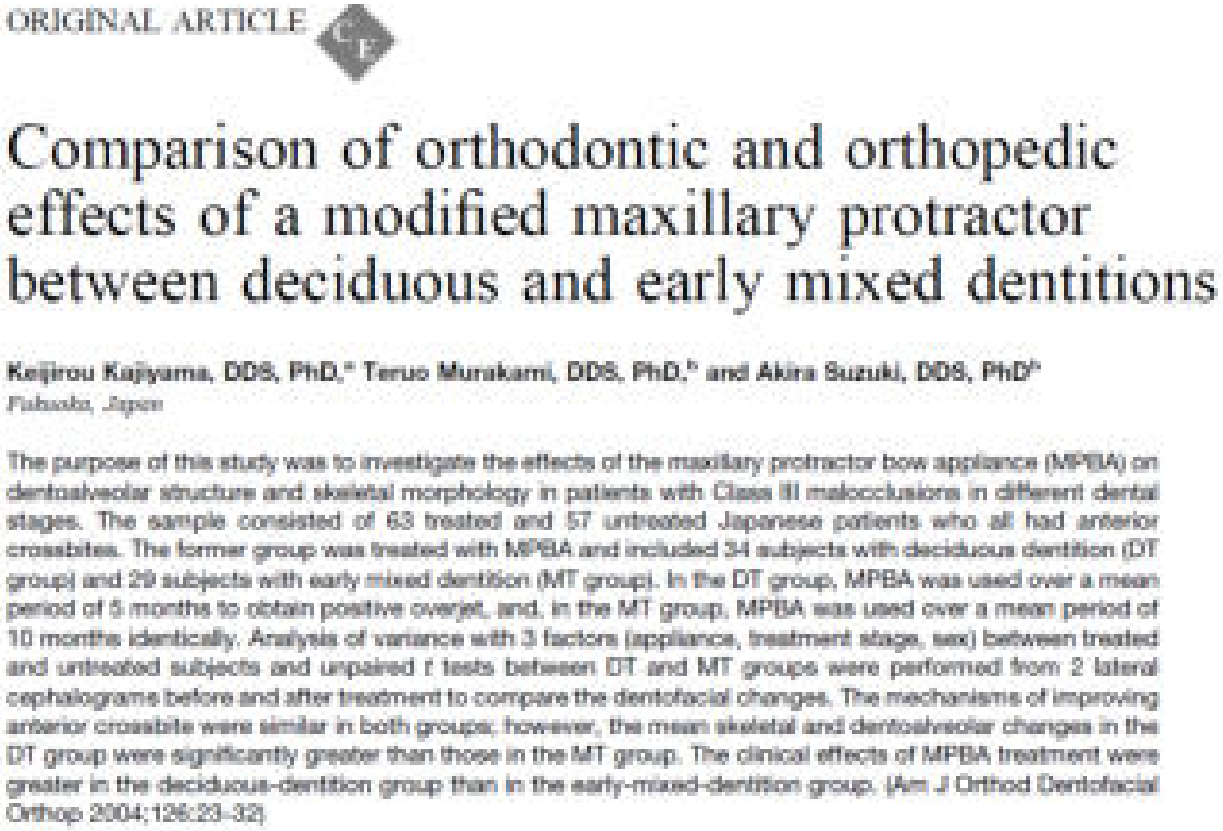
The purpose of this study was to evaluate the effects of orthodontic treatment with a maxillary protraction bow appliance on anterior crossbite patients with Class III malocclusion in the mixed dentition. The 29 patients treated with a maxillary protraction bow appliance (11 boys, 18 girls) were compared with 25 matched, untreated controls with anterior crossbite (10 boys, 15 girls). The mean age before treatment was 8 years 7 months (range, 6 years 3 months to 11 years 6 months). The mean treatment period to achieve a normal overjet was 10.2 months (range, 5 to 18 months). Fifty-nine cephalometric angular and linear parameters were compared between the treated group and the untreated controls using the analysis of variance and the paired *t* test to evaluate the effect of gender and the maxillary protraction bow appliance treatment. Skeletal and dentoalveolar advancement of the maxilla and retrusion of the mandible contributed significantly to the improvement of Class III malocclusion in the treated group. These results suggest that a maxillary protraction bow appliance is effective for correcting anterior crossbite with a retruded maxilla in the early mixed dentition. (Am J Orthod Dentofacial Orthop 2000;118:549-59)

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie** Children with skeletal and dental ClassIII malocclusion: (anterior crossbite (negative overjet), Angle Class III molar relationship Japan
Schweregrad	Nicht spezifiziert
Einschluss-kriterien	Children with: (1) anterior crossbite (negative overjet), (2) stage III-B of Hellman’s developmental stages (4 maxillary and mandibular incisors have erupted), (3) Angle Class III molar relationship, (4) no previous orthodontic treatment
Ausschluss-kriterien	- not fullfilling inclusion criteria

Intervention Versuchsgruppe	**kieferorthopädische Behandlung** **MPBA**: Modified maxillary protractor called the maxillary protractor bow appliance (MPBA). This appliance is characterized by its simplicity in design, stability when worn, and ease in adjustment in comparison with other types of maxillary protractors. This appliance consisted of an acrylic face bow, an intraoral component, and 2 elastic bands. The intraoral component consisted of 4 bands that were cemented on the maxillary deciduous molars and permanent first molars, and a palatal button connecting the 4 bands and *B*). The chin pad was made of acrylic and based on an impression of the patient's chin; it was fixed on an acrylic face bow that is adjusted to the patient's facial profile by heating. The bilateral elastic bands were connected from the hooks on the acrylic face bow to the soldered buccal hooks on the adjusted bands and then the intraoral component was pulled forward by about 400 g of elastic force unilaterally in a 20° to 30° direction downward from the occlusal plane. The MPBA was worn for 10 to 12hours or more a day. VERSUCHSGRUPPE 1: **MPBA** N= 29(Anfang) / N=29 (Ende) / Alter = 8,6 ± 1,5/ ♂:♀ = 11:18 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **Untreated Class III** N=15 (Anfang) / N=15 (Ende) / Alter = 8,8 ± 1,4 ♂:♀ = 10:15 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) PRIMÄRZIELGRÖßE: Skeletal: UNA, UNB, ANB
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**

Schluss-folgerungen der Autoren	1. MPBA therapy for Class III malocclusion with maxillary retrusion in the early mixed dentition induced favorable changes in the craniofacial skeleton and alveolus compared with the changes that occurred in matched untreated Class III controls 2. MPBA therapy in the mixed dentition resulted in a significant forward displacement of the maxilla and clockwise rotation of the mandible. The maxillary incisors tipped labially while the mandibular incisors tipped lingually. 3. The combination of these skeletal and dentoalveolar changes resulted in the successful correction of the skeletal Class III malocclusion. 4. Seventy percent of the horizontal correction of the anterior crossbite was achieved by skeletal movement, and 30% by incisor movement in MPBAtreated children in the early mixed dentition.
Zusammen-fassung der Ergebnisse	**GRUPPE MPBA VS. GRUPPE untreated Class III** T1, C1 (pre-treatment): mean age 8,6 years, MPBA; 8,8 years, Control T2, C2 (post-treatment): mean age 9,45 years, MPBA, 9,5 years, Control Skeletal UNA, UNB, ANB 
Angaben auffälliger positiver und/oder negativer Aspekte	Die Äquivalenz von Versuch- und Kontrollgruppe ist umfassend geprüft, allerdings bestehen vor Behandlungsbeginn bereits signifikante, relevante Unterscheide (ANB). Die Kohortenstudie Studie hat daher ein gerade noch akzeptables Risiko für Selection Bias. Insgesamt knapp akzeptable Studie. Die klinische Relevanz ist durch die Verwendung einer proprietären, weniger verbreiteten Apparatur möglicherweise eingeschränkt. *Funding: keine Angabe* *Interessenkonflikte:* keine Angabe *Bias (SIGN): Insgesamt ordentliche Durchführung. Die Vergleichbarkeit der Untersuchungsgruppen wurde geprüft ist aber eingeschränkt. Nachteilig sind die fehlenden Sample Size/ Power Berechnungen.*
Schluss-folgerung des Begutachters	methodische Qualität: akzeptabel Klinische Aussagekraft: Gegeben.
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN)	**Acceptable (+)**

Evidenztabelle Kajiyama, Murakami et al. 2004



ORIGINAL ARTICLE

Comparison of orthodontic and orthopedic effects of a modified maxillary protractor between deciduous and early mixed dentitions

Keijirou Kajiyama, DDS, PhD,[a] Teruo Murakami, DDS, PhD,[b] and Akira Suzuki, DDS, PhD[b]
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The purpose of this study was to investigate the effects of the maxillary protractor bow appliance (MPBA) on dentoalveolar structure and skeletal morphology in patients with Class III malocclusions in different dental stages. The sample consisted of 63 treated and 57 untreated Japanese patients who all had anterior crossbites. The former group was treated with MPBA and included 34 subjects with deciduous dentition (DT group) and 29 subjects with early mixed dentition (MT group). In the DT group, MPBA was used over a mean period of 5 months to obtain positive overjet, and, in the MT group, MPBA was used over a mean period of 10 months identically. Analysis of variance with 3 factors (appliance, treatment stage, sex) between treated and untreated subjects and unpaired *t* tests between DT and MT groups were performed from 2 lateral cephalograms before and after treatment to compare the dentofacial changes. The mechanisms of improving anterior crossbite were similar in both groups; however, the mean skeletal and dentoalveolar changes in the DT group were significantly greater than those in the MT group. The clinical effects of MPBA treatment were greater in the deciduous-dentition group than in the early-mixed-dentition group. (Am J Orthod Dentofacial Orthop 2004;126:23-32)

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie** Children with skeletal and dental ClassIII malocclusion: (anterior crossbite (negative overjet), Angle Class III molar relationship; Japan
Schweregrad	Nicht spezifiziert
Einschluss-kriterien	Children with: (1) anterior crossbite, (2) Class III deciduous canine relationship, (3) bilateral mesial step type of terminal plane or Class III permanent molar relationship, (4) no craniofacial anomalies (eg, cleft lip or palate), (5) no previous orthodontic treatment, (6) concave profiles, (7) retrusive maxillae withor without mandibular protrusion, (8) negative overjet, (9) skeletal Class III
Ausschluss-kriterien	- not fullfilling inclusion criteria

Intervention Versuchsgruppe	**kieferorthopädische Behandlung** **MPBA, Deciduous dentition (DT) or Mixed early dentition (MT)**: Modified maxillary protractor called the maxillary protractor bow appliance (MPBA). This appliance is characterized by its simplicity in design, stability when worn, and ease in adjustment in comparison with other types of maxillary protractors. This appliance consisted of an acrylic face bow, an intraoral component, and 2 elastic bands. The intraoral component consisted of 4 bands that were cemented on the maxillary deciduous molars and permanent first molars, and a palatal button connecting the 4 bands and *B*). The chin pad was made of acrylic and based on an impression of the patient's chin; it was fixed on an acrylic face bow that is adjusted to the patient's facial profile by heating. The bilateral elastic bands were connected from the hooks on the acrylic face bow to the soldered buccal hooks on the adjusted bands and then the intraoral component was pulled forward by about 400 g of elastic force unilaterally in a 20° to 30° direction downward from the occlusal plane. The MPBA was worn for 10 to 12hours or more a day VERSUCHSGRUPPE 1: **MPBA, DT** N= 34(Anfang) / N=34 (Ende) / Alter = 5,5 ± 0,8/ ♂:♀ = 11:23 • Gebissphase: Milchgebiss • KFO-Behandlung: Frühbehandlung VERSUCHSGRUPPE 2: **MPBA, MT** N= 29(Anfang) / N=29 (Ende) / Alter = 8,6 ± 1,4/ ♂:♀ = 11:18 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE 2 : **Untreated Class III, DT** N=32 (Anfang) / N=32 (Ende) / Alter = 4,7 ± 1,0 ♂:♀ = 10:22 • Gebissphase: Milchgebiss • KFO-Behandlung: reguläre Behandlung KONTROLLGRUPPE 2 : **Untreated Class III, MT** N=25 (Anfang) / N=25 (Ende) / Alter = 8,1 ± 1,4 ♂:♀ = 10:15 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) PRIMÄRZIELGRÖßE: Skeletal: SNA, SNB, ANB
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**

Schluss-folgerungen der Autoren	1. **Marked forward displacement** of the maxillary structures was achieved as an outcome of early treatment **in the deciduous dentition group**, whereas the mixed dentition group showed only a small measurable maxillary advancement. 2. **Clockwise relocation** of the mandible was shown more **significantly in the deciduous dentition group** than in the mixed dentition group. 3. Rapid correction of anterior crossbite in the deciduous dentition group was attributed to the high reduction of ANB angle with maxillary down and forward movement and mandibular clockwise relocation. 4. Although the mechanisms of improving anterior crossbite were similar in both groups, the mean **skeletal changes in the deciduous dentition group were greater** than those in the mixed dentition group.
Zusammen-fassung der Ergebnisse	**GRUPPE MPBA, DT VS. GRUPPE Untreated Class III, DT** **GRUPPE MPBA, DT VS. GRUPPE Untreated Class III, MT** **GRUPPE MPBA, MT VS. GRUPPE Untreated Class III, DT** **GRUPPE MPBA, MT VS. GRUPPE Untreated Class III, MT** T1, O1 (pre-treatment): mean age 5,5 years, MPBA, DT; 8,6 years MPBA, MT; 4,7 years, Control, DT; 8,8 Control, MT T2, O2 (post-treatment): mean age 5,9 years, MPBA, DT; 9,0 years MPBA, MT; 5,5 years, Control, DT; 9,7 Control, MT Skeletal SNA, SNB, ANB 

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN)	Die Äquivalenz von Versuch- und Kontrollgruppe ist umfassend geprüft, allerdings bestehen vor Behandlungsbeginn bereits signifikante, relevante Unterschiede (ANB). Die retrospektive Kohortenstudie Studie hat insgesamt aber ein akzeptables Risiko für Selection Bias. Insgesamt akzeptable Studie. Die Berücksichtigung der Einflussgrößen Alter und Geschlecht unterstützen die klinische Relevanz, diese ist durch die Verwendung einer proprietären, wenig verbreiteten Apparatur allerdings möglicherweise eingeschränkt. *Funding: keine Angabe* *Interessenkonflikte:* keine Angabe *Bias (SIGN): Insgesamt ordentliche Durchführung. Die Vergleichbarkeit der Untersuchungsgruppen wurde geprüft ist aber eingeschränkt.* Die Berücksichtigung der Einflussgrößen Alter und Geschlecht unterstützen die klinische Relevanz *Nachteilig sind die fehlenden Sample Size/ Power Berechnungen sowie die die Verwendung* einer proprietären, wenig verbreiteten Apparatur
Schluss-folgerung des Begutachters	methodische Qualität: akzeptabel
	Klinische Aussagekraft: Gegeben.
Evidenzlevel (SIGN)	**2+**
Qualität (RoB, SIGN)	**Akzeptabel (+)**

Evidenztabelle Kama, Ozer et al. 2006

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Orthodontic and orthopaedic changes associated with treatment in subjects with Class III malocclusions

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**Private Practice, Adana, Turkey

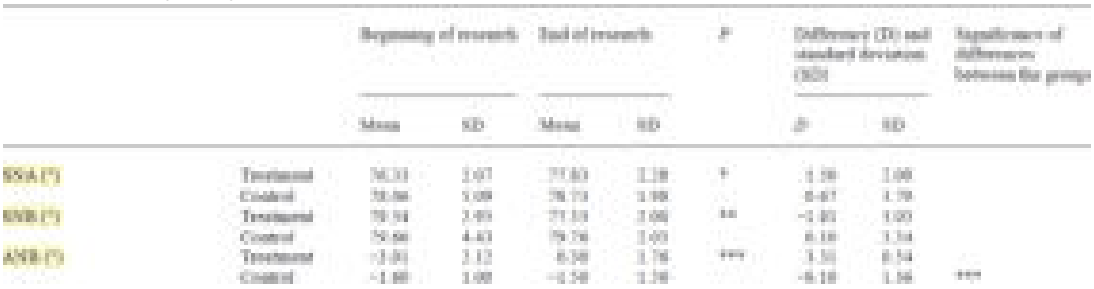
SUMMARY The aim of this study was to determine the cephalometric changes in subjects with Class III malocclusions after rapid palatal expansion (RPE) and facemask treatment. The 30 subjects presented with developing Class III malocclusions. The treatment group comprised 15 patients (eight girls and seven boys, mean age 11 years 6 months) who had undergone RPE and facemask therapy. The control group consisted of nine girls and six boys with a mean age of 11 years 8 months. Radiographs were taken at the same time intervals for both groups, and the average treatment time was 15 months. A Wilcoxon test was used to determine significant differences before and after treatment, and a Mann–Whitney U-test to analyse differences between the treatment and control groups.

In the sagittal plane, significant changes were observed in both groups. In the treatment group, the following dimensions increased significantly: A⊥FHp ($P < 0.001$), ANS-PNS ($P < 0.01$), 6⊥FHp ($P < 0.05$); in the control group Go-Gn ($P < 0.05$) increased significantly. In the treatment group, SN/Go-Gn and SN/ANS-PNS had higher values and this finding was significant ($P < 0.05$).

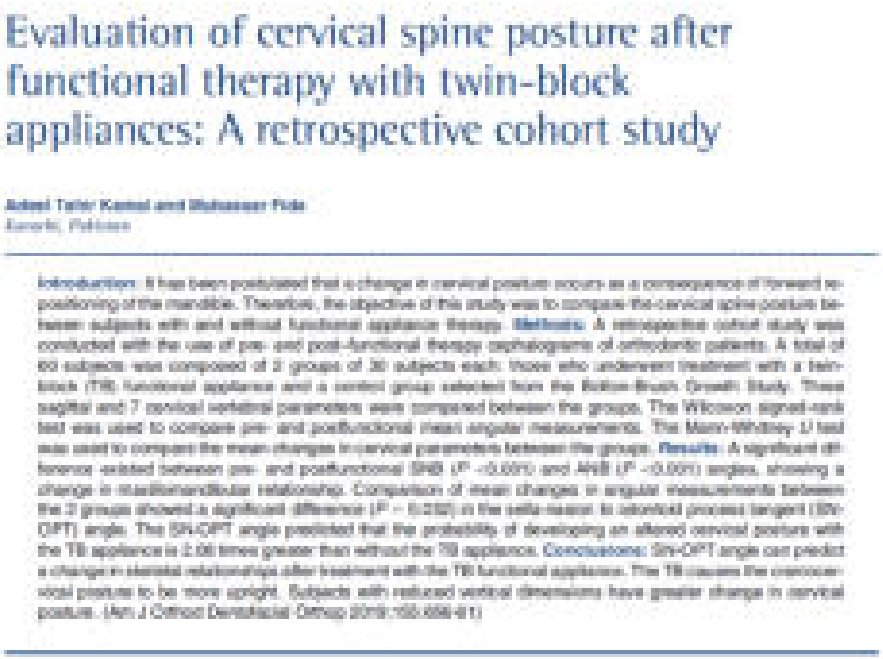
Managing developing Class III malocclusions with RPE and maxillary protraction presents favourable results, such as vertical and sagittal displacement of point A.

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie** - Patients with skeletal Class III occlusion (ANB < 1°) anterior cross-bite, and/or skeletal Class III relationship with maxillary retrognathism; Dicle and Adana, Turkey
Schweregrad	(ANB < 1°)
Einschluss-kriterien	Angle Class III dental relationship with anterior cross-bite, and/or Skeletal Class III relationship with maxillary retrognathism, ANB angle less than -1 degree
Ausschluss-kriterien	other craniofacial anomaly, history of previous orthodontic treatment

Intervention Versuchsgruppe	**kieferorthopädische Behandlung** **RPE/FM (Treatment group):** The first and second premolars and the first molars were banded. After obtaining alginate impressions, a hyrax screw was soldered to the bands on the models in an antero-posterior direction. Following cementation, the patient was instructed to turn the screw twice a day, a one quarter turn in both the morning and evening. After 1 week the screw was removed, a second alginate impression was taken, and the screw was soldered in a transverse direction as the conventional hyrax expander. The average treatment time was approximately 20 days. Following correction of the posterior crossbite, the screw was used for 3 months for retention. Delaire-type facemask with a removable anterior inclined bite plane appliance in the mandible and fixed orthodontic appliances in the maxilla. Elastics, applying a force of 600 g, were directed 20 degrees inferior to the occlusal plane from the mesial surface of the upper canines. These elastics were worn for 16 – 18 hours a day. Finally, a fi xed appliance was placed in the lower arch VERSUCHSGRUPPE 1: **RPE/FM (Treatment group)** N= 15 (Anfang) / N=15 (Ende) / Alter = 11,65 ± 0,54 years ♂:♀ = 7:8 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE 1: **untreated Class III (Control group)** N=15 (Anfang) / N=15 (Ende) / Alter = 11,89 ± 0,55 years ♂:♀ = 6:9 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) PRIMÄRZIELGRÖßE: **Skeletal: SNA, SNB, ANB**
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	Managing developing Class III malocclusions with RPE and maxillary protraction presents favourable results, such as vertical and sagittal displacement of point A.

Zusammen-fassung der Ergebnisse	**GRUPPE RPE/FM (Treatment group) VS. GRUPPE untreated Class III (Control group)** T1 (pretreatment): 11,65, 0,54 years RPE/FM (Treatment group); 11,89, 0,55 years untreated Class III (Control) T2 (posttreatment):): 13,09, 0,59 years RPE/FM (Treatment group); 13,36, 0,48 years untreated Class III (Control) **Skeletal: SNA, SNB, ANB** 
Angaben auffälliger positiver und/oder negativer Aspekte	Die Äquivalenz von Versuch- und Kontrollgruppe ist wahrscheinlich gegeben. Äquivalenz der Versuchsgruppen nur hinsichtlich Alter überprüft. Baseline characteristics verfügbar, jedoch nicht statistisch untersucht. Eine Verblindung wurde nicht durchgeführt. Sample Size/ Power Berechnungen fehlen. Die retrospektive Studie hat einige methodische Schwächen. Die Untersuchung erscheint wenig originell, weder im Design, der Durchführung und im Outcome. Wegen der Schwächen besitzt die Studie daher nur sehr eingeschränkte klinische Relevanz. *Funding:* keine Angabe *Interessenkonflikte:* keine Angabe *Bias (SIGN):* Äquivalenz der Versuchsgruppen nur hinsichtlich Alter überprüft. Power/ Sample Size Berechnungen wurden nicht durchgeführt. Eine Verblindung fand nicht statt.
Schluss-folgerung des Begutachters	<u>methodische Qualität: akzeptabel (mit Tendenz zur Abwertung)</u> <u>Klinische Aussagekraft:</u> Die retrospektive Studie hat einige methodische Schwächen. Die Untersuchung erscheint wenig originell, weder im Design der Durchführung und im Outcome. Wegen der Schwächen besitzt die Studie daher nur sehr eingeschränkte klinische Relevanz.
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN)	**acceptable (+)**

Evidenztabelle Kamal, Fida 2019



Evaluation of cervical spine posture after functional therapy with twin-block appliances: A retrospective cohort study

Ashraf Tahir Kamal and Muhammad Fida
Karachi, Pakistan

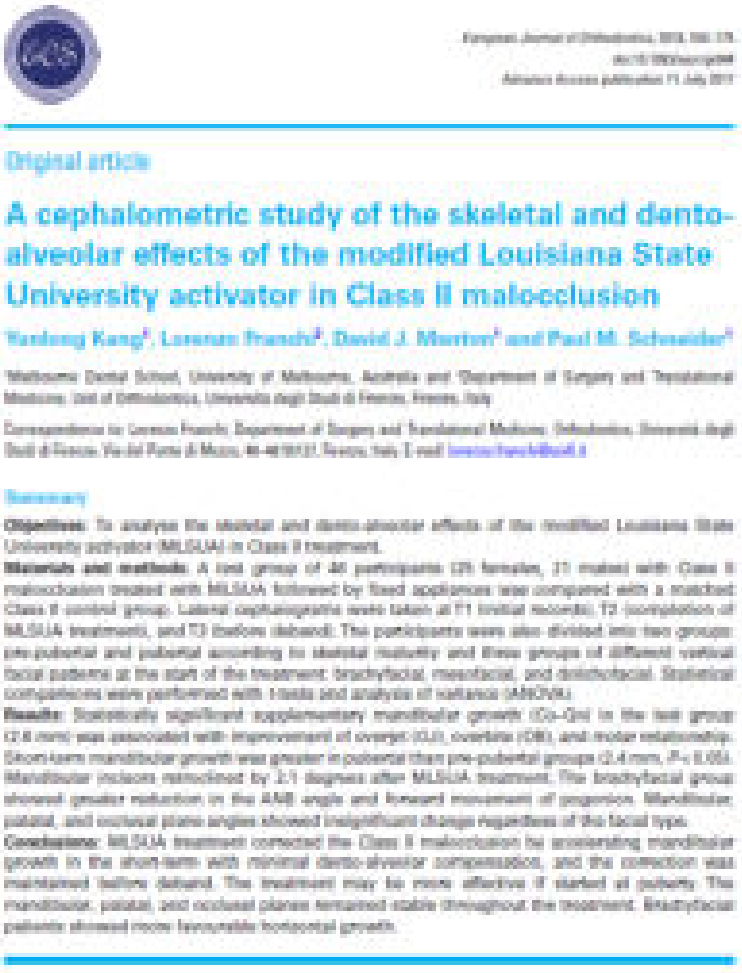
Introduction: It has been postulated that a change in cervical posture occurs as a consequence of forward repositioning of the mandible. Therefore, the objective of this study was to compare the cervical spine posture between subjects with and without functional appliance therapy. Methods: A retrospective cohort study was conducted with the use of pre- and post-functional therapy cephalograms of orthodontic patients. A total of 60 subjects was composed of 2 groups of 30 subjects each: those who underwent treatment with a twin-block (TB) functional appliance and a control group selected from the Bolton-Brush Growth Study. Three sagittal and 7 cervical vertebral parameters were compared between the groups. The Wilcoxon signed-rank test was used to compare pre- and postfunctional mean angular measurements. The Mann-Whitney U test was used to compare the mean changes in cervical parameters between the groups. Results: A significant difference existed between pre- and postfunctional SNB ($P = 0.001$) and ANB ($P = 0.001$) angles, showing a change in maxillomandibular relationship. Comparison of mean changes in angular measurements between the 2 groups showed a significant difference ($P = 0.232$) in the sella-nasion to odontoid process tangent (SN-OPT) angle. The SN-OPT angle predicted that the probability of developing an altered cervical posture with the TB appliance is 2.66 times greater than without the TB appliance. Conclusions: SN-OPT angle can predict a change in skeletal relationships after treatment with the TB functional appliance. The TB causes the craniocervical posture to be more upright. Subjects with reduced vertical dimensions have greater change in cervical posture. (Am J Orthod Dentofacial Orthop 2019;155:656-61)

Population *Setting* *Komorbiditäten*	**Klasse II Anomalie** • A total of 60 subjects was composed of 2 groups of 30 subjects each: those who underwent treatment and a control group selected from the Bolton-Brush Growth StudyDetails
Schweregrad	• ANB > 5° • SNB < 78°
Einschluss-kriterien *Bei Review: PICOS*	1. skeletal Class II malocclusion (ANB >5°) due to mandibular retrognathism (SNB < 78°), 2. full cusp Class II molar, canine, and incisor relationships, 3. pubertal growth spurt (CS3)
Ausschluss-kriterien	1. extracted or missing teeth 2. craniofacial syndromes, 3. history of trauma or surgery involving facial structures, 4. systemic disease that affects the growth and development

Intervention Versuchsgruppe	**kieferorthopädische Behandlung** *TB appliance therapy was considered to be successful when a class I molar relationship was achieved and patients then underwent a PF2 cephalogram.* *Compliance with the TB therapy was monitored by recording the wear time as reported by the patient and his or her parents on every visit, the wear of the appliance, the reduction of overjet of at least 1 mm between the most proclined incisor at monthly intervals and the observation of the pterygoid effect. If there wasn't a reduction in overjet and absence of these factors for 2 consecutive months, it indicated a failure to wear the appliance.* VERSUCHSGRUPPE: **Twinblock Group** N= 30 (Anfang) / N= 30 (Ende) / Alter = 11,8 ± 1,5 Jahre / ♂:♀ = 15:15 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** *A comparison or unexposed group was selected as a control from the Bolton-Brush Growth Study. The control group was taken from the Bolton-Brush Growth Study and was matched with experimental subjects on the basis of skeletal age, sex, molar relationships (Table I), and SNB and ANB angles. Cephalograms (T1) were matched between a subject serving as a control and a subject in the exposed group. Subsequently, a cephalogram (T2) of the same individual was evaluated after TB appliance therapy.* KONTROLLGRUPPE: **Untreated Control Group** N= 30 (Anfang) / N= 30 (Ende) / Alter = 11,6 ± 2,0 Jahre / ♂:♀ = 15:15 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: keine Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** • **Okklusion, Kaufunktion, Funktion** PRIMÄRZIELGRÖßE: *Cephalometric treatment effects*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	1. The TB improves the sagittal relationships between the maxilla and mandible. 2. The TB causes the craniocervical posture to be more upright. 3. Subjects with Class II malocclusion due to mandibular retrognathism with a reduced vertical dimension have a greater forward inclination of the craniocervical posture. 4. The SN-OPT angle can predict a skeletal change in the maxillomandibular relationships.
Zusammen-fassung der Ergebnisse	**Twinblock Group** VERSUS **Untreated Control Group** ***PRIMÄRZIELGRÖßE*** *The change in the PF1 and PF2 values are presented in Table IV. A significant difference was found between SNB (P < 0.001), ANB (P < 0.001), and SN-OPT (P = 0.032).*

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign:* • *Retrospektiv* • *Historische Kontrollgruppe* • *Keine Angabe zu Ethikvotum* • *Wenig Angaben zur Rekrutierung (Methode, Zeitraum)* • *Matching erfolgt* *Durchführung:* • *Keine Angaben zum Behandler/Behandlungsprotokoll* ➔ *Reliabilität der Intervention fraglich* • *Angaben zur Compliance vorhanden* *Auswertung:* • *Solide Statistik (Test auf Normalverteilung vorhanden)* • *Keine Konfidenzintervalle angegeben* • *Reliabilitätstestung vorhanden, keine Aussage zum Auswerter* *Power der Studie/Patientenzahl: vorhanden* *Funding: keine Angabe* *Interessenkonflikte: keine Angabe* *Bias (SIGN/AMSTAR/EinzelstudienRoB – alle negativen Punkte aus Fragebogen auflisten):* • *Selection bias: historische Kontrollgruppe, keine Angabe zur Rekrutierung (Teilnahmerate)* • *Attrition bias: keine Dropouts angegeben* • *Detection bias: keine Verblindung, keine Angaben zur Validität der Outcome-Erhebung* • *Keine Confounders erhoben*
Schluss-folgerung des Begutachters	methodische Qualität: befriedigend
	Klinische Aussagekraft: • Der Twinblock verbessert die sagittale Kieferrelation. • Durch den Twinblock kam es zu einer Aufrichtung der HWS.
Evidenz-level (SIGN)	**2+**
Qualität **(RoB, SIGN /AMSTAR II)**	⊕ Acceptable

Evidenztabelle Kang et al. 2018



Original article

A cephalometric study of the skeletal and dento-alveolar effects of the modified Louisiana State University activator in Class II malocclusion

Yanlong Kang[1], Lorenzo Franchi[2], David J. Manton[1] and Paul M. Schneider[1]

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Summary

Objectives: To analyse the skeletal and dento-alveolar effects of the modified Louisiana State University activator (MLSUA) in Class II treatment.

Materials and methods: A test group of 46 participants (23 females, 23 males) with Class II malocclusion treated with MLSUA followed by fixed appliances was compared with a matched Class II control group. Lateral cephalograms were taken at T1 (initial records), T2 (completion of MLSUA treatment), and T3 (before debond). The participants were also divided into two groups: pre-pubertal and pubertal according to skeletal maturity and three groups of different vertical facial patterns at the start of the treatment: brachyfacial, mesofacial, and dolichofacial. Statistical comparisons were performed with t-tests and analysis of variance (ANOVA).

Results: Statistically significant supplementary mandibular growth (Co–Gn) in the test group (2.8 mm) was associated with improvement of overjet (OJ), overbite (OB), and molar relationship. Short-term mandibular growth was greater in pubertal than pre-pubertal groups (2.4 mm, $P < 0.05$). Mandibular incisors retroclined by 2.1 degrees after MLSUA treatment. The brachyfacial group showed greater reduction in the ANB angle and forward movement of pogonion. Mandibular, palatal, and occlusal plane angles showed insignificant change regardless of the facial type.

Conclusions: MLSUA treatment corrected the Class II malocclusion by accelerating mandibular growth in the short-term with minimal dento-alveolar compensation, and the correction was maintained before debond. The treatment may be more effective if started at puberty. The mandibular, palatal, and occlusal planes remained stable throughout the treatment. Brachyfacial patients showed more favourable horizontal growth.

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** • 46 Class II patients (23 with full unit and 23 with end-to-end molar relationships) • Behandlung mittels MLSUA (“Modified Louisiana State University activator”)
Schweregrad	Overjet greater than 5 mm. Full unit Class II or end-to-end molar relationship. ANB angle greater than 4 degrees.

Einschluss-kriterien *Bei Review: PICOS*	1. No previous orthodontic treatment or craniofacial syndrome. 2. Class II, division 1 malocclusion. 3. Overjet greater than 5 mm. 4. Full unit Class II or end-to-end molar relationship. 5. ANB angle greater than 4 degrees. 6. Completed MLSUA treatment. 7. Complete records available including pre- and post-treatment photos, high quality lateral cephalograms with good visibility of the vital landmark area, treatment notes, and patient details.
Ausschluss-kriterien	Keine Angabe
Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** *All the subjects in the MLSUA group were treated first with MLSUA (Figure 1). This appliance was an activator with a 1–2 cm opening on freeway space and almost maximum protrusion. The mandibular incisors had 1–2 mm labial acrylic capping and complete lingual acrylic relief. Maxillary incisors had incisal edge but no labial acrylic contact, and a Bass spring as a labial bow. The acrylic occlusal to the mandibular posterior teeth was relieved to allow extrusion and levelling of the Curve of Spee if necessary. Headgear tubes were added at the second primary molar level. Deep lingual flanges were used to keep the mandible engaged in the appliance. High-pull headgear was combined with the activator with 400 g of force through the assumed centre of resistance of the maxilla. Force direction was adjusted according to the vertical facial pattern of the subjects. The subjects wore this appliance every night for a minimum of 12–15 h for an average of 21 months.* *A maxillary removable plate was given for them to wear during the day in order to maintain the angulation of the maxillary incisors.* VERSUCHSGRUPPE: **MLSUA** N=46 (Anfang) / N=46 (Ende) / Alter = 11,4 ± 1,3 Jahre / ♂:♀ = 21:25 • Gebissphase: spätes Wechselgebiss / permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** **kieferorthopädische Therapie zu anderem Zeitpunkt /Zeitraum /Gebissphase** *The control group obtained from the database of American Association of Orthodontists Foundation (AAOF) consisted of 46 untreated Class II subjects who had lateral cephalograms taken annually to observe their craniofacial growth for the age ranges studied. These untreated subjects were matched with the treated subjects for age, sex, and skeletal maturity status (CVM method) at the start of observation.* KONTROLLGRUPPE: **Untreated Control** N=46 (Anfang) / N=46 (Ende) / Alter = 11,3 ± 1,4 Jahre / ♂:♀ = 21:25 • Gebissphase: spätes Wechselgebiss / permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: keine Behandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: *FRS-Parameter*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	MLSUA corrected the Class II malocclusion by accelerating mandibular growth in the short term with minimum dento-alveolar compensation, and the correction was maintained before deband. The maxillary incisors were not significantly retroclined, and the mandibular incisors were not proclined. The mandibular, palatal, and occlusal planes remained stable. MLSUA treatment may be more effective if performed at puberty.

Zusammen-fassung der Ergebnisse	**MLSUA VS. Untreated Control** **+ Subgruppenanalyse: Early Group vs. Late Group (als Subgruppen der MLSUA-Gruppe)** ***PRIMÄRZIELGRÖßE*** *Skelettal Changes* *The MLSUA group showed significantly greater reduction in ANB than the controls of 1.9 degrees (P < 0.001). This reduction was maintained before deband (1.0 degree, P < 0.01) (Tables 7–9).* *During T1–T2 and T1–T3, no statistically significant difference between the MLSUA and control group was found in SNA angle and A–Nperp (Tables 7–9).* *The early and late groups did not show any statistically significant difference in maxillary growth, nor did the brachyfacial, mesofacial, and dolichofacial groups (Tables 10 and 11). The MLSUA group showed a statistically significant increase of 2.6 mm in mandibular length (Co–Gn) compared with the controls in T1–T2 (P < 0.001). There was mandibular catch-up growth of 1.3 mm in the control group in T2–T3 (P < 0.05). The MLSUA group gained 1.5 mm of extra mandibular growth before deband (P < 0.05). The SNB increased 1.6 degrees more in the MLSUA group in T1–T2 (P < 0.001) and 1.8 degrees more in T1–T3 (P < 0.01) (Table 7–9). The late group gained an increase in overall mandibular length of 2.4 mm (P < 0.01) and ramus height of 2.2 mm (P < 0.001) compared to the early group (Table 10).* *Dentoalveolar Changes* *The overjet was significantly reduced by 3.9 mm (P < 0.001) in the MLSUA group whilst no reduction was found in the control group in T1–T2. The overjet was reduced 1 mm (P < 0.05) more than the controls during the fixed treatment in T2–T3. Overall, the MLSUA group showed an overjet reduction of 5 mm (P < 0.001) whilst the control group had almost no change. The overbite was reduced in the MLSUA group by 2 mm (P < 0.001) in T1–T2 and 2.8 mm (P < 0.001) in T1–T3. The inter-incisal angle in the MLSUA group increased by 4.4 degrees (P < 0.001) in T1–T2 while there was no change in the control group. The Class II molar relationship was improved in the MLSUA group throughout the entire treatment (Tables 7–9).* *In T1–T2, the MLSUA group showed a statistically significant maxillary incisor retrusion of 1.2 mm (P < 0.001) relating to NA line. Although maxillary incisors were also retroclined by 2.2 degrees, the difference in retroclination was not statistically significant compared with the controls (1.6 degrees). No difference was found between the early and late groups, or between the three vertical facial types (Tables 7–11). The mandibular incisors were significantly retroclined by 2.7 degrees (P < 0.001) in the MLSUA group during T1–T2.*

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign:* - *Gutes Matching der Gruppen zueinander* - *Ausführliche Informationen zur Studienpopulation und zur durchgeführten Intervention angegeben* - *Gut strukturiertes Manuskript* *Auswertung:* - *Adäquate Statistik* - *Übersichtliche Ergebnisdarstellung durch mehrere Tabellen* *Power der Studie/Patientenzahl: vorhanden! Relativ große Kohorte von 46 Patienten je Gruppe* *Funding: Keine Angabe* *Interessenkonflikte: None to declare!* *Ethik: Keine Angabe* *Bias (SIGN/AMSTAR/EinzelstudienRoB – alle negativen Punkte aus Fragebogen auflisten):* - *The study indicates how many of the people asked to take part did so, in each of the groups being studied. – NO!* - *Have confidence intervals been provided? – NO!*
Schluss-folgerung des Begutachters	methodische Qualität: gut
	Klinische Aussagekraft: gut Die Autoren untersuchten das Outcome von Patienten, die mittels MLSUA-Apparatur behandelt wurden, im Vergleich zu einer unbehandelten Kontrollgruppe. Das Manuskript ist übersichtlich gestaltet und es werden viele Informationen zur Studienpopulation und der durchgeführten Intervention gegeben. Insgesamt erscheint die klinische Aussagekraft der Ergebnisse gut.
Evidenz-level (SIGN)	**2++**
Qualität **(RoB, SIGN /AMSTAR II)**	High quality (++)

Evidenztabelle Kilinc, Arslan et al. 2008

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Effects on the sagittal pharyngeal dimensions of protraction and rapid palatal expansion in Class III malocclusion subjects

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SUMMARY This study examined the effects of rapid palatal expansion (RPE) and maxillary protraction headgear therapy in 18 patients with a skeletal Class III malocclusion (11 girls and seven boys; mean age 10.9 years) on upper airway dimensions compared with an untreated control group (nine girls and eight boys; mean age 10.9 years). Pre- and post-treatment cephalometric radiographs were traced and analysed at similar time intervals. The average treatment time was 6.94 ± 0.56 months. Wilcoxon's test was used for intragroup comparisons and the Mann–Whitney U-test for intergroup comparisons.

A significant increase occurred in the maxillary forward position. Mandibular forward movement and downward and backward rotation were inhibited. In addition, the upper incisors were proclined ($P < 0.001$), and the lower incisors were significantly retroclined ($P < 0.05$). When the treatment and control groups were compared, the upper airway linear measurements (prs-ad^1, prs-ad^2, APW-PPW, APW'-PPW') and the nasopharyngeal area had increased in the treatment group.

These results demonstrated that maxillary expansion together with protraction of the maxilla improved naso- and oropharyngeal airway dimensions in the short term.

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie** - Patients with skeletal Class III malocclusion, maxillary skeletal retrusion and anterior cross-bite with a Class III molar relationship; Dicle and Antalya, Turkey
Schweregrad	Keine Angaben
Einschluss-kriterien	skeletal Class III malocclusion with maxillary skeletal retrusion, anterior crossbite with a Class III molar relationship
Ausschluss-kriterien	other congenital anomalies, mandibular displacement

Intervention Versuchsgruppe	**kieferorthopädische Behandlung** **RPE/PHG** (rapid palatal expansion/ protraction head gear) **(T):** Expansion was achieved using a banded Hyrax expansion appliance. The fi rst permanent molars and fi rst premolars or the fi rst primary molars were banded. After obtaining alginate impressions, a Hyrax screw was soldered to the bands on the models in an antero-posterior direction. Following cementation, an orthodontist fi rst activated the appliance; the patients were then asked to activate the screw twice a day for 7 days. At the end of day 7, protraction therapy commenced. A Petittype facemask was used with 600 – 700 g of force applied bilaterally. The direction of the elastics was approximately 20 degrees below the occlusal plane. The patients were instructed to wear the appliance for at least 18 hours a day. VERSUCHSGRUPPE 1: **RPE/PHG (T)** N= 18 (Anfang) / N=18 (Ende) / Alter = 10,9 ± 0,93 years ♂:♀ = 7:11 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE 1: **untreated Class III (C)** N=17 (Anfang) / N=17 (Ende) / Alter = = 10,9 ± 0,82 years ♂:♀ = 8:9 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • Atmung und Luftraum (Airway space, Schlafapnoe), Schlucken und Sprechen PRIMÄRZIELGRÖßE: **Airway dimensions:** NA- nasopharyngeal area, OA- oropharyngeal area, TA- Total airway area
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	RPE together with protraction of the maxilla improved the naso- and oropharyngeal airway dimensions in the short term. The nasopharyngeal area had increased significnatly in the treatment group The present and previous studies concerning airway dimensions were based on two-dimensional cephalometric measurements and thus have limitations.

Zusammen-fassung der Ergebnisse	**GRUPPE RPE/PHG (T) VS. GRUPPE untreated Class III (C)** T1 (pretreatment/ observation): 10,5, 0,93 years RPE/PHG (T); 10,9, 0,82 years untreated Class III (C) T2 (posttreatment/ observation):): 11,07, 0,56 years RPE/PHG (T); 11,71, 0,48 years untreated Class III (C) **Airway dimensions** **NA- nasopharyngeal area** **OA- oropharyngeal area** **TA- Total airway area** Differences (T2–T1) SD Differences (C2–C1) SD P NA (mm^2) 71.30 25.17 13.96 37.22 * OA (mm^2) 111.16 373.65 −52.56 151.84 NS TA (mm^2) 184.46 427.21 −38.40 143.56 NS
Angaben auffälliger positiver und/oder negativer Aspekte	Die Äquivalenz von Versuch- und Kontrollgruppe ist wahrscheinlich gegeben. Baseline characteristics verfügbar, jedoch nicht statistisch untersucht. Eine Verblindung wurde nicht durchgeführt. Sample Size/ Power Berechnungen fehlen. Die retrospektive Studie hat einige methodische Schwächen. Die Untersuchung erscheint wenig originell, weder im Design, der Durchführung und im Outcome. Wegen der Schwächen besitzt die Studie daher nur sehr eingeschränkte klinische Relevanz. *Funding:* keine Angabe *Interessenkonflikte:* keine Angabe *Bias (SIGN):* Die Äquivalenz von Versuch- und Kontrollgruppe ist wahrscheinlich gegeben. Baseline characteristics verfügbar, jedoch nicht statistisch untersucht. Power/ Sample Size Berechnungen wurden nicht durchgeführt. Eine Verblindung fand nicht statt.
Schluss-folgerung des Begutachters	<u>methodische Qualität: akzeptabel</u> <u>Klinische Aussagekraft:</u> Die retrospektive Studie hat einige methodische Schwächen. Die Untersuchung erscheint wenig originell, weder im Design der Durchführung und im Outcome. Wegen der Schwächen besitzt die Studie daher nur sehr eingeschränkte klinische Relevanz.
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN)	**acceptable (+)**

Evidenztabelle Kim-Berman et al. 2019

Treatment effects of the Carriere® Motion 3D™ appliance for the correction of Class II malocclusion in adolescents

Hera Kim-Berman[a]; James A. McNamara Jr.[b]; Joel P. Lints[c]; Craig McMullen[d]; Lorenzo Franchi[e]

ABSTRACT

Objectives: To determine the treatment effects produced in Class II patients by the Carriere® Motion 3D™ appliance (CMA) followed by full fixed appliances (FFA).

Materials and Methods: This retrospective study evaluated 34 adolescents at three time points: T1 (pretreatment), T2 (removal of CMA), and T3 (posttreatment). The comparison group comprised 22 untreated Class II subjects analyzed at T1 and T3. Serial cephalograms were traced and digitized, and 12 skeletal and 6 dentoalveolar measures were compared.

Results: Phase I with CMA lasted 5.2 ± 2.8 months; phase II with FFA lasted 13.0 ± 4.2 months. CMA treatment restricted the forward movement of the maxilla at point A. There was minimal effect on the sagittal position of the chin at pogonion. The Wits appraisal improved toward Class I by 2.1 mm during the CMA phase but not during FFA. Lower anterior facial height increased twice as much in the treatment group as in controls. A clockwise rotation (3.9°) of the functional occlusal plane in the treatment group occurred during phase I; a substantial rebound (−3.6°) occurred during phase II. Overjet and overbite improved during treatment, as did molar relationship; the lower incisors proclined (4.2°).

Conclusions: The CMA appliance is an efficient and effective way of correcting Class II malocclusion. The changes were mainly dentoalveolar in nature, but some skeletal changes also occurred, particularly in the sagittal position of the maxilla and in the vertical dimension. (*Angle Orthod.* 0000;00:000–000.)

KEY WORDS: Carriere Motion appliance; Class II treatment

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** • Class II patients treated by the Carriere Motion 3D appliance (CMA) aus spanischer Praxis • Kontrolle: untreated Class II malocclusion, the records of whom were selected from the files of the University of Michigan Growth Study (eight subjects), the Denver Child Growth Study (eight subjects), and the Bolton- Brush Growth Study (six subjects)
Schweregrad	***Intervention:*** OJ = 5,4 ± 2,4mm; ANB = 5,2 ± 1,7°; Okklusion = -1,3 ± 1,4 mm ***Kontrolle:*** OJ = 7,0 ± 2,0mm; ANB = 4,9 ± 2,5°; Okklusion = -1,6 ± 1,8 mm
Einschluss-kriterien *Bei Review: PICOS*	Für Interventionsgruppe: • Treated without extractions • Using CMA
Ausschluss-kriterien	• technical radiographic issues that made one or more films in the series unusable • the duration of phase I treatment with CMA was greater than 12 months • posttreatment records were obtained more than 4 months following the conclusion of active treatment.

Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** All patients were treated with CMA during phase I. The fit of the CMA was determined using the manufacturer’s instructions. In the mandible, buccal tubes with elastic hooks were bonded to the mandibular second or first molars, and a clear invisible retainer made from 1-mm-thick Essix Aþ plastic (Dentsply Sirona, York, Penn) was placed (Figure 1). Elastic wear consisted of Force 1e elastics (1/4-inch 6 oz) and Force 2e elastics (3/16-inch 8 oz; Henry Schein Orthodontics) worn until the end of treatment with CMA. Subsequently, full fixed appliances (FFA) with preadjusted 0.022-inch edgewise brackets (Carriere SLXe Self-ligating Brackets, Henry Schein Orthodontics) were placed. VERSUCHSGRUPPE: **Carriere Distalizer Group** N=34 (Anfang) / N=34 (Ende) / Alter = 12,8 ± 1,4 Jahre / ♂:♀ = 11:23 • Gebissphase: spätes Wechselgebiss; permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Therapie** The control group consisted of 22 subjects (10 girls and 12 boys) with untreated Class II malocclusion, the records of whom were selected from the files of the University of Michigan Growth Study (eight subjects), the Denver Child Growth Study (eight subjects), and the Bolton- Brush Growth Study (six subjects). The lateral cephalograms were available through the American Association of Orthodontists Foundation Craniofacial Growth Legacy Collection. KONTROLLGRUPPE: **Untreated Control Group** N=22 (Anfang) / N=22 (Ende) / Alter = 12,2 ± 0,8 Jahre / ♂:♀ = 12:10 • Gebissphase: spätes Wechselgebiss; permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: keine
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: Cephalometric Treatment Effects (skeletal, dental)
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	This study examined the treatment effects produced by CMA treatment followed by comprehensive orthodontics. The overall treatment time was relatively short (17.6 months), and Class II correction typically was achieved during the first 5–6 months of treatment. The following conclusions are reached based on the data analyzed: The CMA is efficient and effective in resolving Class II malocclusion. • The primary treatment effects are dentoalveolar in nature, with changes in molar relationship, overbite, and overjet combined with some lower incisor proclination. • The most obvious skeletal change was an increase in lower anterior facial height. • There was a slight restriction in the forward movement of the maxilla at point A. • Mandibular length was not affected by treatment. • The chin point at pogonion did not move forward in the treatment group due, in part, to the increase in lower anterior facial height.

Zusammen-fassung der Ergebnisse	**Carriere Distalizer Group VERSUS Untreated Control Group** ***PRIMÄRZIELGRÖßE*** *Skeletal relationships. Table 3 provides a direct comparison between the pretreatment to posttreatment interval and the extrapolated control cephalometric values. A reduced forward movement of the maxilla at point A in the treatment group compared with controls was noted. In contrast, the chin point at pogonion remained in the same sagittal position (0.0 mm) relative to the nasion perpendicular during T1–T3; the chin moved forward 1.5 mm in the controls. The SNB angle decreased slightly (-0.2°) in the treatment group but increased 0.68 in the controls. Both ANB (-0.9°) and the Wits appraisal (-2.0 mm) showed significant decreases in the treatment group in comparison with controls. Lower anterior facial height (ANS to menton) increased in the treatment group by 3.7 mm, which was almost double that of the untreated Class II controls. Dentoalveolar relationships. Major changes also were observed in the dentoalveolar measures. All six measures of dentoalveolar relationships in the control group remained relatively unchanged from T1 to T3. In the treatment group, overjet and overbite improved (-2.9 mm and -2.6 mm, respectively) as did molar relationship (3.3 mm). There was 4.28 of proclination of the lower incisor as well as a slight closure of the interincisal angle (-3.58).*

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign:* • *Retrospektives Studiendesign* • *Historische Kontrollgruppe aus zwischen unterschiedlichen Wachstumsstudien (Denver, Michigan)* • *Unklares Matchingverfahren* • *Unterschiedliche Erhebungszeitpunkte zwischen Kontroll- und Interventionsgruppe FRS der Kontrolle wurden extrapoliert, damit Intervalle gleich waren* • *Insuffiziente Angabe zur Probandenakquise (mangelnde Einschlusskriterien, Methodik)* • *Zu wenige Information zum Schweregrad und der Ätiologie der Anomalie (skel./dent.)* *Durchführung:* • *Keine Verblindung in der Intervention* • *Wenig Angaben zur Therapie (1 Behandler, keine Compliance angegeben)* ➔ *Reliabilität der Intervention fraglich* *Auswertung:* • *Kein Reliabilitätstest für die Outcome-Erhebung durchgeführt* • *Solide Statistik (Test auf Normalverteilung vorhanden)* *Power der Studie/Patientenzahl: vorhanden* *Funding: keine Angabe* *Interessenkonflikte: keine Angabe* *Bias (SIGN/AMSTAR/EinzelstudienRoB – alle negativen Punkte aus Fragebogen auflisten):* • *Selection bias: Vergleichbarkeit der Studiengruppen fraglich (historische Kontrolle); kaum Angaben zur Rekrutierung (Teilnehmerrate)* • *Detection bias: keine Verblindung erfolgt* • *Kein Erhebung von Confounders*
Schluss-folgerung des Begutachters	methodische Qualität: befriedigend
	Klinische Aussagekraft: moderat
Evidenz-level (SIGN)	**2+**
Qualität **(RoB, SIGN /AMSTAR II)**	**+ Acceptable**

Evidenztabelle Kucukkeles, Ilhan et al. 2007

Original Article

Treatment Efficiency in Skeletal Class II Patients Treated with the Jasper Jumper

A Cephalometric Evaluation

Nazan Küçükkeleş[a]; Işıl İlhan[b]; İ. Ata Orgun[c]

ABSTRACT

Objective: To analyze the effects of the Jasper Jumper appliance during the treatment of skeletal Class II malocclusion.

Materials and Methods: Lateral cephalograms and hand-wrist radiographs were collected from 45 Class II growing patients (22 boys, 23 girls). Three sets of records (initial, before Jasper Jumper, after Jasper Jumper) from 25 patients were compared with 20 control subjects of similar skeletal developmental stage. Mean age of the treatment and control groups were 11.83 years and 11.3 years, respectively. The data were analyzed by using paired *t*-tests.

Results: The results demonstrated that the Jasper Jumper effectively corrected Class II malocclusion, but the changes were 80% dentoalveolar. The Jasper Jumper induced a clockwise rotation of the occlusal plane without much alteration in vertical dimension. Skeletally, the maxillary growth was restricted and pogonion moved forward, improving the profile.

Conclusion: The Jasper Jumper appliance may be an effective method to improve both the skeletal imbalance and the profile in growing patients.

KEY WORDS: Class II correction; Jasper Jumper; Functional treatment

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** • Growing patients exhibiting skeletal Class II malocclusion characterized by mandibular retrognathism
Schweregrad	Intervention: ANB = 5,6 ± 1,79°; Overjet = 8,96 ± 2,46 mm; Overbite = 4,72 ± 2,19mm Kontrolle: ANB = 6,62 ± 1,47°; Overjet = 9,45 ± 3,17 mm; Overbite = 3,47 ± 2,75mm
Einschluss-kriterien *Bei Review: PICOS*	• Class II skeletal and dental relationship • normal or reduced incisor-mandibular plane angle • well aligned lower arch • patient at the peak stage of the growth curve • normal or low-angle growth pattern.
Ausschluss-kriterien	Keine Angabe

Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** *For orthodontic therapy, upper bands with triple attachments and 0.018-inch standard edgewise brackets were used. After the leveling (mean time 4.7 months), 0.017-inch x 0.025-inch stainless steel arch wires were engaged in both arches just before the insertion of the Jasper Jumpers (American Orthodontics, Sheboygan, Wis). Both arches were cinched back to minimize the adverse effects of the appliance and to prevent slippage. The size of the Jasper Jumper was selected according to the manufacturer’s instructions with separate measurements on each side. The upper end of the spring was attached to the maxillary molars via a pin-ball through the headgear tube. The lower first premolar brackets were debonded after the leveling, and a toe-out bending was performed distal to the canine brackets (Figure 1). The Jasper Jumper was then attached onto the mandibular arch wire, distal to the Teflon ball. A minimal gap of 8 mm was allowed from the pin-ball head to the distal of the headgear tube in maxilla to increase appliance efficiency (Figure 2). To ease patient adaptation, no activation was made at the first insertion. After 1 week, a 2-mm activation was performed, which was renewed once in 6 weeks. When an over–Class I relationship was achieved, treatment was continued by standard edgewise techniques.* *From the 25 Jasper Jumper patients, three sets of lateral cephalograms were taken: initial (T1), before Jasper Jumper insertion (T2), and after the removal of the appliance (T3).* Timing of treatment was established according to the skeletal age by means of hand-wrist radiographs, which were interpreted according to Grave’s criteria. VERSUCHSGRUPPE: **Jasper Jumper Group** N=25 (Anfang) / N=25 (Ende) / Alter = 11,83 ± -- Jahre / ♂:♀ = 12:13 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** *A control group was formed by the records of 20 skeletal Class II patients with a mean age of 11.3 years who were observed for 6 months before orthodontic treatment (Table 1).* *In the control group, lateral cephalograms were exposed for each patient at the beginning and at the end of the observation period.* KONTROLLGRUPPE: **Untreated Control Group** N=20 (Anfang) / N=20 (Ende) / Alter = 11,3 ± --- Jahre / ♂:♀ = 10:10 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: keine
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: *Cephalometric Treatment Effects*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**

Schluss-folgerungen der Autoren	a. The maxillary restriction effect of the Jasper Jumper outweighs its skeletal mandibular effect. b. Most of the correction was achieved by dentoalveolar changes, with not much alteration in the vertical dimension. c. The achieved correction was followed by the soft tissues, improving the profile. d. Because of its predominantly dentoalveolar effects, the Jasper Jumper can also be used in nongrowing Class II patients.
Zusammen-fassung der Ergebnisse	**Jasper Jumper Group VERSUS Untreated Control Group** ***PRIMÄRZIELGRÖßE*** **Skeletal Changes** The skeletal values of the control and treatment groups did not show any significant differences. The treatment group, however, presented with significant changes during Jasper Jumper application. Art-Pg distance increased (2.8 ± 1.75 mm, P < .001), SNA decreased (-0.5 ± 0.52°, P < .001), and B-point moved forward (0.94 ± 1.79 mm, P < .01). The gonial ratio was the only parameter that changed significantly during the leveling stage (-2.78 ± 3.3, P < .001). Comparisons with the control group revealed a change in A-point location, which seemed to have moved posteriorly in the treatment group. **Dental Changes** During Jasper Jumper application, the dentoalveolar changes showed that the upper incisors uprighted (-4.1 ± 7.05°, P < .01) and extruded (1.24 ± 1.19 mm, P < .001) and the lower incisors proclined (IMPA: 4.46 ± 5.05°, P < .001) and intruded (-1 ± 2.21 mm, P < .01). In the posterior segment, the upper first molars moved distally (-0.72 ± 1.29 mm, P < .01) and intruded (-0.64 ± 0.67 mm, P < .001), whereas the lower first molars moved mesially (3.6 ± 1.89 mm, P < .001) and extruded (1.54 ± 1.42 mm, P < .001). Consequently, the occlusal plane rotated in clockwise manner. Control group subjects, on the other hand, exhibited a mild counterclockwise rotation. **Soft tissue changes** In Table 4, Jasper Jumper effects were compared with the growth changes observed in the control group. The results indicated that upper lip position and H-ANB angle were the only parameters that changed significantly.

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign:* • *retrospektiv* • *eigene Kontrollgruppe* • *Ethikvotum fraglich* • *Wenig Angaben zur Rekrutierung (Methodik, Teilnehmerrate)* • *Keine Angaben zu Randomisierung/Verblindung* • *Kein Matching beschrieben* *Durchführung:* • *Keine Angaben zum Behandler ➔ Reliabilität der Intervention fraglich* • *Keine Angaben zur Compliance der Patienten* • *Kein detailliertes Behandlungsprotokoll* *Auswertung:* • *Reliablitätstest vorhanden* • *Keine Testung auf Normalverteilung angegeben (obwohl t-Test)* • *Keine Konfidenzintervalle angegeben* *Power der Studie/Patientenzahl: keine Angaben* *Funding: keine Angaben* *Interessenkonflikte: keine Angaben* *Bias (SIGN/AMSTAR/EinzelstudienRoB – alle negativen Punkte aus Fragebogen auflisten):* • *Selection bias (keine Teilnehmerrate, kaum Angaben zur Rekrutierung)* • *Attrition bias: keine Angabe über Dropouts* • *Detection bias: keine Verblindung, Reliabilität/Validität der Outcome-Erhebung fraglich* • *Keine Confounders erhoben*
Schluss-folgerung des Begutachters	methodische Qualität: befriedigend
	Klinische Aussagekraft: Der wachstumshemmende Effekt auf den OK ist größer als die Wachstumsförderung im UK. Der Hauptteil der Korrektur der Klasse-II erfolgte durch dentoalveoläre Veränderungen. Es kam zu keinen nennenswerten Veränderungen der vertikalen Dimension. Die erreichte Korrektur verbesserte ebenfalls das Profil. Aufgrund der hauptsächlich dentoalveolären Effekte kann der Jasper Jumper auch im erwachsenen Gebiss verwendet werden.
Evidenz-level (SIGN)	**2+**
Qualität **(RoB, SIGN /AMSTAR II)**	⊕ Acceptable

Evidenztabelle LaHaye et al. 2006

ORIGINAL ARTICLE

Orthodontic treatment changes of chin position in Class II Division 1 patients

Mark B. LaHaye,[a] Peter H. Buschang,[b] R. G. "Wick" Alexander,[b,c] and Jim C. Boley[b,d]
Thibodaux, La, and Dallas, Tex

Introduction: Because most patients with skeletal Class II malocclusions also have mandibular deficiencies, treatment plans should include improvement in chin projection. On that basis, the purposes of this study were to (1) determine how Class II treatment affects anteroposterior (AP) chin position in growing subjects and (2) ascertain the most important determinants of AP chin position. **Methods:** Pretreatment and posttreatment lateral cephalograms of 67 treated patients (25 extraction headgear and Class II elastics, 23 nonextraction headgear, and 19 Herbst) were collected, traced, and digitized. The average pretreatment age was 12.2 years (range, 9-14 years), and the average treatment duration was 30.2 months (range, 17-65 months). Cephalometric changes were compared with 29 matched untreated Class II controls. Mandibular superimpositions were used to evaluate condylar growth and true mandibular rotation. **Results:** All 3 treatment methods produced normal dental relationships and restricted or inhibited AP maxillary growth, with no significant improvement of AP chin position. Differences between changes in vertical position of the maxilla, maxillary and mandibular molars, and condylar growth could not reliably predict changes in chin position. Analyses demonstrated that true mandibular rotation was the primary determinant of AP chin position. Stepwise multiple regression showed that, combined with true mandibular rotation, condylar growth and movements of the glenoid fossa accounted for 81% of the variation in AP changes of pogonion. **Conclusions:** Contemporary treatments do not adequately address mandibular deficiencies. Future treatments must incorporate true mandibular rotation into Class II skeletal correction. (Am J Orthod Dentofacial Orthop 2006;130:732-41)

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Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalien** • Class II Division 1 white subjects • Unklar, wahrscheinlich Dallas, TX ➔ from the records of 3 private-practice orthodontists (Versuchsgruppen) ➔ Human Growth and Research Center at the University of Montreal. They were from 3 school districts in Montreal representing various socioeconomic strata of the larger population. (Kontrollgruppe)
Schweregrad	Okklusion >= ½ PBD, SNB<Durchschnitt, Unterkieferneigung>Durchschnitt

Einschluss-kriterien *Bei Review: PICOS*	1. Class II Division 1 malocclusion: ≥ half-step Class II molar and canine relationship; 2. Class II skeletal relationships; 3. approximately equal numbers of boys and girls; 4. growing white children (9-14 years); 5. complete records including acceptable pretreatment and posttreatment cephalograms, pretreatment dental models, and intraoral photographs; 6. mandibular deficiency, defined as smaller than average pretreatment SNB angle according to age- and sex-specific norms; 7. vertical growth tendencies, defined as greater than average pretreatment mandibular plane angle (SNGoGn) based on age- and sex-specific norms; and 8. successfully treated by dental criteria: Class I molar and canine relationship, adequate overbite (2-4 mm) and overjet (1-3 mm).
Ausschluss-kriterien	keine
Intervention Versuchsgruppe	**kieferorthopädische Behandlung** VERSUCHSGRUPPE1: **Ext HG group** treated with 4 premolar extractions in a typical Tweed edgewise manner with extensive use of tip-back bends, anchorage preparation, and Class II elastics. Various types of headgear (high-pull J hook, combipull, high-pull bow Hickam) were used. N=25 (Anfang) / N=25 (Ende) / Alter = 12.1 ± 2 Jahre / ♂:♀ = 12:13 • Gebissphase: spätes Wechselgebiss, permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: reguläre Behandlung VERSUCHSGRUPPE2: **NE HG group** treated with the Alexander straightwire appliance in conjunction with cervicalpull headgear and nonextraction therapy. These patients were instructed to wear the headgear a minimum of 14 hours per day. N=23 (Anfang) / N=23 (Ende) / Alter = 12.7 ± 2 Jahre / ♂:♀ = 11:12 • Gebissphase: spätes Wechselgebiss, permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: reguläre Behandlung VERSUCHSGRUPPE3: **Herbst group** treated with stainless steel crown Herbst appliances for an average of 12.7 ± 7 months, followed by fixed edgewise appliances. N=19 (Anfang) / N=19(Ende) / Alter = 11.7 ± 3 Jahre / ♂:♀ = 9:10 • Gebissphase: spätes Wechselgebiss, permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: reguläre Behandlung

Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **untreated control group** N=29 (Anfang) / N=29 (Ende) / Alter =12.4 ± 1.5 Jahre / ♂:♀ = 14:15 • Gebissphase: spätes Wechselgebiss, permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: keine Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär** • **dentofaziale Ästhetik** PRIMÄRZIELGRÖßE: Cephalometric skeletal and dental treatment changes
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	In this study evaluating the effect of extraction headgear and Class II elastics, nonextraction headgear, and Herbst treatment, we made the following conclusions. 1. Methods commonly used to correct Class II skeletal malocclusions produce no significant improvements in AP chin position. Skeletal Class II correction in growing adolescents results primarily from maxillary growth restriction or inhibition. 2. AP changes in chin position cannot be accurately predicted by Schudy’s pogonion formula38 (ie, based on condylar growth, vertical growth of the maxilla, and vertical maxillary and mandibular dentoalveolar growth). 3. Validating previously established mathematical models, approximately 80% of the variability in AP movement of the chin can be explained by true rotation, AP and vertical condylar growth, and AP movement or drift of the glenoid fossa. True mandibular rotation is the most important determinant of AP changes of chin position.

Zusammen-fassung der Ergebnisse	**Ex HG group VS untreated control group** **NE HG group VS untreated control group** **Herbst group VS untreated control group** (Ergebnisse für alle Vergleiche zusammengefasst) ***PRIMÄRZIELGRÖßE*** Cephalometric skeletal and dental treatment changes The SNA and ANB angles were the only measurements showing significant treatment effects (Table II). They decreased in all treated groups and remained unchanged in the untreated control sample. Weitere signifikante Ergebnisse nur Tabelle 3 zu entnehmen, nicht im Text beschrieben. The first regression analysis, evaluating Schudy’s pogonion formula, showed that vertical condylar growth was most closely associated with the AP movements of pogonion. The regression indicated 0.385 mm of anterior movement of pogonion for every 1 mm of superior condylar growth. No other variables entered the regression. Superior condylar growth alone explained 25% (R = .50) of the variation in the AP movements of pogonion; it produced estimates of AP change of pogonion that were within ± 1.1 mm approximately 68% of the time. The second regression analysis (Table IV) showed that true rotation was most closely associated (R = .66) with AP movement of pogonion. As shown in Figure 3, the first step of the regression predicted 0.694 mm of anterior movements of pogonion for every 1° of true forward rotation. For example, assuming 2° for true forward rotation, 2.076 mm of anterior movement of pogonion would be predicted (.688 + [-2 * -.694]). Horizontal condylar growth, horizontal fossa remodeling, vertical fossa remodeling, and vertical condylar growth were the second, third, fourth, and fifth variables to enter the regression, respectively. They produced a multiple regression of 0.90, which accounted for 81% of the variation in AP chin movement. The standard error of the estimate indicated that these 5 variables predicted the AP movements of pogonion within ± 0.55 mm approximately 68% of the time.

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign:* - *retrospektiv* - *historische Kontrollgruppe* - *Kontrollgruppe aus Kanada, Versuchsgruppen amerikanisch* - *Gutes Matching von Kontroll- und Versuchsgruppen* *Durchführung:* - *Keine Angabe zu Behandlern* - *Ko-Intervention Multiband in Herbst group* - *Unterschiedliche Behandlungsdauern in den Versuchsgruppe* *Auswertung:* - *Keine Verblindung* - *Solide Statistik mit Post hoc Test* - *Reliabilitätsprüfung erfolgt* *Power der Studie/Patientenzahl:* - *Keine Power Analyse* *Funding:* - *Keine Angabe* *Interessenkonflikte:* - *Keine Angabe* *Bias (SIGN):* *The assessment of outcome is made blind to exposure status. If the study is retrospective this may not be applicable. –NO* *Where blinding was not possible, there is some recognition that knowledge of exposure status could have influenced the assessment of outcome. – NO* *The main potential confounders are identified and taken into account in the design and analysis. - NO* *Have confidence intervals been provided? - NO*
Schluss-	methodische Qualität: gut

folgerung des Begutachters	Klinische Aussagekraft: Die Behandlung mit 4-Prämolaren-Extraktion und Headgear führt im Vergleich zu einer unbehandelten Kontrollgruppe zu - einer signifikanten Verringerung von SNA und ANB. - Einer signifikanten Veränderung von Pg, Me, A Punkt, U6, Co sup, L6 sup Die Behandlung ohne Extraktion und Headgear führt im Vergleich zu einer unbehandelten Kontrollgruppe zu - einer signifikanten Verringerung von SNA und ANB. - Einer signifikanten Veränderung von Pg, Me, A Punkt, U6, Co sup, L6 sup Die Behandlung mit Herbst-Apparatur führt im Vergleich zu einer unbehandelten Kontrollgruppe zu - einer signifikanten Verringerung von SNA und ANB. - einer signifikanten Rückverlagerung des A-Punktes - einer signifikanten Mesialisation der unteren 6-Jahr-Molaren
Evidenz-level (SIGN)	**2++**
Qualität (RoB, SIGN /AMSTAR II)	**High quality (++)**

Evidenztabelle Lange et al. 1995

Changes in soft tissue profile following treatment with the bionator

D. William Lange, DMD, MSD; Varun Kaira, BDS, MDS, D Orth.RCS, DDS, MS; B. Holly Broadbent, Jr., DDS; Michael Powers, DDS, MSD; Suchitra Nelson, PhD

Abstract

The purpose of this study was to determine the changes in the soft tissue profile in patients treated in the mixed dentition with a bionator. Two groups of 30 individuals, between 9 and 12 years old and with Class II, Division 1, malocclusion were matched for age, sex, observation time, and dentofacial characteristics. Patients in the first group were treated with a bionator for an average of 18.7 months, resulting in a Class I molar relationship and reduction of overjet. The second group acted as a control and individuals did not receive any form of orthodontic treatment. Pretreatment and posttreatment cephalograms were analyzed and paired t-tests were used to compare the significance of changes between the two groups. Compared with the control group, the treated group demonstrated 1.97° decrease in ANB, a 3.35 mm increase in anterior facial height, 2.22° decrease in soft tissue profile convexity, and 17.4° increase in mentolabial angle.

Key Words

Bionator • Class II • Soft tissue profile • Esthetics

Submitted: August 1994 **Revised and accepted:** February 1995 Angle Orthod 1995;65(6):423-430.

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** • individuals with Class II, Division 1, malocclusion. • Private practice (bionator group) • Bolton-Brush Growth Study Center in Cleveland,. Ohio (untreated control group)

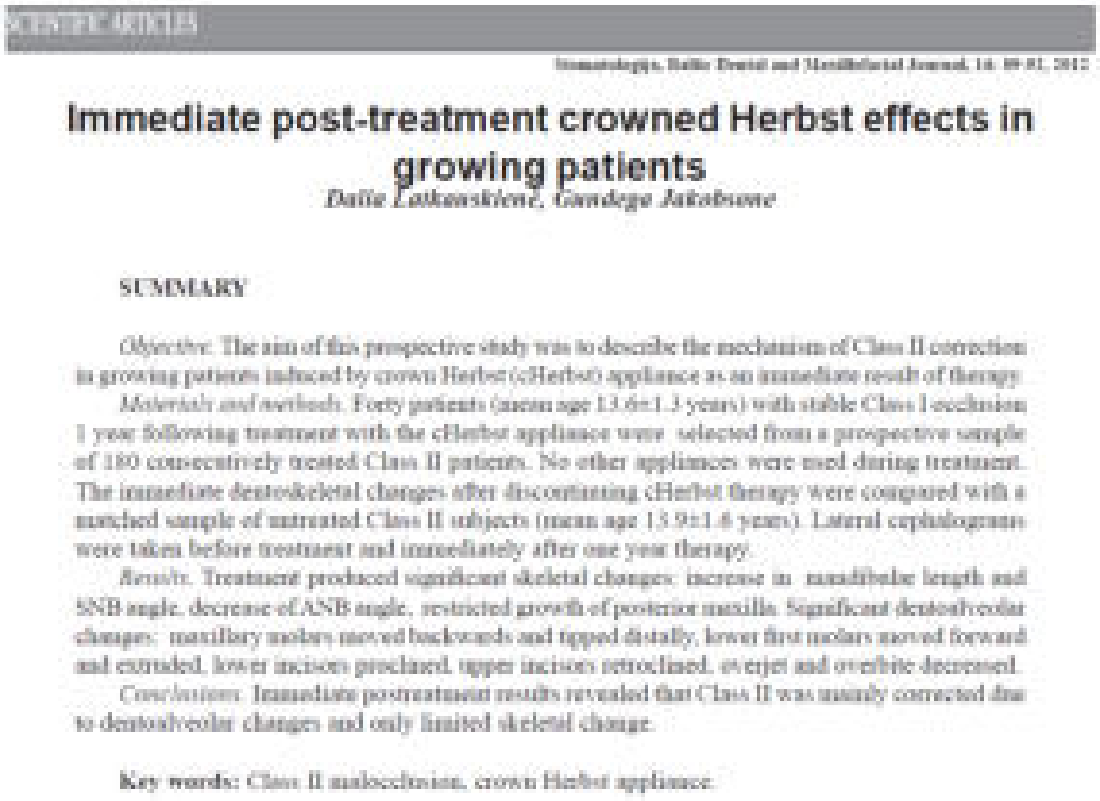
Schweregrad	Bionator group: ANB >= 5° FMA 20-29° Overjet 6-10mm Overbite > 0mm Untreated control group: closely matched for age, sex, treatment time, and dentofacial characteristics
Einschluss-kriterien *Bei Review: PICOS*	• mixed dentition • ANB of 5° or more • FMA 20° to 29° • overjet 6 mm to 10 mm • positive overbite • have complete records available, including lateral cephalograms taken with lips in repose • have noncontributory medical and dental histories
Ausschluss-kriterien	keine
Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** *The bionator used in this study was a variation of the appliance designed by Balters in the 1950s (Figure 1). Because the patients included in this study demonstrated excessive overbite, the bionator allowed for eruption of both maxillary and mandibular posterior teeth, while the man-dibular incisors were capped with acrylic. The construction bite was taken with the incisors in an edge-to-edge relationship and an opening of approximately 4 mm to 5 mm in the molar re-gion. The patients were instructed to wear the bionator 24 hours a day (except during meals) and were advised to keep the lips together to form a lip seal when the appliance was being worn. Full-time wear continued throughout the active phase of bionator therapy. However, once the objectives were attained, the bionator was worn at night only.* VERSUCHSGRUPPE: **bionator group** N=30 (Anfang) / N=30 (Ende) / Alter = 10y6m ± 1y2m / ♂:♀ = keine Angabe • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Therapie** KONTROLLGRUPPE: **untreated control group** N=30 (Anfang) / N=30 (Ende) / Alter = 10y6m ± 1y2m / ♂:♀ = keine Angabe • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: keine Behandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** • **dentofaziale Ästhetik** PRIMÄRZIELGRÖßE: *Cephalometric hard and soft tissue treatment effects*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	Based on the sample of this study, one can conclude that treatment with a bionator results in: 1.Decreased skeletal convexity; 2.Increased anterior and posterior face heights; 3.Reduced overjet and overbite; 4.Decreased facial convexity; 5.Uncurling and increase in length of the lower lip; 6.Minimal effect on the upper lip.

Zusammen-fassung der Ergebnisse	**Bionator group vs. Untreated control group** ***PRIMÄRZIELGRÖßE*** *Cephalometric hard and soft tissue treatment effects* **Hard Tissue** **Mandible** SNB increased 1.05° more in the bionator group than in the control group (P<=0.001). As determined by cranial base superimposition, B point moved forward 0.80 mm more. The length of the mandible as represented by Ar-Gn increased 6.45 mm in the treated group compared with 2.83 mm in the control group. The difference was statistically significant (p<0.001). **Maxilla** SNA decreased 0.50° in the bionator group and increased 0.40° in the control group. The difference between the two groups was significant (P<=.001). Cranial base superimposition showed that in the treated group, A point moved anteriorly 1.17 mm less than in the control sample. **Facial convexity** Skeletal convexity was measured by the ANB angle. There was a reduction of 1.97° in the ANB angle in the bionator group compared with the control group, which was significant at the 0.001 level. **Facial height** There were significant increases in anterior and posterior facial height in both the treated and control groups. However, anterior facial height, N-Me, increased 3.35 mm more in the bionator patients than in the controls (P<=0.001). The bionator group also demonstrated 2.20 mm additional increase in posterior facial height as measured by Ar-Go, compared with the control group (P<=0.001). **Dentition** The overjet in the treated group decreased 4.75 mm as compared with the control group (P<=0.001). Furthermore, the treated group showed 3.15 mm reduction in overbite (P<=0.001). Maxillary incisor angulation, as represented by U1-FH, decreased 3.93° (P<=0.001), but mandibular incisor angulation did not change. **Soft tissue** **Facial form** G-Sn-Pg', which is a measure of soft tissue facial convexity (Figure 4), decreased 2.22° in the treated group, representing a significant reduction in the convexity of the profile (P<=0.001). As determined by cranial base superimposition, subjects in the treated group demonstrated 3.73 mm anterior movement of Pg', whereas the control group showed 2.80 mm forward movement of Pg'. The 0.93 mm additional anterior movement of Pg' in the treated group was significant (P<=0.001). **Upper lip** Protrusion of the upper lip, as determined by the distance of the upper lip to the Sn-Pg' line, decreased 1.1 mm in the treated group as compared with the control group (P<=0.001). As determined by cranial base superimposition, A' moved forward 1.1 mm less in the bionator group than in the control (P<=0.01). **Lower lip** The lower lip was the region of the integumental profile that demonstrated the most significant changes (Figure 6). During treatment, the lower lip uncurled, thereby increasing the mentolabial angle by 15.2° (P<=0.001). Concurrent with the angular change and uprighting of the lower lip, lip length increased 2.53 mm and lip thickness decreased 2.65 mm.

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign:* - *retrospektiv, keine Angabe zur Geschlechterverteilung* - *historische Kontrollgruppe, kein Ethikvotum* *Durchführung:* - *keine Angabe zum Behandler* *Auswertung:* - *Keine Verblindung* - *Keine Baseline Imbalancen thematisiert* - *Keine Überprüfung auf Normalverteilung* *Power der Studie/Patientenzahl:* - *Keine Power Analyse* *Funding:* - *Keine Angabe* *Interessenkonflikte:* - *Keine Angabe* *Bias (SIGN):* *The assessment of outcome is made blind to exposure status. If the study is retrospective this may not be applicable.- No* *Where blinding was not possible, there is some recognition that knowledge of exposure status could have influenced the assessment of outcome. – No* *The main potential confounders are identified and taken into account in the design and analysis. – No* *Have confidence intervals been provided? - No*
Schluss-folgerung des Begutachters	methodische Qualität: gut-befriedigend
	Klinische Aussagekraft: Die Behandlung mit einem Bionator führt im Vergleich mit einer unbehandelten Kontrollgruppe zu: - Signifikanten Veränderung des dentofazialen Komplexes - Einer verringerten Anteriorbewegung des Oberkiefers - Einer vergrößerten Anteriorbewegung des Unterkiefers - Signifikanter Zunahme der vorderen und hinteren Gesichtshöhe - Signifikanter Profilverändern: Abnahme der Gesichtskonvexität
Evidenz-level (SIGN)	**2+**
Qualität **(RoB, SIGN /AMSTAR II)**	**Acceptable (+)**

Evidenztabelle Latkauskiene, Jakobsone 2012



SCIENTIFIC ARTICLES

Stomatologija, Baltic Dental and Maxillofacial Journal, 14: 89-95, 2012

Immediate post-treatment crowned Herbst effects in growing patients

Dalia Latkauskienė, Gundega Jakobsone

SUMMARY

Objective. The aim of this prospective study was to describe the mechanism of Class II correction in growing patients induced by crown Herbst (cHerbst) appliance as an immediate result of therapy.

Materials and methods. Forty patients (mean age 13.6±1.3 years) with stable Class I occlusion 1 year following treatment with the cHerbst appliance were selected from a prospective sample of 180 consecutively treated Class II patients. No other appliances were used during treatment. The immediate dentoskeletal changes after discontinuing cHerbst therapy were compared with a matched sample of untreated Class II subjects (mean age 13.9±1.6 years). Lateral cephalograms were taken before treatment and immediately after one year therapy.

Results. Treatment produced significant skeletal changes: increase in mandibular length and SNB angle, decrease of ANB angle, restricted growth of posterior maxilla. Significant dentoalveolar changes: maxillary molars moved backwards and tipped distally, lower first molars moved forward and extruded, lower incisors proclined, upper incisors retroclined, overjet and overbite decreased.

Conclusions. Immediate posttreatment results revealed that Class II was mainly corrected due to dentoalveolar changes and only limited skeletal change.

Key words: Class II malocclusion, crown Herbst appliance.

Population *Setting* *Komorbiditäten*	**Klasse II Anomalie** • Treatment Group: Patients with stable Class I occlusion 1 year following treatment with the cHerbst appliance were selected from a prospective sample of 180 consecutively treated Class II patients • Control Group: selected from the longitudinal records of the University of Michigan and the Denver Growth Studies
Schweregrad	Intervention: Overjet = 5,5 ± 2,2 mm; Overbite = 5,6 ± 1,3mm; ANB = 4,8 ± 1,9° Kontrolle: Overjet = 5,5 ± 2,4 mm; Overbite = 4,5 ± 2,0mm; ANB = 4,5 ± 1,5°
Einschluss-kriterien *Bei Review: PICOS*	• at least end-to-end Class II molar relationship bilaterally or more severe • permanent dentition • no previous orthodontic treatment or tooth extractions • fair oral hygiene
Ausschluss-kriterien	• no periodontal problems • no temporomandibular joint complaints and lesions • no tooth size, form and number anomalies • no syndroms

Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** *cHerbst (Ormco, 1717 West Collins Avenue, Orange, CA) was used as the only tool for 12 months.* *The standard crowns were cemented with Ketac-Cem glass-ionomer cement (3M Espe Dental Products, St.Paul, MN 55144-1000) while occlusal rests on the lower first molars were secured with composite. At the start of treatment (T1) the appliance was activated to edge-to-edge incisor relationship.* *Patients were seen once every 4-6 weeks to evaluate the appliance status and the need for activation. The activations were performed by placing collars on pistons to make sure that the cusp of upper first premolar was projecting in between the lower first and second premolars to help natural vertical occlusion settling process.* *The appliance was removed after 12 months of active treatment (T2). After cHerbst removal, no appliance was provided and the patients were asked to come for a check up visit after 6 months (T3).* *All patients were treated by the same orthodontist (D.L.) in one private orthodontic office and the laboratory work was performed by the same technician.* *Patients with Class II division 2 malocclusion received braces on the upper front six teeth to convert the Class II division 2 into a Class II division 1malocclusion* VERSUCHSGRUPPE: **Herbst Group** N=40 (Anfang) / N=40 (Ende) / Alter = 13,6 ± 1,3 Jahre / ♂:♀ = 20:20 • Gebissphase: permanentes Gebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Therapie** *Control group: 18 subjects (11 males, 7 females, mean age 13.9±1.6 years) selected from the longitudinal records of the University of Michigan and the Denver Growth Studies and matched to the treated group as to skeletal maturity before and after treatment.* KONTROLLGRUPPE: **Untreated Control Group** N=18 (Anfang) / N=18 (Ende) / Alter = 13,9 ± 1,6 Jahre / ♂:♀ = 11:7 • Gebissphase: permanentes Gebiss • KFO-Behandlung: --
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: Cephalometric Treatment Effects
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**

Schluss-folgerungen der Autoren	1. cHerbst therapy increased mandibular length significantly immediately after treatment; 2. Appliance restricted vertical growth in posterior maxilla; 3. Substantial distalization of the upper molars was achieved without significant effect on the upper incisors 4. Class II was mainly corrected due to dentoalveolar changes
Zusammen-fassung der Ergebnisse	**Herbst Group** … VERSUS **Untreated Control Group** ***PRIMÄRZIELGRÖßE*** *Skeletal changes The cHerbst appliance had no effect on the sagittal position of the maxilla. Total mandibular length (cogn) showed a statistically significant increase. CHerbst treatment resulted in following significant findings: increased SNB angle, decreased ANB angle, restriction of posterior maxilla (nl to T-FMN).* *Dental changes Significant changes: reduced overjet and overbite, upper first molars moved backwards and tipped distally, upper incisors retruded, lower first molars moved forward and extruded, lower incisors proclined significantly.*
Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign:* • *Historische Kontrollgruppe* • *Studiengruppe aus vorheriger Studie extrahiert* • *Keine Angaben zu Randomisierung/Verblindung* • *Kein Ethikvotum* • *Suffizientes Matching der Gruppen vorhanden* *Durchführung:* • *Keine Angabe zu Behandler, detailliertem Behandlungsprotokoll* ➔ *Reliabilität der Intervention fraglich* • *Keine Angabe zur Compliance* *Auswertung:* • *Reliablitiätsprüfung vorhanden (1 Behandler, Test auf Intra-Rater-Reliabilität)* • *Solide Statistik (Shapiro-Wilk, Levene, t-Test)* *Power der Studie/Patientenzahl: Poweranalyse vorhanden* *Funding: keine Angabe* *Interessenkonflikte: keine Angabe* *Bias (SIGN/AMSTAR/EinzelstudienRoB – alle negativen Punkte aus Fragebogen auflisten):* • *Selection bias: historische Kontrollgruppe, keine Aussage zur Rekrutierung der Patienten, keine Teilnehmerrate angegeben* • *Attrition bias: keine Angabe über Dropouts* • *Detection bias: keine Verblindung; Validität/Reliablität der Outcome-Erhebung fraglich* • *Keine Confounders*

Schluss-folgerung des Begutachters	methodische Qualität: befriedigend
	Klinische Aussagekraft: • Die Therapie mit der cHerbst-Apparatur führte significant zu einer Zunahme der Unterkieferlänge direkt nach der Behandlung. • Die Apparatur hemmt das vertikale Wachtums im hinteren Bereich der Maxilla. • Eine Distalisation der OK-Molaren wurde erreicht, ohne Effekt auf die OK-Frontzähne. • Die Klasse-II-Anomalie wurde hauptsächlich durch dento-alveoläre Veränderungen korrigiert.
Evidenz-level (SIGN)	**2+**
Qualität **(RoB, SIGN /AMSTAR II)**	⊕ Acceptable

Evidenztabelle Lee, Tu et al. 2018

REVIEW ARTICLE

WILEY

Pharyngeal airway changes following maxillary expansion or protraction: A meta-analysis

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Abstract

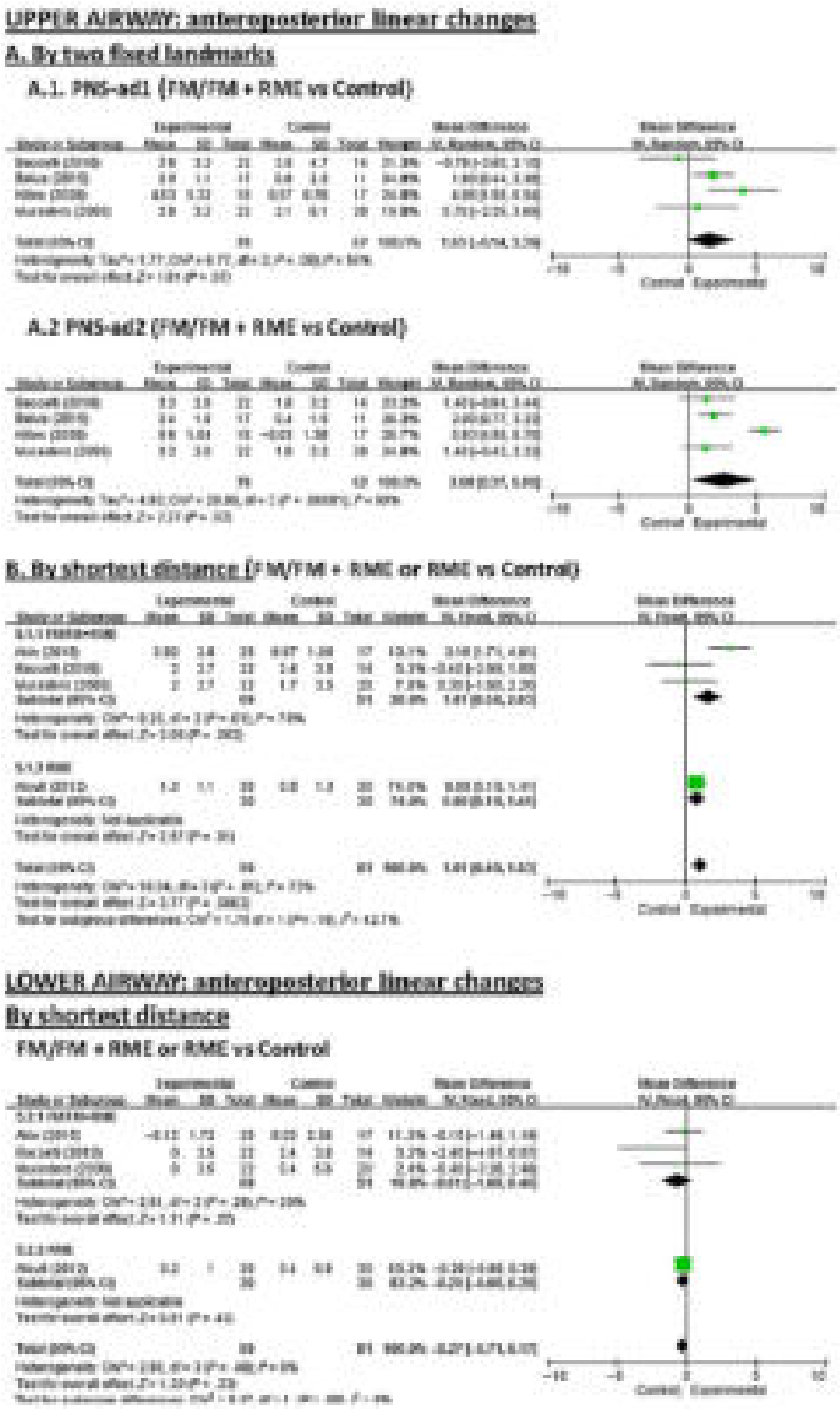
The aim of this meta-analysis was to investigate the changes in airway dimensions after rapid maxillary expansion (RME) and facemask (FM) protraction. Using PubMed, Medline, ScienceDirect and Web of Science, only controlled clinical trials, published up to November 2016, with RME and/or FM as keywords that had ≥6 months follow-up period were included in this meta-analysis. The changes in pharyngeal airway dimension in both two-dimensional and three-dimensional images were included in the analysis. Nine studies met the criteria. There are statically significant changes in upper airway and nasal passage airway in the intervention groups as compared to the control groups, assessed in two-dimensional and three-dimensional images. However, in the lower airway and the airway below the palatal plane, no statistically significant changes are seen in 2D and 3D images. RME/FM treatments might increase the upper airway space in children and young adolescents. However, more RCTs and long-term cohort studies are needed to further clarify the effects on pharyngeal airway changes.

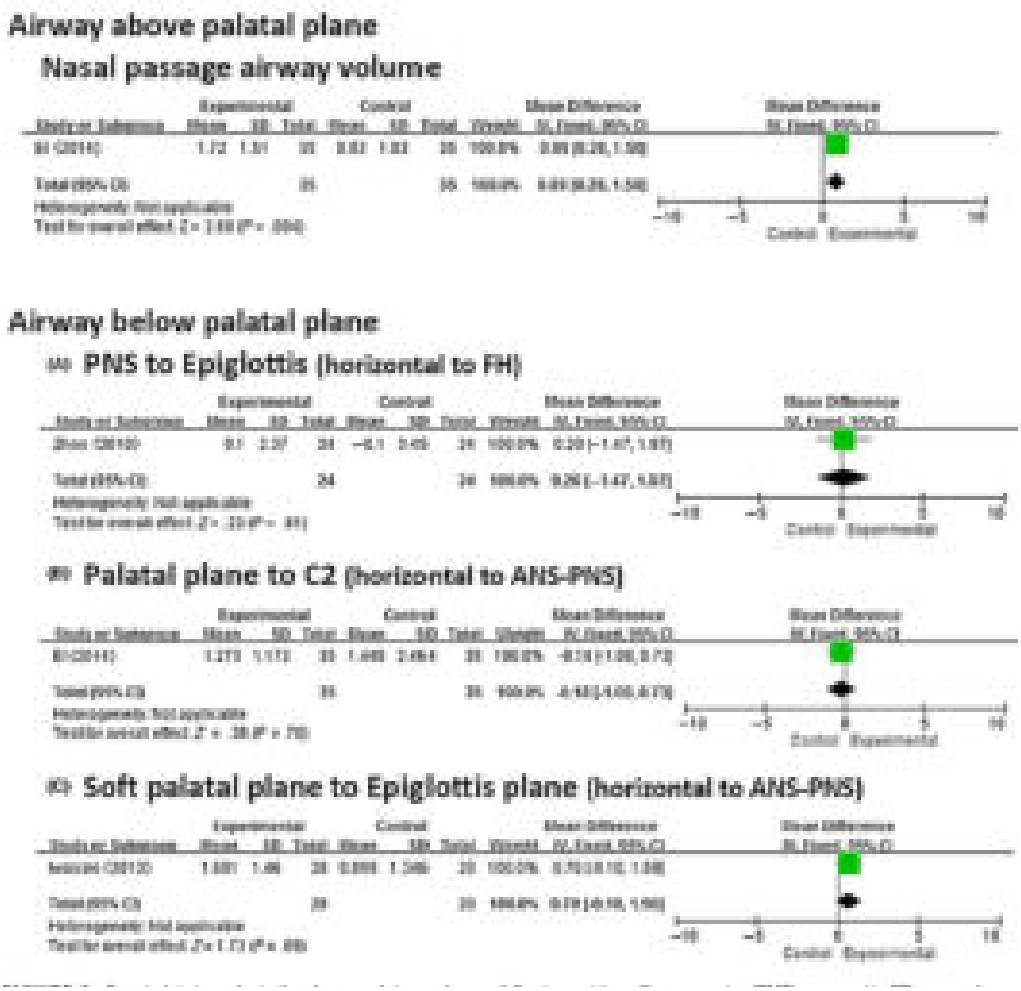
KEYWORDS

expansion, meta-analysis, pharyngeal airway, protraction

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie** • Studies with patients with transverse maxillary deficiency or midface deficiency from the period of early mixed dentition to earlypermanent dentition (age ranged from 6 to 16 years • Single Center Studien aus Asien, Europa und den USA.
Schweregrad	Nicht definiert

Einschluss-kriterien *Bei Review: PICOS*	• Population: Patients with transverse maxillary deficiency or midface deficiency from the period of early mixed dentition to earlypermanent dentition (age ranged from 6 to 16 years). • Untreated Class III; comparisons: (i) FM/FM+RME vs control, (ii) FM/FM+RME or RME vs control and (iii) RME vs control. • Two-dimensional (2D) and three-dimensional (3D) measurements for airway changes were obtained by cephalometric radiography (anteroposterior linear changes) and CBCT (volume changes).Patients with mandibular prognathism (skeletal class III malocclusion) who were treated with maxillary protraction (with or without rapid palatal expansion). • Intervention was the selection of different treatment modalities of FM alone or RME alone or a combination of FM+RME • PRIMÄRZIELGRÖßE: linear changes in distances PNS-ad1 and PNS-ad2, the shortest distance in the upper airway and the shortest distance in the lower airway by 2D analyses • SEKUNDÄRZIELGRÖßE: pharyngeal airway volumes were compared by 3D analyses
Ausschluss-kriterien	i) letters, reviews, abstracts,case reports and case series; (ii) patients without upper first molars; (iii) patients with history of systematic disease and craniofacialanomaly.
Intervention Versuchsgruppe	**kieferorthopädische Behandlung** VERSUCHSGRUPPE 1: **Patients with transverse maxillary deficiency or midface deficiency from the period of early mixed dentition to earlypermanent dentition (age ranged from 6 to 16 years) treted with FM/FM+RME or RME** N= 221(Anfang) / N= 221 (Ende) / Alter = 11,1 (SD 2,3) / ♂:♀ = 89:99 • Gebissphase: spätes Wechselgebiss, permanentes Gebiss < 18 • KFO Behandlung: reguläre Behandlung Patients with transverse maxillary deficiency or midface deficiency treated with maxillary protraction (with or without rapid palatal expansion).
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **Untreated Class III** • N= 188(Anfang) / N= 188(Ende) / Alter = 10,9 (SD 2,4) / ♂:♀ = 96:125 • Gebissphase: spätes Wechselgebiss, permanentes Gebiss < 18 • KFO: Behandlung: keine Behandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • Atmung und Luftraum (Airway space, Schlafapnoe), Schlucken und Sprechen PRIMÄRZIELGRÖßE: linear changes in distances PNS-ad1 and PNS-ad2, the shortest distance in the upper airway and the shortest distance in the lower airway by 2D analyses  SEKUNDÄRZIELGRÖßE: pharyngeal airway volumes were compared by 3D analyses

Outcome	
Studientyp	**Systematischer Review und Meta-Analyse** *Review:* Inkludierte Studien in Bezug auf PICO: Systematisches Review und Meta Analyse N= 9 (Kontrollierte nicht randomisierte Kohortenstudien) *Review:* Gesamt-Teilnehmerzahl in Bezug auf PICO: N = 409
Schluss-folgerungen der Autoren	In conclusion, our meta-analysis showed that **RME/FM treatments might increase the upper airway space changes in children or young adolescents**. However, the **relatively small sample size** and real pharyngeal airway changes from 2D cephalometric radiography might not completely reflect the exact changes in the pharyngeal airway space. Further **long-term 3D cohort** studies are required for more comprehensive analyses.

Zusammen-fassung der Ergebnisse	**GRUPPE Patients with transverse maxillary deficiency or midface deficiency from the period of early mixed dentition to earlypermanent dentition (age ranged from 6 to 16 years) treted with FM/FM+RME or RME VS. GRUPPE Untreated Class III** In the **upper airway** the lenght (PNS-ad1 and PNS-ad2)) increased FM treatment groups more than in the non-treatment groups (random effect model, mean difference: 1.63 and 2.68, 95% CI = −0.14 to 3.39 and 0.37-5.00, ***P* = .07 and .02** for PNS-ad1 and PNS-ad2, respectively). When the space changes were recorded by the shortest distance of the spaces, two subgroups were included based on the protocol of **FM or RME**. For the four studies, the random effects model with mean difference was 1.01 (95% CI = 0.49-1.53, *P* = .0002). In the **lower airway no statistical difference in space changes** between the groups with and without treatment was noted (fixed effect model, mean difference: −0.27, 95% CI = −0.71 to 0.17, *P* = .23). In the **nasal passage airway volume**, the volume changes between groups with and without treatment were **statistically different** (fixed effect model, mean difference: 0.89, 95% CI = 0.28-1.5, *P* = .004 for the nasal passage airway). In the **pharyngeal airway below the palatal plane, no difference in volume** changes between the groups with and without treatments was noted.
Angaben auffälliger positiver und/oder negativer Aspekte	Prinzipiell recht ordentlich durchgeführter Review. Unverständlich warum Angaben zur Fianzierung und zu Interessenskonflikten fehlen. Es fehlen Listen und Begründungen zu ausgeschlossenen Studien sowie ein Protokoll. Eine kombinierte Evidenz RoB Analyse erfolgte anhand der Newcastle Ottawa Scale (NOS), die u.U. im Vergleich zu aktuelleren Alternativen, einen erheblichen Ermessensspielraum aufweist. Die Qualität der Primärliteratur, nach NOS, war vergleichbar und im Mittel moderat. Eingeschlossen waren ausschließlich kontrollierte, nicht randomisierte Kohortenstudien.
Schluss-folgerung des Begutachters	methodische Qualität: Review: moderat; Einzelstudien: moderat Review von moderater Qualität mit ebenfalls moderater klinischer Relevanz.
Evidenz-level (SIGN)	**2+**
Qualität **(RoB, /AMSTAR II)**	**Moderat ⊕⊕**

Evidenztabelle Levin et al. 2008

Introduction: The aim of this retrospective controlled investigation was to analyze the short-term and long-term skeletal and dentoalveolar treatment outcomes of Function Regulator 3 (FR-3) therapy. **Methods:** A group of 32 subjects with Class III malocclusion treated with the FR-3 appliance of Fränkel was compared with untreated Class III controls. The first observation was prepubertal, and the long-term observation was postpubertal for all subjects. Treatment consisted of full-time wear of the appliance for about 2.5 years, followed by a retention phase with the same appliance for at least 3 years. The overall observation period was 9 years 2 months. All patients showed a good level of compliance. Active treatment and posttreatment cephalometric changes were evaluated statistically with Mann-Whitney U tests. **Results:** The FR-3 sample showed significant improvements in both maxillary size and position. No significant reduction in the increase of total mandibular length was recorded, but significant closures of both the gonial angle and the mandibular plane angle were found. Intermaxillary and interdental changes produced in the craniofacial skeleton were maintained successfully through the pubertal growth spurt. **Conclusions:** Long-term results of FR-3 therapy in patients with good compliance consisted of significant maxillary modifications and induced changes in mandibular morphology. Long-term appliance wear (more than 5 years) should be emphasized when considering treatment outcomes. (Am J Orthod Dentofacial Orthop 2008;134:513-24)

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie (inkl. LKG)** A group of 32 subjects with Class III malocclusion treated with the FR-3 appliance of Fränkel was compared with untreated Class III controls
Schweregrad	Overjet ≤ 0mm, Wits ≥ -2mm
Einschluss-kriterien *Bei Review: PICOS*	The primary inclusionary criterion was a Class III malocclusion at T1, characterized by an anterior crossbite or an edge-to-edge incisor relationship, with a Wits appraisal of –2 mm or more.
Ausschluss-kriterien	The exclusionary criteria were as follows. 1. Subjects who were not at stage CS 4 or more mature at T3 (CS 4-CS 6, postpubertal), as assessed with the cervical vertebral maturation method. 2. Cephalograms of inadequate quality for hard-tissue analysis. 3. Auxiliary appliances used either before, during, or after FR-3 therapy, including palatal expanders, removable plates, and fixed mechanotherapy. 4. Congenitally missing permanent teeth or permanent teeth extracted before or during the active treatment interval (T1-T2).
Intervention Versuchsgruppe	**kieferorthopädische Behandlung** VERSUCHSGRUPPE: **FR3-Gruppe** • N=32 (Anfang) / N=32 (Ende) / Alter = ♂ 7y ± 1y 4m ♂:♀ = 15:17 • Gebissphase: frühes und spätes Wechselgebiss • KFO-Behandlung: frühe /Früh-Behandlung

Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE 1: **T1-T2** N=32 (Anfang) / N=32 (Ende) / Alter: ♂ 6y10m± 1y0m ♂:♀ =15:17 • Gebissphase: frühes und spätes Wechselgebiss • KFO-Behandlung: frühe /Früh-Behandlung KONTROLLGRUPPE 2: **T2-T3** N=32 (Anfang) / N=32 (Ende) / Alter: ♂ 9y9m± 1y7m ♂:♀ =15:17 • Gebissphase: frühes und spätes Wechselgebiss • KFO-Behandlung: frühe /Früh-Behandlung KONTROLLGRUPPE 3: **T1-T3** N=26 (Anfang) / N=26 (Ende) / Alter: ♂ 7y4m± 1y3m ♂:♀ =13:13 • Gebissphase: frühes und spätes Wechselgebiss • KFO-Behandlung: frühe /Früh-Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) • Reduktion eines weiteren Therapiebedarfs • Stabilität des Behandlungsergebnisses **Primärzielgröße: Dentoalveoläre und skelett. „short-term changes“** **Sekundärzielgröße: Veränderungen nach aktiver Therapie (in Retentionsphase)** **Tertiärzielgröße: Dentoalveoläre und skelett. „long-term changes“**
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**

Schluss-folgerungen der Autoren	The purpose of this retrospective controlled investigation was to characterize the short-term and longterm skeletal and dentoalveolar treatment outcomes of FR-3 therapy in a group of white subjects with Class III malocclusion. All were treated by the same clinician (Rolf Fränkel). Treatment consisted of full-time wear of the appliance for just under 2.5 years, followed by a retention phase with the same appliance for at least 3 years. All patients had a high level of compliance. These subjects were matched with untreated Class III controls. The following craniofacial modifications were seen over the 9-year, 2-month observation interval. 1. Full-time wear of the FR-3 appliance induced significant improvements in both maxillary size and position. Increases in effective midfacial length continued into the posttreatment phase and led to an overall increase in midfacial length over the untreated controls of about 3.5 mm. 2. No significant long-term inhibition of mandibular growth was recorded. However, a significant mandibular shape change was observed in the form of closure at the gonial angle and associated closure of the mandibular plane angle. 3. Intermaxillary and interdental changes in the craniofacial skeleton were maintained successfully through the pubertal growth spurt.

Zusammen-fassung der Ergebnisse	**GRUPPE FR3-GRUPPE VS. GRUPPE T1-T2** **GRUPPE FR3-GRUPPE VS. GRUPPE T2-T3** **GRUPPE FR3-GRUPPE VS. GRUPPE T1-T3** Table III. Comparison of the long-term changes (T1-T3)
Angaben auffälliger positiver und/oder negativer Aspekte	Sehr gut gemachte Studie, einzige Schwachpunkte liegen in: ➔ Kein Blinding erwähnt ➔ Einfluss auf das Ergebnis könnte jedoch die Kointervention des Lippenschlusstrainings haben. So ist nicht klar in welchem Umfang die Lippenübungen auch wirklich ausgeübt wurden bzw. welchen Einfluss diese auf das Ergebnis hatten.
Schluss-folgerung des Begutachters	<u>methodische Qualität:</u> sehr gut <u>Klinische Aussagekraft: sehr hoch</u>
Evidenz-level (SIGN)	**2++**
Qualität	**High quality (++)**

Evidenztabelle Li, Liu et al. 2014

CBCT Evaluation of the Upper Airway Morphological Changes in Growing Patients of Class II Division 1 Malocclusion with Mandibular Retrusion Using Twin Block Appliance: A Comparative Research

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Abstract

Objective: The purpose of this study was to evaluate the morphological changes of upper airway after Twin Block (TB) treatment in growing patients with Class II division 1 malocclusion and mandibular retrusion compared with untreated Class II patients by cone beam computed tomography (CBCT).

Materials and Methods: Thirty growing patients who have completed TB treatment were recruited into TB group. The control group (n = 30) was selected from the patients with the same diagnosis and without TB treatment. CBCT scans of the pre-treatment (T1) and post-treatment (T2) data of TB group and control data were collected. After three-dimensional (3D) reconstruction and registration of T1 and T2 data, the morphological changes of upper airway during TB treatment were measured. The statistical differences between T1 and T2 data of TB group as well as T2 and control data were accessed by t-test.

Results: During the TB treatment, the mandible moved advanced by 3.52±2.14 mm in the horizontal direction and 3.77±2.10 mm in the vertical direction. The hyoid bone was in a more forward and inferior place. The upper airway showed a significant enlargement in nasopharynx, oropharynx and hypopharynx. In addition, the nasopharynx turned more circular, and the oropharynx became more elliptic in transverse shape. However, the transverse shape of the hypopharynx showed no significant difference. After comparison between T2 and control data, only the horizontal movement of the hyoid bone, the volumetric expansion of the oropharynx and hypopharynx, and changes of the oropharyngeal transverse shape showed significant difference.

Conclusion: Compared to the untreated Class II patients, the upper airway of growing patients with Class II division 1 malocclusion and mandibular retrusion showed a significant enlargement in the oropharynx and hypopharynx as well as a more elliptic transverse shape in the oropharynx, and the hyoid bone moved to an anterior position after TB treatment.

Citation: Li L, Liu H, Cheng H, Han Y, Wang C, et al. (2014) CBCT Evaluation of the Upper Airway Morphological Changes in Growing Patients of Class II Division 1 Malocclusion with Mandibular Retrusion Using Twin Block Appliance: A Comparative Research. PLoS ONE 9(4): e94378. doi:10.1371/journal.pone.0094378

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Competing Interests: The authors have declared that no competing interests exist.

* E-mail: [illegible] (DL); [illegible] (JS)

¶ These authors contributed equally to this work.

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** Thirty growing patients who have completed TB treatment between 2011 and 2013 were included in this study as TB group. The control group was selected to match with TB group based on age, sex and development condition.
Schweregrad	Overjet ≥ 7 mm, SNA angle was within the normal range between 78.4° ≤ SNA ≤ 85°, SNB ≤ 75°, ANB ≥ 4°

Einschluss-kriterien *Bei Review: PICOS*	1. the overjet was at least 7 mm with an Angle Class II molar relationship 2. SNA angle was within the normal range between 78.4° and 85° 3. SNB angle was less than 75°, and the patients had a clinically retrognathic mandible which is determined by the soft tissue of the chin being posterior to Bass' analysis vertical reference line 4. ANB angle was greater than 4° 5. the patients had no other potential airway abnormalities
Ausschluss-kriterien	-
Intervention Versuchsgruppe	**Kieferorthopädische Therapie** Growing patients who have completed TB treatment were recruited into TB group. The treatment duration of TB group was 13.67 +- 1.51 months. Until therapy completed. Patients of TB group were instructed to wear the TB appliance for 24 hours a day except during sports activities and tooth brushing. The patients were examined at 1-month intervals until the functional appliance therapy completed. Same researcher. **Kointervention** The CBCT scans of the pre-treatment and post-treatment of TB group were collected as T1 data and T2 data, respectively. VERSUCHSGRUPPE: treatment with **Twin Block** N=30 (Anfang) / N=30 (Ende) / Alter = 11,57 ± 0,94 Jahre / ♂:♀ = 13:17 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** The control group was selected from patients with the same diagnosis who just began orthodontic treatment, and matches well with the post-treatment patients of TB group through age, sex and development condition. **Kointervention** The CBCT scans of control group were collected before orthodontic therapy as control data. KONTROLLGRUPPE: **control group** N=30 (Anfang) / N=30 (Ende) / Alter = 11,72 ± 0,86 Jahre / ♂:♀ = 13:17 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: keine kieferorthopädische Therapie
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **Atmung und Luftraum (Airway space, Schlafapnoe), Schlucken und Sprechen** PRIMÄRZIELGRÖßE: *Bezeichnung (gemessene Variable in Klammern)*

Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	1. Comparing to the untreated Class II patients, the oropharynx and hypopharynx of growing patients with Class II division 1 malocclusion and mandibular retrusion showed a significant enlargement and the hyoid bone moved to a more anterior place. 2. The oropharynx was found to be more elliptic in transverse shape after TB treatment.
Zusammen-fassung der Ergebnisse	**GRUPPE TB VS. GRUPPE control group** ***PRIMÄRZIELGRÖßE*** In the TB group, the mandible advanced by 3.52+-2.14 mm (mean+-SD) in the horizontal direction and 3.77+-2.10 mm in the vertical direction, respectively. With the mandibular advancement, the hyoid bone showed a more forward and downward displacement, and the upper airway expanded after treatment. The greatest changes of volume and mean cross-sectional area occurred in the oropharynx. In addition, the post-oropharynx turned more elliptic in the transverse shape compared with the pre-treatment while the post-nasopharynx became more circular. The hypopharyngeal shape, however, showed no significantly change during treatment. By comparing the T2 data of TB group and the control data, we discovered that the hyoid bone in the post-TB group was more anterior but its vertical position did not show a significant difference. A significant enlargement in the oropharynx and hypopharynx after TB treatment was observed. In addition, the oropharynx showed more oval-shaped after TB treatment.
Angaben auffälliger positiver und/oder negativer Aspekte	*Power: limitiert, nicht spezifiziert* *Funding:* The study was supported by grants from National Creative Project Contract Research (201310422049), Shandong Science and Technology Planning Project Contract Research (2010G0020232 and 2010HM053, 2050205) and Shandong University Dental School Project Research (P2009008, P2009010) of China. *Interessenkonflikte:* The authors have declared that no competing interests exist. The study does not indicate how many of the people asked to take part did so, in each of the groups being studied. No confidence intervals provided
Schluss-folgerung des Begutachters	<u>methodische Qualität:</u> insgesamt gut
	<u>Klinische Aussagekraft:</u> Comparing to the untreated Class II patients, the oropharynx and hypopharynx of growing patients with Class II division 1 malocclusion and mandibular retrusion showed a significant enlargement and the hyoid bone moved to a more anterior place.
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN /AMSTAR II)	**Acceptable ⊕**

Evidenztabelle Lin, Chang et al. 2007

Treatment Effects of Occipitomental Anchorage Appliance of Maxillary Protraction Combined with Chincup Traction in Children with Class III Malocclusion

Hsiang-Chien Lin,[1] Hong-Po Chang,[2] Hsin-Fu Chang[3]*

Background/Purpose: Little information related to the treatment effects of the occipitomental anchorage (OMA) appliance of maxillary (Mx) protraction combined with chincup traction is available. The aim of this study was to investigate the treatment effects of the OMA orthopedic appliance on patients with Class III malocclusion.

Methods: Pretreatment and post-treatment cephalometric records of 20 consecutively treated patients with Class III malocclusions were evaluated and compared with a matched sample of untreated Class III control subjects.

Results: The OMA appliance is effective for correcting skeletal Class III malocclusion in growing children. The treatment effects of this orthopedic appliance were considered to be from both skeletal and dentoalveolar changes. The skeletal effects were mainly obtained by stimulating forward growth of the Mx complex with negligible rotation of the Mx plane and restraining forward advancement of the mandible (Mn) with backward and downward rotation of the Mn plane. The observed dentoalveolar effects were mostly due to the labial tipping movement of the Mx incisors.

Conclusion: Our results suggest that the OMA orthopedic appliance can correct the mesial jaw relationship and negative incisal overjet. This appliance is effective for correcting skeletal Class III malocclusion with both midface deficiency and Mn prognathism in growing children. [*J Formos Med Assoc* 2007;106(5): 380–391]

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie** - Patients Class III molar realtionship and negative incisal overjet • Taiwan
Schweregrad	- (SNA) = 78°–81° - (SNB) = 81°–84° - (ANB)=−6°–0°, not smaller than -7 °
Einschluss-kriterien	- (SNA) = 78°–81° - (SNB) = 81°–84° - (ANB)=−6°–0°, not smaller than -7 ° - midface deficiency and Mn prognathism - negative incisal overjet - Class III molar relationship.

Ausschluss-kriterien	Not fulfilling inclusion criteria .
Intervention Versuchsgruppe	**kieferorthopädische Behandlung** **OMA (Occipitomental Anchorage Appliance) CC (Treated group):** The OMA (see below) provided a force for Mx protraction of 200–250 g applied at each side. Elastics ran at an angle of 5˚ –10˚ downward to the occlusal plane from the buccal hooks on the upper first molars to the horns extending from the chincup. The retraction force on the mandible by chincup was 200–250 g each side. The upper first molars were reinforced for anchorage by a modified Nance appliance connecting the lingual bar with the vertical tubes and posts (ST Lock, Sankin Trading Co., Tokyo, Japan) semifixed on the lingual aspect of the bands on the Mx molars. Patients were instructed to wear the appliance for 12 hours/day. VERSUCHSGRUPPE 1**: OMA (Occipitomental Anchorage Appliance) CC (Treated group)** N= 20 (Anfang) / N=20 (Ende) / Alter = 9,91 years / ♂:♀ = 10:10 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** Records of the untreated Class III subjects were obtained from the growth study material which had been collected as a control group in this study KONTROLLGRUPPE 1**: Untreated Class III** N= 20 (Anfang) / N= 20 (Ende) / Alter = 9,5 years / ♂:♀ = 10:10 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) PRIMÄRZIELGRÖßE: **Skeletal: SNA, SNB, ANB** SEKUNDÄRZIELGRÖßE: **Dental: Overjet**
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**

Schluss-folgerungen der Autoren

The **OMA appliance of Mx protraction combined with chincup traction is effective for correcting skeletal Class III malocclusion** with midface deficiency and Mn prognathism in growing children.

The study also suggested that the treatment effects of this orthopedic appliance may be considered to be from **skeletal and dentoalveolar changes**.

The **skeletal effects** were mainly obtained by **stimulating forward growth of the Mx complex** with **negligible counterclockwise rotation of the MxP** and **restraining forward advancement of the mandible with backward and downward rotation of the MnP**.

The **dentoalveola**r effects were mostly due to the **labial tipping movement of the Mx incisors.**

Further longitudinal **long-term studies are required** to fully ascertain the long-term stability of OMA orthopedic therapy.

Zusammen-fassung der Ergebnisse

GRUPPE OMA (Occipitomental Anchorage Appliance) CC (Treated group) VS. GRUPPE Untreated Class III

T1: 9,91 years OMA CC (Treatment group) ; 9,5 years untreated Class III (control group)

T2: 11,24 years OMA CC (Treatment group) ; 10,92 years untreated Class III (control group)

Skeletal: SNA, SNB, ANB

	Treated group			Control group			Difference	t-test
	T1	T2	T2–T1	T1	T2	T2–T1	Mean	p
Angular (°)								
SNA	79.7	81.6	1.8	78.4	78.9	0.5	1.3	0.001
SNB	81.9	81.3	−0.6	80.4	81.7	1.3	−1.9	<0.001
ANB	−2.1	0.3	2.4	−1.9	−2.7	−0.8	3.2	<0.001

Dental: Overjet

	Treated group			Control group			Difference	t-test
	T1	T2	T2–T1	T1	T2	T2–T1	Mean	p
Overjet	−2.4	3.2	5.6	−2.9	−2.9	−0.1	5.7	<0.001

Angaben auffälliger positiver und/oder negativer Aspekte

Äquivalenz von Versuchs- und Kontrollgruppen gegeben. Baseline characteristics verfügbar und statistisch geprüft.
Power/ Sample Size Berechnungen wurden nicht durchgeführt. Die Auswertung war nicht verblindet.
Retrospektive Studie mit akzeptablem Risiko für Bias. Seltene Prüfung einer occipitomentalen anchorage appliance, daher ist die klinische Relevanz gegeben.

Funding: This study was supported by grants from the National Science Council of Taiwan (NSC91-2320- B-037-022; NSC92-2320-B-037-015; NSC93-2320- B-037-001)

Interessenkonflikte: keine Angabe

Bias (SIGN): Äquivalenz von Versuchs- und Kontrollgruppen hinsichtlich morphologischer Merkmale gegeben. Power/ Sample Size Berechnungen wurden nicht durchgeführt. Eine Verblindung fand nicht statt.

Schluss-folgerung des Begutachters	methodische Qualität: akzeptabel
	Klinische Aussagekraft: Retrospektive Studie mit akzeptablem Risiko für Bias. Seltene Prüfung einer occipitomentalen anchorage appliance, daher ist die klinische Relevanz gegeben.
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN)	**acceptable (+)**

Evidenztabelle **Lippold et al. 2013**

Lippold et al. Trials 2013, 14:20
http://www.trialsjournal.com/content/14/1/20

RESEARCH Open Access

Early treatment of posterior crossbite - a randomised clinical trial

Carsten Lippold[1*], Thomas Stamm[1†], Ulrich Meyer[2†], András Végh[3†], Tatjana Moiseenko[1†] and Gholamreza Danesh[4†]

Abstract

Background: The aim of this randomised clinical trial was to assess the effect of early orthodontic treatment in contrast to normal growth effects for functional unilateral posterior crossbite in the late deciduous and early mixed dentition by means of three-dimensional digital model analysis.

Methods: This randomised clinical trial was assessed to analyse the orthodontic treatment effects for patients with functional unilateral posterior crossbite in the late deciduous and early mixed dentition using a two-step procedure: initial maxillary expansion followed by a U-bow activator therapy. In the treatment group 31 patients and in the control group 35 patients with a mean age of 7.3 years (SD 2.1) were monitored. The time between the initial assessment (T1) and the follow-up (T2) was one year. The orthodontic analysis was done by a three-dimensional digital model analysis. Using the Digimodel software, the orthodontic measurements in the maxilla and mandible and for the midline deviation, the overjet and overbite were recorded.

Results: Significant differences between the control and the therapy group at T2 were detected for the anterior, median and posterior transversal dimensions of the maxilla, the palatal depth, the palatal base arch length, the maxillary arch length and inclination, the midline deviation, the overjet and the overbite.

Conclusions: Orthodontic treatment of a functional unilateral posterior crossbite with a bonded maxillary expansion device followed by U-bow activator therapy in the late deciduous and early mixed dentition is an effective therapeutic method, as evidenced by the results of this RCT. It leads to three-dimensional therapeutically induced maxillary growth effects. Dental occlusion is significantly improved, and the prognosis for normal craniofacial growth is enhanced.

Trial registration: Registration trial DRKS00003497 on DRKS

Population *Setting* *Komorbiditäten*	**Transversale Anomalie** • Untersuchung in Münster, Deutschland • Alter: 7.3 Jahre
Schweregrad	Keine Angaben
Einschluss-kriterien *Bei Review: PICOS*	• Unilateraler Kreuzbiss • Spätes Milchgebiss oder frühes Wechselgebiss

Ausschluss-kriterien	• Mittellinienverschiebung • Persistierende Habits • Allgemeinerkrankungen mit Dauermedikation (z.B. Diabetes mellitus) • Syndrome • LKGS • Generelle Beeinträchtigungen • Strukturelle orthopädische Erkrankung
Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** VERSUCHSGRUPPE 1: **GNE Gruppe** Beschreibung: The orthodontic therapy was principally divided into two different steps: 1) the initial maxillary expansion and 2) subsequent activator treatment for midline correction and functional rehabilitation. For the maxillary expansion, a bonded hyrax according to McNamara was applied. The U-bow activator is a double-plate activator with an additional transversal expansion screw N= 40 (Anfang) N=31 (Ende) / Alter = 7.3 ± 2.2 Jahre / ♂:♀ = keine Angabe • Gebissphase: Milchgebiss und frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung, interzeptiv
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** KONTROLLGRUPPE: **Kontrollgruppe** N=33 (Anfang und Ende) / Alter = 7.2 ± 2.0 Jahre / ♂:♀ = keine Angabe • Gebissphase: Milchgebiss und frühes Wechselgebiss • KFO-Behandlung: keine Behandlung
Outcome	**Direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** ***PRIMÄRZIELGRÖßE:*** Maxilläre Zahnbogenbreite (Intercanine Breite, Anteriore, Zahnbogenbreite, Mittlere Zahnbogenbreite, Posteriore Zahnbogenbreite) ***SEKUNDÄRZIELGRÖßE:*** Maxilläre Zahnbogenlänge und –inklination (Zahnbogenlänge, Zahnbogeninklination) ***TERTIÄRZIELGRÖßE:*** Gaumenbogenlänge (Anteriore Gaumenbogenlänge, Mittlere Gaumenbogenlänge, Posteriore Gaumenbogenlänge) ***QUARTÄRZIELGRÖSSE:*** Gaumenhöhe(Anteriore Gaumenhöhe, Posteriore Gaumenhöhe) **QUINTÄRZIELGRÖSSE:** Mandibuläre Zahnbogenbreite (Intercanine Breite, Anteriore Breite, Mittlere Breite, Posteriore Breite) ***SEXTÄRZIELGRÖSSE***: Mittellinienverschiebung ***SEPTIMÄRZIELGRÖSSE***:Frontzahnrelation (Overjet, Overbite)
Studientyp	**RCT**

Schluss-folgerungen der Autoren	Orthodontic treatment of a functional unilateral posterior crossbite with a bonded maxillary expansion device followed by U-bow activator therapy in the late deciduous and early mixed dentition is an effective therapeutic method, as evidenced by the results of this RCT. It leads to three-dimensional therapeutically induced maxillary growth effects. Dental occlusion is significantly improved, and the prognosis for normal craniofacial growth is enhanced.
Zusammen-fassung der Ergebnisse	**GRUPPE GNE Gruppe VS. GRUPPE Kontroll Gruppe** *1. **PRIMÄRZIELGRÖßE**: The difference between orthodontic treatment effects in the therapy group and normal maxillary growth in the control group at T2 was very significant. Statistically, a very significant difference for the intercanine distance, the anterior, median and posterior transversal widths were observed between the therapy group and the control group.* *2. **SEKUNDÄRZIELGRÖßE**: Regarding the sagittal maxillary arch, the length in projection on the occlusal plane remained stable in the control group, although this decreased comparatively significantly in the therapy group. The maxillary arch inclination increased very significantly for the therapy group between T1 and T2 but showed no significant differences for the control group. The t-test revealed a highly significant difference between the therapy and control groups at T2.* *3. **TERTIÄRZIELGRÖßE**: The basal arch length increase in the therapy group was very significant compared to that in the control group in all three measured regions: anterior, middle and posterior basal arch lengths.* *4. **QUARTÄRZIELGRÖSSE**: The difference between the control and therapy groups at T2 was determined to be highly significant. In the second deciduous molar region, a slight but not statistically significant increase was detected in the control group. The therapy group showed an insignificantly slight decrease in palatal depths. However, the difference at T2 between the therapy and control groups was statistically significant.* *5. **QUINTÄRZIELGRÖSSE** The intercanine, anterior, middle and posterior transversal distances in the mandible revealed neither any statistically significant differences between T1 and T2 for the either the therapy or control group nor intergroup differences at T2.* *6. **SEXTÄRZIELGRÖSSE**: At T2, the midline deviation was very significantly reduced for the therapy group while it was slightly increased for the control group. The therapeutic effect of midline correction was statistically very significant between the therapy and control groups.* *7. **SEPTIMÄRZIELGRÖSSE** :The vertical overbite between T1 and T2 remained stable for the control group but increased very significantly for the therapy group. At T2, the deepening of the bite was highly significant between the therapy and control groups. The sagittal overjet, however, showed no statistically significant effects.*

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign: RCT, gute Studiendurchführung, alle Patienten durch zwei fachkompetente Behandler therapiert, genaue Angaben über die Drop Outs, Blockrandoisierung (Blocklänge 20 (Verhältnis zwischen Behandlung/Kontrolle 1:1). Gute Zuordnung der Kontrollgruppe zur GNE Gruppe.* *Power der Studie/Patientenzahl: keine Angaben* *Funding: keine Angaben* *Interessenkonflikte: keine* *Bias:* • Can´t say if an adequate concealment method is used. • No ‘blind’ allocation was used.
Schluss-folgerung des Begutachters	methodische Qualität: hoch
	Klinische Aussagekraft: hoch Kombinierte Behandlung im frühen Wechselgebiss Hyrax und Aktivator weisen Effekte auf sagittaler, transversaler und vertikale Ebene.
Evidenz-level (SIGN)	**1++**
Qualität **(RoB, SIGN /AMSTAR II)**	**High quality ⊕⊕**

Evidenztabelle Lisson et al., 2013

Journal of Orofacial Orthopedics
Fortschritte der Kieferorthopädie

Original article

Changes in soft-tissue profiles after treatment of class II/1 patients with bite-jumping appliances

Veränderungen des Weichgewebeprofils nach Klasse-II,1-Therapie mit Doppelvorschubplatten

Jörg Alexander Lisson[1], Kay Mokrys[2], Gero Stefan Michael Kinzinger[1], Bettina Glasl[3], Björn Ludwig[1,3]

Abstract

We performed this study to describe changes in the soft-tissue profile after orthodontic treatment with Tränkmann's bite-jumping appliances. A total of 69 patients thus treated were compared to a control group of 36 age-matched patients based on cephalograms. Statistical analysis included mean values, standard deviations, t-tests, and Pearson's correlation testing. Highly significant ($p<0.001$) changes in total profile angle (N'-Ns-Pog') were observed over the course of treatment. Furthermore, a mildly significant ($p<0.05$) correlation with SNA angles was noted. Changes in the soft-tissue profile angle (N'-Sn-Pog') were moderately significant ($p<0.001$). The profile angles of the upper lip (Sn-SS-Ls) and lower lip (Pog'-Sm-Li) did not reveal significant changes. We observed highly significant ($p<0.001$) findings in the esthetic line (NsPog') advancement relative to the Ls and Li landmarks and in increases in lower-face height. Midface heights remained unchanged. Our results indicate that treatment with bite-jumping appliances results in increased facial convexity, advancement of the esthetic line, and increased lower-face height. The cumulative effects of growth and treatment do not, however, appear pronounced enough to result in a preference for or against treatment with a bite-jumping appliance.

Keywords

Soft tissue · Jumping-the-bite appliance · Cephalometry

Zusammenfassung

Die vorliegende Untersuchung beschreibt die Veränderungen des Weichgewebeprofils nach kieferorthopädischer Behandlung mit Doppelvorschubplatten (DVP) nach Tränkmann. Es wurden 69 behandelte mit 36 unbehandelten Patienten einer vergleichbaren Altersgruppe mit Hilfe einer FRS-Analyse verglichen. Zur statistischen Auswertung wurden Mittelwerte, Standardabweichungen, t-Test und die Korrelation nach Pearson verwendet. Der Gesamtprofilwinkel N'-Ns-Pog' veränderte sich im Therapieverlauf hochsignifikant ($p<0,001$). Weiterhin bestand eine gering signifikante ($p<0,05$) Korrelation zu SNA. Der Weichteilprofilwinkel N'-Sn-Pog' veränderte sich signifikant ($p<0,01$). Der Oberlippenprofilwinkel Sn-SS-Ls sowie der Unterlippenprofilwinkel Pog'-Sm-Li wurden nicht signifikant verändert. Es zeigten sich hochsignifikante ($p<0,001$) Ventralverlagerungen der Esthetic-Line (NsPog') zu den Punkten Ls und Li. Zudem zeigte sich eine hochsignifikante Verlängerung ($p<0,001$) des Untergesichtes. Die Länge des Mittelgesichtes blieb unverändert. Die Therapie mit DVP steigert laut den Ergebnissen dieser Untersuchung die Gesichtskonvexität, verlagert die Esthetic-Line nach anterior und verlängert das Untergesicht. Die kumulativen Effekte aus Wachstums- und Therapiefolgen erscheinen aber nicht so ausgeprägt, dass sie als entscheidendes Kriterium für oder gegen die Therapie mit DVP herangezogen werden können.

Schlüsselwörter

Weichgewebe · Doppelvorschubplatte · FRS-Analyse

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** Es erfolgte eine retrospektive Auswertung der FRS-Dokumentation von 69 (37w, 32m) Patienten, die ausschließlich mit Doppelvorschubplatten nach Tränkmann behandelt wurden. Die Untersuchungsgruppe wurde mit einer Kontrollgruppe aus 36 unbehandelten und altersentsprechenden Patienten mit einer skelettal bedingten Angle-Klasse II/1, jeweils mit Anfangs- und Endbefund verglichen.

Schweregrad	1. Angle-Klasse II, 1 mit Distalokklusion im Seitenzahnbereich ≥1/2 Prämolarenbreite 2. vergrößerte sagittale Frontzahnstufe ≥5 mm 3. Vergrößerter ANB – Winkel ≥4°.
Einschluss-kriterien *Bei Review: PICOS*	1. Angle-Klasse II, 1 mit Distalokklusion im Seitenzahnbereich ≥1/2 Prämolarenbreite 2. vergrößerte sagittale Frontzahnstufe ≥5 mm 3. Vergrößerter ANB – Winkel ≥4°. 4. keine skelettalen Fehlstellungen mit absehbarer Notwendigkeit einer späteren chirurgischen Intervention 5. kontinuierliche Behandlung durch einen Behandler nach derselben Methode 6. vollständige FRS-Dokumentation vorhanden (Anfangsbefund, Endbefund) 7. Patienten in einem Alter, in dem noch Kieferwachstum zu erwarten ist 8. Erfolgreiche Therapie der Angle-Klasse II,1
Ausschluss-kriterien	Nicht angegeben
Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** nach kieferorthopädischer Behandlung mit Doppelvorschubplatten (DVP) nach Tränkmann. Die Dauer der kieferorthopädischen Behandlung einschließlich Retention betrug 4,33±1,56 Jahre. Der Behandlungsbeginn lag im Mittel bei 10,17±1,48, das Behandlungsende bei 14,51±1,81 Jahren. **Kointervention** Lateral cephalograms before and after treatment VERSUCHSGRUPPE: **Behandelte Gruppe mit DVP** N=69 (Anfang) / N=69 (Ende) / Alter: 10,17±1,48/ ♂:♀ = 32:37 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Behandlung** Observation of 36 unbehandelten und altersentsprechenden Patienten mit einer skelettal bedingten Angle-Klasse II/1 **Kointervention** Lateral cephalograms before and after treatment KONTROLLGRUPPE: **unbehandelte Gruppe** N=36 (Anfang) / N=36 (Ende) / Alter = n.a. / ♂:♀ = n.a. • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: Keine kieferorthopädische Behandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** • **dentofaziale Ästhetik** PRIMÄRZIELGRÖßE: Veränderungen der Weichteilwinkel (N'-Ns-Pog', N'-SnPog', Cotg-Sn-Ls, Sn-SS-Ls, Pog'-Sm-Li) SEKUNDÄRZIELGRÖßE: Veränderungen der Abstände der Weichteilpunkte (Ls--NsPog', Li--NsPog', Ls--NPog, Li--NPog, Ss--NPog, Sm--NPog) TERTIÄRZIELGRÖßE: *Veränderungen der Gesichtsdimension (*Sto-Me', S-Go*100/N-Me, Sto-Me*100/Sn-Me', SGo und NMe, Sn-Sto*100/Sn-Me', Sn-Sto, S-Go*100/N-Me, N'-Ns-Pog', SNA. N'-Sn-Pog', Cot-Sn-Ls, Sn-SS-Ls, NsPog' zu den Punkten Ls und Li, Sto-Me')
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	Die Auswirkungen der DVP-Therapie auf die Gesichtsweichteile beim Vergleich mit einer unbehandelten Kontrollgruppe entsprechenden Alters zeigen sich am deutlichsten bei Veränderungen des Weichteilprofilwinkels sowie der Lippenverhältnisse in Relation zur Esthetic Line. Der Hemmeffekt auf das Oberkieferlängenwachstum scheint hierbei keinen signifikanten Einfluss auf das Gesichtsprofil zu haben. Ober- und Unterlippenprofil werden nicht verändert. Auch die Abstände der Lippenreferenzpunkte zur skelettalen Bezugsebene bleiben gleich. Die Therapie mit DVP während des Wachstums steigert vergleichsweise die Gesichtskonvexität, verlagert die Esthetic Line nach anterior und verlängert das Untergesicht. Die kumulativen Effekte aus Wachstums- und Therapiefolgen erscheinen aber im Vergleich zur unbehandelten Kontrollgruppe nicht so ausgeprägt, dass sie als entscheidendes Kriterium für oder gegen die Therapie mit DVP herangezogen werden können.

Zusammen-fassung der Ergebnisse	**GRUPPE behandelt VS. GRUPPE unbehandelt** ***PRIMÄRZIELGRÖßE*** N'-Ns-Pog' wurde hoch signifikant kleiner (p<0,001), N'-SnPog' wurde signifikant kleiner (p<0,01). Cotg-Sn-Ls wurde gering signifikant (p<0,05) größer, Sn-SS-Ls und Pog'-Sm-Li wurden nicht signifikant verändert. Im Vergleich zu den Veränderungen in der Kontrollgruppe war die Veränderung von Cotg-Sn-Ls gering signifikant (p<0,05). ***SEKUNDÄRZIELGRÖßE*** Ls--|NsPog' wurde hoch signifikant kleiner (p<0,001), Li--|NsPog' wurde hoch signifikant größer (p<0,001). Ls--|NPog, Li- -|NPog, Ss--|NPog und Sm--|NPog wurden nicht signifikant verändert. Im Vergleich zu den Veränderungen in der Kontrollgruppe waren die Veränderungen von Ls--|NsPog' und Li-- |NsPog' hoch signifikant (p<0,001) und die Veränderung von Ls--|NPog gering signifikant (p<0,05). ***TERTIÄRZIELGRÖßE*** Sto-Me', S-Go*100/N-Me, Sto-Me*100/Sn-Me', SGo und NMe wurden hoch signifikant größer (p<0,001), Sn-Sto*100/Sn-Me' wurde hoch signifikant kleiner (p<0,001). Sn-Sto veränderte sich nicht signifikant. Im Vergleich zu den Veränderungen in der Kontrollgruppe war die Veränderung von S-Go*100/N-Me signifikant (p<0,01). Die Auswirkung der Therapie auf das Weichteilprofil zeigte sich ausgeprägt bei Veränderungen von Gesamt- und Weichteilprofilwinkel. Der Gesamtprofilwinkel N'-Ns-Pog' wurde hochsignifikant (p<0,001) verändert. Es zeigte sich weiterhin eine gering signifikante Korrelation zu SNA. Der Weichteilprofilwinkel N'-Sn-Pog' veränderte sich signifikant (p<0,01). Der Nasolabialwinkel Cot-Sn-Ls vergrößerte sich gering signifikant (p<0,05) und korrelierte gering signifikant mit SNA (p<0,05). Der Oberlippenprofilwinkel Sn-SS-Ls wurde nicht signifikant verändert. Es zeigte sich eine signifikante hochsignifikante (p<0,001) Ventralverlagerung der Esthetic Line (NsPog') zu den Punkten Ls und Li. Zudem zeigte sich eine hochsignifikante Verlängerung des Untergesichtes, ausgedrückt durch die Strecke Sto-Me' (p<0,001). Die Strecke Sn-Sto blieb unverändert.
Angaben auffälliger positiver und/oder negativer Aspekte	Keine Angabe hinsichtlich der Geschlechterverteilung innerhalb der Kontrollgruppe, kleine Kontrollgruppe (n=36) *Power der Studie/Patientenzahl: limitiert, nicht spezifiziert* *Funding: nicht Angabe* *Interessenkonflikte: keine Angabe* Exposure level or prognostic factor is assessed only once. No confidence intervals.
Schluss-folgerung des Begutachters	methodische Qualität: insgesamt gut Klinische Aussagekraft: Die Auswirkungen der DVP-Therapie auf die Gesichtsweichteile beim Vergleich mit einer unbehandelten Kontrollgruppe entsprechenden Alters zeigen sich am deutlichsten bei Veränderungen des Weichteilprofilwinkels sowie der Lippenverhältnisse in Relation zur Esthetic Line. Ober- und Unterlippenprofil werden nicht verändert. Auch die Abstände der Lippenreferenzpunkte zur skelettalen Bezugsebene bleiben gleich. Die Therapie mit DVP während des Wachstums steigert vergleichsweise die Gesichtskonvexität, verlagert die Esthetic Line nach anterior und verlängert das Untergesicht.
Evidenz-level (SIGN)	**2+**
Qualität	**Acceptable ⊕**

Evidenztabelle Liu, Li et al. 2011

Review Article

Efficacy of short-term chincup therapy for mandibular growth retardation in Class III malocclusion

A systematic review

Z. P. Liu[a]; C. J. Li[b]; H. K. Hu[c]; J. W. Chen[d]; F. Li[e]; S. J. Zou[f]

ABSTRACT

Objective: To assess the efficacy of chincup therapy for mandibular growth retardation in early orthopedic treatment of Class III malocclusion.

Materials and Methods: An electronic search for articles reporting randomized clinical trials, controlled clinical trials, and cohort studies testing the efficacy of chincup appliance for Class III malocclusion published up to the present was done through four databases: Cochrane Central Register of Controlled Trials (CENTRAL: to March 2010), MEDLINE (1950–March 2010), EMBASE (1980–March 2010), and CBM (1978–March 2010). Study quality assessment and data extraction were done by two reviewers independently. Meta-analysis was done with the assistance of Revman 5.01.

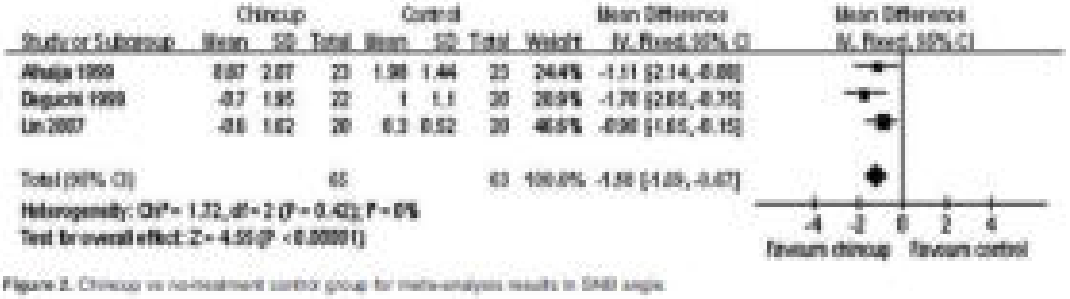
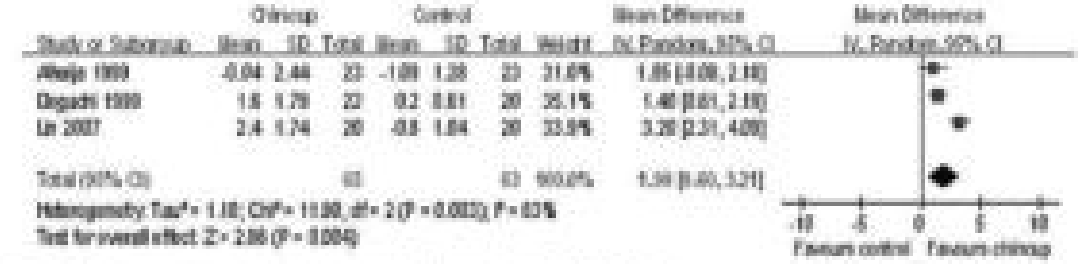
Results: The search resulted in 50 articles. After selection following the established criteria, four cohort studies qualified for the final review analysis. The results showed that chincup therapy decreased SNB angle and increased ANB angle; the total pooled weighted mean difference values (95% confidence interval) were −1.18 (−1.69, −0.67; $P < .00001$) and 1.90 (0.60, 3.21; $P = .004$), respectively. Two studies showed a increase in Gonial angle ($P < .05$) but no significant change in the mandibular length (Cd-Gn; $P = .059$ and .39, respectively). One study indicated that chincup therapy exerted no effect on mandibular growth retardation, and mandibular growth continued after the treatment in a downward direction.

Conclusion: There are insufficient data in these studies to make clear recommendations regarding the efficacy of chincup therapy in the retardation of mandibular growth. (*Angle Orthod* 2011;81:162–168.)

KEY WORDS: Systematic review; Class III malocclusion; Chincup therapy

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie (inkl. LKG)** • Studies with Patients with Class III malocclusio treted with early chincup therapy for mandibular growth retardation (age ranged from 8 to 11 years) • Single Center Studien aus Asien (Taiwan, Japan), Europa (UK, Türkei).
Schweregrad	Keine Angabe

Einschluss-kriterien *Bei Review: PICOS*	Population: Population: Patients with Class III malocclusio treted with early chincup therapy for mandibular growth retardation (age ranged from 8 to 11 years) • 1. Studies testing the efficacy of chincup appliance for Class III malocclusion • 2. Randomized clinical trials (RCTs), controlled clinical trials(CCTs), cohort studies • 3. Studies involving adolescents • 4. Studies on chincup appliances with variations in force magnitude and direction, treatment timing, and duration • 5. Studies conducted on lateral cephalograms that included measurements of SNB, ANB, gonial angles, and length of total, ramus, and body • length of mandible • 6. Studies with untreated control subjects • Intervention Early chincup therapy for mandibular growth retardation • Comparison: Untreated Class III (concurrent cohort or historical control samples). • Outcome PRIMÄRZIELGRÖßE: SNB, SEKUNDÄRZIELGRÖßE: ANB
Ausschluss-kriterien	1. Case reports, descriptive studies, review articles, opinion articles, abstracts 2. Studies on adults 3. Studies with no untreated control groups 4. Animal studies.
Intervention Versuchsgruppe	**kieferorthopädische Behandlung** VERSUCHSGRUPPE**: Patients with Class III malocclusio treted with early chincup therapy for mandibular growth retardation (age ranged from 8 to 11 years)** N= 96(Anfang) / N= 96 (Ende) / Alter = 9,6 (SD 1,2) / ♂:♀ = 33:63 • Gebissphase: frühes Wechselgebiss • KFO Behandlung: Frühbehandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **Untreated Class III** • N= 83(Anfang) / N= 83(Ende) / Alter = 9,4 (SD 0,99) / ♂:♀ = 44:39 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: keine Behandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) PRIMÄRZIELGRÖßE: SNB  Figure 2. Chincup vs no-treatment control group for meta-analysis results in SNB angle. SEKUNDÄRZIELGRÖßE: ANB  Figure 3. Chincup vs no treatment control group for meta-analysis results in ANB angle.
Studientyp	**Systematisches Review mit Meta-Analyse** *Review:* Inkludierte Studien in Bezug auf PICO: Systematisches Review und Meta Analyse N= 4 (Kontrollierte nicht randomisierte Kohortenstudien, prospektiv und retrospektiv) *Review:* Gesamt-Teilnehmerzahl in Bezug auf PICO: N = 179
Schluss-folgerungen der Autoren	A meta-analysis showed that **chincup therapy decreased the SNB** angle and **increased the ANB** angle, leading to an **improvement of the maxillomandibular relationship**. Whether these results can be **maintained after puberty is not clear** because there was no long-term follow-up in the studies reported. There are **insufficient data in these studies to make clear recommendations** regarding the efficacy of chincup therapy in retardation of mandibular growth.

Zusammen-fassung der Ergebnisse	**GRUPPE Patients with Class III malocclusion treated with early chincup therapy for mandibular growth retardation (age ranged from 8 to 11 years) VS. GRUPPE Untreated Class III** **SNB angle**. All of the studies reported a **significantly better** result in the **chincup** group compared with the control group. The total pooled WMD value (95% CI) of SNB was 1.18 (1.69, 0.67; **P , .00001**), indicating the result favored the chincup group. **ANB angle**. As significant heterogeneity existed, the random-effect model was adopted. The total pooled **WMD value (95% CI) of ANB was 1.90 (0.60, 3.21), which favored the chincup**group. **Gonial angle (Ar-Go-Me)**. Deguchi and McNamara showed that the gonial angle increased after chincup therapy in comparison to controls (**P < .05).** Lin et al. reported similar findings and concluded that the gonialangle changed more in the chincup group **(P = .007).** **Mandibular length (Cd-Gn), body length (Go-Me), and ramus height (Ar-Go).** Three studies included these variables. Deguchi and McNamara17 and Lin et al.5 reported that there was no significant change in the mandibular length (Cd-Gn), **with P values .059 and .39, respectively (P >. .05)**. Alhaija and Richardson16 found that there was no significant change in the mandibular length; however, the growth continued after the treatment, measured by Ar-Gn (considered the same as Cd-Gn) and Go-Me.
Angaben auffälliger positiver und/oder negativer Aspekte	Prinzipiell recht ordentlich durchgeführter Review. Unverständlich warum Angaben zu Interessenskonflikten fehlen. Es fehlen Listen und Begründungen zu ausgeschlossenen Studien sowie ein Protokoll. Eine kombinierte Evidenz RoB Analyse erfolgte anhand CRD (Centre for Reviews and Dissemination) Richtlinien. Eine dezidierte “publication-bias Analyse wurde nicht erkennbar durchgeführt. Die Qualität der Primärliteratur, nach CRD, reichte von schlecht bis gut und war im Mittel moderat. Eingeschlossen waren ausschließlich kontrollierte, nicht randomisierte Kohortenstudien (prospektiv und retrospektiv).
Schluss-folgerung des Begutachters	methodische Qualität: Review: moderat; Einzelstudien: moderat Review von moderater Qualität mit ebenfalls moderater klinischer Relevanz
Evidenz-level (SIGN)	**2+**
Qualität **(RoB, SIGN /AMSTAR II)**	**Moderat ⊕⊕**

Evidenztabelle Lucchese, Carinci et al 2012

SKELETAL EFFECTS INDUCED BY TWIN BLOCK IN THERAPY OF CLASS II MALOCCLUSION

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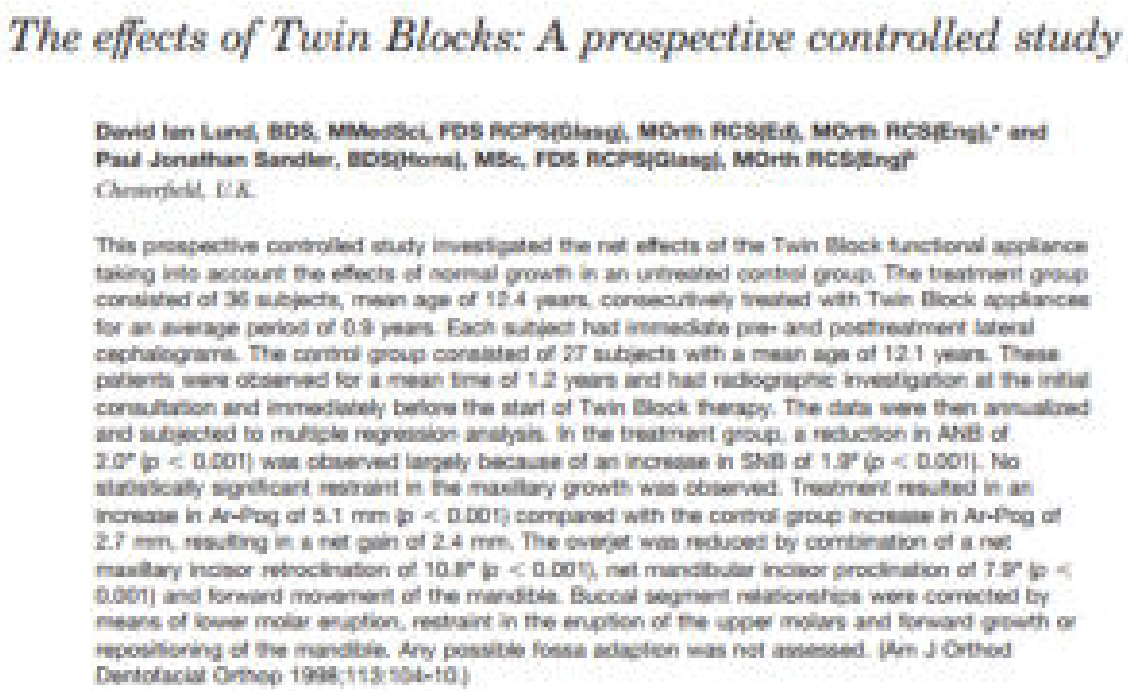
The aim of this clinical study was to evaluate the treatment skeletal effects induced by Twin Block in the therapy of Class II malocclusion during or slightly after the onset of the pubertal peak in the growth velocity. The study sample was obtained from the records of the author's private practice and consisted of a parent sample of 70 Class II division 1 subjects treated consecutively with the Twin-block appliance, from which good quality lateral cephalograms were available. From this sample, 23 subjects (Study Sample) 15 males and 15 females, were selected according to the following inclusion criteria: ANB greater than or equal to 4°, full Class II or end-to-end molar relationships, no history of previous orthodontic treatment or surgery treatment, absence of congenital anomalies, same Caucasian race. All patients received active treatment with Twin-block before or during their pubertal growth spurt, as assessed by the cervical vertebral maturation (CVM) method. Lateral cephalograms for each subject was digitized by a single author (AL.) respectively at time 1 (T1), immediately before treatment, (mean age 10.0± 1.1years) and at time 2 (T2) immediately after treatment (mean age 12.0 ± 1.1 years). The error of the method was calculated with the formula described by Dahlberg (1940). In addition systematic error and the coefficient of reliability were determined as suggested by Houston. The Control Group consisted of untreated Class II subjects (Michigan Standard). A modification of the Twin-block appliance, originally developed by Clark, was used in this study. In the present study the mean duration of the Twin -block treatment was 1.2 ± 0.5 years. Results of the statistical comparisons between Study Sample (treated subjects) and Control Group (untreated subjects) on the changes for all cephalometric variables during the T1–T2 observation showed significantly favorable changes: the total mandibular length (Co-Me) and ramus height (Co-Go) and corpus length (Go-Me) increased more in cases than in controls. Our results show a significantly higher average answer in the Study Sample, both in the paired t- test, comparing pre and post treatment, and in the unpaired t- test, comparing the Study Sample and the Control Group. Paired t- test data for the variables Co-Me, Co- Go, Go- Me, with a P=.05 significance level, lead us to reject the null hypothesis (differences average = 0) in favor of the alternative of a positive differences average, meaning that the average of the values is higher after the treatment.

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** The study sample was obtained from the records of the author's private practice and consisted of a parent sample of 70 Class II division 1 subjects treated consecutively with the Twinblock appliance, from which good quality lateral cephalograms were available. From this sample, 23 subjects (Study Sample) 15 males and 15 females, were selected according to specific criterias. The Control Group consisted of untreated Class II subjects selected from the University of Michigan (Michigan Standard).
Schweregrad	ANB ≥ 4°
Einschluss-kriterien *Bei Review: PICOS*	1. ANB greater than or equal to 4° 2. full Class II or end-to-end molar relationships, 3. no history of previous orthodontic treatment or surgery treatment 4. absence of congenital anomalies 5. same race (Caucasian)

Ausschluss-kriterien	-
Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** All patients received active treatment with Twin-block before or during their pubertal growth spurt, as assessed by the cervical vertebral maturation (CVM) method. The assessment of the cervical vertebral stages for each subject was performed by one investigator and verified by a second one. Any disagreements were resolved to the satisfaction of both observers. A modification of the Twin-block appliance, originally developed by Clark, was used in this study. This appliance consisted of maxillary and mandibular removable appliance retained with 0.7mm Adams claps on the first permanent molars and 0.9mm ball claps placed in the mandibular incisor interproximal areas. A passive maxillary labial bow was also used to aid anterior retention and retrocline the maxillary incisors if they were proclined. The jaw registration was taken with approximately 7 to 8 mm protrusion and the blocks 7 mm apart in the buccal segments. The steep inclined planes interlocked at about 70° to the occlusal plane. When necessary compensatory lateral expansion of the maxillary arch was achieved with a maxillary expansion screw that was furned once a week. Reactivation of the blocks was carried out when necessary. When the patient's overjet had been fully correct, patients continued to wear the appliance as a retainer at night only or was fitted with a retainer with a steep inclined biteplane. All patients were instructed to wear the appliance for 24 hours per day (except for contact sports and swimming). In the present study the mean duration of the Twin-block treatment was I.4 + 0.5 years. **Kointervention** Lateral cephalograms for each subject was digitized by a single author (AL) respectively at time 1(T1), immediately before treatment, (mean age 10.0+ 1.1 years) and at time 2 (T2) immediately after treatment (mean age 12.0 + 1.1 years). VERSUCHSGRUPPE: **treatment with Twin Block** N=23 (Anfang) / N=23 (Ende) • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** The Control Group consisted of untreated Class II subjects selected from the University of Michigan (Michigan Standard). **Kointervention** Lateral cephalograms (age and sex matched) KONTROLLGRUPPE: **control group (untreated subjects)** N=23 (Anfang) / N=23 (Ende) • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: keine kieferorthopädische Behandlung

Outcome	direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** • **Okklusion, Kaufunktion, Funktion** PRIMÄRZIELGRÖßE: *Cephalometric variables contributing to Class-II correction (the total mandibular length Co-Me, Ramus height Co-Go, Corpus length Go-Me)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	1. Twin-block appliance can achieve substantial skeletal improvement in young growing class II patients 2. According to our experience, we have demonstrated, thanks to skeletal data obtained through cephalometric analysis historically verified and important from a skeletal point of view, that there is a real increase in the jaw dimension. This permits to hypothesize the treatment of Class II patients with micrognatic jaw who represent a percentage of the entire Class II skeletal
Zusammen-fassung der Ergebnisse	**GRUPPE treatment with Twin Block VS. GRUPPE control group (untreated subjects)** ***PRIMÄRZIELGRÖßE*** All cephalometric variables contributing to Class II correction showed significantly favorable changes: the total mandibular length (Co-Me) and ramus height (Co Go) and corpus length (Go-Me) increased significantly more in cases than in controls (p-<0.05) Our results show a significantly higher average answer in the Study Sample, both in the paired /- test, comparing pre and post treatment, and in the unpaired t-test, comparing the Study Sample and the Control Group. Paired t- Test data for the variables Co-Me, Co-Go, Go-Me, with a P-0.05 significance level, lead us to reject the null hypothesis (differences average - 0) in favor of the alternative of a positive differences average, meaning that the average of the values is higher after the treatment.
Angaben auffälliger positiver und/oder negativer Aspekte	*Power: limitiert, nicht spezifiziert* *Funding: keine Angabe* *Interessenkonflikte: keine Angabe* No confidence intervals been provided.
Schluss-folgerung des Begutachters	methodische Qualität: insgesamt gut Klinische Aussagekraft: Twin-block appliance may probably achieve skeletal improvement in young growing class II patients.
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN /AMSTAR II)	**Acceptable ⊕**

Evidenztabelle Lund, Sandler 1998



The effects of Twin Blocks: A prospective controlled study

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This prospective controlled study investigated the net effects of the Twin Block functional appliance taking into account the effects of normal growth in an untreated control group. The treatment group consisted of 36 subjects, mean age of 12.4 years, consecutively treated with Twin Block appliances for an average period of 0.9 years. Each subject had immediate pre- and posttreatment lateral cephalograms. The control group consisted of 27 subjects with a mean age of 12.1 years. These patients were observed for a mean time of 1.2 years and had radiographic investigation at the initial consultation and immediately before the start of Twin Block therapy. The data were then annualized and subjected to multiple regression analysis. In the treatment group, a reduction in ANB of 2.0° ($p < 0.001$) was observed largely because of an increase in SNB of 1.9° ($p < 0.001$). No statistically significant restraint in the maxillary growth was observed. Treatment resulted in an increase in Ar-Pog of 5.1 mm ($p < 0.001$) compared with the control group increase in Ar-Pog of 2.7 mm, resulting in a net gain of 2.4 mm. The overjet was reduced by combination of a net maxillary incisor retroclination of 10.8° ($p < 0.001$), net mandibular incisor proclination of 7.9° ($p < 0.001$) and forward movement of the mandible. Buccal segment relationships were corrected by means of lower molar eruption, restraint in the eruption of the upper molars and forward growth or repositioning of the mandible. Any possible fossa adaption was not assessed. (Am J Orthod Dentofacial Orthop 1998;113:104-10.)

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** This prospective controlled study investigated the net effects of the Twin Block functional appliance taking into account the effects of normal growth in an untreated control group. The treatment group consisted of 36 subjects, mean age of 12.4 years, consecutively treated with Twin Block appliances for an average period of 0.9 years. Each subject had immediate pre- and posttreatment lateral cephalograms. The control group consisted of 27 subjects with a mean age of 12.1 years. These patients were observed for a mean time of 1.2 years and had radiographic investigation at the initial consultation and immediately before the start of Twin Block therapy.
Schweregrad	1. ANB > 5° 2. Overjet > 6 mm
Einschluss-kriterien *Bei Review: PICOS*	1. 10 to 14 years of age 2. White 3. Class II skeletal pattern with ANB > 5° 4. Class II division 1 incisor relationship 5. An overjet of greater than 6 mm
Ausschluss-kriterien	-

Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** The treatment group consisted of 36 subjects consecutively treated with Twin Block appliances for an average period of 0.9 years. Each subject had immediate pre- and posttreatment lateral cephalograms. A modification of the Twin Block appliance described by Clark was used with Adams clasps on the maxillary and mandibular first premolars and first molars and ball clasps to the lower labial segment to maximize retention. A labial bow was also used that was soldered to the Adams clasp on the maxillary premolars. The jaw registration was taken with approximately 7 to 8 mm protrusion and the blocks 6 to 7 mm apart in the buccal segments. The steep inclined planes interlocked at about 70° to the occlusal plane. Compensatory lateral expansion of the upper arch was achieved by means of an upper midline expansion screw that was turned once a week. Reactivation of the blocks was carried out when necessary after 4 or 5 months therapy. **Kointervention** immediate pre- (t1) and posttreatment (t2) lateral cephalograms VERSUCHSGRUPPE: **treatment with Twin Block** N = 36 (Anfang) / N = 36 (Ende) / Alter = 12,4 ± ? Jahre / ♂:♀ = 19:17 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: Frühbehandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** The control group consisted of 27 subjects with a mean age of 12.1 years. These patients were observed for a mean time of 1.2 years and had radiographic investigation at the initial consultation and immediately before the start of Twin Block therapy. **Kointervention** age and sex matched lateral cephalograms KONTROLLGRUPPE: **untreated control** N = 27 (Anfang) / N = 27 (Ende) / Alter = 12,1 ± ? Jahre / ♂:♀ = 13:14 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: keine kieferorthopädische Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** • **Okklusion, Kaufunktion, Funktion** PRIMÄRZIELGRÖßE: *Linear changes (A-horiz, Ui-horiz, Li-horiz, U6-horiz, L6-horiz, Pog-horiz, Ar-Pog, Ar-Go, Go-Me, U6-vert, L6-vert, OJ, OB, TAFH, LFH/TAFH%)* SEKUNDÄRZIELGRÖßE: *Angular changes (SNA, SNB, ANB, Ui-Max, Li-Mand, Sn-Max, Sn-Mand, Max-Mand, A-Go-Me)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**

Schluss-folgerungen der Autoren	1. The Twin Block appliance is a very effective and efficient tool with which overjets can be reduced. 2. They leave something to be desired, which invariably necessitate finishing with fixed appliances. 3. Much of the overjet reduction is due to dentoalveolar tipping although a small and significant increase in SNB is very worthwhile. 4. Correction of postnormal buccal segments is also efficiently obtained. Further modifications to the Twin Block appliance might attempt to minimize the contribution from dentoalveolar tipping and to maximize skeletal changes by including the use of headgear to maximize maxillary restraint and torqueing spurs to the upper labial segment. 5. Further work is proceeding in this field. Further studies are indicated on what role, if any, the fossa adaptation and possible relocation plays in the sagittal correction.
Zusammen-fassung der Ergebnisse	**GRUPPE treatment with Twin Block VS. GRUPPE untreated control** ***PRIMÄRZIELGRÖßE*** The mean overjet reduction is 7.5 mm. A mean forward growth/repositioning of the mandible of 2.4 mm, measured at Ar-Pog, was demonstrated after Twin Block therapy ***SEKUNDÄRZIELGRÖßE*** The mean overjet reduction of 7.5 mm involved a net 10.8° retroclination of the upper incisors and 7.9° proclination of the lower incisors. The most noticeable skeletal change was an increase in the angle SNB.
Angaben auffälliger positiver und/oder negativer Aspekte	Keine Angaben über tägliche Tragedauer der Apparatur. *Power der Studie/Patientenzahl: limitiert, nicht spezifiziert* *Funding: keine Angabe* *Interessenkonflikte: keine Angabe* The main potential confounders are not clearly identified. The study does not indicates how many of the people asked to take part did so, in each of the groups being studied.
Schluss-folgerung des Begutachters	methodische Qualität: insgesamt gut Klinische Aussagekraft: The Twin Block appliance is a very effective and efficient tool with which overjets can be reduced. Much of the overjet reduction is due to dentoalveolar tipping although a small and significant increase in SNB is very worthwhile. Probably an option to maximize skeletal changes by including the use of headgear to maximize maxillary restraint and torqueing spurs to the upper labial segment.
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN /AMSTAR II)	**Acceptable ⊕**

Evidenztabelle Lux, Rubel et al., 2001

Effects of Early Activator Treatment in Patients with Class II Malocclusion Evaluated by Thin-Plate Spline Analysis

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Abstract: The aim of the present longitudinal cephalometric study was to evaluate the dentofacial shape changes induced by activator treatment between 9.5 and 11.5 years in male Class II patients. For a rigorous morphometric analysis, a thin-plate spline analysis was performed to assess and visualize dental and skeletal craniofacial changes. Twenty male patients with a skeletal Class II malrelationship and increased overjet who had been treated at the University of Heidelberg with a modified Andresen–Häupl-type activator were compared with a control group of 15 untreated male subjects of the Belfast Growth Study. The shape changes for each group were visualized on thin-plate splines with one spline comprising all 13 landmarks to show all the craniofacial shape changes, including skeletal and dento-alveolar reactions, and a second spline based on 7 landmarks to visualize only the skeletal changes. In the activator group, the grid deformation of the total spline pointed to a strong activator-induced reduction of the overjet that was caused both by a tipping of the incisors and by a moderation of sagittal discrepancies, particularly a slight advancement of the mandible. In contrast with this, in the control group, only slight localized shape changes could be detected. Both in the 7- and 13-landmark configurations, the shape changes between the groups differed significantly at $P < .001$. In the present study, the morphometric approach of thin-plate spline analysis turned out to be a useful morphometric supplement to conventional cephalometrics because the complex patterns of shape change could be suggestively visualized. (*Angle Orthod* 2001;71:120–126.)

Key Words: Thin-plate spline analysis; Morphometrics; Class II malocclusion; Activator treatment

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** male patients with a skeletal Class II malrelationship and increased overjet who had been treated at the University of Heidelberg were compared with a group of untreated male subjects of the Belfast Growth Study. The activator group consisted of 20 patients who were treated without extraction of teeth with a modified Andresen–Häupl-type activator. Fifteen male untreated probands from the Belfast Growth Study, the material for which had been collected by Professor C. P. Adams at the Queens University of Belfast.
Schweregrad	ANB angle ≥ 5°, overjet ≥ 5 mm
Einschluss-kriterien *Bei Review: PICOS*	1. ANB angle ≥ 5° in the initial lateral cephalogram, 2. overjet ≥ 5 mm in the initial lateral cephalogram, 3. first cephalogram taken at age 9.5 ± 1 years, 4. second cephalogram taken at age 11.5 ±1 years, 5. time interval between the 2 cephalograms of 2±1 years The activator group consisted of 20 patients who were treated without extraction of teeth with a modified Andresen–Häupl-type activator in the respective 2-year interval.
Ausschluss-kriterien	1. hint of a repeated insufficient compliance during activator treatment, especially concerning the recommendation to wear the appliance about 14 hours a day. 2. Patients with extractions

Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** The activator group consisted of 20 patients who were treated without extraction of teeth with a modified Andresen–Häupl-type activator in the respective 2-year interval at the University of Heidelberg. The construction bite was taken with teeth in neutralocclusion and with an approximate vertical increase in the molar region of about 4–5 mm. The recommendation to wear the appliance about 14 hours a day. **Kointervention** Lateral cephalograms immediately before treatment t1 and after 2 year interval t2 VERSUCHSGRUPPE: **Activatorgroup** N=20 (Anfang) / N=20 (Ende) / Alter = 9,48 ± 0,69 Jahre / ♂:♀ = 20:0 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** Fifteen male untreated probands from the Belfast Growth Study, the material for which had been collected by Professor C. P. Adams at the Queens University of Belfast, served as a control group. **Kointervention** Age and sex matched lateral cephalograms KONTROLLGRUPPE: **controlgroup** N=15 (Anfang) / N=15 (Ende) / Alter = 9,5 ± 0,37 Jahre / ♂:♀ = 15:0 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: Keine Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) • Okklusion, Kaufunktion, Funktion PRIMÄRZIELGRÖßE: Dental relationships and incisor angulation *(*U1-SN,U1-PP, L1-MP,Interincisal, Overjet, Overbite) SEKUNDÄRZIELGRÖßE: Sagittal relationships *(*SNA, SNB, SNPog, ANB) TERTIÄRZIELGRÖßE: Vertical relationships *(*PP/MP, SN/MP, SN/PP*)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**

Schluss-folgerungen der Autoren	1. Thin-plate spline analysis seems to provide a valuable supplement for conventional angular analyses because the complex patterns of shape change are visualized suggestively by means of grid deformations, thus opening up a wide field of possible applications in cephalometrics. 2. In male subjects exhibiting a Class II skeletal discrepancy, the Andresen–Häupl-type activator seems to be a suitable tool for overjet reduction and a moderation of sagittal discrepancies. Thin-plate spline analysis supports the hypothesis that dento-alveolar mechanisms seem to play an important role in this correction but also suggests a relative mandibulo-maxillary displacement, mainly a mandibular advancement. In future, additional studies with a prospective study design are called for, also with respect to the long-term stability of the dental and skeletal changes.
Zusammen-fassung der Ergebnisse	**GRUPPE activatorgroup VS. GRUPPE untreated control group** ***PRIMÄRZIELGRÖßE*** Statistically significant differences between the 2 groups were found in the extent of overjet and in the inclination of the upper incisors. At the beginning of treatment in the activator group, the upper incisors are more proclined and the overjet is significantly larger (mean 9.5 mm) than in the control group (mean 7.1 mm). In the activator group, a pronounced reduction of overjet is visualized by a horizontal compression of the grid between the edges of the upper and lower incisors. In addition, the pattern of grid deformation points to a marked retrusion of the upper incisors as well as an additional protrusion of the lower incisors, thus suggesting a considerable dento-alveolar contribution to overjet correction. By contrast, in the thin-plate spline analysis of the control group, the grid lines deviate only marginally from straight lines, indicating merely slight local, nonaffine deformations especially affecting the region between the A point and the anterior nasal spine. ***SEKUNDÄRZIELGRÖßE*** No significant differences were found in the sagittal and vertical relationships ($P > .05$). As far as the changes in sagittal relationships are concerned, an ANB reduction of 1.388 is found in the activator group, which differs significantly ($P > .05$) from the decrease of 0.548 in the control group. Similarly, the increase in the SNB angle is significantly larger ($P > .001$) in the activator group than in the control group. In the case of the SNA angle, the changes between the 2 groups do not differ significantly. As far as the changes in sagittal relationships are concerned, an ANB reduction of 1.388 is found in the activator group, which differs significantly from the decrease of 0.548 in the control group. Similarly, the increase in the SNB angle is significantly larger in the activator group than in the control group. In the case of the SNA angle, the changes between the 2 groups do not differ significantly. In the activator group, an anteriorly directed bending of the grid lines can be seen in the intermaxillary region, which points to an intermaxillary positional change, particularly a slight advancement of the mandible. ***TERTIÄRZIELGRÖßE*** No significant differences were found in the sagittal and vertical relationships ($P > .05$). Moreover, no significant differences were found between the 2 groups concerning vertical relationships. This corresponds to the observation that, in both groups, the grid lines in the respective spline transformations show next to no change in the vertical dimension.

Angaben auffälliger positiver und/oder negativer Aspekte	Keine Interrater-Reliabilität bestimmt, Baseline-Imbalance v.a. verkleinerter Overjet innerhalb der control group und verkleinerter OK Front Inklination. *Power: limitiert, nicht spezifiziert* *Funding: keine Angabe* *Interessenkonflikte: keine Angabe* The main potential confounders are not taken into account in the design and analysis. No confidence intervals.
Schluss-folgerung des Begutachters	<u>methodische Qualität:</u> insgesamt gut
	<u>Klinische Aussagekraft:</u> - the Andresen–Häupl-type activator seems to be a suitable tool for overjet reduction and a moderation of sagittal discrepancies. - dento-alveolar mechanisms seem to play an important role in this correction but also suggests a relative mandibulo-maxillary displacement, mainly a mandibular advancement. - In future, additional studies with a prospective study designs and similar settings without baseline imbalances are called for, also with respect to the long-term stability of the dental and skeletal changes
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN /AMSTAR II)	**Acceptable ⊕**

Evidenztabelle Macdonald, Kapust et al. 1999

ORIGINAL ARTICLE

Cephalometric changes after the correction of Class III malocclusion with maxillary expansion/facemask therapy

Keith E. Macdonald, DDS,[a] Andrew J. Kapust, DDS,[b] and Patrick K. Turley, DDS, MSD, MEd[c]
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The purpose of this study was to analyze the cephalometric changes that occurred during and after the correction of Class III malocclusion. The records of 24 Class III patients treated with a banded expansion appliance and custom facemask were compared with 24 Class I and 27 Class III untreated controls. Cephalometric means were calculated for the annualized data and compared univariately with unpaired *t* tests to determine significant differences. Treatment results showed more convexity of the facial profile from anterior displacement and downward and backward rotation of the maxilla and clockwise rotation of the mandible. The maxillary teeth moved forward while the lower incisors retruded. Postprotraction results showed the maxilla did not relapse after treatment but grew anteriorly similar to the Class III controls but less than the Class I controls. Mandibular growth was similar for the treatment and control groups. Dental changes compensated for decreasing overjet whereas the soft tissue profile showed no significant posttreatment changes. Results in the intercontrol comparison showed the Class III controls had significantly less forward movement of A-point and greater forward movement of the mandible than Class I controls. Because of these differences using a Class I control group to compare to a Class III treatment group will tend to underestimate the treatment effects and overestimate posttreatment changes. Overcorrection of the Class III malocclusion is recommended to compensate for postprotraction growth deficiency of the maxilla. (Am J Orthod Dentofacial Orthop 1999;116:13-24)

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie** - Patients with skeletal Class III malocclusion an edge to edge incisor relationship or anterior crossbite • USA
Schweregrad	- 3.0 mm mesial step molar relation, - an ANB measurement of less than 1°, - Wit’s denture base relationship of zero or less
Einschluss-kriterien	1) Class III (a corrected ANB analysis showed a difference of less than 1.5 degrees) (2) deep overbite and reverse overjet (3) forward mandibular displacement.
Ausschluss-kriterien	- Craniofacial anomaly

Intervention Versuchsgruppe	**kieferorthopädische Behandlung** **Class III Treatment:** Patients were treated with a soldered jackscrew expansion appliance with two teeth per side banded. Soldered hooks extended anterior to the canine area to attach elastics. The appliance was activated twice a day before the start of facemask wear. Continued expansion was dependent on the need for increased width. Each patient wore a facemask with chin and forehead support for an average of 18 to 22 hours a day for the first 3 to 4 months followed by “bed-time only” wear for the next 3 or 4 months. Force levels ranged from 200 to 450 grams per side with elastics oriented 15° to 30° downward from the occlusal plane. VERSUCHSGRUPPE 1 **Class III Treatment** N= 24 (Anfang) / N=24 (Ende) / Alter = 7,4 years ♂:♀ = 12:12 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: frühe Behandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** **Class I:** The Class I control group consisted of 24 patients matched for age and sex from the Michigan Growth Study **Untreated Class III:** The Class III control group was 27 patients with two successive cephalograms and no prior or intervening orthodontic treatment KONTROLLGRUPPE 1: **Class I** N=24 (Anfang) / N=24 (Ende) / Alter = 7,2 years / ♂:♀ = ?:? • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: reguläre Behandlung KONTROLLGRUPPE 1: **Untreated Class III** N=27 (Anfang) / N=27 (Ende) / Alter = 8,7 years / ♂:♀ = ?:? • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) • dentofaziale Ästhetik PRIMÄRZIELGRÖßE: **Skeletal: SNA, SNB, ANB, Wits** SEKUNDÄRZIELGRÖßE: **Dental: Overjet** TERTIÄRZIELGRÖßE: **Soft tissue: Nasolabial angle**

Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	1. Facemask therapy is an effective treatment for Class III, maxillary deficient, deep bite patients with all treated patients showing positive overjet after treatment. 2. Growth differences between the untreated Class I and Class III control groups were found in prepubescent patients showing significantly less forward movement of A-point and greater forward movement of the mandible in the Class III control group. 3. Using a Class I control group to compare with a Class III treatment group may tend to underestimate the treatment effects and overestimate posttreatment changes. 4. After facemask therapy, the maxilla continued to grow anteriorly in an amount equal to untreated Class III patients but less than untreated Class I patients; mandibular growth was similar in all groups. 5. There is a partial closure of the vertical opening associated with facemask therapy possibly the result of mandibular counter-clockwise rotation that resulted in a slight decrease in the mandibular plane angle and lower face height after treatment. 6. The maxillary incisors proclined to compensate for decreasing overjet and erupted vertically more than Class III controls. The lower incisors retroclined during treatment and moved forward after treatment. 7. None of the soft tissue landmarks showed significant changes during the posttreatment period. 8. Overcorrection of the Class III malocclusion is recommended to counteract the postprotraction growth deficiency of the maxilla. Part-time wear of the facemask is then encouraged depending on the patient’s specific growth pattern.

Zusammenfassung der Ergebnisse

GRUPPE Class III Treatment VS. Class I

GRUPPE Class III Treatment VS. Untreated Class III

T1: 7,4 years; Class III (Treatment), 7,2 years Class I; 8,7 years untreated Class III

T2: 8,4 years; Class III (Treatment), 7,9 years Class I; 11,3 years untreated Class III

T3: 10,3 years; Class III (Treatment), 10,3 years Class I; 11,3 years untreated Class III

For untreated Class III patients only two records were available.

Skeletal: SNA, SNB, ANB, Wits

T1-T2

	Treatment group		Class I control group		Tr. vs Class I		Class III control group		Treatment vs Class III	
Variables	Mean	SE	Mean	SE	Difference	P value	Mean	SE	Difference	P value
Skeletal measures										
SNA	2.31	0.40	-0.16	0.17	2.61	****	0.02	0.18	2.59	****
SNB	-1.33	0.28	-0.16	0.20	-0.78	*	0.54	0.14	-1.28	****
ANB	3.48	0.60	0.05	0.23	3.53	****	-0.52	0.11	3.85	****
Wits	2.75	1.05	0.67	0.49	2.08	*	-0.66	0.39	2.74	****

T2-T3

	Treatment group		Class I control group		Treatment vs Class II		Class III control group		Treatment vs Class III	
Variables	Mean	SE	Mean	SE	Difference	P value	Mean	SE	Difference	P value
Skeletal measures										
SNA	-0.57	0.47	0.11	0.16	-0.88	*	0.02	0.18	-0.99	.260
SNB	0.13	0.36	0.47	0.13	-0.14	.899	0.58	0.14	-0.68	.758
ANB	-0.90	0.24	-0.35	0.10	-0.75	***	-0.53	0.11	-0.22	.359
Wits	-0.19	0.25	0.01	0.20	-0.20	.870	-0.66	0.39	0.48	.370

*$P < .05$; **$P < .01$; ***$P < .001$; ****$P < .0001$.

Dental: Overjet

T1-T2

	Treatment group		Class I control group		Tr. vs Class I		Class III control group		Treatment vs Class III	
Variables	Mean	SE	Mean	SE	Difference	P value	Mean	SE	Difference	P value
Overjet	6.97	0.31	1.31	0.09	5.66	****	-0.41	0.08	7.38	****

T2-T3

	Treatment group		Class I control group		Tr. vs Class I		Class III control group		Treatment vs Class III	
Variables	Mean	SE	Mean	SE	Difference	P value	Mean	SE	Difference	P value
Overjet	-0.70	0.04	0.83	0.05	-1.41	****	-0.41	0.08	-0.17	*

*$P < .05$; **$P < .01$; ***$P < .001$; ****$P < .0001$.

Soft tissue: Nasolabial angle

T1-T2

	Treatment group		Class I control group		Tr. vs Class I		Class III control group		Treatment vs Class III	
Variables	Mean	SE	Mean	SE	Difference	P value	Mean	SE	Difference	P value
Nasolabial angle	0.93	2.14	-0.17	2.42	1.76	.950	-1.42	2.60	4.12	.280

T2-T3

	Treatment group		Class I control group		Tr. vs Class I		Class III control group		Treatment vs Class III	
Variables	Mean	SE	Mean	SE	Difference	P value	Mean	SE	Difference	P value
Nasolabial angle	-1.35	1.99	1.49	1.32	-4.84	.328	-1.41	2.6	-1.41	1.000

*$P < .05$; **$P < .01$; ***$P < .001$; ****$P < .0001$.

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN)	Äquivalenz von Versuchs- und Kontrollgruppen, auch der Class III Kontrollgruppe im Vergleich mit der Versuchsgruppe möglicherweise eingeschränkt. Es bestehen signifikante hinsichtlich relevanter morphologischer Kriterien (z.B. overjet). Klasse I Kontrollgruppe notwendigerweise nicht äquivalent. Power/ Sample Size Berechnungen wurden nicht durchgeführt. Die Auswertung war nicht verblindet. Retrospektive Studie mit hohem Risiko für Bias (relevante Unterscheide in den Klasse III Versuchs- und Kontrollgruppen zu Behandlungsbeginn), daher mit sehr deutlichen Schwächen in der Durchführung. Die klinische Relevanz ist entsprechend sehr stark eingeschränkt. *Funding:* keine Angabe *Interessenkonflikte:* keine Angabe *Bias (SIGN):* Äquivalenz von Versuchs- und Kontrollgruppen möglicherweise eingeschränkt. Dies ist gezeigt für Alter und Therapie/ Beobachtungszeitraum. Power/ Sample Size Berechnungen wurden nicht durchgeführt. Eine Verblindung fand nicht statt.
Schluss-folgerung des Begutachters	methodische Qualität: akzeptabel Klinische Aussagekraft: Retrospektive Studie mit hohem Risiko für Bias (Es bestehen signifikante hinsichtlich relevanter morphologischer Kriterien (z.B. overjet). Klasse I Kontrollgruppe notwendigerweise nicht äquivalent.), daher mit sehr deutlichen Schwächen in der Durchführung. Die klinische Relevanz ist entsprechend sehr stark eingeschränkt.
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN)	**acceptable (+)**

Evidenztabelle Malta, Baccetti et al. 2010

Long-Term Dentoskeletal Effects and Facial Profile Changes Induced by Bionator Therapy

Luciana Abreo Malta[a]; Tiziano Baccetti[b]; Lorenzo Franchi[c]; Kurt Faltin, Jr[d]; James A. McNamara, Jr[e]

ABSTRACT

Objective: To evaluate the long-term skeletal and soft tissue changes induced by the bionator in Class II subjects.

Materials and Methods: The treatment sample consisted of 20 Class II patients (6 males and 14 females) treated consecutively with the bionator. The sample was evaluated at T1, start of treatment; T2, end of bionator therapy; and T3, long-term observation (including fixed appliances). Mean age at the start of treatment was 10 years 2 months (T1); at posttreatment, 12 years 4 months (T2); and at long-term follow-up, 18 years 11 months (CS 6). The control group consisted of 20 subjects (8 males and 12 females) with untreated Class II malocclusions. Lateral cephalograms were analyzed at the three time points for all groups. Student's *t* tests were used for comparisons of starting forms, and of the T1–T2 and T1–T3 changes between groups.

Results: The bionator group showed significant, favorable T1–T2 changes both at the skeletal and dentoalveolar levels. The vertical dimension was increased. Significant modifications were assessed for the soft tissues as well. The treated group showed a final improvement in soft tissue pogonion of about 2.5 mm. Significant mandibular changes were noted in the treated group, with a net average 3.3 mm long-term increase in mandibular length compared with untreated Class II controls.

Conclusions: This study suggests that bionator treatment of Class II malocclusion maintains favorable results over the long-term with a combination of skeletal, dentoalveolar, and soft tissue changes. (*Angle Orthod* 2010;80:10–17.)

KEY WORDS: Bionator; Class II malocclusion; Functional jaw orthopedics; Cephalometrics; Soft tissues

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** The treatment sample consisted of 20 Class II division I treated consecutively with the bionator in a single orthodontic practice (K.F.). The control group consisted of 20 subjects with untreated Class II division I malocclusions (obtained from the University of Michigan Growth Study and the Denver Child Growth Study) White
Schweregrad	Nicht spezifiziert
Einschluss-kriterien *Bei Review: PICOS*	• Class II division I malocclusion
Ausschluss-kriterien	-

Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** consecutively treated with the bionator in a single orthodontic practice (K.F.). The treatment protocol consisted of a bionator, constructed without coverage of the lower incisors, to be worn 16 hours a day and followed by approximately 1 year of fixed appliance therapy. Those patients still in the mixed dentition phase by the end of bionator treatment were instructed to wear the appliance only at night until complete eruption of the premolars and permanent canines. After the comprehensive phase of treatment, each patient was given a lower incisor fixed retainer. **Kointervention** Lateral cephalograms were obtained at three time periods: T1, at the start of treatment; T2, at the end of bionator therapy; and T3, at long-term observation after completion of growth, including the phase with fixed appliances. VERSUCHSGRUPPE: **Bionator** N=20 (Anfang) / N=20 (Ende) / Alter = 10,2 ± 1,6 Jahre / ♂:♀ = 14:6 • Gebissphase: Ruhephase, spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** **Kointervention** Cephalograms of the untreated subjects were obtained from the University of Michigan Growth Study and the Denver Child Growth Study. Significant effort was directed toward matching the control sample to the treatment sample as closely as possible with respect to gender distribution (for the effect this variable would have on head size), age at all observation periods, duration of observation intervals (T1–T2, T2–T3, and T1–T3), and skeletal maturity at all time points. All treated and untreated patients had completed active growth (CS6) at T3. KONTROLLGRUPPE: **Bezeichnung** N=20 (Anfang) / N=20 (Ende) / Alter = 9,1 ± 1,5 Jahre / ♂:♀ = 12:8 • Gebissphase: Ruhephase, spätes Wechselgebiss • KFO-Behandlung: keine Therapie
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** • **Okklusion, Kaufunktion, Funktion** PRIMÄRZIELGRÖßE: *Maxillary, Mandibular, Intermaxillary measurements (SNA, Co-Pt A, SNB, Co-Gn, ANB, Wits, Mx/Mn diff.)* SEKUNDÄRZIELGRÖßE: *Vertical skeletal measurements (FH-PP, FMA, LAFH, Gonial angle, Co-Go-Me)* TERTIÄRZIELGRÖßE: *Interdental, dentoalveolar maxillary/mandibular measurements (Overjet, Overbite, I/I, 6/6, U1-Pt A vert, IMPA)* QUARTÄRZIELGRÖßE: *Soft tissue measurements (U Lip protraction, L Lip protraction, A’ to N perp, Pg’ to N perp)*

Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	1. The bionator appliance, over a long-term period, did not induce a restraining effect on the maxilla, while it produced a significant enhancing effect on mandibular length (3.3 mm more than untreated Class II controls). 2. The bionator improved significantly the overjet and the molar relationship, with a significant reduction of the overbite associated with an increase in LAFH. 3. The soft tissue profile was favorably altered by bionator therapy in the long term: the chin was advanced 2.5 mm more than that of untreated controls.
Zusammen-fassung der Ergebnisse	**GRUPPE Bionator VS. GRUPPE untreated control** Bionator: T1, at the start of treatment and T3, at long-term observation after completion of growth Control: age and gender matched at time points T1 and T3 ***PRIMÄRZIELGRÖßE*** There were no significant between group differences for sagittal maxillary measures. The treated group had a significant increase of 3.3 mm in mandibular length (Co-Gn) when compared with controls. ***SEKUNDÄRZIELGRÖßE*** The treated group showed a significantly smaller amount of closure of FMA, a significant counterclockwise rotation of the palatal plane, and a significantly greater increase in lower anterior facial height (LAFH) with respect to the controls. ***TERTIÄRZIELGRÖßE*** Both overjet and overbite showed a significant decrease in the bionator group. The molar relationship was significantly improved in the treatment group that presented also with a significant retroclination of upper incisors. ***QUARTÄRZIELGRÖßE*** As to the soft tissue analysis, the results showed a significantly smaller protrusion of soft tissue A-point and a significantly smaller retrusion of Pg’ in the bionator group when compared with the control group.
Angaben auffälliger positiver und/oder negativer Aspekte	Baseline-Imbalancen innerhalb beider untersuchter Gruppen (m>f). Gruppe control ist durchschnittlich jünger als Gruppe Bionator. *Power der Studie/Patientenzahl:* The power of the study was calculated on the basis of the difference in means and standard deviation of the changes in mandibular length (Co-Pg) in a previous long-term study,12 as well as on sample size. The resulting power was 0.85. *Funding: keine Angabe Interessenkonflikte: keine Angabe* No confidence intervals provided.
Schluss-folgerung des Begutachters	methodische Qualität: insgesamt gut Klinische Aussagekraft: The bionator appliance, over a long-term period, probably produced a significant enhancing effect on mandibular length (3.3 mm). The bionator improved significantly the overjet and the molar relationship. Overbite decreased. The chin was advanced 2.5 mm more.
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN /AMSTAR II)	**Acceptable ⊕**

Evidenztabelle Mandall et al. 2012

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SCIENTIFIC SECTION

Is early class III protraction facemask treatment effective? A multicentre, randomized, controlled trial: 3-year follow-up

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Objective: To investigate the effectiveness of early class III protraction facemask treatment in children under 10 years of age at 3-year follow-up.

Design: Multicentre randomized controlled trial.

Subjects and Methods: Seventy-three patients were randomly allocated, stratified for gender, into early class III protraction facemask group (PFG) (*n*=35) and a control/no treatment group (CG) (*n*=38).

Outcomes: Dentofacial changes were assessed from lateral cephalograms and occlusal changes using the peer assessment rating (PAR). Self-esteem was assessed using the Piers–Harris children's self-concept scale, and the psychosocial impact of malocclusion with oral aesthetic subjective impact score (OASIS) questionnaire. Temporomandibular joint (TMJ) signs and symptoms were also recorded. The time points for data collection were at registration (DC1), 15 months later (DC2) and 3 years post-registration (DC3).

Results: The following mean skeletal and occlusal changes occurred from the class III starting point to DC3 (3-year follow-up): SNA, PFG moved forwards +2.3° (CG forward +1.6°; *P*=0.16); SNB, PFG moved forwards +0.8° (CG forward +1.5°, *P*=0.26); ANB, PFG class III base improved +1.5° (CG stayed about the same at +0.1°; *P*=0.001). This contributed to an overall difference in ANB between PFG and CG of +1.4° in favour of early protraction facemask treatment. The overjet was still improved by +3.6 mm in the PFG and changed a small amount +1.1 mm in the CG (*P*=0.001). A 21% improvement in PAR was shown in the PFG and the CG worsened by 8.4% (*P*=0.02). There was no increase in self-esteem (Piers–Harris score) for PFG compared with the CG (*P*=0.56) and no statistically significant difference in the impact of malocclusion (OASIS) between groups in terms of the changes from DC1 to DC3 (*P*=0.18). TMJ signs and symptoms were very low at DC1 and DC3.

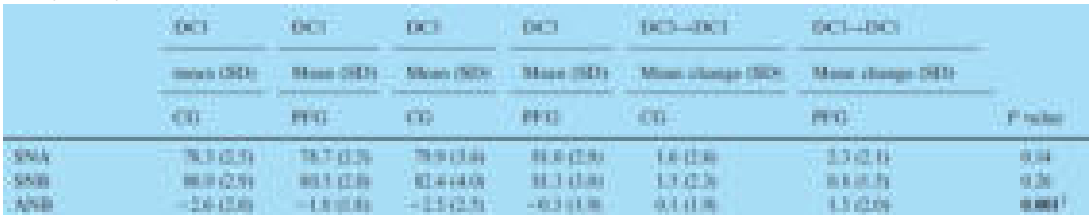
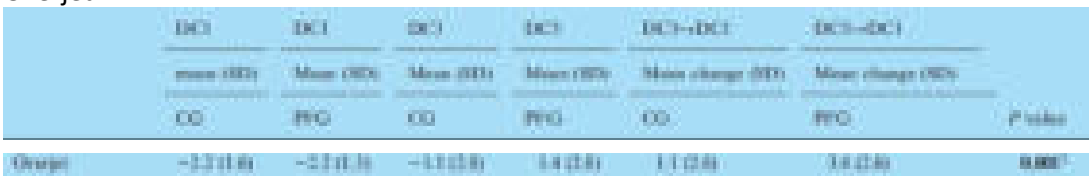
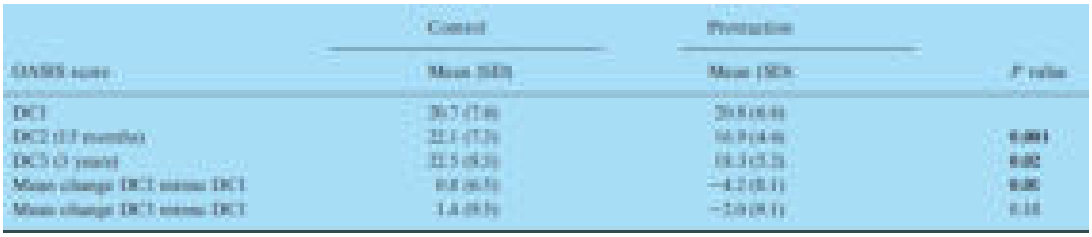
Conclusion: The favourable effect of early class III protraction facemask treatment undertaken in patients under 10 years of age, is maintained at 3-year follow-up in terms of ANB, overjet and % PAR improvement. The direct protraction treatment effect at SNA is still favourable although not statistically significantly better than the CG. Seventy per cent of patients in PFG had maintained a positive overjet which we have defined as ongoing treatment success. Early protraction facemask treatment does not seem to influence self-esteem or reduce the patient's personal impact of their malocclusion at 3-year follow-up.

Key words: Class III skeletal pattern, early orthognathic treatment, protraction facemask, randomized controlled trial

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie** Children with skeletal and dental ClassIII malocclusion: seven to nine years old at the time of registration, three or four incisors in crossbite in the intercuspal position, clinical assessment of a class III skeletal problem • UK
Schweregrad	a maxillo-mandibular planes angle smaller than 35° or lower face height lower than 70 mm

Einschluss-kriterien	Children: -seven to nine years old at the time of registration -three or four incisors in crossbite in the intercuspal position -clinical assessment of a class III skeletal problem
Ausschluss-kriterien	-child of non-Caucasian origin -cleft lip and palate and/or craniofacial syndrome -a maxillo-mandibular planes angle greater than 35° or lower face height greater than 70 mm -previous history of TMJ signs or symptoms -lack of consent
Intervention Versuchsgruppe	**kieferorthopädische Behandlung** **RME + FM Del (PFG)** Rapid maxillary expansion (RME). A bonded maxillary acrylic expansion device was placed as outlined by Baccetti et al. Acommercially available adjustable facemask was used (TP Orthodontics), which had bilateral vertical rods connected to both chin and forehead pads. Extra oral elastics of increasing strength were used (3/ 80 8 oz elastics for 1–2 weeks; then 1/20 14 oz elastics; then 5/160 14 oz elastics) until a force of 400 g per side was delivered.24 The direction of elastic traction was downwards and forwards 30u from the vestibular hooks on the bonded maxillary expander to the adjustable crossbar of the facemask. Patients were asked to wear the facemask for 14 hours per day, continuously, during the evening and night. VERSUCHSGRUPPE 1: **RME + FM Del** N= 35(Anfang) / N=30 (Ende) / Alter = 12,3/0,8 (Ende) ♂:♀ = 15:15 (Ende) • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **Untreated Class III (CG)** N=38 (Anfang) / N=33 (Ende) / Alter = 12,1/ 0,9 (Ende) ♂:♀ = 15:18 (Ende) • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: reguläre Behandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** • **mundgesundheitsbezogene Lebensqualität (MLQ), psychische Entwicklung** • **medizinischer Schaden, Nebenwirkungen bzw. Zunahme der Anomalie /Malokklusion/Dysgnathie** • **Stabilität des Behandlungsergebnisses** PRIMÄRZIELGRÖßE: Skeletal: SNA, SNB, ANB SEKUNDÄRZIELGRÖßE: Dental: overjet TERTIÄRZIELGRÖßE: Psychosocial outcome QUARTÄRZIELGRÖßE: TMJ signs and symptoms
Studientyp	**RCT**
Schluss-folgerungen der Autoren	At 3-year follow-up: - Early class III orthopaedic treatment, with a protraction facemask, in patients under 10 years of age, is skeletally effective; however, only the combined bimaxillary skeletal effect reflected in ANB measurements, was clinically or statistically significant. - Seventy per cent of patients still presented with a positive overjet in the PFG and they had a PAR improvement of 21% compared with the CG who worsened by just over 8%. - Early protraction facemask treatment does not seem to confer a clinically significant psychosocial benefit. - There were no TMJ signs or symptoms that could be attributed to the early protraction facemask treatment.

Zusammen-fassung der Ergebnisse	**GRUPPE RME + FM Del VS. Untreated Class III (CG)** DC1 (pre-treatment): mean age 8,7 years, RME+ FM Del; 9,0 years, Control DC3 (3 year follow-up): mean age 12,1 vears, RME+ FM Del, 12,3 years, Control Skeletal SNA, SNB, ANB  Dental Overjet  Psychosocial outcome Piers-Harris  OASIS  Piers Harris: There were tiny changes in self-esteem over time and no statistically significant increase in self-esteem as a result of protraction facemask treatment. OASIS: Although OASIS scores at DC3 (Table 4) tended towards a reduced impact of malocclusion PFG (-2.0 points) compared with increased impact in the CG (+1.4 points), this was not statistically significant (regression P=0.18). TMJ signs and symptoms low prevalence of TMJ signs and symptoms at both time points; therefore, no statistical analysis was carried out. Crepitus was the most frequently observed sign at DC3

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN)	**Randomisierte Studie mit wenigen Schwächen. Die Äquivalenz der Gruppen war gegeben, die Charakteristika sind angegeben. Die Art der Randomisierung ist adäquat. Eine Power/ Sample Size Analyse wurde durchgeführt. Die Reliabilität der Outcome Messungen ist für die skeletalen und dentalen Parameter überprüft. Die Gruppengröße ist ausreichend. Schwächen zeigen sich in der weniger gut nachvollziehbaren und ungeprüften Methode und Erhebung der TMJ Symptome.** *Funding:* The study was sponsored by TP Orthodontics. Orthodontic products, La Porte, Indiana. Keine Angaben zur Rolle des Geldgebers *Interessenkonflikte:* keine Angabe *Bias (SIGN): Wenige Schwächen, diese vor allem in der* ungeprüften Methode und Erhebung der TMJ Symptome.
Schluss-folgerung des Begutachters	methodische Qualität: gut
	Klinische Aussagekraft: Voll gegeben.
Evidenz-level (SIGN)	**1++**
Qualität (RoB, SIGN)	**High quality (++)**

Evidenztabelle Mandall, Cousley et al. 2016

SCIENTIFIC SECTION Journal of Orthodontics, Vol. 43, 2016, 164–175

Early class III protraction facemask treatment reduces the need for orthognathic surgery: a multi-centre, two-arm parallel randomized, controlled trial

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[5]St Luke's Hospital, Bradford, UK
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[7]Southend Hospital, Westcliff-on-Sea, Essex, UK
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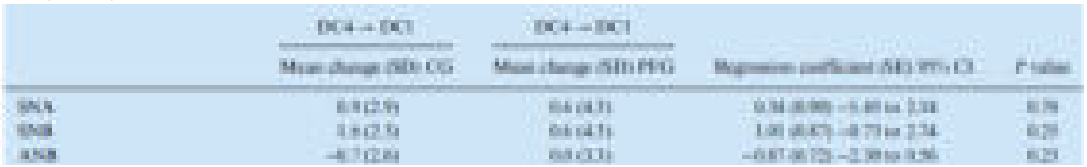
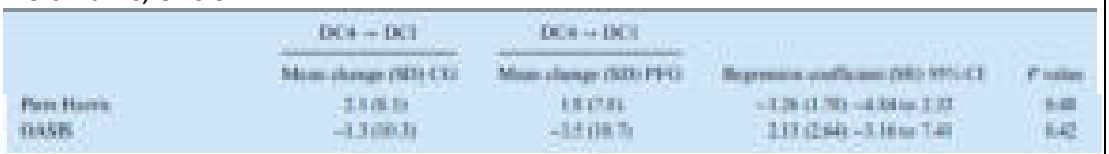
Objective: To evaluate whether patients who had received early class III protraction facemask treatment were less likely to need orthognathic surgery compared with untreated controls. This paper is a 6-year follow-up of a previous clinical trial. **Design:** Multi-centre 2-arm parallel randomized controlled trial. **Setting:** Eight United Kingdom hospital orthodontic departments. **Participants:** Seventy three 7- to 9-year-old children. **Method:** Patients were randomly allocated, stratified for gender, into an early class III protraction facemask group (PFG) ($n = 35$) and a control/no treatment group (CG) ($n = 38$). The primary outcome, need for orthognathic surgery was assessed by panel consensus. Secondary outcomes were changed in skeletal pattern, overjet, Peer Assessment Rating (PAR), self-esteem and the oral aesthetic impact of malocclusion. The data were compared between baseline (DC1) and 6-year follow-up (DC4). A per-protocol analysis was carried out with $n = 32$ in the CG and $n = 33$ in the PFG. **Results:** Thirty six percent of the PFG needed orthognathic surgery, compared with 66% of the CG ($P = 0.027$). The odds of needing surgery was 3.5 times more likely when protraction facemask treatment was not used (odds ratio = 3.34 95% CI 1.21–9.24). The PFG exhibited a clockwise rotation and the CG an anti-clockwise rotation in the maxilla (regression coefficient 8.24 (SE 0.75); 95% CI 6.73–9.75; $P < 0.001$) and the mandible (regression coefficient 6.72 (SE 0.73); 95% CI 5.27–8.18; $P < 0.001$). Sixty eight per cent of the PFG maintained a positive overjet at 6-year follow-up. There were no statistically significant differences between the PFG and CG for skeletal/occlusal improvement, self-esteem or oral aesthetic impact. **Conclusions:** Early class III protraction facemask treatment reduces the need for orthognathic surgery. However, this effect cannot be explained by the maintenance of skeletal cephalometric change.

Key words: Class III, interceptive treatment, orthognathic surgery, protraction facemask

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie** Children with skeletal and dental ClassIII malocclusion: seven to nine years old at the time of registration, three or four incisors in crossbite in the intercuspal position, clinical assessment of a class III skeletal problem • UK
Schweregrad	a maxillo-mandibular planes angle smaller than 35° or lower face height lower than 70 mm

Einschluss-kriterien	Children: seven to nine years old at the time of registration; three or four incisors in crossbite in the intercuspal position; clinical assessment of a class III skeletal problem
Ausschluss-kriterien	child of non-Caucasian origin; cleft lip and palate and/or craniofacial syndrome; a maxillo-mandibular planes angle greater than 35° or lower face height greater than 70 mm; previous history of TMJ signs or symptoms; lack of consent
Intervention Versuchsgruppe	**kieferorthopädische Behandlung** **RME + FM Del (PFG)**: Rapid maxillary expansion (RME). A bonded maxillary acrylic expansion device was placed as outlined by Baccetti et al. Acommercially available adjustable facemask was used (TP Orthodontics), which had bilateral vertical rods connected to both chin and forehead pads. Extra oral elastics of increasing strength were used (3/ 80 8 oz elastics for 1–2 weeks; then 1/20 14 oz elastics; then 5/160 14 oz elastics) until a force of 400 g per side was delivered.24 The direction of elastic traction was downwards and forwards 30u from the vestibular hooks on the bonded maxillary expander to the adjustable crossbar of the facemask. Patients were asked to wear the facemask for 14 hours per day, continuously, during the evening and night. VERSUCHSGRUPPE 1: **RME + FM Del** N= 35(Anfang) / N=33 (Ende) / Alter = 15,0 ± 0,8 (Ende) / ♂:♀ = 17:16 (Ende) • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **Untreated Class III (CG)** N=38 (Anfang) / N=32 (Ende) / Alter = 15,3 ± 0,9 (Ende) / ♂:♀ = 15:17 (Ende) • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** **und** **medizinischer Schaden, Nebenwirkungen** **bzw. Zunahme der Anomalie /Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) • mundgesundheitsbezogene Lebensqualität (MLQ), psychische Entwicklung • Reduktion eines weiteren Therapiebedarfs • Stabilität des Behandlungsergebnisses PRIMÄRZIELGRÖßE: Need for orthognathic surgery SEKUNDÄRZIELGRÖßE: Skeletal: SNA, SNB, ANB TERTIÄRZIELGRÖßE: Dental: overjet QUARTÄRZIELGRÖßE: Psychosocial outcome
Studientyp	**RCT**

Schluss-folgerungen der Autoren	At 6-year follow-up: - Early class III **protraction facemask treatment reduces the need for orthognathic surgery** from two-thirds (CG) to one-third (PFG); - Early protraction facemask treatment-related improvements in **SNA, SNB and ANB were not maintained at 6 years follow-up**. However, there was a statistically significant long-term clockwise rotation in the maxilla and mandible in the PFG; - Sixty eight per cent of patient in the PFG presented with a positive overjet at age 15 years and - Early protraction facemask treatment does **not seem to confer a clinically significant psychosocial benefit.**
Zusammen-fassung der Ergebnisse	**GRUPPE RME + FM Del (PFG) VS. Untreated Class III (CG)** DC1 (pre-treatment): mean age 8,7 years, RME+ FM Del; 9,0 years, Control DC4 (6 year follow-up): mean age 15,0 vears, RME+ FM Del, 15,3 years, Control Need for orthognathic surgery Early protraction facemask treatment was successful in reducing the need for orthognathic surgery. In the **CG, 21 (66%)** were considered to be in need of orthognathic surgery compared with only **12 (36%) thought to need surgery in the PFG (P = 0.026).** Percentage difference between groups = 30%: 95% CI 6% to 53%). This can be expressed as an unadjusted relative effect **odds ratio of 3.34** (95% CI 1.21–9.24) Skeletal SNA, SNB, ANB  Dental Overjet  Psychosocial outcome Piers-Harris, OASIS  Piers Harris, OASIS: Very small trends towards increased self-esteem and reduced impact of malocclusion were seen in both the PFG and the CG. However, an association between improved self-esteem or reduced impact of malocclusion following early protraction facemask treatment is not supported. This is perhaps not surprising as the skeletal and dental outcomes were similar in PFG and CG.

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN)	**Randomisierte Studie mit wenigen Schwächen. Die Äquivalenz der Gruppen war gegeben, die Charakteristika sind angegeben. Die Art der Randomisierung ist adäquat. Eine Power/ Sample Size Analyse wurde durchgeführt. Die Reliabilität der Outcome Messungen ist für die skeletalen und dentalen Parameter überprüft. Für das hier eingeführte neue primäre Outcome war wurde keien Power/ sample size Analyse durchgeführt. Die Gruppengröße ist ausreichend. Die in diesem 6-year follow-up neue Zielgröße „Need for orthgnathic surgery“ wurde durch ein Panel erhoben, dies ist adäquat.** **Unklar bleibt wie sich das für die Behandlung günstige Ergebniss hinsichtlich des verringerten OP-Bedarfs in den, nach 6 Jahren, kaum mehr vorhandenen skeletalen und dentalen Änderungen wiederfindet.** *Funding:* The 6-year follow-up study was sponsored by TP Orthodontics Europe. The sponsor was not involved in the design conduct and analysis of this trial. *Interessenkonflikte:* keine Angabe *Bias (SIGN): Wenige Schwächen, diese vor allem in der nicht nachvollziehbaren und unzureichend diskutierten Kausalität von früher Protraktion und reduziertem OP Bedarf*
Schluss-folgerung des Begutachters	methodische Qualität: gut
	Klinische Aussagekraft: Gegeben.
Evidenz-level (SIGN)	**1++**
Qualität (RoB, SIGN)	**High quality (++)**

Evidenztabelle Mandall, DiBiase et al. 2010

SCIENTIFIC SECTION

Is early class III protraction facemask treatment effective? A multicentre, randomized, controlled trial: 15-month follow-up

Nicky Mandall
Andrew DiBiase
Simon Littlewood
Spencer Nute
Richard Cousley
Fiona Dyer
Rye Mattick
Barbara Doherty
Nadia Stivaros, Ross McDowall, Inderjit Shargill and Helen Worthington

Objective: To investigate the effectiveness of early class III protraction facemask treatment in children under 10 years of age.

Design: Multicentre, randomized controlled trial.

Setting: Eight UK hospital orthodontic units.

Subjects and methods: Seventy-three patients were randomly allocated, stratified for gender, into an early class III protraction facemask group (PFG) (n= 55) and a control/no treatment group (CG) (n= 18).

Outcomes: Dentofacial changes from lateral cephalograms and occlusal changes using the peer assessment rating (PAR). Self-esteem was assessed using the Piers Harris children's self-concept scale, and the psychosocial impact of malocclusion with an oral aesthetic subjective impact scores (OASIS) questionnaire. Temporomandibular joint (TMJ) signs and symptoms were also recorded. The time points for data collection were at registration (DC1) and 15 months later (DC2).

Results: The following mean skeletal and occlusal changes occurred from the class III starting point: SNA, PFG moved forwards 1.4° (CG forward 0.3°, $P=0.018$); SNB, PFG moved backwards −0.7° (CG forward 0.8°, $P<0.001$); ANB, PFG class III base improved +2.1° (CG worsened by −0.5°; $P<0.001$). This contributed to an overall difference in ANB between PFG and CG of 2.6° in favour of early protraction facemask treatment. The overjet improved +4.4 mm in the PFG and marginally changed +0.3 mm in the CG ($P<0.001$). A 32.2% improvement in PAR was shown in the PFG and the CG worsened by 8.6%. There was no increased self-esteem (Piers Harris score) for treated children compared with controls ($P=0.22$). However, there was a reduced impact of malocclusion (OASIS score) for the PFG compared with the CG ($P=0.003$), suggesting treatment resulted in slightly less concern about the teeth appearance. TMJ signs and symptoms were very low at DC1 and DC2 and none were reported during active facemask treatment.

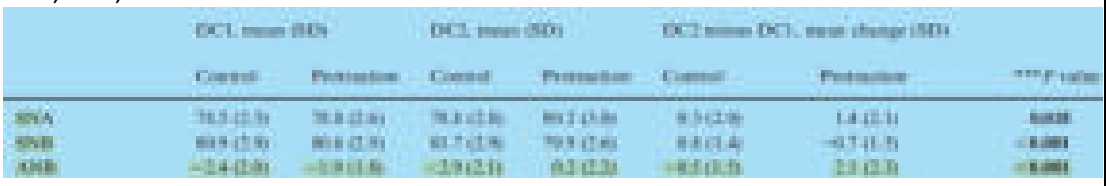
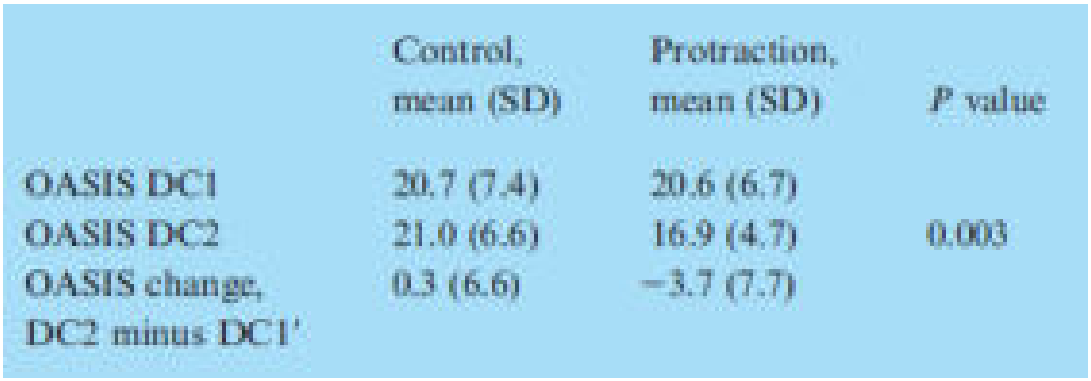
Conclusions: Early class III orthopaedic treatment, with protraction facemask, in patients under 10 years of age, is skeletally and dentally effective in the short term and does not result in TMJ dysfunction. Seventy per cent of patients had successful treatment, defined as achieving a positive overjet. However, early treatment does not seem to confer a clinically significant psychosocial benefit.

Key words: Class III skeletal pattern, early orthopaedic treatment, protraction facemask, randomized controlled trial

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie** Children with skeletal and dental ClassIII malocclusion: seven to nine years old at the time of registration, three or four incisors in crossbite in the intercuspal position, clinical assessment of a class III skeletal problem • UK
Schweregrad	a maxillo-mandibular planes angle smaller than 35° or lower face height lower than 70 mm

Einschluss-kriterien	Children: seven to nine years old at the time of registration; three or four incisors in crossbite in the intercuspal position; clinical assessment of a class III skeletal problem
Ausschluss-kriterien	child of non-Caucasian origin; cleft lip and palate and/or craniofacial syndrome; a maxillo-mandibular planes angle greater than 35° or lower face height greater than 70 mm; previous history of TMJ signs or symptoms; lack of consent
Intervention Versuchsgruppe	**kieferorthopädische Behandlung** **RME + FM Del**: Rapid maxillary expansion (RME). A bonded maxillary acrylic expansion device was placed as outlined by Baccetti et al. Acommercially available adjustable facemask was used (TP Orthodontics), which had bilateral vertical rods connected to both chin and forehead pads. Extra oral elastics of increasing strength were used (3/ 80 8 oz elastics for 1–2 weeks; then 1/20 14 oz elastics; then 5/160 14 oz elastics) until a force of 400 g per side was delivered.24 The direction of elastic traction was downwards and forwards 30u from the vestibular hooks on the bonded maxillary expander to the adjustable crossbar of the facemask. Patients were asked to wear the facemask for 14 hours per day, continuously, during the evening and night. VERSUCHSGRUPPE 1: **RME + FM Del** N= 35(Anfang) / N=33 (Ende) / Alter = 8,7 ± 0,9 / ♂:♀ = 18:17 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **Untreated Class III** N=38 (Anfang) / N=36 (Ende) / Alter = 9,0 ± 0,8 / ♂:♀ = 16:22 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** **und** **medizinischer Schaden, Nebenwirkungen** **bzw. Zunahme der Anomalie /Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) • mundgesundheitsbezogene Lebensqualität (MLQ), psychische Entwicklung PRIMÄRZIELGRÖßE: Skeletal: SNA, SNB, ANB SEKUNDÄRZIELGRÖßE: Dental: overjet TERTIÄRZIELGRÖßE: Psychosocial outcome QUARTÄRZIELGRÖßE: TMJ signs and symptoms

Studientyp	**RCT**
Schluss-folgerungen der Autoren	- Early class III orthopaedic treatment, with protraction facemask, in patients under 10 years of age, is skeletally and dentally effective in the short term. - Seventy per cent of patients had successful treatment, defined as achieving a positive overjet. - There were no resultant TMJ problems. - Early treatment does not seem to confer a clinically significant psychosocial benefit.

Zusammen-fassung der Ergebnisse	**GRUPPE RME + FM Del VS. GRUPPE Untreated Class III** DC1 (pre-treatment): mean age 8,7 years, RME+ FM Del; 9,0 years, Control DC2 (post-treatment): mean age 9,95 years, RME+ FM Del, 10,25 years, Control Skeletal SNA, SNB, ANB  Dental Overjet  Psychosocial outcome Piers-Harris  OASIS  Piers Harris: Small increases and decreses which were not statistically different. OASIS: The RME+FM Del children were statistically significantly ‘less concerned’ by their malocclusion at DC2, compared with the CG (regression P=0.003). Again, although statistically significant, the values show a fairly small clinical difference of four points between groups. TMJ signs and symptoms the number of children with TMJ signs or symptoms. This was low for both groups at both time points with (3% of patients having intra-articular pain, locking, loss of movement or temporalis/masseter spasm.

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN)	**Randomisierte Studie mit wenigen Schwächen. Die Äquivalenz der Gruppen war gegeben, die Charakteristika sind angegeben. Die Art der Randomisierung ist adäquat. Eine Power/ Sample Size Analyse wurde durchgeführt. Die Reliabilität der Outcome Messungen ist für die skeletalen und dentalen Parameter überprüft. Die Gruppengröße ist ausreichend. Schwächen zeigen sich in der weniger gut nachvollziehbaren und ungeprüften Methode und Erhebung der TMJ Symptome.** *Funding:* This study was funded by the British Orthodontic Society Foundation (BOSF) UK. *Interessenkonflikte:* keine Angabe *Bias (SIGN): Wenige Schwächen, diese vor allem in der* der weniger gut nachvollziehbaren und ungeprüften Methode und Erhebung der der TMJ Symptome.
Schluss-folgerung des Begutachters	methodische Qualität: gut
	Klinische Aussagekraft: Voll gegeben.
Evidenzlevel (SIGN)	**1++**
Qualität (RoB, SIGN)	**High quality (++)**

Evidenztabelle Mantysaari, Kantomaa et al. 2014

European Journal of Orthodontics 26 (2004) 59–64

The effects of early headgear treatment on dental arches and craniofacial morphology: a report of a 2 year randomized study

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SUMMARY The aim of the present study was to determine the effects of early headgear treatment on dental arches and craniofacial morphology in children in the early mixed dentition. The total study group comprised 68 children of both sexes (40 boys and 28 girls) aged 7.6 years (standard deviation (SD) 0.3). The children, who had a Class II tendency in occlusion and moderate crowding of the dental arches, were randomly divided into two groups of equal size, matched according to gender. In the headgear (HG) group, treatment was initiated immediately. The mean treatment time was 18 months. In the second group, which served as the control, only interceptive procedures were performed during the follow-up period. The records, which included dental casts and lateral cephalograms, were obtained after follow-up periods of 1 and 2 years.

The lengths and the widths of the maxillary and mandibular dental arches were significantly increased in the HG group after the 2 year follow-up period. The mean increase in lower arch length and width was 2.4 mm (SD 1.7) and 2.2 mm (SD 1.2), respectively. On average, the space gain in the lower arch was half that of the upper arch. No significant changes were found in the arch dimensions of the control group. Maxillary growth restraint and labial tilting of the incisors were the most significant cephalometric findings in the HG group when compared with the controls.

The use of headgear in the early mixed dentition is effective in the treatment of moderate crowding. It is noteworthy that significant space gain in the dimensions of the lower arch can be achieved by headgear application to the upper first molars.

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** A group of 7-year-old children were screened for the investigation. Children in need of orthodontic treatment due to moderate crowding and a Class II tendency were selected for comprehensive orthodontic examination. The children, who had a Class II tendency in occlusion and moderate crowding of the dental arches, were randomly divided into two groups of equal size, matched according to gender. The children were randomly divided into two groups of equal size, matched according to gender.
Schweregrad	Nicht spezifiziert
Einschluss-kriterien *Bei Review: PICOS*	Twenty per cent of the children had an Angle Class II molar relationship. Eighty per cent had either a bilateral cusp to cusp molar relationship, a unilateral cusp to cusp relationship, or a Class I relationship on either side. The crowding was clinically diagnosed as moderate based on the degree of space deficiency in the anterior regions of the dental arches.
Ausschluss-kriterien	-

Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** Early headgear treatment, headgear (HG) treatment was initiated immediately. In the HG group, the maxillary first molars were banded and cervical headgear was used, but no other appliances were applied. The long outer bows of the headgear were bent 10 degrees upwards in relation to the inner bow and a force of 700–1000 g was applied. The inner bow of the headgear was expanded and constantly held 10 mm wider than the dental arch. The patients were instructed to wear the headgear during sleep, for 8–10 hours. For safety reasons, the cervical headgear was only worn during sleep to avoid possible accidents during active periods of the day. The mean treatment time was 16 months. **Kointervention**: The records, which included dental casts and lateral cephalograms, were taken before (T0), and after follow-up periods of 1 (T1) and 2 years (T2). VERSUCHSGRUPPE: **Headgear** N=34 (Anfang) / N=34 (Ende); ♂:♀ = 20:14; Alter = ?? ± ??Jahre • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** Only interceptive procedures were performed during the follow-up period. **Kointervention** The records, which included dental casts and lateral cephalograms, were taken before (T0), and after follow-up periods of 1 (T1) and 2 years (T2). KONTROLLGRUPPE: **control** N=34 (Anfang) / N=34 (Ende); ♂:♀ = 20:14; Alter = ?? ± ??Jahre • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: keine kieferorthopädische Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** • **Okklusion, Kaufunktion, Funktion** PRIMÄRZIELGRÖßE: *Maxillary dental arch changes (U1+U2, U3, U4)* SEKUNDÄRZIELGRÖßE: *Mandibular dental arch changes (L1+L2, L3, L4, Overbite, Overjet)* TERTIÄRZIELGRÖßE: *Cephalometric measurements (SNA, ANB, SN/NL, NL/ML, facial axis, UI/SN, UI/NL, NPog/LI, LI/ML, UI/LI)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**

Schluss-folgerungen der Autoren	1. early cervical headgear is effective in the treatment of subjects with moderate crowding 2. Space was gained in both dental arches by widening the arches and labial inclination of the incisors 3. With a distal force on the upper first molars, a restraint of maxillary growth distally was also observed Marked correction of overjet cannot, however, be successfully carried out with orthopaedic cervical headgear alone as the sole early treatment method.
Zusammen-fassung der Ergebnisse	**GRUPPE X VS. GRUPPE Y: Headgear VS Control** **PRIMÄRZIELGRÖßE** At T1 and T2 the length of the maxillary arch (U1 + U2) was significantly greater ($P \leq 0.001$) in the HG group than in the controls. The mean increase in the HG group after the 1 year (T0–T1) interval was 4.7 mm (SD 2.42) and after the 2 year (T0–T2) interval 6.0 mm (SD 3.61). The corresponding values in the control group were 0.2 mm (SD 2.01) and 0.2 mm (SD 2.78). After 1 (T0–T1) and 2 (T0–T2) years of headgear therapy, the width of the upper arch was increased by 2.9 mm (SD 1.38) and 3.7 mm (SD 2.05) when measured as the distance between the primary canines (U3) ($P \leq 0.001$) and 5.4 mm (SD 2.76) and 5.6 mm (SD 2.12) when measured as the distance between the upper first molars (U4)($P \leq 0.001$). There was a small but significant increase in the control group in the width of the maxillary arch after 1 and 2 years when measured as the distance between the upper molars, the mean increase being 0.6 mm (SD 1.51) and 1.1 mm (SD 1.87) ($P \leq 0.01$). The differences between the HG and control groups were highly statistically significant after the 1 and 2 year ($P \leq 0.001$) follow-up periods when measured as the distance between the primary canines and between the upper first molars. **SEKUNDÄRZIELGRÖßE** After the 1 and 2 year follow-up periods, the length of the mandibular dental arch (L1 + L2) was significantly greater ($P \leq 0.001$) in the HG group than in the controls. The mean increase in the HG group from T0 to T1 was 2.1 mm (SD 1.35) and from T0 to T2 2.4 mm (SD 1.68) (Table 1). The corresponding values in the control group were –0.4 mm (SD 1.41) and –0.5 mm (SD 1.76) (Table 1). The width of the lower dental arch after 1 (T0–T1) and 2 (T0–T2) years of headgear therapy was increased by 1.4 mm (SD 0.82) and 1.3 mm (SD 0.90) when measured as the distance between the primary canines (L3) ($P \leq 0.001$) and 1.9 mm (SD 1.16) and 2.2 mm (SD 1.18) when measured as the distance between the lower first molars (L4) ($P \leq 0.001$). There was no significant increase in the control group in the width of the mandibular dental arch after 1 and 2 years, the mean changes being 0.0 mm (SD 0.47) and 0.1 mm (SD 0.68) when measured as the distance between the lower first molars. The difference between the control and HG groups was highly statistically significant ($P \leq 0.001$) after the follow-up periods when measured as the distance between the lower first molars, but the difference was not significant between the groups in the distance between the primary canines. No significant difference in overjet was found between the groups after the follow-up periods. There was a significant difference between the groups in overbite at T1 and T2. The mean overbite at T1 in the HG group was 2.4 mm (SD 1.65) and in the controls 3.2 mm (SD 1.72), and at T2 2.7 mm (SD 1.44) in the HG group and 3.6 mm (SD 1.65) in the controls ($P \leq 0.001$).

	TERTIÄRZIELGRÖßE In the HG group, SNA significantly decreased after the 1 and 2 year intervals (–1.3 degrees, SD 1.08, $P \leq 0.001$ and –1.7 degrees, SD 1.39, $P \leq 0.001$, respectively). No significant changes occurred in the control group. ANB was significantly decreased in the HG group at T1 (–1.8 degrees, SD 1.25, $P \leq 0.001$) and T2 (–2.6 degrees, SD 1.45, $P \leq 0.001$). No significant changes occurred in the control group (Table 2). There was a significant difference in ANB between the groups at T2 ($P \leq 0.01$). There were no significant differences in SN/NL, NL/ML or in the facial axis angles in the HG group compared with the control group at either T1 or T2. The cephalometric measurements showed that the upper incisors were labially tilted in the HG group, the mean change in UI/SN angle being 4.3 degrees (SD 3.69) at T1 and 4.7 degrees (SD 5.88) at T2 ($P \leq 0.001$). For UI/NL angle, the measurements were 4.8 (SD 3.62) and 5.7 degrees (SD 6.63) ($P \leq 0.001$), respectively. No significant changes occurred in the control group during the 2 year follow-up period. The difference between the groups was highly significant at T1 and T2 ($P \leq 0.001$). The lower incisors were found to be labially tilted in the HG group at the follow-up periods, the mean change in LI/ML angle being 2.6 degrees (SD 3.63; $P \leq 0.01$) at T1 and 2.6 degrees (SD 4.50; $P \leq 0.05$) at T2. The mean change in NPog/LI angle was 2.2 degrees (SD4.16; $P \leq 0.01$) at T1 and 2.2 degrees (SD 4.61; $P \leq 0.05$) at T2. The difference in Npog/LI angle between the HG group and the controls was significant at both observation periods, but for LI/ML angle the difference was significant only at T1. The interincisal angle (UI/LI) was found to be decreased in the HG group at T1 and T2 ($P \leq 0.001$). There was no significant change in the interincisal angle in the control group. The difference between the groups was significant both at T1 and T2 ($P \leq 0.001$).
Angaben auffälliger positiver und/oder negativer Aspekte	Keine Interrater-Reliabilität bestimmt *Power der Studie/Patientenzahl:* unklar/limitiert, nicht spezifiziert *Funding: keine Angabe* *Interessenkonflikte: keine Angabe* The study does not indicate how many of the people asked to take part did so, in each of the groups being studied. No confidence intervals.
Schluss-folgerung des Begutachters	<u>methodische Qualität:</u> insgesamt gut
	<u>Klinische Aussagekraft:</u> early cervical headgear is effective in the treatment of subjects with moderate crowding**, w**ith a distal force on the upper first molars, a restraint of maxillary growth distally was also observed Marked correction of overjet cannot, however, be successfully carried out with orthopaedic cervical headgear alone as the sole early treatment method.
Evidenz-level (SIGN)	**2+**
Qualität **(RoB, SIGN /AMSTAR II)**	**Acceptable ⊕**

Evidenztabelle Marisco et al., 2011

SYSTEMATIC REVIEW AJO-DO

Effectiveness of orthodontic treatment with functional appliances on mandibular growth in the short term

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Introduction: The aim of this study was to analyze the current literature for the best evidence (randomized clinical trials) about the efficacy of functional appliances on mandibular growth in the short term. **Methods:** A survey of articles published up to September 2009 was performed by using the following electronic databases: PubMed, Embase, Ovid Medline, Cochrane Central Register of Controlled Trials, Web of Science, LILACS, and Google Scholar. The reference lists of the retrieved articles were hand-searched for possible missing articles. No language restriction was applied during the identification of the published studies. A methodologic scoring process was developed to identify which randomized clinical trials were stronger methodologically. The selection process and the quality assessment were undertaken independently and in duplicate by 2 authors. A meta-analysis was attempted by using random-effects models. Clinical and statistical heterogeneity was examined, and a sensitivity analysis was performed. **Results:** Electronic searches identified the following items: 146 articles were retrieved from PubMed, 45 from Cochrane Central Register of Controlled Trials, 29 from Ovid, 42 from LILACS, 628 from Web of Science, and 1000 from Google Scholar. Thirty-two articles fulfilled the specific inclusion criteria and were identified as potentially appropriate randomized clinical trials to be included in this meta-analysis. Only 4 articles, based on data from 338 patients (168 treated vs 170 controls) with Class II malocclusion in the mixed dentition, were selected for the final analysis. The quality analysis of these studies showed that the statistical methods were at the medium-high level. The outcome measurements chosen to evaluate the efficacy of the various functional appliances were Co-Pg, Pg/Olp + Co/Olp, and Co-Gn and the values were annualized and standardized to a uniform scale with the standardized mean differences (SMD). The results of the meta-analysis from the random-effects model showed a statistically significant difference of 1.79 mm in annual mandibular growth of the treatment group compared with the control group (SMD = 0.81, 95% CI, 0.30 to -0.93; chi-square test, 5.34; 3 df; $P = 0.15$; $I^2 = 43.9\%$; test for overall effect, $Z = 3.83$ and $P = 0.0001$). The sensitivity analysis showed a substantially similar outcome of 1.91 mm (SMD = 0.65, 95% CI, 0.25 to 1.25; chi-square test, 4.96; 2 df; $P = 0.08$; $I^2 = 59.7\%$; test for overall effect, $Z = 3.19$ and $P = 0.001$). **Conclusions:** The analysis of the effect of treatment with functional appliances vs an untreated control group showed that skeletal changes were statistically significant, but unlikely to be clinically significant. (Am J Orthod Dentofacial Orthop 2011;139:24-36)

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** • children during the transitional dentition stage of development with Class II malocclusion
Schweregrad	Nicht angegeben

Einschluss-kriterien *Bei Review: PICOS*	• population: children during the transitional dentition stage of development with Class II malocclusion • intervention: functional appliances • comparison: comparable untreated control group • outcome: PRIMÄRZIELGRÖßE: effective increase of total mandibular length – linear cephalometric measurements (condylionpogonion (Co-Pg), condylion-gnathion (Co-Gn), and pogonion-occlusal line perpendiculare + condylionocclusal line perpendiculare (Pg/Olp 1 Co/OLp)) • study type: RCTs
Ausschluss-kriterien	1. Previous or additional/ concomitant treatments (headgear, extractions, or fixed appliances) 2. articles related but had a different aim 3. Abstracts, laboratory studies, descriptive studies, individual case reports, series of cases, reviews, studies of adult patients, controlled clinical trials, retrospective longitudinal studies, and meta-analyses 4. Studies that used articulare as a cephalomteric refrence point
Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** VERSUCHSGRUPPE: **functional appliances** N=168 (Anfang) / N=?? (Ende) / Alter = 8,5-11,6 Jahre / ♂:♀ = ?:? • Gebissphase: frühes bis spätes Wechselgebiss • KFO-Behandlung: Frühbehandlung (interzeptiv), reguläre Behandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Therapie** KONTROLLGRUPPE: **untreated control group** N=170 (Anfang) / N=?? (Ende) / Alter = 8,5-11,6 Jahre / ♂:♀ = ?:? • Gebissphase: frühes bis spätes Wechselgebiss • KFO-Behandlung: keine Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: effective increase of total mandibular length – linear cephalometric measurements (condylionpogonion (Co-Pg), condylion-gnathion (Co-Gn), and pogonion-occlusal line perpendiculare + condylionocclusal line perpendiculare (Pg/Olp 1 Co/OLp))
Studientyp	**Systematisches Review mit Meta-Analsye** Inkludierte Studien in Bezug auf PICO: RCT N=4 Gesamt-Teilnehmerzahl in Bezug auf PICO: N=338

Schluss-folgerungen der Autoren	In this systematic review, we analyzed results from RCTs in the literature concerning Class II functional therapy to evaluate the efficacy of functional appliances on mandibular growth in the short term. This meta-analysis showed that, when functional appliance treatment is provided in **early adolescence, there are small beneficial changes in skeletal patterns**, but these are probably not very clinically significant.
Zusammen-fassung der Ergebnisse	**functional appliances VERSUS untreated control group** **effective increase of total mandibular length – linear cephalometric measurements (condylionpogonion (Co-Pg), condylion-gnathion (Co-Gn), and pogonion-occlusal line perpendiculare + condylionocclusal line perpendiculare (Pg/Olp 1 Co/OLp)):** statistically **significant difference of 1.79 mm in the annual** mandibular growth of the treatment groups compared with the control groups (SMD 5 0.61, 95% CI, 0.30 to –0.93; chi-square test, 5.34; 3 df; P=0.15; I2 = 43.9%; test for overall effect, Z = 3.83 and P = 0.0001) (figure 2). To test how robust the results of this meta-analysis were, a **sensitivity analysis** was performed. A new metaanalysis was carried out **without the study with the highest risk** of bias,32 with a substantially **similar** outcome of 1.91 mm (SMD 5 0.65, 95% CI, 0.25-1.25; chi-square test, 4.96; 2 df; P 5 0.08; I2 5 59.7%; test for overall effect, Z 5 3.19 and P 5 0.001) as shown in Figure 3.
Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign: kein Protokoll a priori, keine genaue Angabe zur unbehandelten Kontrollgruppe hinsichtlich Dysgnathie, solide Literaturrecherche, exakte Definition des Outcomes* *Durchführung: gleichmäßige Aufteilung der Teilnehmer in Kontroll- und Versuchsgruppe, Einzelstudien in vier verschiedenen Ländern durchgeführt – aber vermutlich ähnliche Ethnizität* *Auswertung: gut durchgeführte Meta-Analyse mit Berücksichtigung des RoB und der verschiedenen Messparameter einzelner Studien* *Power der Studie/Patientenzahl: 4/338* *Funding: k.A.* *Interessenkonflikte:* The authors report no commercial, proprietary, or financial interest in the products or companies described in this article. *Bias (SIGN/AMSTAR/EinzelstudienRoB – alle negativen Punkte aus Fragebogen auflisten):* **2. Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol?** **3. Did the review authors explain their selection of the study designs for inclusion in the re** **5. Did the review authors perform study selection in duplicate?** **10. Did the review authors report on the sources of funding for the studies included in the review?** **13. Did the review authors account for RoB in individual studies when interpreting/ discussing the results of the review?** *Publikationsbias (Reviews): -*
Schluss-	methodische Qualität: Review gut, Einzelstudien tw gut/ tw hohes RoB

folgerung des Begutachters	Klinische Aussagekraft: Funktionskieferorthopädische Geräte, die bei Kindern mit Klasse-II im Wechselgebiss eingesetzt werden, scheinen zu einer Zunahme der Unterkkieferlänge zu führen. Die Rolle der unterschiedlichen Wachstumsmuster sowie der Langzeiteffekt sind jedoch nicht geklärt.
Evidenz-level (SIGN)	**1+**
Qualität (RoB, SIGN /AMSTAR II)	**Moderat ⊕⊕**

Evidenztabelle Martina, Cioffi et al. 2013

Orthodontics & Craniofacial Research

ORIGINAL ARTICLE

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Efficacy of the Sander bite-jumping appliance in growing patients with mandibular retrusion: a randomized controlled trial

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Martina R., Cioffi I., Galeotti A., Tagliaferri R., Cimino R., Michelotti A., Valletta R., Farella M., Paduano S. Efficacy of the Sander bite-jumping appliance in growing patients with mandibular retrusion: a randomized controlled trial.
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Structured Abstract

Objectives – The efficacy of functional appliances remains highly debated. This randomized controlled trial investigated the skeletal and dentoalveolar effects determined by the Sander bite-jumping appliance (SJA). The null hypothesis to be tested was that the appliance would not induce supplementary mandibular growth compared to untreated controls.

Setting and Sample Population – This study was carried out at the Section of Orthodontics, University of Naples Federico II, Italy. Forty-six patients receiving a clinical diagnosis of skeletal and dental class II due to mandibular retrusion were either allocated to a treatment (23 patients;15 boys, 8 girls; mean age ± SD: 10.9 ± 1.3 years) or to an untreated control group (23 patients,11 boys, 12 girls; mean age ± SD: 10.6 ± 1.2 years), by using a balanced block randomization.

Methods – Lateral cephalograms were taken before and after treatment and used for comparisons. Measurements were analyzed by descriptive statistics, univariate and multivariate statistical tests.

Results – Treated individuals had a significant increase in mandibular length (6.4 ± 2.3 vs. 3.5 ± 2.5 mm; $p < 0.001$), overjet reduction (−5.0 ± 2.9 vs. 0.3 ± 1.2 mm; $p < 0.001$) and molar relationship improvement (−5.3 ± 2.4 vs. 0.1 ± 1.1 mm; $p < 0.001$) compared to controls. The use of the appliance did not significantly affect jaw divergence. Proclination of lower incisors was slightly greater (3.0°, $p = 0.021$) in treated patients than in controls. The increase in mandibular length was not significantly influenced by cervical stage ($p = 0.40$).

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** Patients seeking an orthodontic consultation were screened by two specialists in orthodontics (RM and RT) at the Department of Oral Sciences, Section of Orthodontics, University of Naples Federico II, Italy, between April 2006 and June 2007.
Schweregrad	overjet ≥ 6 mm
Einschluss-kriterien *Bei Review: PICOS*	• full class II molar relationships • overjet ≥ 6 mm • an age range of 10– 13 years for boys and of 9–12 years for girls
Ausschluss-kriterien	• cervical vertebral maturation stage (CVMS) <2 or >3 • lack of parent’s willingness to sign an informed consent form • sella-nasion to mandibular plane (Me-Go) angle equal to or greater than the normal value plus a standard deviation • periodontal diseases • orofacial inflammatory conditions • tooth agenesis • congenital syndromes • previous orthodontic treatment

Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** treatment with Sander bite-jumping appliance. The appliance tested in this study was a Sander BJA (22). This appliance consists of an upper and lower acrylic plate. The core of the appliance tested is an expansion screw moulded with two robust prongs 13 mm long, which are embedded in the upper plate and positioned to form an angle of 60° with the occlusal plane (Fig. 2). The mid-portion of the lower plate has an inclined plane made of acrylic, which meets with the upper prongs when the mouth is closed, so that the patient is forced to posture the mandible forward. Stability and retention of both plates is obtained by means of Adams clamps; this is further increased by the use of a labial bow in the upper plate, and by covering the edges of the lower incisors and canines with acrylic in the lower plate. The initial wax bite registration was made with the mandible advanced by 4 mm. Subsequent reactivations of the appliance were obtained chair-side by adding a layer of acrylic 1.5 mm thick to the inclined plane of the lower plate. The timing of reactivation was determined in each patient based on the individual amount of improvement in sagittal dental relationships. The expansion screw was activated during treatment (one turn = 0.25 mm per week) as appropriate. The need for expansion was determined by comparing the transversal relationship of the upper and lower dentition in the initial models fitted in a class I molar relationship. Patients allocated to the treatment group were seen every 5 weeks until a full class I molar relationship was achieved. The maximum treatment duration, however, was set at 18 months. The patients were asked to wear the appliance 14 h/day, including sleep time, but not during meals. The patients were strongly motivated to wear the appliance consistently and were asked to record the daily wearing time in a diary. **Kointervention** The cephalograms were taken in centric relation at the start (T0) and end (T1) of the treatment in the BJA group. The mean (SD) treatment duration was 14.5 months (±3.5 months). VERSUCHSGRUPPE: **treatment with Sander bite-jumping appliance** N=23 (Anfang) / N=23 (Ende) / Alter = 10,9 ± 1,3 Jahre / ♂:♀ = 15:8 • Gebissphase: Ruhephase, spätes Wechselgebissphase • KFO-Behandlung: Frühbehandlung, reguläre Behandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** Untreated control group. The control patients were seen every 3 months for 12 months. **Kointervention** The cephalograms were taken in centric relation at the start (T0) and at the end of control period (12 months) in the control group. KONTROLLGRUPPE: **untreated control** N=23 (Anfang) / N=23 (Ende) / Alter = 10,5 ± 1,2 Jahre / ♂:♀ = 11:12 • Gebissphase: Ruhephase, spätes Wechselgebiss • KFO-Behandlung: keine Therapie

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** • **Okklusion, Kaufunktion, Funktion** PRIMÄRZIELGRÖßE: *Cephalometric measurements before and at the end of treatment/observation period (Overjet, Molar relation, Maxillary base, Mandibular base, Condylar head, Mandibular length, Mandibular height, Maxillary incisor, Mandibular incisor, Maxillary molar, Mandibular molar, SN-MP, MP-FH; U1/SN, IMPA, L1-FH, PP-MP)*
Studientyp	**Randomisiert-kontrollierte Interventionsstudie (RCT)**
Schluss-folgerungen der Autoren	The results of the present RCT reveal that BJA is effective in determining supplementary mandibular growth in young individuals as selected in the present study. The side effects of this appliance, such as clockwise rotation of the jaws, sagittal upper jaw growth control and proclination of the lower incisors were minimal. Even if a significant component of class II correction might be obtained by an incremental growth of the mandible using this device, further studies should be performed to address the long-term effects produced by the BJA.
Zusammen-fassung der Ergebnisse	**GRUPPE treatment with Sander bite-jumping appliance VS. GRUPPE untreated control** ***PRIMÄRZIELGRÖßE*** *Sagittal skeletal relationships were improved in the treatment group. The treatment determined a significant increase of mandibular length in treated individuals as compared to controls (Pg/OLp + Co/OLp = + 2.9 mm; 95% CI, 1.4– 4.3 mm) as a result of increased mandibular base (Pg/OLp = +2.1 mm; 95% CI, 0.9–3.2 mm) and increased Co/OLp (+0.8 mm; 95% CI, 0.2– 1.8 mm). The increase in mandibular length was not significantly influenced by cervical stage (p = 0.40). The BJA did not appear to cause significant maxillary restraint compared to controls (Ss/ OLp = -0.3 mm; 95% CI, -1.7–1.0 mm). The treatment did not determine any clinically and statistically relevant clockwise rotation of the lower jaw as compared to controls (MP-FH, + 1.0°; 95% CI, -0.5 – 2.6 °; SN-MP, +1.1°; 95% CI -0.3 – 2.6°; PP-MP, -0.9°; 95% CI -0.1 – 2.9°). The appliance determined an improvement of sagittal dental relationships as compared to controls, by producing a significant overjet reduction (-5.3 mm; 95% CI -6.7 – -4.1 mm), a minor proclination of the lower incisors (IMPA, + 3.0°; 95% CI 0.4 – 5.6°) and a slight retroclination of the maxillary incisors (U1/SN, -5.4°; 95% CI -8.3 – 2.5°).*
Angaben auffälliger positiver und/oder negativer Aspekte	*Keine Interrater- bzw. Interrater-Reliabilität angegeben.* *Power der Studie/Patientenzahl:* By setting type I error at 0.05 and type II error at 0.20 (80% power), it was found that at least 19 patients per group were needed to detect an increase in mandibular length ≥ 2.0 mm. *Funding:* The manuscript was supported by a grant of the Italian Ministry of University and Research (MIUR Protocol Number: 2005069705). *Interessenkonflikte: nicht angegeben*
Schluss-	methodische Qualität: insgesamt gut

folgerung des Begutachters	Klinische Aussagekraft: This study aimed to assess whether a functional therapy performed by means of the Sander Bite Jumping Appliance (BJA) induced supplementary mandibular growth in skeletal class II patients. In order to improve the internal validity of the trial, we have used strictly defined selection criteria. Indeed, the patients recruited in this trial showed skeletal class II jaw relationships that improved upon forward posturing of the mandible, were close to the growth peak, and did not present a severe hyperdivergent jaw pattern. The trial provided evidence that BJA determined a statistically and clinically significant increase of mandibular growth, as the mandibular skeletal change represented 51% of the total class II correction. The findings support the short-term efficacy of BJA for the treatment of skeletal class II in a specific subset of patients. Long-term stability of the correction, however, needs to be evaluated.
Evidenz-level (SIGN)	**1+**
Qualität (RoB, SIGN /AMSTAR II)	**Acceptable ⊕**

Evidenztabelle Martina, D'Anto et al 2019

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Original article

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Cephalometric outcomes of a new orthopaedic appliance for Class III malocclusion treatment

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Summary

Objective: To evaluate dental and skeletal effects of a new orthopaedic appliance for the treatment of Class III malocclusion in growing patients.

Material and methods: This retrospective cephalometric study was performed on a sample of 18 patients with a skeletal Class III malocclusion (4 males; 14 females; mean age 8.8 ± 1.5 years) treated with the Pushing Splints 3 (PS3) protocol. The control group consisted of 18 subjects (5 males; 13 females; mean age 9.1 ± 1.8 years) selected from a database of subjects with untreated Class III malocclusion. The cephalometric analysis was performed at the beginning (T0) and the end of the orthopaedic therapy (T1). Significant differences between the treated and control groups were assessed with independent samples *t*-test ($P < 0.05$).

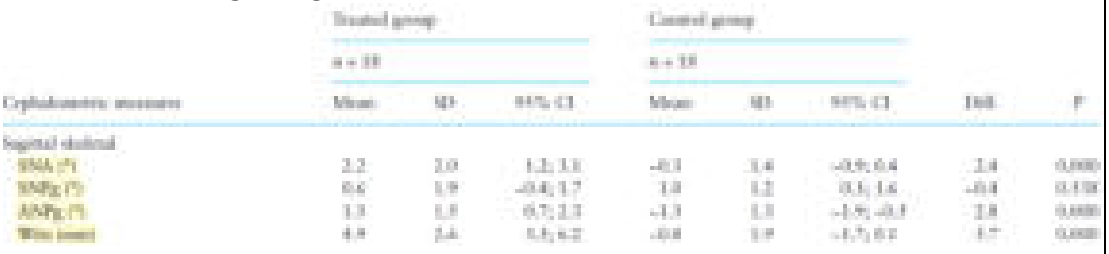
Results: In the PS3 group, the post-treatment cephalometric values showed a forward displacement of the maxilla, resulting in a statistically significant increase of the SNA angle. ANPg and Wits appraisal improved significantly compared with the control group. Lingual inclination of mandibular incisors and buccal inclination of the upper incisors were significantly increased in comparison with the control group. No significant differences were recorded for backward mandibular rotation.

Limitations: This study presents a short-term evaluation of the treatment and the use of a historical control group.

Conclusions: The PS3 was effective for the treatment of Class III malocclusion in growing patients, with favourable maxillary advancement and control of the vertical skeletal relationships.

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie** Children in the early or late mixed dentition (6- 12 years) with Class III permanent molar relationship; Naples, Rome (PS3), Florence (Control), Italy
Schweregrad	Wits appraisal of −2.0 mm or less
Einschluss-kriterien	Caucasian ethnicity; early or late mixed dentition (6- 12 years); mesial step deciduous molar relationship or Class III permanent molar relationship; Wits appraisal of −2.0 mm or less.

Ausschluss-kriterien	craniofacial anomalies, systemic disease affecting the normal growth patterns, clinically evident (less than 5%) facial and/or mandibular asymmetry, previous orthodontic treatment, impacted teeth, anomalies in teeth morphology, periodontal disease, signs and symptoms of temporomandibular disorders
Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** **PS3** Pushing Splints 3 **(Treated group):** The PS3 appliance consists of three components: two removable acrylic splints and one Forsus™ L-pin module per side. The two splints cover all the tooth crowns—usually 6 to 6—in both the arches. The Forsus™ modules were used to deliver a force of 200 grams per side in a forward direction to the upper splint and in a backward direction to the lower splint. VERSUCHSGRUPPE 1: **PS3 Pushing Splints 3** N= 18 (Anfang) / N=18 (Ende) / Alter = 8,8 ± 1,5 years / ♂:♀ = 4:14 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: frühe Behandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE 1: **untreated Class III (Control group)** N=18 (Anfang) / N=18 (Ende) / Alter = 9,1 ± 1,8 years / ♂:♀ = 5:13 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) PRIMÄRZIELGRÖßE: **Skeletal: SNA, SNPg, ANPg, Wits** SEKUNDÄRZIELGRÖßE: **Dental: Overjet**
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**

Schluss-folgerungen der Autoren	In conclusion, - the PS3 protocol produces **favourable skeletal effects in terms of maxillary advancement, leading to a greaterimprovement in sagittal skeletal relationships** when compared with untreated Class III controls. - The **significant increase in overjet** was due to proclination of the maxillary incisors and retroclination of the mandibular incisors. The PS3 protocol is able to produce a favourable control of the vertical skeletal relationships. The results of this study suggest that PS3 is an **effective approach to correct skeletal Class III malocclusion and it might be preferred in hyperdivergent Class III patients**.
Zusammen-fassung der Ergebnisse	**GRUPPE PS3 Pushing Splints 3 VS. GRUPPE untreated Class III (Control group)** T1 (pretreatment/observation): 8,8, 1,5 years PS3 (Treatment group); 9,1, 1,8 years untreated Class 3 (Control group) T2 (posttreatment/observation): 10,5, 1,4 years PS3 (Treatment group); 10,8, 1,8 years untreated Class 3 (Control group) **Skeletal: SNA, SNPg, ANPg, Wits**  **Dental: Overjet** 

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN)	Die Äquivalenz von Versuch- und Kontrollgruppe ist gegeben. Die Versuchsgruppe ist an zwei Standorten rekrutiert worden. Die Kontrollgruppe ist historisch. Beides könnte möglicherweise zu Verzerrungen führen. Insgesamt aber ordentlich durchgeführte retrospektive Kohortenstudie. Power/ Sample Size Berechnungen wurden durchgeführt und Konfidenzintervalle fehlen allerdings. Es fehlt eine Verblindung, die technisch bei der Auswertung wohl möglich gewesen wäre. Ordentlich durchgeführte Studie mit klinischer Relevanz, insbesondere auch wegen der verwendeten neuartigen Apparatur. *Funding:* keine Angabe *Interessenkonflikte:* The authors declare they have no conflict of interest *Bias (SIGN):* Die Äquivalenz von Versuch- und Kontrollgruppe ist gegeben. Die Versuchsgruppe ist an zwei Standorten rekrutiert worden. Die Kontrollgruppe ist historisch. Beides könnte möglicherweise zu Verzerrungen führen. Power/ Sample Size Berechnungen wurden durchgeführt. Eine Verblindung fand nicht statt.
Schluss-folgerung des Begutachters	methodische Qualität: akzeptabel (mit Tendenz zur Abwertung) Klinische Aussagekraft: Ordentlich durchgeführte Studie mit klinischer Relevanz, insbesondere auch wegen der verwendeten neuartigen Apparatur.
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN)	**acceptable (+)**

Evidenztabelle Maspero, Giannini et al. 2015

ORIGINAL ARTICLE

Stomatologija, Baltic Dental and Maxillofacial Journal, 17: 114-20, 2015

Upper airway obstuction in class II patients. Effects of Andresen activator on the anatomy of pharingeal airway passage. Cone beam evalution

Cinzia Maspero, Lucia Giannini, Guido Galbiati, Laima Kairyte, Giampietro Farronato

SUMMARY

Aim. The aim of this study is to assess the response and changes on pharyngeal airway passage (PAP) to class II Andresen appliance in class II growing patients with obstructive sleep apnea syndrome (OSAS).

Methods. The sample consisted of forty patients with a class II malocclusion in the age range of 9 to 14 years with mandibular retrusion and OSAS and ten control group subjects. A CBCT was taken before treatment (T0) and a second one after a follow-up period of approximately 16 months (T1). The dimensions of PAP were determined according to the method described by Jena et al. with Mimics program.

The following parameters were considered: DOP, DPH, MP-H, PAS, PNS-U, SNA, SNB, ANB. The statistical analysis was carried out with t test.

Results. The change in ANB, SNB, MP-H, PNS-U, PAS was significantly more in the patients undergoing treatment as compared to the control group.

The improvement of DOP and DPH among the treatment group subjects was significantly more compared to the control group subjects.

Conclusions. Class II correction by functional appliances during childhood might help to eliminate the adaptive changes in the upper airway and predisposing factors to OSAS, thus decreasing the risk of OSAS development in adulthood.

Key words: Skeletal class II, Oropharyngeal airway, Functional Orthopedic treatment, OSAS, Andresen activator.

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** The sample consisted of forty patients with a class II malocclusion in the age range of 9 to 14 years with mandibular retrusion and OSAS and ten control group subjects. Study material was obtained from orthodontic, ear nose and throat (ENT) and neurologic Departments of Milan University
Schweregrad	Nicht spezifiziert

Einschluss-kriterien *Bei Review: PICOS*	1. Unremarkable medical history except OSAS 2. Caucasian ethnicity 3. Availability for scheduled appointments 4. No history of orthodontic treatment 5. Pre-treatment and post-treatment CBCT 6. Availability of a signed and written informed consent statement 7. Growing patients 8. the patients have documented nocturnal symptoms monitored for at least 1 night during sleep
Ausschluss-kriterien	1. Congenital and dental anomalies 2. Systemic or local condition that might have jeopardized the results 3. Failure to attend more than two appointments 4. Facial or dental asymmetries
Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** The treatment group was corrected by an Andresen appliance. Mandibular advancement was carried out during the wax bite registration. An edge-to-edge incisor relationship with 2 to 3 mm opening between the maxillary and mandibular central incisors was maintained for all subjects. The inter-occlusal acrylic was trimmed in all subjects to allow unhindered vertical development of the mandibular buccal segments. The patients were instructed to wear the appliance 16 h/day. They were followed once in every 4 weeks. All the functional devices were constructed by the same technician. **Kointervention** A CBCT was taken before treatment (T0) and a second one was taken after a follow-up period of approximately 16 months (T1). CBCT were taken by the same technician (C. R.). VERSUCHSGRUPPE: **treatment with activator** N=40 (Anfang) / N=40 (Ende) / Alter = min. 9 to max. 14 Jahre / ♂:♀ = 23:17 • Gebissphase: Ruhephase bis spätes Wechselgebiss • KFO-Behandlung: Frühbehandlung bis reguläre Behandlung

Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** The control group involved patients who required a phase of pre-functional therapy, which included sectional fixed orthodontic appliance for the correction of occlusal interferences, mild crowding and/or rotations. **Kointervention** A CBCT was taken (T0) and a second one was taken after a follow-up period of approximately 16 months (T1). CBCT were taken by the same technician (C.R.). KONTROLLGRUPPE: **control group** N=10 (Anfang) / N=10 (Ende) / Alter = min. 9 to max. 14 Jahre / ♂:♀ = 5:5 • Gebissphase: Ruhephase bis spätes Wechselgebiss • KFO-Behandlung: keine Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **Atmung und Luftraum (Airway space, Schlafapnoe), Schlucken und Sprechen** PRIMÄRZIELGRÖßE: *Values and differences (SNA, SNB, ANB, MP-H, PNS-P(0), PAS, DOP, DHP)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	1. Correction of mandibular retrusion in patients with a class II malocclusion can increase the sagittal dimension on the posterior oropharyngeal airway. 2. The length of the soft palate improves following the correction of mandibular retrusion. 3. The data suggest that in addition to control polysomnographic examinations, orthodontic treatment can be considered for patients with obstructive sleep apnea/hypopnea. 4. To maximize treatment success in patients with OSAS a close collaboration with neurologist and ENT specialist is advisable and necessary.
Zusammen-fassung der Ergebnisse	**GRUPPE treatment with activator VS. GRUPPE control group** ***PRIMÄRZIELGRÖßE*** The skeletal changes in the treatment and control group subjects are described in Table. The change in the sagittal position of the mandible (SNB angle) was significantly more in the treatment group compared to the control group (*P<0.001*). The change in ANB, MP-H, PNS-U, PAS was significantly more in the treatment group as compared to the control group (*P*<0.001). The DOP improved by 2.43 mm in the treatment group patients (*P*<0.001) and it increased by 0.15 mm (*P*<0.001) in control group subjects. The improvement of DOP among the treatment group subjects was significantly more compared to the control group subjects (*P*<0.001). The DHP was improved significantly in treatment group subjects (*P*<0.001). The PAS increased significantly in treatment group subjects (*P*<0.001) and the difference between the treatment and control group was statistically significant (*P*<0.05) indicating that the airway space improved significantly producing an expansion of the PAP. MP-H decreased significantly of 4.93 mm (*P*<0.001) indicating that the body of the hyoid bone moved superiorly by the traction of the mandible. The length of the soft palate, PNS-U, in treatment group subjects was improved compared to control group subjects.

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	Kleine Patientenzahl innerhalb der Kontrollgruppe. *Power der Studie/Patientenzahl:* limitiert, nicht spezifiziert *Funding:* Fondazione IRCCS Cà Granda, Ospedale Maggiore Policlinico, Department of Biomedical, Surgical and Dental Sciences, University of Milan, Milan, Italy. *Interessenkonflikte:* The authors declare that there are no conflicts of interest. The study does not indicate how many of the people asked to take part did so, in each of the groups being studied. No confidence intervals provided.
Schluss-folgerung des Begutachters	methodische Qualität: insgesamt gut
	Klinische Aussagekraft: Correction of mandibular retrusion in patients with a class II malocclusion can increase the sagittal dimension on the posterior oropharyngeal airway. The data suggest that in addition to control polysomnographic examinations, orthodontic treatment can be considered for patients with obstructive sleep apnea/hypopnea. To maximize treatment success in patients with OSAS a close collaboration with neurologist and ENT specialist is advisable and necessary.
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN /AMSTAR II)	**Acceptable ⊕**

Evidenztabelle Masucci, Franchi et al. 2014

C. Masucci
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Short-term effects of a modified Alt-RAMEC protocol for early treatment of Class III malocclusion: a controlled study

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Masucci C., Franchi L., Giuntini V., Defraia E. Short-term effects of a modified Alt-RAMEC protocol for early treatment of Class III malocclusion: a controlled study
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Structured Abstract

Objectives – To assess the effects of a modified alternate rapid maxillary expansion and constriction (Alt-RAMEC) protocol in combination with facemask (FM) in Class III growing patients.

Setting and Sample Population – Thirty one Class III patients (17 males, 14 females) were treated with a modified Alt-RAMEC/FM protocol at the Department of Orthodontics of the University of Florence.

Material and Methods – All patients were evaluated at the beginning (T1, mean age 6.4 ± 0.6 years) and at the end of orthopedic therapy (T2, mean age 8.1 ± 0.9 years), and they were compared to a matched sample of 31 Class III patients (16 males and 15 females) treated with rapid maxillary expansion and facemask (RME/FM) and to a matched control group of 21 subjects (9 males and 12 females) with untreated Class III malocclusion. The three groups were compared with ANOVA with Benjamini-Hochberg correction for multiple tests.

Results – Both the Alt-RAMEC/FM and the RME/FM protocols showed significantly favorable effects leading to correction of the Class III malocclusion. The Alt-RAMEC/FM protocol produced a more effective advancement of the maxilla (SNA +1.2°) and greater intermaxillary changes (ANB +1.7°) vs. the RME/FM protocol. No significant differences were recorded as for mandibular skeletal changes and vertical skeletal relationships.

Conclusion – The Alt-RAMEC/FM protocol induced more favorable skeletal short-term effects compared with RME/FM therapy in Class III growing patients.

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie** Patients of European ancestry with Angle Class-III molar relationship and Wits appraisal of -2.0 m or less and absence of pseudo Class III malocclusion • Italy
Schweregrad	Wits appraisal of -2.0 mm or less

Einschluss-kriterien	- European ancestry (white); - Anterior crossbite or edge-to-edge incisor relationship; - Accentuated mesial step relationships of the primary second molars or Class III relationships of the permanent first molars; - Wits appraisal of -2.0 mm or less; - Absence of CO-CR discrepancy (indicating pseudo-Class III malocclusion); - Deciduous or early mixed phase of dentition; - Pre-pubertal skeletal maturation (CS1 to CS2)
Ausschluss-kriterien	Not fullfilling inclusion criteria

Intervention Versuchsgruppe	**kieferorthopädische Behandlung** **Mod Alt-RAMEC/FM** A maxillary acrylic splint expander with soldered hooks for the facemask was bonded to the deciduous canines and the first and second deciduous molars. The expansion screw (LeoneA2620, Leone Orthodontic Products, Sesto Fiorentino,Firenze, Italy) was activated by the patient’s parents twice a day (0.20 mm per turn,one turn in the morning and one turn at night)for 1 week, then it was deactivated twice a day (one turn in the morning and one turn at night) for 1 week. This alternating protocol was repeated twice. After 4 weeks of Alt-RAMEC therapy, an additional twice-daily activation of the expansion screw was performed until overcorrection was achieved (palatal cusps of the upper posterior teeth approximating the buccal cusps of the lower posterior teeth). At the end of the expansion phase, a facemask according to the design of Petit (Dynamic face Mask, Leone Orthodontic Products, Sesto Fiorentino, Firenze, Italy) was placed for maxillary protraction. Elastics producing orthopedic forces of as much as 400–500 g per side were attached from the hooks on the maxillary expander to the support bar of the facial mask in a downward and forward direction [at least 30° to the occlusal plane. The patients were instructed to wear the facemask 14 h per day for 6 months, then at night only for another 6 months, after which appliances were removed. All patients were trea treated at least to a positive dental overjet before discontinuing treatment; most patients were overcorrected toward a Class II occlusal relationship. **RME/FM** The acrylic splint expander extended from the deciduous canines to the second deciduous molars. When the permanent first molars were erupted, it extended from the first deciduous molars to the permanent first molars. The patients’ parents were instructed to activate the expansion screw (Leone A2620, Leone Orthodontic Products, Sesto Fiorentino, Firenze, Italy) 1–2 times per day until overcorrection was achieved as in Alt-RAMEC/FM protocol. Patients were given facemasks immediately after expansion.The clinical management of the facemask therapy was similar to the Alt-RAMEC/FM group. All patients were treated at least to a positive dental overjet before discontinuing treatment; most patients were overcorrected toward a Class II occlusal relationship. Average duration of RME/ FM treatment was 1.1 ± 0.2 years. After removal of the expander patients treated with both protocols received a removable mandibular retractor as a retainer. VERSUCHSGRUPPE 1: **Mod Alt-RAMEC/FM** N= 31 (Anfang) / N=31 (Ende) / Alter = 6,4 ± 0,8 / ♂:♀ = 17:14 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: frühe Behandlung VERSUCHSGRUPPE 2: **RME/FM** N= 31 (Anfang) / N=31 (Ende) / Alter = 6,9 ± 1,1 / ♂:♀ = 16:15 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: frühe Behandlung

Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE 1: **untreated Class III** N=21 (Anfang) / N=21 (Ende) / Alter = 6,5 / ♂:♀ = 9:12 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: frühe Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) PRIMÄRZIELGRÖßE: **Skeletal: SNA, SNB, ANB, Wits**
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	- The use of a facemask in association with both the Alt-RAMEC protocol and the conventional RME protocol can be considered an efficient treatment modality for the early correction of Class III dentoskeletal disharmony in the short term. - The modified Alt-RAMEC/FM protocol allows obtaining more favorable skeletal effects in terms of maxillary advancement leading to a greater improvement in sagittal skeletal relationships as compared to the conventional RME/FM protocol. - The Alt-RAMEC/FM protocol and the RME/ FM protocol show similar effects as for mandibular skeletal changes and vertical skeletal relationships. - The Alt-RAMEC/FM protocol produced a more effective advancement of the maxilla (SNA +1.2°) and greater intermaxillary changes (ANB +1.7°) vs. the RME/FM protocol. - No significant differences were recorded as for mandibular skeletal changes and vertical skeletal relationships.
Zusammen-fassung der Ergebnisse	**GRUPPE Mod Alt-RAMEC/FM VS GRUPPE Untreated Class III** **GRUPPE RME/FM VS GRUPPE GRUPPE Untreated Class III** T1 (pre-treatment): mean age 6,4 years, mod Alt-RAMEC/FM; 6,9 years,RME/FM; 6,5 years, untreated Class III T2 (post treatment/ observation): mean age 8,1 years, mod Alt-RAMEC/FM; 8,5 years,RME/FM; 8,0 years, untreated Class III **SNA, SNB, ANB, Wits** 

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN)	Die Äquivalenz von Versuch- und Kontrollgruppe wurde nachvollziehbar überprüft. Hinsichtlich der relevanten Merkmale ist die Äquivalenz gegeben, beobachtetet Unterscheide sind nicht relevant. Power/ Sample Size Berechnungen wurden durchgeführt. Die Kontrollgruppe setzt sich aus unterschiedlichen Wachstumsstudien aus unterschiedlichen europäischen Ländern und den USA zusammen. Eine Verblindung fand nicht statt. Trotz einiger methodischer Schwächen ist das Gesamtdesign der Studie akzeptabel mit Tendenz zu gut. Die gut durchgeführte retrospektive Studie hat klinische Relevanz. *Funding:* keine Angabe *Interessenkonflikte* keine Angabe *Bias (SIGN):* Die Äquivalenz von Versuch- und Kontrollgruppe ist gegeben. Power/ Sample Size Berechnungen wurden durchgeführt. Eine Verblindung fand nicht statt. Trotz einiger methodischer Schwächen ist das Gesamtdesign der Studie akzeptabel mit Tendenz zu gut. Die gut durchgeführte retrospektive Studie hat klinische Relevanz.
Schluss-folgerung des Begutachters	methodische Qualität: akzeptabel
	Klinische Aussagekraft: Die gut durchgeführte retrospektive Studie hat klinische Relevanz.
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN)	**Acceptable (+)**

Evidenztabelle **McNamara et al. 2010**

Original Article

Changes in Occlusal Relationships in Mixed Dentition Patients Treated with Rapid Maxillary Expansion

A Prospective Clinical Study

James A. McNamara, Jr[a]; Lauren M. Sigler[a]; Lorenzo Franchi[b]; Susan S. Guest[c]; Tiziano Baccetti[b]

ABSTRACT

Objective: To prospectively measure occlusal changes in mixed dentition patients who underwent a standardized early expansion protocol.

Materials and Methods: The treatment sample consisted of 500 patients who were assigned to three groups according to molar relationship: Class I (n = 204), end-to-end (n = 166), and Class II (n = 130). All patients were treated with a bonded rapid maxillary expander (RME) followed by a removable maintenance plate and a transpalatal arch. Mean age at the start of treatment was 8.8 years (T_1), with a pre–phase 2 treatment cephalogram (T_2) taken 3.7 years later. The control sample consisted of the cephalometric records of 168 untreated subjects (Class I, n = 79; end-to-end, n = 51; Class II, n = 58).

Results: The largest change in molar relationship was noted when the Class II treatment group (1.8 mm) was compared with the matched control group (0.3 mm). A positive change was seen in 81% of the Class II treatment group, with almost half of the group improving by ≥2.0 mm. The end-to-end treatment group had a positive change of 1.4 mm, compared with a control value of 0.6 mm, and the Class I group of about 1 mm compared with controls, who remained unchanged (0.1 mm). Skeletal changes were not significant when any of the groups were compared with controls.

Conclusion: The expansion protocol had a significantly favorable effect on the sagittal occlusal relationships of Class II, end-to-end, and Class I patients treated in the early mixed dentition. (*Angle Orthod.* 2010;80:230–238.)

KEY WORDS: Rapid maxillary expansion; Acrylic splint expander; Cephalometrics; Class II malocclusion; Transpalatal arch

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie, transversale Anomalie** Study objects: • Data on the treatment sample used in this study were gathered prospectively as part of a larger sample of 1135 consecutively treated patients who underwent a standardized expansion protocol in the early mixed dentition. • Setting: Vermutlich Ann Arbor, Michigan, USA Control subjects: • were chosen from the records of three large longitudinal databases on orthodontically untreated children: the University of Michigan Growth Study, the Bolton-Brush Growth Study, and the Denver Child Growth Study.
Schweregrad	Keine Angaben

Einschluss-kriterien *Bei Review: PICOS*	• Class I or Class II malocclusion • Early mixed dentition (all first permanent molars erupted, as well as all erupting upper and lower permanent incisors
Ausschluss-kriterien	1. other orthodontic treatment provided 2. growth problems (craniofacial syndromes, etc)
Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** VERSUCHSGRUPPE 1: **GNE Gruppe** Beschreibung: patients who underwent a standardized expansion protocol in the early mixed dentition. All patients were treated with a bonded RME followed by a removable palatal plate that was worn full-time at least for 1 year, and by the placement of a soldered transpalatal arch during the transition to the permanent dentition. N=547 (Anfang) / N=500 (Ende) / Alter = 8.8 ± 1.1 Jahre / ♂:♀ =224:276 • Gebissphase: frühes Wechselgebiss, permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: Frühbehandlung, interzeptiv
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** KONTROLLGRUPPE: **Kontrollgruppe** Beschreibung: Inclusion criteria were essentially the same as for the treatment group. Particular attention was paid to the stage of dental development as the GNE-Gruppe N=188 (Anfang) / N=188 (Ende) / Alter = 9.3 ± 1.2 Jahre / ♂:♀ = 101:87 • Gebissphase: frühes Wechselgebiss, permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: keine Behandlung
Outcome	**Direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: Okklusale Relation (gemessen am FRS) 1. Sagittale Molarenrelation: 2. Overjet 3. Overbite SEKUNDÄRZIELGRÖßE: Skelettale Relation (gemessen am FRS) 1. Sagittale Lage der Maxilla (Pt A-Na perp) Point A to Nasion perpendicular (an indication of the sagittal maxillary position relative to the cranial base) 2. Sagittale Lage der Mandibula (Pg-Na perp) Pogonion to Nasion perpendicular (sagittal position of the mandible relative to the cranial base) 3. Untere anteriore Gesichtshöhe LAFH (lower anterior facial height) 4. Unterkieferinklination (mandibular plane) mandibular plane angle relative to the Frankfort plane

Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	1. The expansion protocol evaluated in mixed dentition patients, which included the use of a bonded acrylic splint expander and a transpalatal arch just prior to phase 2 treatment, results in an improvement in sagittal relationships in Class II, end-to-end, and Class I patients in comparison with their matched control groups. 2. Forty-nine percent of Class II patients, 29% of endtoend patients, and 23% of Class I patients demonstrated an improvement in sagittal molar relationships of 2 mm or greater. Less than 5% of corresponding control groups had positive changes of 2 mm or greater
Zusammen-fassung der Ergebnisse	**GRUPPE GNE Gruppe VS. GRUPPE Kontrollgruppe** ***PRIMÄRZIELGRÖßE*** *Okklusale Relation* *s. Tabelle 4-5-6* ***SEKUNDÄRZIELGRÖßE*** *Skelettale Relation* *s. Tabelle 4-5-6*
Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign: Prospektive Studie, keine Fallzahlberechnung vorliegend, Interräter realibilität angegeben, Methodenfehler nach Dahlberg für Primär- und Sekundärzielgröße berechnet. Keine Verblindung, Ein-/Auschlusskriterien grob definiert.* *Insgesamt klinisch relevante Ergebnisse.* *Power der Studie/Patientenzahl: Given the sample sizes of all treatment and control groups and subgroups and a P value of .05, the power of this study was 100%.* *Funding: Keine Angabe* *Interessenkonflikte: Keine Angabe* *Bias (SIGN/AMSTAR/EinzelstudienRoB – alle negativen Punkte aus Fragebogen auflisten):* - *Can’t say if comparison is made between participants and non-participants to establish their similarities or differences* - *Can’t say if measures will have been taken to prevent knowledge of primary exposure influencing case ascertainment.* - *Confidence intervals are not provided.*
Schluss-folgerung des Begutachters	methodische Qualität: hohe Qualität Klinische Aussagekraft: hoch 1. Die transversale Erweiterung hat einen positiven Effekt auf die molaren Relation bei Klasse II Patienten, dieser ist außgeprägter je stärker die Klasse II im Molarenberich ist. 2. Ein Effekt der transversalen Erweiterung auf skelettalen Ebene konnte nicht erkannt werden.
Evidenz-level (SIGN)	**2++**
Qualität	High Quality ⊕⊕

Evidenztabelle Merwin, Ngan et al. 1997

Timing for effective application of anteriorly directed orthopedic force to the maxilla

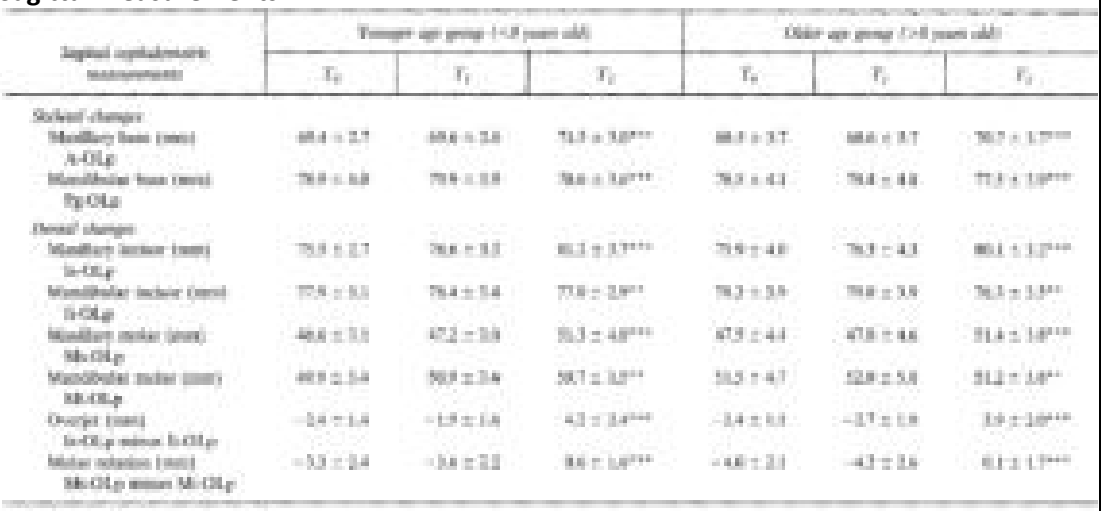
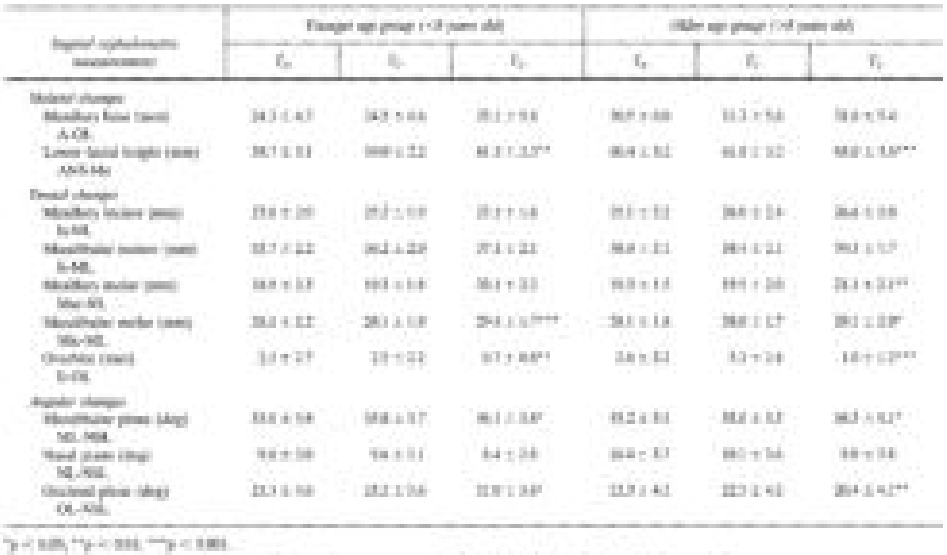
Daniel Merwin, DDS, MS,[a] Peter Ngan, DMD,[b] Urban Hagg, DDS, Odont. Dr.,[c] Cynthia Yiu, BDS, MDS,[d] and Stephen H.Y. Wei, DDS, MS[e]
Memphis, Tenn., Morgantown, W.Va., and Hong Kong

Class III malocclusion with retrusive maxilla can be orthopedically corrected in the deciduous and mixed dentition, with reverse-pull headgear in combination with rapid palatal expansion. The literature recommends this procedure be carried out before the patient is 8 years old to obtain the optimal orthopedic result. This statement, however, has not been supported by scientific data. The current study examined the treatment effects of patients younger than 8 years old (5 to 8 years) and patients older than 8 years old (9 to 12 years). Thirty patients treated with maxillary protraction and expansion in the Department of Children's Dentistry and Orthodontics, University of Hong Kong were included in this study. Cephalometric radiographs were taken 6 months before the initiation of treatment (T_0), at the initiation of treatment (T_1), and after 6 months of treatment (T_2). In this way, (T_1-T_0) represented cephalometric changes during the treatment period and (T_2-T_0) represented 6 months of growth changes without treatment. Experimental subjects served as their own control in this study. A grid system consisting of maxillary occlusal plane (OL) and a line perpendicular to OL through sella (OLp) was used for linear measurements. A total of 15 linear and 3 angular cephalometric measurements were made. A multivariate analysis of variance (MANOVA), which used age and treatment time as its factors, was used to determine effect of age and/or treatment on each cephalometric parameter. Results indicated strikingly similar therapeutic response between the younger and older age groups. These data suggest that similar skeletal response can be obtained when maxillary protraction was started either before age 8 (5 to 8 years) or after age 8 years (8 to 12 years). (Am J Orthod Dentofac Orthop 1997;112:292-9.)

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie** - Patients in the mixed dentition with skeletal Class III malocclusion, reverse overjet and completion of at least 6 months of headgear wear • Hong Kong
Schweregrad	keine Angaben
Einschluss-kriterien	(1) mixed dentition, (2) reverse overjet, (3) cephalometric data indicating a Class III skeletal pattern with maxillary retrusion, (4) completion of at least 6 months of headgear wear
Ausschluss-kriterien	- Not fulfilling inclusion criteria

Intervention Versuchsgruppe	**kieferorthopädische Behandlung** **RPE HG, 5- 8 years, T1-T2, RPE HG, 9- 12 years, T1-T2**: Patients were treated with a Hyrax rapid palatal expansion appliance and a Tubinger reverse-pull headgear (Dentaurum, Inc.). The expansion appliance was activated twice daily (0.25 mm per turn) for 10 days. The headgear was worn 12 to 14 hours per day for at least 6 months. Elastics were worn from the soldered buccal hooks on the expansion appliance to the headgear and delivered 380 gm of anterior force per side at an angle of 30 ° downward from the occlusal plane. VERSUCHSGRUPPE 1 **RPE HG, 5- 8 years, T1-T2** N= 15 (Anfang) / N=15 (Ende) / Alter = 6,8 ± 0,9 years / ♂:♀ = 5:10 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: frühe Behandlung VERSUCHSGRUPPE 2 **RPE HG, 9- 12 years, T1-T2** N= 15 (Anfang) / N=15 (Ende) / Alter = 10,2 ± 1,2 years / ♂:♀ = 5:10 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** **RPE HG, 5- 8 years, T0-T1, RPE HG, 9- 12 years, T0-T1:** Standardized lateral cephalograms of each patient were taken at the following time periods: 6 months before the initiation of treatment (To), at the initiation of treatment (T 0, and after 6 months of treatment (T2). In this way, (T2-T1) represented cephalometric changes during the treatment period and (T1-To) represented 6 months of growth changes without treatment. Comparison of (T2- TI) and (T1-To) showed effects as a result of appliance therapy alone. **Thus experimental subjects served as their own controls in this study.** KONTROLLGRUPPE 1: **RPE HG, 5- 8 years, T0-T1** N= 15 (Anfang) / N=15 (Ende) / Alter = 6,8 ± 0,9 years / ♂:♀ = 5:10 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: frühe Behandlung KONTROLLGRUPPE 2: **RPE HG, 9- 12 years, T0-T1** N= 15 (Anfang) / N=15 (Ende) / Alter = 10,2 ± 1,2 years / ♂:♀ = 5:10 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) PRIMÄRZIELGRÖßE: **Sagittal measurements (Cephalmetric measurements described by Pancherz.)** SEKUNDÄRZIELGRÖßE: **Vertical measurements (Cephalmetric measurements described by Pancherz.)**
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	The current study investigated whether there were a greater orthopedic effect and less dental movement when Class III malocclusion was treated with maxillary expansion and protraction before and after 8 years of age in the mixed dentition. Results indicated **strikingly similar therapeutic response between the younger and the older age groups**. These data suggest that **similar skeletal response can be obtained when maxillary protraction was initiated either before age 8 years (5 to 8 years) or after age 8 years (8 to 12 years).**

Zusammen-fassung der Ergebnisse	**GRUPPE RPE HG, 5- 8 years, T1-T2 VS. GRUPPE RPE HG, 5- 8 years, T0-T1** **GRUPPE RPE HG, 5- 8 years, T1-T2 VS. GRUPPE RPE HG, 9- 12 years, T0-T1** **GRUPPE RPE HG, 9- 12 years, T1-T2 VS. GRUPPE RPE HG, 5- 8 years, T0-T1** **GRUPPE RPE HG, 9- 12 years, T1-T2 VS. GRUPPE RPE HG, 9- 12 years, T0-T1** T0 (treatment start minus 6 months): 6,2 years, **RPE HG, 5- 8 years;** 9,6 years, **RPE HG, 9- 12 years** T1 (treatment start): 6,8, 0,9 years, **RPE HG, 5- 8 years;** 10,2, 1,2 years, **RPE HG, 9- 12 years** T1 (treatment start plus 6 months): 7,4 years, **RPE HG, 5- 8 years;** 10,8 years, **RPE HG, 9- 12 years** Als Kontrolldaten werden die Wachstumsdaten von T0 (Behandlungsstart minus 6 Monate) – T1 (Behandlungsstart) mit den Versuchsdaten T1 (Behandlungsstart) bis T2 (Behandlungsstart plus 6 Monate) verglichen. **Sagittal measurements**  **Vertical measurements** 

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN)	Äquivalenz von Versuchs- und Kontrollgruppe wahrscheinlich gegeben. Baseline characteristics verfügbar und statistisch geprüft. Ungewöhnliche Kontrollgruppe. Diese besteht aus den jeweiligen Patienten in der entsprechenden Altersgruppe selbst. Als Kontrolldaten werden die Wachstumsdaten von T0 (Behandlungsstart minus 6 Monate) – T1 (Behandlungsstart) mit den Versuchsdaten T1 (Behandlungsstart) bis T2 (Behandlungsstart plus 6 Monate) verglichen. Durch die kurzen, vergleichbaren Zeiträume ist die Kontrollgruppe in diesem Fall wahrscheinlich angemessen. Power/ Sample Size Berechnungen wurden durchgeführt. Die Auswertung war nicht verblindet. Retrospektive Studie mit Ungewöhnliche Kontrollgruppe. Diese besteht aus den jeweiligen Patienten in der entsprechenden Altersgruppe selbst. Die klinische Relevanz dürfte in diesem Fall aufgrund der kurzen Beobachtungszeit und der mutmaßlichen Vergleichbarkeit des Wachstums innerhalb dieses Zeitraums wahrscheinlich gegeben sein. *Funding:* keine Angabe *Interessenkonflikte:* keine Angabe *Bias (SIGN):* Äquivalenz von Versuchs- und Kontrollgruppen wahrscheinlich gegeben. Power/ Sample Size Berechnungen wurden nicht durchgeführt. Eine Verblindung fand nicht statt.
Schluss-folgerung des Begutachters	methodische Qualität: akzeptabel Klinische Aussagekraft: Retrospektive Studie mit Ungewöhnliche Kontrollgruppe. Diese besteht aus den jeweiligen Patienten in der entsprechenden Altersgruppe selbst. Die klinische Relevanz dürfte in diesem Fall aufgrund der kurzen Beobachtungszeit und der mutmaßlichen Vergleichbarkeit des Wachstums innerhalb dieses Zeitraums wahrscheinlich gegeben sein.
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN)	**acceptable (+)**

Evidenztabelle Mills, McCulloch 1998

Treatment effects of the twin block appliance: A cephalometric study

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A clinical study was undertaken to investigate the treatment effects of a modified Twin Block appliance. Pretreatment and posttreatment cephalometric records of 28 consecutively treated patients with Class II malocclusions were evaluated and compared with an age- and sex-matched sample of untreated Class II control subjects. The treatment group was considered to have severe skeletal Class II malocclusions and was treated using only the Twin Block appliance. Results indicated that mandibular growth in the treatment group was on average 4.2 mm greater than in the control group over the 14-month treatment period. In addition, some dentoalveolar effects in both arches contributed to the overjet correction. No statistically significant increase in the SN-mandibular plane angle occurred during treatment and, in general, the magnitude and direction of the skeletal changes were found to be quite favorable. (Am J Orthod Dentofacial Orthop 1998;114: 15-24.)

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** Pretreatment and posttreatment cephalometric records of 28 consecutively treated patients with Class II malocclusions were evaluated and compared with an age- and sex-matched sample of untreated Class II control subjects. The treatment group was considered to have severe skeletal Class II malocclusions and was treated using only the Twin Block appliance. From the private practice of one of the authors. Records for a control group of 28 untreated persons with Class II malocclusions were obtained from the Burlington Growth Centre at the University of Toronto. The control group was matched as closely as possible to the treatment group. Matching was made on the basis of age, sex, and vertical facial pattern (that is, deep overbite versus anterior open bite).
Schweregrad	ANB of 5° or greater
Einschluss-kriterien *Bei Review: PICOS*	1. skeletal Class II malocclusion in which the esthetic appearance of the patient improved when the mandible was postured forward; 2. angle ANB of 5° or greater; 3. full cusp Class II molar relationship on one side and end to end Class II molar relationship or greater on the other side
Ausschluss-kriterien	-

Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** The treatment group was considered to have severe skeletal Class II malocclusions and was treated using only the Twin Block appliance. The design differs somewhat from the conventional design advocated by Clark (like labial bow in the lower arch. The active treatment time with the Twin Block appliance ranged from 6 to 15 months. The patients were asked to wear their Twin Block appliances full-time. **Kointervention**: Cephalometric head films were taken approximately 10 days before the start of the Twin Block treatment and again approximately 1 year into the treatment. The mean time interval between the initial (T1) and posttreatment (T2) cephalograms was 14 months, with a range of 8 months to 17 months. VERSUCHSGRUPPE: **Twin Block** N=28 (Anfang) / N=28 (Ende) / Alter = 9 years 1 month ± ?? Jahre / ♂:♀ = 11:17 • Gebissphase: Ruhephase, frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** Records for a control group of 28 untreated persons with Class II malocclusions were obtained from the Burlington Growth Centre at the University of Toronto. The control group was matched as closely as possible to the treatment group. Matching was made on the basis of age, sex, and vertical facial pattern (that is, deep overbite versus anterior open bite). **Kointervention** Cephalometric head films. In the control group, the mean time interval between the first (T1) and second (T2) cephalometric films was 13 months, with a range of 10 months to 15 months. KONTROLLGRUPPE: **control** N=28 (Anfang) / N=28 (Ende) / Alter = 9 years 1 month ± ?? Jahre / ♂:♀ = 11:17 • Gebissphase: Ruhephase, frühes Wechselgebiss • KFO-Behandlung: keine Behandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** • **Okklusion, Kaufunktion, Funktion** PRIMÄRZIELGRÖßE: *Anterioposterior skeletal measurements (SNA, SNB, ANB, Na-Pog facial convexity)* SEKUNDÄRZIELGRÖßE: *Mandibular and maxillary length measurements (Mand. unit length (Co-Gn), Mand. body length (Go-Gn), Ramus height (Art.-Go), Ramus height (Co-Go), B pt. to ref. pl. (mm), Max. unit length (Co-SubANS), A pt. to ref. pl.)* TERTIÄRZIELGRÖßE: *Vertical skeletal and cranial base measurements (Ant. fac. ht. (Na-Me), Post. fac. ht. (S-Go), SN-GoGn, Saddle angle (N-S-Art), Articular angle (S-Art-Go), Gonial angle (Art-Go-Gn), Articulare-ref. pl., Condylion-ref. pl., Ant. cran. base length, Post. cran. base length)* QUARTÄRZIELGRÖßE: *Incisor and molar measurements (U1-SN, U1-ref. pl., L1-GoGn, L1-ref. pl., Incisor overjet, U6-ref. pl., U6-palatal pl., L6-ref. pl, L6-mand. pl., Molar overjet)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	1. The mandibular unit length (measured from condylion to gnathion) increased by 6.5 mm in the Twin Block group as compared with only a 2.3 mm increase in the control subjects. Approximately two thirds of the overall mandibular length increase could be attributed to an increase in ramus height (measured from condylion to gonion). The remaining one third was the result of an increase in the mandibular body length (measured from gonion to gnathion). This mandibular growth probably was responsible for the 1.9° increase in angle SNB in the Twin Block group. By comparison, an increase of only 0.3° in angle SNB was noted in the control group. 2. In addition, some “headgear effect” was observed, with the Twin Block group experiencing a slight inhibition of forward maxillary growth as evidenced by a 0.9° decrease in angle SNA during the treatment phase. The “headgear effect” also was observed dentally as a 1.0 mm distalization effect on the upper molars in the Twin Block group. In contrast, a 0.3 mm forward migration of the upper molars was measured for the control group. 3. A slight uprighting effect (2.5°) was observed for the upper incisors as a result of the Twin Block treatment. This was despite the fact that no labial bow was attached to any of the Twin Block appliances used in this study. The lower incisors tipped labially 5.2° on average in the Twin Block group as compared with only a 1.4° labial tipping in the control subjects. 4. The lower molars moved mesially 1.4 mm in the treatment group as compared with only a 0.2 mm mesial movement in the control group. Molar correction or overcorrection was achieved in all 28 patients in the treatment group. Incisor overjet decreased 5.6 mm on average in the treatment group. Nearly two thirds of this reduction in overjet could be accounted for by the forward growth of the mandible.

Zusammen-fassung der Ergebnisse	**GRUPPE Twin Block VS. GRUPPE control** ***PRIMÄRZIELGRÖßE*** The Twin Block group experienced on average a slight inhibition of forward maxillary growth, as evidenced by the reduction seen in angle SNA as compared with the small increase seen in angle SNA in the control subjects (–0.9° compared with 10.1°, $p < 0.001$). The mandibular growth may account for the 1.9° increase in angle SNB in the treatment group as compared with almost no change in the control group. ***SEKUNDÄRZIELGRÖßE*** The maxillary unit length increased only slightly less in the treatment group than in the control group and this difference was not statistically significant. The mandibular unit length (measured from condylion to gnathion) increased by 6.5 mm in the Twin Block group in contrast to only a 2.3 mm increase in the control group. Approximately two thirds of this increase in overall mandibular length in the treatment group was the result of an increase in ramus height (4.1 mm on average as measured from condylion to gonion). In contrast, the control subjects experienced on average only 1.2 mm of increase in ramus height. The remaining one third of the mandibular length increase in the Twin Block group occurred in the mandibular body with Go-Gn increasing by 3.0 mm. This increase was almost twice as much as that experienced by the control subjects. ***TERTIÄRZIELGRÖßE*** Both anterior facial height and posterior facial height increased significantly in the Twin Block group during treatment (5.6 mm and 4.3 mm, respectively, $p < 0.001$ for both variables). In spite of the change in vertical facial height, there was no net increase in the angle of SN to mandibular plane in the treatment group. Some small but significant differences existed between the treatment group and control group when the cranial base angles and measurements were compared. In particular, the Twin Block group experienced a 0.9° decrease in the saddle angle, a 1.3° increase in the gonial angle, and a 1.6 mm increase in anterior cranial base length. The level of significance for these changes was $p <. 0.001$. ***QUARTÄRZIELGRÖßE*** An average uprighting effect of 2.5° on the upper incisors was observed during Twin Block treatment, but almost no change occurred in the control subjects. The lower incisors were proclined on average 5.2° in the Twin Block group during treatment as compared with only 1.4° of labial tipping in the untreated control subjects. The overjet was decreased in total 5.6 mm in the treatment group. Nearly two thirds of this decrease could be accounted for by the forward growth of the mandible.The upper first molars were distalized 1.0 mm on average in the Twin Block group, whereas the upper first molars came forward 1.5 mm in the control group relative to the vertical reference plane. When the effects of forward maxillary growth were taken into consideration, most of the forward movement of the upper molars in the control group resulted from forward growth of the maxilla (1.2 mm), and only about 0.3 mm was attributable to tooth movement. In contrast, the Twin Block group experienced a distalization effect on the upper molars of 1.6 mm. In addition, some significant withholding effect was noted with respect to the eruption of the maxillary molars in the Twin Block group. The lower molars erupted on average almost four times as much (2.3 mm compared with 0.6 mm) in the Twin Block group as in the control group. They also tended to move more mesially in the treatment group then in the control subjects. When the distance from the lower molars to the vertical reference plane was measured, a total increase of 5.2 mm was noted for the Twin Block group compared with only 1.9 mm for the control group. In both groups, however, much of this forward change in molar position is explained by the forward growth of the mandible. The net dentoalveolar change for the lower molars is a mesial movement of 1.4 mm in the treatment group as compared with only 0.2 mm for the control group. In the Twin Block treatment group, the combination of distalization of the upper molars (1.6 mm), forward growth of the maxilla (0.6 mm as measured at A point), forward growth of the mandible (3.8 mm as measured at B point), and forward migration of the lower molars (1.4 mm) gave a net reduction in the molar overjet of 6.2 mm as compared with a reduction of only 0.4 mm in the control group. Thus in the treatment group, approximately 50% of the molar correction was accomplished by skeletal improvement in the lower jaw and 50% by dentoalveolar change in the upper and lower molars.

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	Keine Interrater-Reliabilität bestimmt. In general, comparison of the two groups indicates that the Class II malocclusions were significantly greater in the Twin Block group than in the control group at the start of the investigation. *Power der Studie/Patientenzahl:* limitiert *Funding:* This study was made possible by the use of materials from the Burlington Growth Centre, Faculty of Dentistry, University of Toronto. The Burlington Study was supported by funds provided by Grant #605-7-299, National Health Grant, Canada. *Interessenkonflikte: Keine Angabe* The study does not indicate how many of the people asked to take part did so, in each of the groups being studied.
Schluss-folgerung des Begutachters	methodische Qualität: insgesamt gut
	Klinische Aussagekraft: Approximately two thirds of the overall mandibular length increase could be attributed to an increase in ramus height (measured from condylion to gonion). The remaining one third was the result of an increase in the mandibular body length (measured from gonion to gnathion). Molar correction or overcorrection was achieved in all 28 patients in the treatment group. Incisor overjet decreased 5.6 mm on average in the treatment group. Nearly two thirds of this reduction in overjet could be accounted for by the forward growth of the mandible.
Evidenz-level (SIGN)	**2+**
Qualität **(RoB, SIGN /AMSTAR II)**	**Acceptable ⊕**

Evidenztabelle Mills, McCulloch 2000

Posttreatment changes after successful correction of Class II malocclusions with the Twin Block appliance

Christine M. Mills, DDS, MS,[a] and Kara J. McCulloch, DMD, MSD[b]
Vancouver, British Columbia, Canada

This investigation is a continuation of a previously published study assessing the treatment effects of the Twin Block appliance. All active treatment was carried out during the mixed dentition stage (mean starting age, 9 years 1 month) with final follow-up for the treatment group occurring in the permanent dentition (mean age, 13 years 1 month). Of the original group consisting of 28 consecutively treated severe skeletal Class II patients, 26 were available for follow-up. A comparison group of 28 untreated Class II subjects matched for age, sex, and vertical facial type was obtained from the Burlington Growth Centre according to the original study design. Of these 28 control subjects, 24 had 4-year follow-up cephalometric films available. The mean age of the controls was 12 years 11 months at the time of follow-up. During the active treatment phase, the Twin Block group experienced an average increase in mandibular unit length of 6.5 mm over a mean of 14 months (annualized rate of change of 5.6 mm per year). In comparison, the control group experienced a 2.3 mm increase in mandibular unit length during the 13-month observation period (annualized rate of 2.1 mm per year). In the posttreatment phase, the change in mandibular unit length for the Twin Block group was 6.0 mm over a 36-month period (annualized rate of change of 2.0 mm per year). The control group experienced an average increase in mandibular unit length of 6.7 mm over the posttreatment assessment period that was 34 months in duration (annualized rate of change of 2.4 mm per year). Although there was a slight reduction in mandibular growth rate after treatment, much of the significant increase in mandibular length achieved during the active phase of treatment with the Twin Block appliance was still present 3 years later when the subjects had matured into the permanent dentition stage. (Am J Orthod Dentofacial Orthop 2000;118:24-33)

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** • The treatment group consisted of 28 consecutively treated Class II patients (11 males, 17 females) from the private practice of one of the authors (C.M.M.). Of the original group consisting of 28 consecutively treated severe skeletal Class II patients, 26 were available for follow-up. A comparison group of 28 untreated Class II subjects matched for age, sex, and vertical facial type was obtained from the Burlington Growth Centre according to the original study design. • Canada, private practice of one of the authors (C.M.M.)
Schweregrad	ANB ≥ 5°
Einschluss-kriterien *Bei Review: PICOS*	• skeletal Class II malocclusion with retrognathic mandible • full cusp Class II molar relationship on one side and end-to-end or greater Class II molar relationship on the other side • an angle ANB of 5° or greater at the start of treatment
Ausschluss-kriterien	-

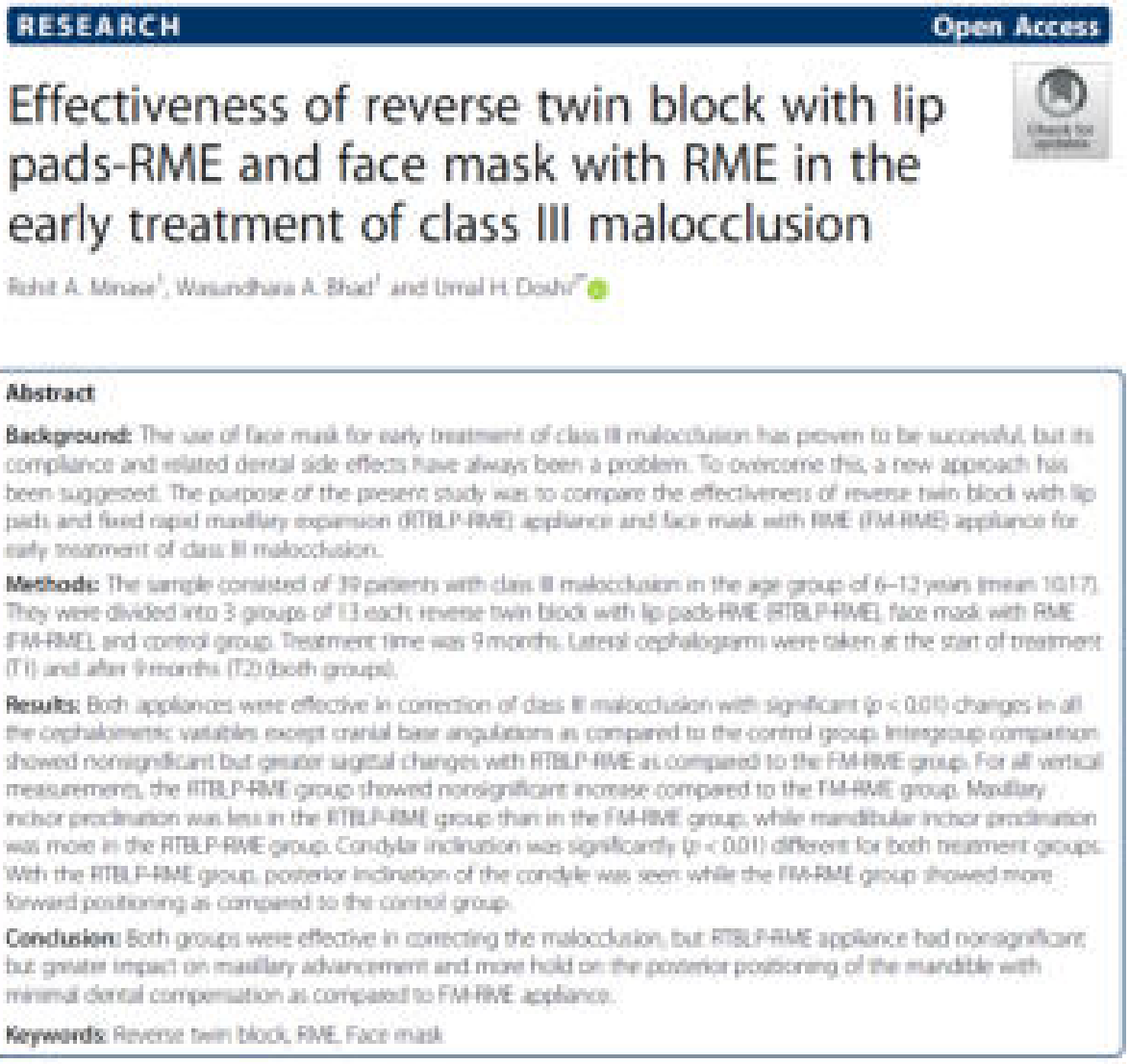
Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** The basic design of the modified Twin Block appliance used in this study is shown in Fig 1 and described in a previous publication.6 Patients were instructed to wear the Twin Block appliance full-time except for meal times and for brushing. The length of time required to achieve a Class I molar relationship ranged from 6 to 15 months. A further retention phase followed during which the patients wore their Twin Block appliances as night retainers for an average of 18 months. Wearing time varied greatly depending on the level of patient cooperation and the rate at which the deciduous teeth exfoliated. Patients routinely outgrew their appliances as the second deciduous molars exfoliated and the second premolars erupted; thus, the goal of treatment was to achieve the skeletal and dental correction before exfoliation of the second deciduous molars, as these molars were clasped by the appliance. After the retention and postretention phases, a second phase of treatment was required for 20 of the 26 patients; 16 were scheduled to start phase II treatment after the T3 records. This second phase of treatment in most instances involved minor detailing of the occlusion, necessitating less than a year of full or partial banded treatment. Of the total treatment group of 26 patients, 5 needed no treatment at all after the initial correction with the Twin Block appliance and 1 patient needed some minor incisor alignment that was accomplished with removable retainers only. Four patients went into full braces before the T3 headfilms were taken. Of these 4 patients, only 2 wore elastics; 1 wore Class II elastics for 6 weeks, and the other wore Class II elastics full time for 6 months and then continued the elastics at night for an additional 3 months. **Kointervention** Lateral headfilms were obtained on the Twin Block treatment group before starting treatment (T1; mean age, 9 years 1 month), at the time of achieving a Class I molar relationship (T2; mean age, 10 years 5 months), and again at the posttreatment follow-up stage (T3; mean age, 13 years 1 month). VERSUCHSGRUPPE: Treatment with Twin Block N=26 (Anfang) / N=26 (Ende) / Alter = 9,1 ± ?? Jahre / ♂:♀ = 11:15 • Gebissphase: Ruhephase, frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** For comparison purposes, a sample of 28 untreated Class II individuals matched to the treatment group for age, sex, and vertical facial type was obtained from the Burlington Growth Centre at the University of Toronto. The mean age of the control group was 9 years 1 month at the start of the observation period and 12 years 11 months nearly 4 years later. **Kointervention** Cephalometric films were available for 24 of the 28 Class II control subjects from the Burlington sample at ages corresponding to the T1, T2, and T3 films of the Twin Block treatment group KONTROLLGRUPPE: **untreated control** N=24 (Anfang) / N=24 (Ende) / Alter = 9,1 ± ?? Jahre / ♂:♀ = 11:13 • Gebissphase: Ruhephase, frühes Wechselgebiss • KFO-Behandlung: keine Therapie

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** • **Okklusion, Kaufunktion, Funktion** PRIMÄRZIELGRÖßE: *Comparison of Anteroposterior skeletal measurements, Mandibular length measurements and Maxillary length measurements (SNA, SNB, ANB, Na-Pog facial convexity, mand unit length, mand body length, ramus height, B pt to Ref Pl, Max unit length, A pt to Ref Pl)* SEKUNDÄRZIELGRÖßE: *Comparison of vertical skeletal measurements and cranial base measurements (ant fac ht, post fac ht, SN-GoGn, saddle angle, articular angle, gonial angle, articulare- Ref pl, condylion – Ref Pl, ant cran base length, pos ant cran length)* TERTIÄRZIELGRÖßE: *Comparison of incisor and molar measurements (U1-SN, U1-Ref Pl, L1-GoGn, L1-Ref Pl, Insicor overjet, U6-Ref Pl, U6-Palatal Pl, L6-Ref Pl, L6-Mand Pl, molar overjet)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	1. Although there was a trend toward slightly smaller mandibular growth increments in the treatment group than in the controls, most of the positive gain in mandibular size achieved during the active treatment phase still was present 3 years posttreatment. The mandibular body length actually increased slightly more in the posttreatment phase in the Twin Block group than in the controls, but the ramus height increased significantly less in the treatment group. 2. Statistically significant differences were found in some of the dental measurements made posttreatment. The treatment group experienced some uprighting of the lower incisors (1.5°) and some slight labial proclination of the upper incisors (0.8°) both of which contributed to a 1.0 mm increase in the overjet. This overjet increase was statistically significant at the $P \leq .01$ level. 3. In addition, the Twin Block group experienced less mesial migration of the lower first molars posttreatment (1.5 mm on average as compared with 2.5 mm in the control group). This difference was statistically significant ($P \leq .01$) and would account for much of the 1.2 mm loss of molar correction that occurred posttreatment ($P \leq .05$) compared with the control group. 4. Much of the favorable skeletal change that resulted during the active treatment with the Twin Block appliance was maintained when the patients were assessed nearly 3 years later.

Zusammen-fassung der Ergebnisse	**GRUPPE X VS. GRUPPE Y:** Treatment with Twin Block VS. untreated control group ***PRIMÄRZIELGRÖßE*** In the T2-T3 time period, the ramus height (Co-Go) increased 2.7 mm on average for the Twin Block treatment group and 4.3 mm on average for the untreated control group. The net 1.6 mm difference is statistically significant at the $P \leq .05$ level. This decline in growth is also reflected in the mandibular unit length (Co-Gn) measurement (6.0 mm in the treatment group, 6.7 mm in the controls). Similarly, the ramus height (Art-Go) increased less in the Twin Block group (2.5 mm) than in the controls (3.0 mm) perhaps indicating an overall trend toward diminished growth in the mandibular condylar area. These differences, however, were not found to be statistically significant but may indicate a tendency for some “rebound” effect after treatment with the Twin Block appliance. In contrast, the mandibular body length (Go-Gn) increased more in the Twin Block group (5.2 mm) than in the control group (4.5 mm) when the T2-T3 changes were compared. This difference, although not statistically significant, is an interesting but unexpected finding. Although none of the variables used to assess maxillary changes showed any statistically significant differences in the posttreatment phase, it appears that there may be a trend for slightly less forward maxillary growth in the Twin Block treatment group from T2-T3. Both angle SNA and maxillary unit length (Co-SubANS), as well as the horizontal measurement from point A to the vertical reference plane all suggest slightly less forward maxillary growth taking place in the Twin Block group than in the untreated controls. ***SEKUNDÄRZIELGRÖßE*** Cranial base angles, mandibular plane angle, and measurements of anterior and posterior facial height dimensions showed no statistically significant differences between the 2 groups from T2-T3. However, there appears to be a trend with posttreatment growth for the saddle angle to open slightly (0.9°) and also for the mandibular plane angle to increase slightly (1.0°) compared with the control group. These changes are also reflected in the greater increase in anterior facial height (1.2 mm) seen in the Twin Block group. ***TERTIÄRZIELGRÖßE*** Predominate differences in the posttreatment phase were seen in molar and incisor positions. Specifically, there was a tendency for the lower incisors to upright; the angle of the lower incisors to mandibular plane (∠L1 – Go-Gn) decreased by 1.5° on average in the Twin Block group compared with a mean increase of 0.6° in the untreated controls. The upper incisors (∠U1 – SN) tended to procline slightly labially (0.8°) in the treatment group, but this posttreatment finding was not statistically significant. The posttreatment incisor overjet measurement increased in the Twin Block group (1.0 mm), whereas it tended to decrease slightly in the untreated controls (–0.1 mm). This difference was statistically significant at the $P \leq .01$ level. The molar relationship as measured in the sagittal plane showed a mean relapse of 1.2 mm in the Twin Block group as compared with almost no change (0.1 mm) in the control group ($P \leq .05$). The difference in molar relationship response between the Twin Block group and the controls can be attributed, in part, to the fact that the lower molars in the treatment group migrated forward less in the posttreatment phase than did the molars of the control group when measurements were made to the vertical reference plane (L6 to Ref Pl). When the translational effect on the molars of the forward growth of the mandible is subtracted, the net forward migration of the lower molars through the bone in the Twin Block group was on average 0.6 mm in the posttreatment phase and 1.4 mm in the controls. This difference was not statistically significant. The lower molars tended to erupt more in the controls than in the Twin Block group from T2-T3 (2.5 mm eruption in controls, 1.5 mm in treatment group). This response was the opposite of what happened during the active treatment phase and was statistically significant at the $P \leq .01$ level.

Angaben auffälliger positiver und/oder negativer Aspekte	No Intra-/Interrater reliability mentioned. Keine erwähnte Randomisierung bzw. Verblindung erwähnt. *Power der Studie/Patientenzahl: limitiert, nicht spezifiziert* *Funding:* This study was made possible by the use of materials from the Burlington Growth Centre, Faculty of Dentistry, University of Toronto. The Burlington Study was supported by funds provided by Grant #605-7-299, National Health Grant, Canada. *Interessenkonflikte: keine Angabe* No evidence from other sources is used to demonstrate that the method of outcome assessment is valid and reliable. No confidence intervals been provided.
Schluss-folgerung des Begutachters	methodische Qualität: insgesamt gut
	Klinische Aussagekraft: - positive gain in mandibular size achieved during the active treatment phase still was present 3 years posttreatment - The treatment group experienced some uprighting of the lower incisors and some slight labial proclination of the upper incisors both of which contributed to a slight increase in the overjet - the Twin Block group experienced less mesial migration of the lower first molars posttreatment - skeletal change that resulted during the active treatment with the Twin Block appliance was maintained when the patients were assessed nearly 3 years later
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN /AMSTAR II)	**Acceptable ⊕**

Evidenztabelle Minase, Bhad et al. 2019



RESEARCH Open Access

Effectiveness of reverse twin block with lip pads-RME and face mask with RME in the early treatment of class III malocclusion

Rohit A. Minase[1], Warsundhara A. Bhad[1] and Unmal H. Doshi[2*]

Abstract

Background: The use of face mask for early treatment of class III malocclusion has proven to be successful, but its compliance and related dental side effects have always been a problem. To overcome this, a new approach has been suggested. The purpose of the present study was to compare the effectiveness of reverse twin block with lip pads and fixed rapid maxillary expansion (RTBLP-RME) appliance and face mask with RME (FM-RME) appliance for early treatment of class III malocclusion.

Methods: The sample consisted of 39 patients with class III malocclusion in the age group of 6–12 years (mean 10.17). They were divided into 3 groups of 13 each: reverse twin block with lip pads-RME (RTBLP-RME), face mask with RME (FM-RME), and control group. Treatment time was 9 months. Lateral cephalograms were taken at the start of treatment (T1) and after 9 months (T2) (both groups).

Results: Both appliances were effective in correction of class III malocclusion with significant ($p < 0.01$) changes in all the cephalometric variables except cranial base angulations as compared to the control group. Intergroup comparison showed nonsignificant but greater sagittal changes with RTBLP-RME as compared to the FM-RME group. For all vertical measurements, the RTBLP-RME group showed nonsignificant increase compared to the FM-RME group. Maxillary incisor proclination was less in the RTBLP-RME group than in the FM-RME group, while mandibular incisor proclination was more in the RTBLP-RME group. Condylar inclination was significantly ($p < 0.01$) different for both treatment groups. With the RTBLP-RME group, posterior inclination of the condyle was seen while the FM-RME group showed more forward positioning as compared to the control group.

Conclusion: Both groups were effective in correcting the malocclusion, but RTBLP-RME appliance had nonsignificant but greater impact on maxillary advancement and more hold on the posterior positioning of the mandible with minimal dental compensation as compared to FM-RME appliance.

Keywords: Reverse twin block, RME, Face mask

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie (inkl. LKG)** • 39 patients with a Class III relationship and reverse overjet • *Setting*: After ethical approval, screening of 1200 patients reporting at the Government Dental College outpatient department between the age of 6–12 years was done over a period of 3 months. Those children who exhibited class III relationships, assessed primarily on the presence of anterior crossbites (n = 64), were further investigated based on following inclusion and exclusion criteria • Keine Komorbiditäten

Schweregrad	Overjet unter <0mm
Einschluss-kriterien *Bei Review: PICOS*	1. Growing patient in the age group 6–12 years 2. Anterior crossbite/edge-edge incisor relationship 3. Angle’s class III molar relation in permanent dentition or mesial step in deciduous dentition 4. Cephalometrically ANB—0° or less (up to − 4°)
Ausschluss-kriterien	1. Severe skeletal class III resulting primarily from mandibular prognathism (ANB less than − 4°) 2. Class III patients with craniofacial syndromes 3. Cleft lip and palate patients
Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** *VERSUCHSGRUPPE 1:* ***RTBLP-RME Gruppe (twin block with lip pads and fixed rapid maxillary expansion)*** N= 13 (Anfang) / N=13 (Ende) / Alter = 10 ± 3,8 Jahre / ♂:♀ = 3:10 • Gebissphase: frühes Wechselgebiss, spätes Wechselgebiss • KFO-Behandlung: frühe Behandlung, reguläre Behandlung *VERSUCHSGRUPPE 2:* ***FM-RME Gruppe (face mask with RME)*** N= 13 (Anfang) / N=13 (Ende) / Alter = 10,2 ± 3,7 Jahre / ♂:♀ = 6:7 • Gebissphase: frühes Wechselgebiss, spätes Wechselgebiss • KFO-Behandlung: frühe Behandlung, reguläre Behandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Therapie** KONTROLLGRUPPE: ***untreated control group*** N=13 (Anfang) / N=13(Ende) / Alter = 10,3 ± 3,6 Jahre / ♂:♀ = 6:7 • Gebissphase: frühes Wechselgebiss, spätes Wechselgebiss • KFO-Behandlung: keine Behandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) **Primärzielgröße:** Antero-posterior skeletal measurements **Sekundärzielgröße:** Vertical skeletal measurements **Tertiärzielgröße:** Cranial Base angulations **Quartärzielgröße:** Measurements for assessment of condyle inclination **Quintärzielgröße:** Dentoalveolar measurements
Studientyp	**RCT**
Schluss-folgerungen der Autoren	Based on clinical and cephalometric findings of two treatment groups when compared to control group, the following conclusions can be drawn: 1. From a clinical point of view, both modified RTB (RTBLP-RME) and FM-RME showed favorable results in 9 months but RTB (RTBLP-RME) had a greater impact on maxillary advancement and more hold on the posterior positioning of the mandible compared to FM-RME. 2. With RTBLP-RME, minimal dental compensation was observed compared with FM-RME. 3. For all vertical measurements, RTBLP-RME showed an increase compared to FM-RME which could be due to posterior open bite.
Zusammen-fassung der Ergebnisse	**GRUPPE RTBLP-RME Gruppe (twin block with lip pads and fixed rapid maxillary expansion) VS. GRUPPE untreated control group** **GRUPPE FM-RME Gruppe (face mask with RME) VS. GRUPPE untreated control group** s. unter “Schlussfolgerungen”

Angaben auffälliger positiver und/oder negativer Aspekte	*Sehr gute Studie.* *Kein Blinding in Auswertung erwähnt. Keine Aussage über Anzahl der Auswerter.*
Schluss-folgerung des Begutachters	methodische Qualität: gut-sehr gut
	Klinische Aussagekraft: gegeben
Evidenz-level (SIGN)	**1++**
Qualität	**++**

Evidenztabelle Ming, Hu et al 2018

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Review Article

Effects of maxillary protraction appliances on airway dimensions in growing class III maxillary retrognathic patients: A systematic review and meta-analysis

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ARTICLE INFO

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ABSTRACT

Objective: The purpose of this study was to assess, through a systematic review and meta-analysis, the efficacy of maxillary protraction appliances (MPAs) on improving pharyngeal airway dimensions in growing class III patients with maxillary retrognathism.

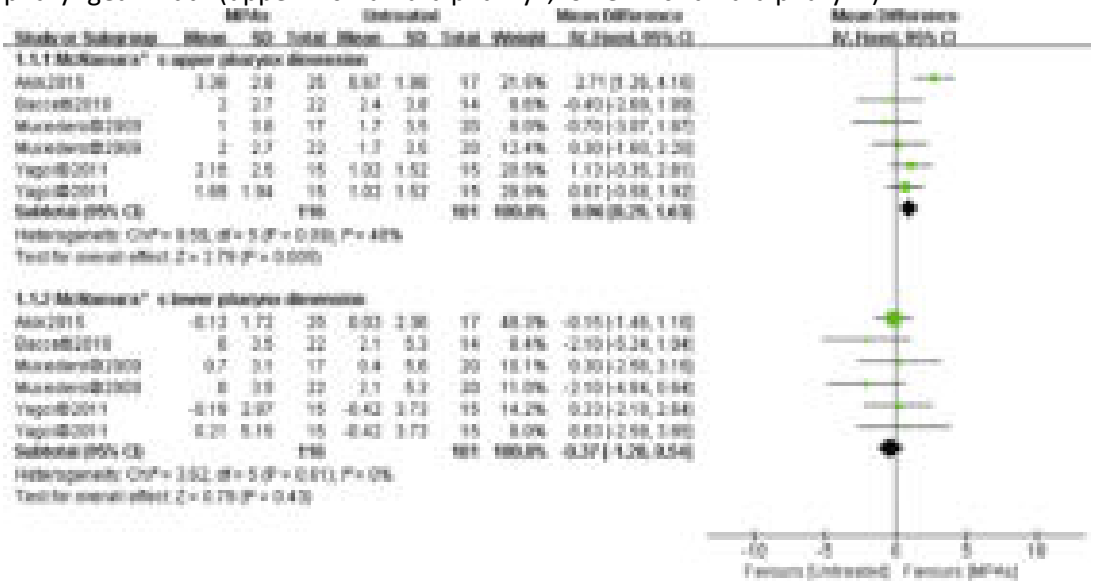
Methods: An electronic search in PubMed, Cochrane Library, Web of Science, and EMBASE was until September 2nd, 2017. The assessments of methodological quality of the selected articles were performed using the Newcastle-Ottawa Scale. Review Manager 5.3 (provided by the Cochrane Collaboration) was used to synthesize the effects of MPAs on pharyngeal airway dimensions.

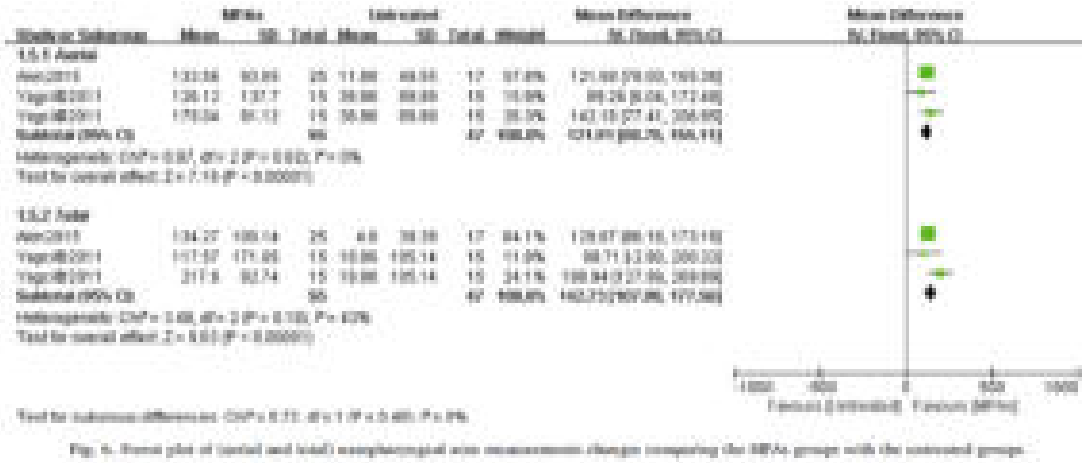
Results: Following full-text articles evaluation for eligibility, 6 studies (180 treated subjects and 140 untreated controls) were included in final quantitative synthesis and they were all high-quality. Compared to untreated control groups, the treatment groups had increased significantly nasopharyngeal airway dimensions with the following measurements: PNS-AD1 (fixed: mean difference, 1.33 mm, 95% CI, 0.48 mm to 2.19 mm, P = .0021, PNS-AD2 (random: mean difference, 1.91 mm, 95% CI, 0.02 mm to 3.81 mm, P = .05), aerial nasopharyngeal area (fixed: mean difference, 120.91 mm^2, 95% CI, 88.79 mm^2 to 153.13 mm^2, P < .00001) and total nasopharyngeal area (fixed: mean difference, 142.71 mm^2, 95% CI, 107.90 mm^2 to 177.50 mm^2, P < .00001). Meanwhile, McNamara's upper pharynx dimension (fixed: mean difference, 0.96 mm, 95% CI, 0.29 mm to 1.63 mm, P = .005), which was highly related to post palatal airway dimension, was also improved significantly. However, no statistically significant differences in adenoidal nasopharyngeal area (P > .05) and McNamara's lower pharynx dimension (P > .05) existed.

Conclusions: MPAs can increase post palatal and nasopharyngeal airway dimensions in growing skeletal class III subjects with maxillary retrusion. It may be suggested that MPAs have the potential to reduce the risk of obstructive sleep apnea syndromes in children with maxillary retrusion by enlarging airway space.

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie (inkl. LKG)** • Studies with Individuals with skeletal class III malocclusion with retrusive maxilla in the period from mixed dentitions to early permanent dentitions and their ages ranged from six to fourteen years old • Single Center Studien aus der Türkei (4x) und Italien (2x)
Schweregrad	Keine Angabe

Einschluss-kriterien *Bei Review: PICOS*	• Population: Patientswith skeletal class III malocclusion with retrusive maxilla in the period from mixed dentitions to early permanent dentitions and their ages ranged from six to fourteen years old • Intervention Maxillary protraction appliances (MPAs) • Comparison Between MPAs-(differnt types) treated patients and untreated control groups Meta Anaylsis only performed for MPA (all types) vs. untreated control • Outcome, planned PRIMÄRZIELGRÖßE: Measurements of sagittal pharyngeal dimensions As assessed by the analysis of pharyngeal width (upper Mc Namara pharnyx; lower McNamara pharynx), PNS-AD1, PNS-AD2, aerial and total nasopharyngeal area adenoidal nasopharyngeal area measurements change 
Ausschluss-kriterien	1) Study type: case reports, reviews, abstracts, conference papers,letters, animal studies; (2) Subjects: children with previous orthodontictreatment, cleft palate, other congenital anomalies, temporomandibularjoint disorders, OSAS due to tonsil and adenoid hypertrophy or nasalobstructive problems
Intervention Versuchsgruppe	**kieferorthopädische Behandlung** VERSUCHSGRUPPE: **Maxillary protraction appliances (MPAs)** N= ? (Anfang) / N= 114 (Ende) / Alter = 9,6; 1,5/ ♂:♀ = 49:65 • Gebissphase: frühes Wechselgebiss • KFO Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **No Maxillary protraction appliances (MPAs) OR other MPAs** No Maxillary protraction appliances N= ? (Anfang) / N= 94(Ende) / Alter = 9,3; 1,3, ♂:♀ = 42:52; Other MPAs N= ? (Anfang) / N= 54(Ende) / Alter = 9,7; 1,4, ♂:♀ = 25:29 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: reguläre Behandlung ODER keine kieferorthopädische Behandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** ▪ primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) ▪ Atmung und Luftraum (Airway space, Schlafapnoe), Schlucken und Sprechen Alle Analysen: **MPA (all) vs. untreated** pharyngeal width (upper Mc Namara pharnyx; lower McNamara pharynx)  PNS-AD1  PNS-AD2  PNS-AD2 (Sensitivity –one study) 

Outcome	aerial and total nasopharyngeal area  adenoidal nasopharyngeal area measurements change 
Studientyp	**Systematisches Review mit Meta-Analyse** *Review:* Inkludierte Studien in Bezug auf PICO: Systematisches Review N= N= 6 (4 retrospektive Kohorten-, und 2 prospektive Kohortenstudien) *Review:* Gesamt-Teilnehmerzahl in Bezug auf PICO: N = 262
Schluss-folgerungen der Autoren	1. This systematic review and meta-analysis indicates that **MPAs can increase pharyngeal airway** dimensions in the **short term**. 2. After MPAs therapy, post-palatal and nasopharyngeal airway dimensions were significantly improved in growing class III maxillary retrognathic patients. 3. It can be **suggested** that MPAs have the potential to improve respiratory efficiency of children with maxillary retrusion and **reduce the risk of sleep-disordered breathing** in children, such as pediatric OSAS..

Zusammen-fassung der Ergebnisse	**GRUPPE Maxillary protraction appliances (MPAs) VS. GRUPPE No Maxillary protraction appliances (MPAs) OR other MPAs** The-analysis, with acceptable heterogeneity, showed **significant difference in McNamara's upper pharynx dimension** (fixed: mean difference, 0.96 mm, 95% CI, 0.29mm-1.63 mm, P=.005). However, there was **no difference in the change of McNamara's lower pharynx dimension** between the two groups (fixed: mean difference, −0.37 mm, 95% CI, −1.28mm-0.54 mm, P=.43). With respect to nasopharynx thickness measurements changes, the results showed **significant improvements in PNS-AD1** (fixed: mean difference, 1.33 mm, 95%CI, 0.48mm-2.19 mm, P=.002) and **PNS-AD2** (random: mean difference, 1.91 mm, 95%CI, 0.02mm- 3.81 mm, P=.05) when comparing MPAs groups with untreated groups in 4 studies which enrolled 209 participants. The effects on **nasopharyngeal area** were reported in two studies with the comparison between MPAs groups enrolling 55 patients and untreated control groups including 47. The results in favor of MPAs therapy told **significant differences in aerial nasopharyngeal area** (, fixed: mean difference, 121.91mm2, 95% CI, 88.70mm2 - 155.11mm2, P < .00001) and **total nasopharyngeal area** (fixed: mean difference, 142.73mm2, 95% CI, 107.90mm2-177.56mm2, P < .00001), whereas **no statistically significant difference in adenoidalnasopharyngeal area** (random: mean difference 23.78mm2, 95% CI, −7.59mm2-55.16mm2, P=.14) existed.
Angaben auffälliger positiver und/oder negativer Aspekte	Aktueller, weitestgehend ordentlich durchgeführter Review. Der Einfluss von “funding” wurde bei der Primärliteratur nicht erfasst. Ausgeschlossene Studien und eine Begründung für den Ausschluss sind nicht inkludiert. Die Literatursuche weist leichte Lücken (experts, grey literature) auf. Der Einschluss von ausschließlich NRSI ist nicht begründet. Die RoB/ Qualitätsbeurteilung erfolgte, da nur Kohortenstudien und keine RCTs eingeschlossen wurden konnten, mit Hilfe der Newcastle-Ottawa Scal, die einen gewissen Ermessensspielraum aufweist und nur unzureichend mögliche “reporting bias” erfasst. Anhand dieser Skala wurde die Qualität der inkludierten Primärliteratur als hoch eingestuft. Dies ist u.U. prüfenswert, da von **6 eingeschlossenen Kohortenstudien 4 retrospektiv waren**. Dies sollte ebenfalls, wie auch das **selektive “setting” (4 x Türkei, 2x Italien)** bei der Bewertung der klinischen Relevanz berücksichtigt werden. Diese ist daher als niedrig bis moderat einzustufen.
Schluss-folgerung des Begutachters	methodische Qualität: Review: moderat; Einzelstudien: hoch (laut Review, NOS) Von **6 eingeschlossenen Kohortenstudien waren 4 retrospektiv**. Dies sollte, wie auch das **selektive “setting” (4 x Türkei, 2x Italien)** bei der Bewertung der klinischen Relevanz berücksichtigt werden. Diese ist daher als niedrig bis moderat einzustufen.
Evidenzlevel (SIGN)	**2+**
Qualität (RoB, /AMSTAR II)	**Moderat ⊕⊕**

Evidenztabelle **Mutinelli et al. 2015**

Eur J Paediatr Dent. 2015 Jun;16(2):119-22.

Rapid maxillary expansion in early-mixed dentition: effectiveness of increasing arch dimension with anchorage on deciduous teeth.

Mutinelli S[1], Cozzani M[1]

Author information

Abstract

AIM: To assess the effectiveness of a Haas expander anchored to deciduous teeth in changing dental arch dimension and improving crowding and to evaluate stability of changes until permanent dentition.

MATERIALS AND METHODS: STUDY DESIGN: closed cohort retrospective and case-control study. Eighteen patients undergoing early treatment for lateral crossbite (mean age 7.6 yrs; SD 1.0) at two practices located in La Spezia and Massa (Italy) were analysed. The treated group was compared with 72 control subjects divided into: 32 untreated adolescents with and without lateral crossbite and the same canine dental class as treated patients before expansion (Class II Division 2), 18 adults and 16 adolescents with dental Class I. All groups were matched for gender (ratio males females, 8:10). The dental casts images of treated patients were digitally measured before and after treatment, and in permanent dentition. Patients at the last follow-up were compared with control subjects.

RESULTS: In treated patients the increase in intermolar width and the improvement in anterior crowding were significant and stable until adolescence. Untreated adolescents with lateral crossbite showed the narrowest transversal widths and the highest irregularity. No difference was found among treated patients, adolescents without lateral crossbite, and adolescents and adults with a normal occlusion.

CONCLUSIONS: The Haas expander anchored on deciduous teeth is effective in improving dental arch constriction and crowding in patients treated for lateral crossbite. The result is stable until permanent dentition. In absence of treatment, constriction of dental arch may persist, with a higher level of irregularity.

Population *Setting* *Komorbiditäten*	**Transversale Anomalie, Zahnengstand, Klasse II** • KFO Praxen in La Spezia und Massa, Italien • Alter: 7.6 Jahre
Schweregrad	Keine Angabe
Einschluss-kriterien *Bei Review: PICOS*	Deciduous Expansion Group (DExp) 1. children with a unilateral or bilateral cross-bite 2. who had been treated with a Haas expander anchored to the deciduous teeth Control Group with Crossbite (CGCr): 1. adolescent 2. lateral crossbite 3. matching to the DExp according to gender, dental age, canine dental class
Ausschluss-kriterien	Keine Angaben.

Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** VERSUCHSGRUPPE 1: **Deciduous Expansion Group (DExp Gruppe)** Beschreibung: Haas expander anchored to the deciduous teeth: The expander had to be activated once or twice a day, and this was performed by the parents (each activation was equal to 0.2 mm; mean activation period, 28 days). The patients were checked weekly, and the expansion was terminated when the first permanent molars were in correct transverse occlusion, i.e., without lateral crossbite. Twice a day each activation was equal to 0.2 mm; mean activation period, 28 days. N= 18 (Anfang) / N= 18 (Ende) / Alter = 7.6 ± 1.0 Jahre / ♂:♀ = 8:10 • Gebissphase: frühes Wechselgebiss, spätes Wechselgebiss, permanentes Gebiss <18 und ≥ 18. • KFO-Behandlung: Frühbehandlung, interzeptiv
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** KONTROLLGRUPPE: **Control Group with Crossbite (CGCr)** N=18 (Anfang) / N=18 (Ende) / Alter = 13.1 ± 1.6 Jahre / ♂:♀ =8:10 • Gebissphase: spätes Wechselgebiss und permanentes Gebiss <18 und ≥ 18. • KFO-Behandlung: keine Behandlung
Outcome	**Direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** • **Reduktion eines weiteren Therapiebedarfs** ***PRIMÄRZIELGRÖßE:*** Zahnbogenbreite (intercanine, intermolar) ***SEKUNDÄRZIELGRÖßE:*** Zahnbogenlänge ***TERTIÄRZIELGRÖßE:*** Ausmaß des Engstands
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	This study provides evidence that, in patients in canine dental Class II, early treatment of lateral crossbites with a modified Haas expander anchored to deciduous teeth is effective and produces stable results until the stage of permanent dentition. On the contrary, the persistence of a lateral crossbite is an obstacle to normal development of the dental arch. The advantages of anchorage to deciduous teeth are clinically relevant. Initially, the risk of exposing permanent molars and premolars to root resorption, to periodontal problems, and to white-spot lesions (WSL) is greatly reduced. Second, misalignment in the anterior maxillary dentition improves spontaneously toward a low level of irregularity, which may reduce the prevalence of patient requests to align the anterior maxillary dentition. Moreover, when fixed orthodontic treatment is performed, the better the pre-treatment alignment of the permanent dentition, the better the long-term stability

Zusammen-fassung der Ergebnisse	**GRUPPE Deciduous Expansion Group (DExp Gruppe) VS. GRUPPE Control Group with Crossbite (CGCr)** *1.* ***PRIMÄRZIELGRÖßE****:* The group of adolescents with a lateral crossbite was the only control group in which the inter-molar width was smaller than that of the adolescents treated in the early-mixed dentition (F4,68 = 20.48; p < 0.001) (Table 4). The intercanine width was also smaller in the adolescents with a lateral cross-bite than in the treated group. *2.* ***SEKUNDÄRZIELGRÖßE****:* siehe Tabelle im Anhang. *3.* ***TERTIÄRZIELGRÖßE****:* Similarly, the prevalence of differences in the moderate irregularity index (Table 6) was significant in the comparison between the adolescents with a lateral crossbite and the group of early-treatment adolescents (Kruskal-Wallis test, p = 0.0197; Wilcoxon signed-rank test, p = 0.0053).
Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign:* Fall-Kontroll-Studie, Vergleich zu vier verschiedenen Kontrollgruppen, wovon jedoch nur eine Gruppe einen Kreuzbiss aufweist, sehr gute Berücksichtigung von Confoundern, aufwändige Datenanalyse. *Power der Studie/Patientenzahl:* The power calculation was estimated a posteriori. The requisite sample size of about 17 was calculated a priori based on data published by Lima et al. [2005]. *Funding:* keine Angaben *Interessenkonflikte:* keine Angaben *Bias:* • Can´t say if cases are clearly defined and differentiated from controls. • Can’t say if it is clearly established that controls are non-cases. • No confidence intervals are provided.
Schluss-folgerung des Begutachters	methodische Qualität: akzeptabel
	Klinische Aussagekraft: mittel Die Korrektur des Kreuzbisses im Sinne einer Frühbehandlung mittels Haas-GNE führt zu größeren Zahnbogenbreiten und weniger ausgeprägtem Engstand im Vergleich zu einer nicht behandelten Kontrollgruppe.
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN /AMSTAR II)	**Acceptable ⊕**

Evidenztabelle **Mutinelli et al. 2015**

Progress in Orthodontics

RESEARCH Open Access

Anchorage onto deciduous teeth: effectiveness of early rapid maxillary expansion in increasing dental arch dimension and improving anterior crowding

Sabrina Mutinelli, Mario Manfredi, Antonio Gualucci, Gloria Denotti and Mauro Cozzani

Abstract

Background: Anchorage onto permanent dentition is a common procedure in rapid maxillary expansion. However, replacing first permanent molars with the second deciduous molars seems to be an option to reduce some negative side effects during orthodontic treatment. The purpose of this study was to evaluate the dental effect of rapid maxillary expansion with anchorage exclusively onto deciduous teeth performed in the first period of transition.

Methods: Twenty patients with a lateral cross-bite treated exclusively by a Haas expander in early mixed dentition were retrospectively analyzed before treatment, at appliance removal, and at 21 months out of retention. The sagittal and transverse dimensions, together with the inter-canine arch and irregularity index, were digitally measured on scanned images of dental casts. The patients were compared with three balanced control groups (in total, 60 individuals) matched for gender. Two control groups had the same canine dental class as the treated group at T1, were in the inter-transitional period, and either had or lacked a lateral cross-bite. The last control group was comprised of adolescents in permanent dentition with a dental class I. The statistical analysis was performed by means of repeated measures ANOVA for paired data and one-way ANOVA, the Kruskal-Wallis test, and the Mann-Whitney test for independent measures (α-level $p < 0.05$).

Results: At the end of follow-up (inter-transitional period of dentition), the dental arch dimensions of treated patients were similar to those of adolescents with a dental class I and significantly wider than those of patients with a lateral cross-bite. Also, the anterior irregularity index was lower among patients who had undergone expansion treatments than in all untreated study participants.

Conclusions: The Haas expander anchored to the deciduous teeth is effective in increasing the dental arch width in patients with a lateral cross-bite. The dimensions of the dental arch were modified earlier toward the values of the permanent dentition.

Keywords: Rapid maxillary expansion, Early mixed dentition, Dental arch changes, Irregularity index

Population *Setting* *Komorbiditäten*	**Transversale Anomalie, Engstand, Klasse II** • clinical archives of two orthodontists, Italy • Alter der RME Gruppe vor Intervention: 7 Jahre 1 Monat ± 11 Monate • Alter der RME Gruppe zum Vergleichszeitpunkt mit der Kontrollgruppe: 9 Jahre 10 Monate ± 1 Jahr 4 Monate
Schweregrad	Keine Angabe

Einschluss-kriterien *Bei Review: PICOS*	1. RME Group: Children in the first period of transition (mean age, 7 years and 1 month; SD, 11 months) with a mono- or bilateral cross-bite. Fifteen of the 20 patients had a canine class II. 2. Control Group (CG1): the same canine dental class and the male-to-female ratio as the RME group. The dental age coincided with the intertransitional period. 3. CG2: the same canine dental class and the male-to-female ratio as the RME group. The dental age coincided with the intertransitional period and lateral cross-bite. 4. CG3: adolescents in permanent dentition with normal occlusion, with the same male-to-female ratio as the RME group, and full natural dental arch up to the first or second molars.
Ausschluss-kriterien	Keine Angaben.
Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** Beschreibung: Group of children with a unilateral or bilateral cross-bite, who had been treated with a Haas expander anchored to the deciduous teeth. The patients were monitored weekly, and the expansion was terminated when the cross-bite was corrected (mean, 20 days) [9]. The appliance was kept in situ as retention for 12 months (SD, 4 months), after the screw was fixed. The Haas expander was activated once or twice per day; each activation was 0.2 mm, with a maximum allowable total expansion of 10 mm. VERSUCHSGRUPPE 1: **RME Group** N=20 (Anfang) / N=20 (Ende) / Alter = RME Gruppe vor Intervention: 7 Jahre 1 Monat ± 11 Monate; Alter der RME Gruppe zum Vergleichszeitpunkt mit der Kontrollgruppe: 9 Jahre 10 Monate ± 1 Jahr 4 Monate / ♂:♀ = 7:13 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung, interzeptiv
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** Beschreibung: Uni- oder Bilateraler Kreuzbiss und Klasse I oder Klasse II KONTROLLGRUPPE: **Control Group 1 (CG1)** N=20 (Anfang und Ende) / Alter = 9 Jahre ± 11 Monate / ♂:♀ =7:13 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: keine KFO-Behandlung

Outcome	**Direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** • **Reduktion eines weiteren Therapiebedarfs** ***PRIMÄRZIELGRÖßE:*** Zahnbogenbreite (intercanine, intermolar) ***SEKUNDÄRZIELGRÖßE:*** Zahnbogenlänge ***TERTIÄRZIELGRÖßE:*** Ausmaß des Engstands
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	Rapid maxillary expansion performed in the first period of transition is effective in the treatment of patients with a lateral cross-bite. The dental arch increases in dimensions earlier toward the values of the permanent dentition stage, in comparison with dimensions in homogeneous untreated individuals. As a result, the increase in arch length can improve the alignment of the upper anterior teeth in patients with low or moderate crowding. Therefore, early treatment with a Haas expander anchored to the primary dentition could be a satisfactory procedure for lateral cross-bite resolution and for anterior crowding improvement, due to simplicity of appliance design, ease of treatment management, and low risk of side effects.
Zusammen-fassung der Ergebnisse	**GRUPPE RME Group VS. GRUPPE Control Group 1 (CG1)** *1.* ***PRIMÄRZIELGRÖßE****:* The inter-canine width of the patients who had undergone expansion, at T3 (mean, 32.2 mm; SD, 2.0), was significantly higher than the value for children in the inter-transitional period with a lateral cross-bite (mean, 30.3 mm; SD, 3.1; p = 0.042). The inter-molar width of the treated group (mean, 49.6 mm; SD, 2.3) was significantly higher than that of children with a lateral cross-bite (mean, 44.5 mm; SD, 2.4; p < 0.001). *2.* ***SEKUNDÄRZIELGRÖßE****:* The value of the inter-molar depth was significantly lower in the treated group (mean, 29.8 mm; SD, 1.7) than in the children with (mean, 31.8 mm; SD, 2.2; p = 0.006) and without a lateral cross-bite (mean, 32.1 mm; SD, 2.0; p = 0.001). *3.* ***TERTIÄRZIELGRÖßE****:* The irregularity index was significantly higher in untreated children in malocclusion, whether with (median, 3.2 mm; interquartile range, 2.9; p = 0.0094) or without (median, 4.0 mm; interquartile range, 4.0; p = 0.0080) a lateral crossbite, compared with that of the treated group (median, 2.4 mm; interquartile range, 1.4) (Table 3).

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign:* Fall-Kontroll-Studie, Vergleich zu vier verschiedenen Kontrollgruppen, wovon jedoch nur eine Gruppe einen Kreuzbiss aufweist. Retrospektive Analyse, Auswahlkriterien nicht 100% klar. *Power der Studie/Patientenzahl:* Keine Angabe. *Funding:* keine Angaben *Interessenkonflikte:* keine Angaben *Bias:* • Can´t say if cases are clearly defined and differentiated from controls. • Can’t say if it is clearly established that controls are non-cases.
Schluss-folgerung des Begutachters	methodische Qualität: akzeptabel
	Klinische Aussagekraft: mittel Die Korrektur des Kreuzbisses im Sinne einer Frühbehandlung mittels milchzahngetragener Haas-GNE führt zu größeren Zahnbogenbreiten, einer verkürzten Zahnbogenlänge und weniger ausgeprägtem Engstand im Vergleich zu einer nicht behandelten Kontrollgruppe.
Evidenz-level (SIGN)	**2+**
Qualität **(RoB, SIGN /AMSTAR II)**	**Acceptable ⊕**

Evidenztabelle Nalbantgil, Arun et al. 2005

Skeletal, Dental and Soft-Tissue Changes Induced by the Jasper Jumper Appliance in Late Adolescence

Didem Nalbantgil[a]; Tülin Arun[b]; Korkmaz Sayinsu[c]; Fulya Işik[d]

Abstract: The purpose of this study was to evaluate the skeletal, dental, and soft-tissue changes in late-adolescent patients treated with Jasper Jumpers applied with sectional archies. The study sample consisted of 30 subjects (15 treated, 15 untreated) with skeletal and dental Class II malocclusion. Our study was carried out on 75 lateral cephalometric films. Among these radiograms, 15 were taken before the leveling stage in the treatment group. Half of the remaining 60 were taken before placement and after removal of the Jasper Jumper appliance in the treatment group and the other half at the beginning and six months after in the control group. The patient selection criteria were Class II malocclusion caused by retrognathic mandible, normal or low-angle growth pattern, and postpeak growth period. The statistical assessment of the data suggests that the sagittal growth potential of the maxilla was inhibited. There were no significant changes in the vertical skeletal parameters. The mandibular incisors were protruded and intruded, whereas the maxillary incisors were retruded and extruded. The upper molars tipped distally as the lower molars tipped mesially. Because of these changes, the occlusal plane rotated in the clockwise direction. Overbite and overjet were reduced, and the soft-tissue profile improved significantly. The results revealed that, in late-adolescent patients, the Jasper Jumper corrected Class II discrepancies mostly through dentoalveolar changes. It is suggested that this treatment method could be an alternative to orthognathic surgery in borderline Class II cases. (*Angle Orthod* 2005;75:426–436.)

Key Words: Jasper Jumper; Functional therapy; Skeletal Class II malocclusion; Dentofacial orthopedics; Facial profile

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** • The study sample consisted of 30 subjects (15 treated, 15 untreated, probably Turkish) with skeletal and dental Class II malocclusion. The study was carried out on 75 lateral cephalometric films.
Schweregrad	Nicht spezifiziert
Einschluss-kriterien *Bei Review: PICOS*	1. Skeletal and dental Class II malocclusion caused by retrognathic mandible; 2. normal or low-angle growth pattern; 3. postpeak growth period
Ausschluss-kriterien	-

Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** Standard edgewise brackets and bands were placed with a transpalatal arch in the upper arch to increase stability. After leveling, 0.017 x 0.022–inch and 0.017 x 0.025–inch stainless steel continuous archwires were inserted and cinched back in the upper and lower arches, respectively. In the lower arch, 0.018 x 0.025/0.022 x 0.028–inch cross tubes were crimped distal to the canine brackets. Jasper Jumper mechanics were applied on 0.017 X 0.025–inch stainless steel sectional arches connected to the lower continuous archwire by means of 0.018 x 0.025/ 0.022 x 0.028–inch cross tubes. The anterior tip of the sectional arch was adjusted to pass close to the deepest part of the vestibular sulcus, which coincided with approximately one crown length of extension from the enamelcement border of the canine tooth. Because it was impossible to pass through the center of resistance of the lower dentoalveolar arch, this way provided the most practical way to pass the force as near as possible to the center of resistance of the lower dentoalveolar arch without causing an excessive irritation on the mucosal surface of the vestibular sulcus. Jasper Jumpers were selected according to the manufacturer’s instructions and connected to the lower arch through sectional arches inserted between the auxiliary tubes of the lower molar bands and cross tubes. The appliance was removed when a Class I or overcorrected Class I canine and molar relationship was achieved. The mean pretreatment age for the treatment group was 15.06 +- 0.96 years. The patients were seen every four weeks, and the appliances were activated every eight weeks. **Kointervention**: Pretreatment, Posttreatment lateral cephalograms. VERSUCHSGRUPPE: **Jasper Jumper** N=15 (Anfang) / N=15 (Ende) / Alter = 15,06 ± 0,96 Jahre / ♂:♀ = 7:8 • Gebissphase: spätes Wechselgebiss, permanentes Gebiss <18 Jahre • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** Untreated study sample **Kointervention** Lateral cephalograms at the beginning and 6 months later KONTROLLGRUPPE: **control** N=15 (Anfang) / N=15 (Ende) / Alter = 15,13 ± 0,81 Jahre / ♂:♀ = 6:9 • Gebissphase: spätes Wechselgebiss, permanentes Gebiss <18 Jahre • KFO-Behandlung: keine Therapie

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** • **Okklusion, Kaufunktion, Funktion** PRIMÄRZIELGRÖßE: *skeletal changes (SNA, SNB, ANB, SN/PP, SN/MP, SE, SL, Pg-NB, Ar-Pg, A-RL2, B-RL2, A-RL1, ANS-Me/N-Me)* SEKUNDÄRZIELGRÖßE: *dental changes (U1/SN, IMPA, Interincisal angle, SN/OP, L1/NB, Overjet, Overbite)* TERTIÄRZIELGRÖßE: *soft-tissue changes (H angle, Nasolabial angle, N-A-Pg, A-labialis superior, E line-labialis superior, E line-labialis inferior, Labialis superior-RL2, Labialis inferior-RL2, Lip strength)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	1. This study demonstrated the skeletal, dental, and softtissue effects of the Jasper Jumper used in late adolescence. 2. The results revealed that, the appliance corrected Class II discrepancies mostly through dentoalveolar changes. 3. Because the Jasper Jumper can successfully correct the softtissue profile in late-adolescent patients, it is suggested that this treatment method could be an alternative to orthognathic surgery in borderline Class II cases. 4. further studies will be needed to evaluate the long-term effects and stability of the appliance used in young adults

Zusammen-fassung der Ergebnisse	**GRUPPE X VS. GRUPPE Y: Jasper Jumper VS. control** ***PRIMÄRZIELGRÖßE*** Comparisons of the cephalometric measurements revealed that the appliance had only limited skeletal effect on the maxilla. In the control group, SNA show a statistically significant increase whereas, no significant change was present in the treatment group. When the two groups were compared, a significant decrease was found. As with this finding, a significant decrease was found in the A-RL2 line. When measurements of the mandible were evaluated, no significant change between two groups was found. However, the ANB angle demonstrated a significant decrease when the two groups were compared. When the skeletal vertical parameters were evaluated, the only significant change was found in the ANS-Me/N-Me ratio. ***SEKUNDÄRZIELGRÖßE*** In the treatment group, the dental changes caused by Jasper Jumper were evident. The upper incisors were significantly retroclined as compared with the control group. The maxillary incisal tip moved distally 2.17 mm, whereas the incisor apex moved mesially 0.30 mm. Likewise, significant vertical movements of the upper incisors occurred. On the other hand, in the treatment group, the lower incisors showed significant proclination. The IMPA increased 7.338, whereas L1-NB distance increased 1.96 mm. The changes relative to reference lines also support these findings. The mandibular incisal tip moved forward 2.67 mm, whereas the incisor apex moved backward insignificantly. The vertical changes of the lower incisors displayed a greater movement in the opposite direction to the maxillary incisors. The upper molar showed significant backward movement with distal tipping and intrusion, whereas the lower molar displayed a significant mesial tipping movement. The dentoalveolar effects that occurred both in the upper and lower jaws produced a clockwise rotation of the occlusal plane. The decrease in overbite and overjet supports the incisor inclination variations caused by the appliance. ***TERTIÄRZIELGRÖßE*** Soft-tissue profiles improved significantly, reflecting the changes that took place in the dentoskeletal structures. When the two groups were compared, a significant increase was seen in the nasolabial angle. Likewise, the statistically significant decrease in the labialis superior-RL2 distance and lip strength also showed the retrusion of the upper lip. When the parameters related to the lower lip were evaluated, the decrease in the E line-labialis inferior distance showed that the lower lip moved forward as the lower incisors protruded.
Angaben auffälliger positiver und/oder negativer Aspekte	*Keine Interrater-Reliabilität* *Power der Studie/Patientenzahl: limitiert, nicht angegeben* *Funding: keine Angabe Interessenkonflikte: keine Angabe* The study does not indicate how many of the people asked to take part did so, in each of the groups being studied. No confidence intervals provided.
Schluss-folgerung des Begutachters	<u>methodische Qualität:</u> insgesamt gut
	<u>Klinische Aussagekraft:</u> Jasper Jumper corrects Class II malocclusions mostly through dentoalveolar changes. It can correct soft tissue profiles in late-adolescent patients.
Evidenz-level (SIGN)	**2+**
Qualität	**Acceptable ⊕**

Evidenztabelle Ngan, Yiu et al. 1998

Cephalometric and occlusal changes following maxillary expansion and protraction

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SUMMARY A prospective clinical trial was conducted to determine the cephalometric and occlusal changes following maxillary expansion and protraction. Twenty Southern Chinese patients (eight males and 12 females with a mean age of 8.4 ± 1.8 years) with skeletal Class III malocclusions were treated consecutively with maxillary expansion and a protraction facemask. Growth adaptation of these patients was followed for 2 years after removal of the appliances and compared with a control group of subjects with no treatment. Lateral cephalometric radiographs were used to quantify the skeletal and dental changes before treatment (T_1), immediately after treatment (T_2) and 2 years after removal of appliances (T_3). With 8 months of treatment ($T_2 - T_1$), overjet was overcorrected from a –2.0 to 3.5 mm. The maxilla moved forwards by an average of 2.1 mm and the molar relationship was improved to a Class I dental arch relationship. The palatal and occlusal planes were tilted upward 1.0 and 2.0 degrees, respectively. Two years following removal of the appliances ($T_3 - T_2$), a positive overjet was maintained in 18 out of 20 patients. The maxilla continued to move forwards in the treated subjects similar to the controls. The mandible outgrew the maxilla. In most instances, dental compensation with proclination of the maxillary incisors was observed. The palatal plane returned to pre-treatment value. The occlusal plane continued to tilt upward due to eruption of the molars and proclination of the incisors. Analysis of dental casts showed a significant increase in maxillary intercanine (2.2 mm) and intermolar widths (2.3 mm) with 7 days of rapid palatal expansion followed by maxillary protraction. The percentage relapse in maxillary intermolar widths was 30–45 per cent after 1 year, in most cases with minimal retention. In the mandibular arch, the concurrent increase in intermolar width (2.3 mm) was primarily due to buccal uprighting of the posterior molars when the maxilla was protracted into a Class I skeletal relationship and was stable after 1 year.

The results of this study indicate stability of orthopaedic treatment of Class III malocclusions directed at the maxilla. Despite some relapse, a net improvement in maxillomandibular relationship and a positive overjet was maintained in 18 out of 20 patients at the end of the follow-up period.

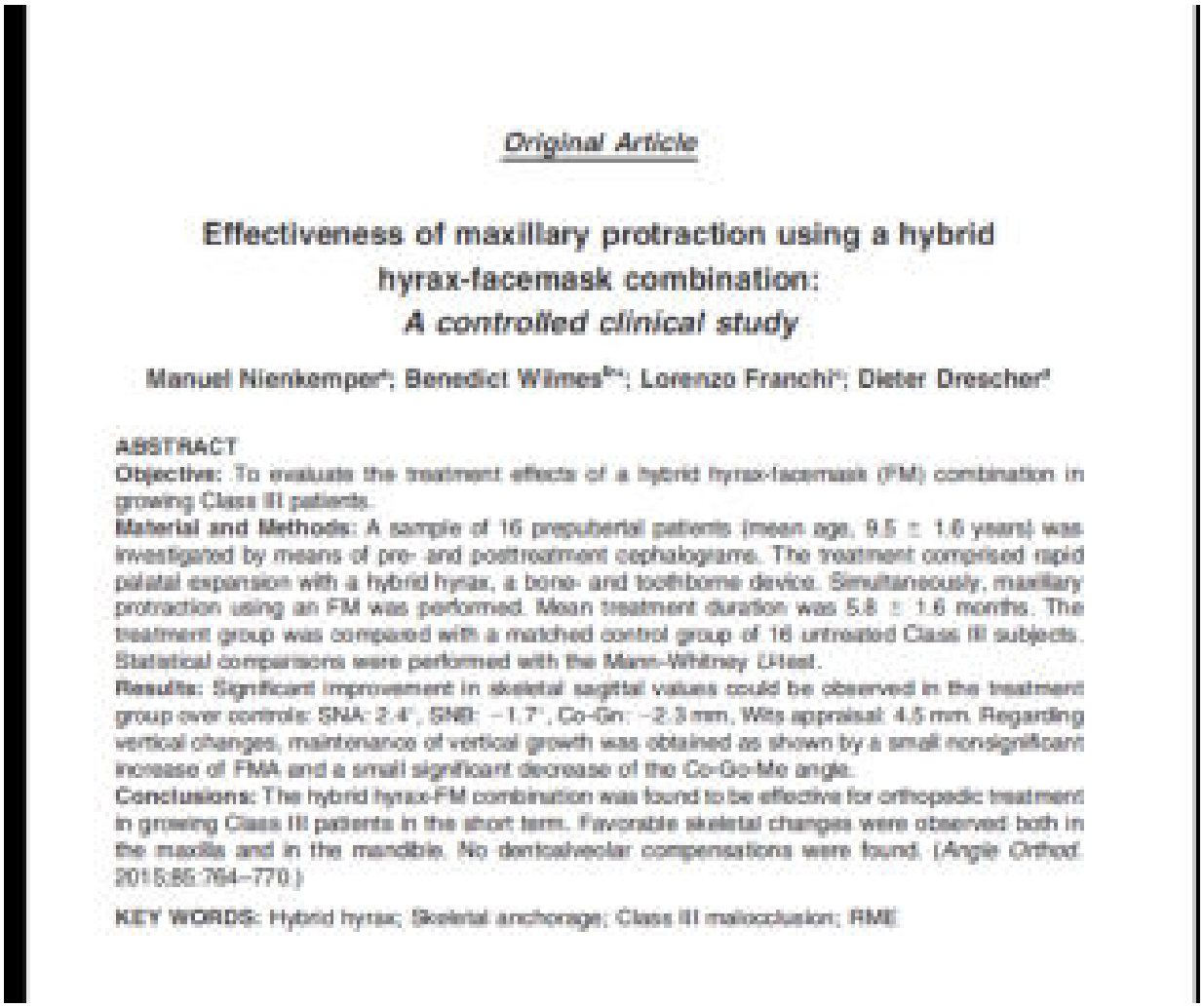
Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie** - Children with skeletal Class III malocclusion and negative overjet • China
Schweregrad	Keine Angaben
Einschluss-kriterien	- from early mixed to early permanent dentition. - negative overjet - Skeletal Class III malocclusion

Ausschluss-kriterien	- Not fulfilling inclusion criteria
Intervention Versuchsgruppe	**kieferorthopädische Behandlung** **RPE FM:** The Hyrax rapid palatal expansion appliance was constructed. The appliance was activated twice daily (0.25 mm per turn) by the patient for 1 week. In patients with a constricted maxilla, activation of the expansion screw was applied for 2 weeks. The facemask was a one-piece construction with an adjustable anterior wire and hooks to accommodate a downward and forward pull of the maxilla with elastics. The protraction elastics were attached near the maxillary canines with a downward and forward pull of 30 degrees to the occlusal plane. Maxillary protraction generally requires an orthopaedic force of 300–600 g per side, depending on the age of the patient. In the present study, elastics that delivered 380 g per side as measured by a gauge were used. The patients were instructed to wear the facemask for 12 hours a day VERSUCHSGRUPPE 1 **RPE FM** N= 30 (Anfang) / N=20 (Ende) / Alter = 8,4 ± 1,8 years / ♂:♀ = 8:12 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: frühe Behandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** **Untreated Class III:** Untreated Chinese subjects with Class III malocclusions who were closely matched in age, sex, and pretreatment skeletal morphology to the treated group. KONTROLLGRUPPE 1: **Untreated Class III** N=? (Anfang) / N= ? (Ende) / Alter = = ? ±? years / ♂:♀ = ?:? • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: keine Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) PRIMÄRZIELGRÖßE: **Skeletal: SNA, SNB, ANB** SEKUNDÄRZIELGRÖßE: **Dental: Overjet**
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	The results of this study **support early treatment of Class III patients with maxillary retrusion**. In some ethnic groups of patients, treatment directed at the maxilla was found to be stable 2 years following removal of the appliances. Whilst a positive overjet was maintained in the majority of the treated subjects, the majority of the patients had not reached their pubertal growth spurt. **The degree of relapse and ultimate success of this treatment modality require further study**. The need for orthognathic intervention after the pubertal growth period remains to be determined.

Zusammen-fassung der Ergebnisse	**GRUPPE RPE FM VS. GRUPPE Untreated Class III** T1: 8,4, 1,8 years, RPE FM, ?, ? untreated Class III T2: 8,9, 1,8 years, RPE FM, ?, ? untreated Class III T3: 10,4, 1,8 years, RPE FM; ?, ? untreated Class III Treatment: 8,0, 3,0 months Observation: up to 2,0 years **Skeletal: SNA, SNB, ANB** **T1-T2** Variables / Treated (Mean, SD) / Control (Mean, SD) / Significance Angular (degrees) SNA: 1.6, 1.2, −0.1, 1.0, *** SNB: −1.5, 1.4, 0.2, 1.0, *** ANB: 3.0, 1.5, −0.2, 0.8, * NS, not significant; * significant at $P < 0.05$; ** significant at $P < 0.01$; *** significant at $P < 0.001$. **T2-T3** Variables / Treated (Mean, SD) / Control (Mean, SD) / Significance Angular (degrees) SNA: −0.3, 1.4, 0.5, 1.7, NS SNB: 1.6, 1.8, 1.5, 2.1, NS ANB: −2.0, 1.3, −1.1, 1.7, NS NS, not significant; * significant at $P < 0.05$; ** significant at $P < 0.01$; *** significant at $P < 0.001$. **Dental: Overjet** **T1-T2** Variables / Treated (Mean, SD) / Control (Mean, SD) / Significance Sagittal (mm) Overjet: 5.5, 2.11, −0.1, 1.8, *** NS, not significant; * significant at $P < 0.05$; ** significant at $P < 0.01$; *** significant at $P < 0.001$. **T2-T3** Variables / Treated (Mean, SD) / Control (Mean, SD) / Significance Sagittal (mm) Overjet: −0.9, 2.1, −0.3, 1.9, NS NS, not significant; * significant at $P < 0.05$; ** significant at $P < 0.01$; *** significant at $P < 0.001$.

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN)	Äquivalenz von Versuchs- und Kontrollgruppen unklar. Baseline characteristics nicht verfügbar. Keine Details zur Kontrollgruppe verfügbar (dies schließt Alter und Geschlecht ein). Die Attrition in der behandelten Gruppebetrug 33%. Es fehlen Angaben zum Umgang mit fehlenden Daten. Power/ Sample Size Berechnungen wurden nicht durchgeführt. Die Auswertung war nicht verblindet. Prospektive Studie mit hohem Risiko für Bias (Unklar Äquivalenz von Versuchs- und Kontrollgruppen, fehelende Daten zur Charakterisierung der Kontrollgruppe), daher mit sehr deutlichen Schwächen in der Durchführung. Die klinische Relevanz ist entsprechend sehr stark eingeschränkt. *Funding:* keine Angabe *Interessenkonflikte:* keine Angabe *Bias (SIGN):* Äquivalenz von Versuchs- und Kontrollgruppen möglicherweise eingeschränkt. Power/ Sample Size Berechnungen wurden nicht durchgeführt. Eine Verblindung fand nicht statt.
Schluss-folgerung des Begutachters	methodische Qualität: akzeptabel
	Klinische Aussagekraft: Prospektive Studie mit hohem Risiko für Bias (Unklar Äquivalenz von Versuchs- und Kontrollgruppen, fehelende Daten zur Charakterisierung der Kontrollgruppe), daher mit sehr deutlichen Schwächen in der Durchführung. Die klinische Relevanz ist entsprechend sehr stark eingeschränkt.
Evidenzlevel (SIGN)	**2+**
Qualität (RoB, SIGN)	**acceptable (+)**

Evidenztabelle Nienkemper, Wilmes et al. 2015



Original Article

Effectiveness of maxillary protraction using a hybrid hyrax-facemask combination: *A controlled clinical study*

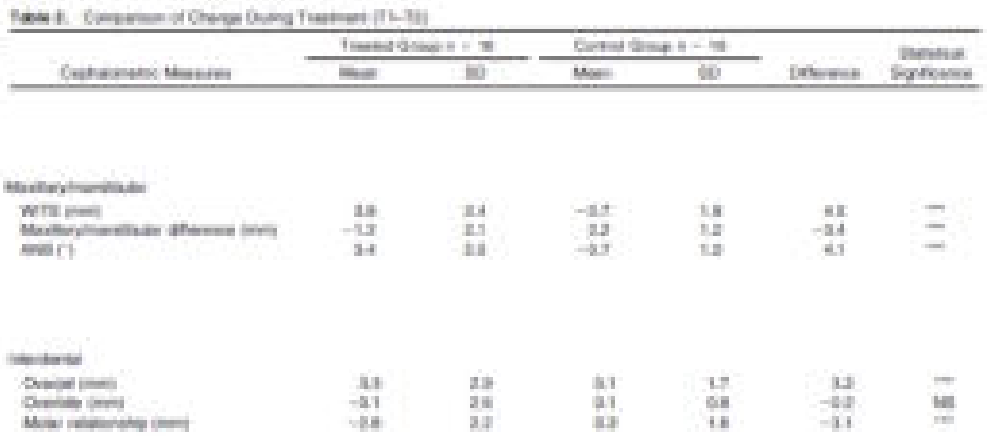
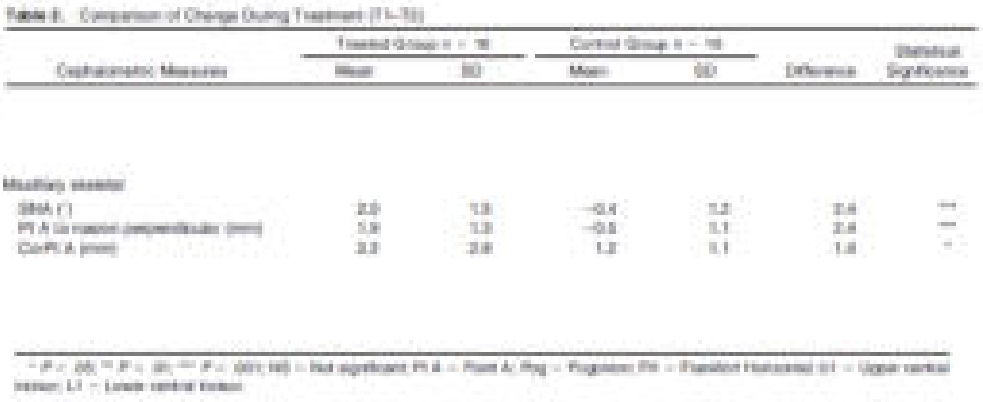
Manuel Nienkemper[a]; Benedict Wilmes[b,c]; Lorenzo Franchi[d]; Dieter Drescher[a]

ABSTRACT
Objective: To evaluate the treatment effects of a hybrid hyrax-facemask (FM) combination in growing Class III patients.
Material and Methods: A sample of 16 prepubertal patients (mean age, 9.5 ± 1.6 years) was investigated by means of pre- and posttreatment cephalograms. The treatment comprised rapid palatal expansion with a hybrid hyrax, a bone- and toothborne device. Simultaneously, maxillary protraction using an FM was performed. Mean treatment duration was 5.8 ± 1.6 months. The treatment group was compared with a matched control group of 16 untreated Class III subjects. Statistical comparisons were performed with the Mann-Whitney *U* test.
Results: Significant improvement in skeletal sagittal values could be observed in the treatment group over controls: SNA: 2.4°, SNB: −1.7°, Co-Gn: −2.3 mm, Wits appraisal: 4.5 mm. Regarding vertical changes, maintenance of vertical growth was obtained as shown by a small nonsignificant increase of FMA and a small significant decrease of the Co-Go-Me angle.
Conclusions: The hybrid hyrax-FM combination was found to be effective for orthopedic treatment in growing Class III patients in the short term. Favorable skeletal changes were observed both in the maxilla and in the mandible. No dentoalveolar compensations were found. (*Angle Orthod.* 2015;85:764–770.)

KEY WORDS: Hybrid hyrax; Skeletal anchorage; Class III malocclusion; RME

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie (inkl. LKG)** • Consequently, 16 consecutively treated patients (10 males and 6 females) of white ancestry with dentoskeletal Class III malocclusion were included in the treatment group. All patients were treated in the same clinic using the hybrid hyrax-FM combination. Therapeutic success at the end of the observation period was not a determining factor for inclusion or exclusion of patients. • A control group of 16 untreated subjects (8 males and 8 females) with dentoskeletal Class III malocclusion was obtained from the departments of orthodontics at the University of Florence, Italy, and the University of Michigan. The mean age at T1 was 9.4 ± 1.1 years, mean age at T2 was 10.4 ± 1.1 years, and the mean T1-T2 interval was 1.0 ± 0.3 years. The control group matched the treatment group as to type of dentoskeletal disharmony, skeletal maturation at each time point, sex distribution, and mean duration of observation intervals.
Schweregrad	At T1, all patients had a Class III malocclusion in the mixed dentition characterized by a Wits appraisal of -2 mm or less (mean, -5.6 ± 2.2 mm), anterior crossbite or incisor edge-to-edge relationship, and a Class III molar relationship.

Einschluss-kriterien *Bei Review: PICOS*	Wits appraisal of -2 mm or less (mean, -5.6 ± 2.2 mm), anterior crossbite or incisor edge-to-edge relationship, and a Class III molar relationship
Ausschluss-kriterien	Keine Angaben
Intervention Versuchsgruppe	**kieferorthopädische Behandlung** VERSUCHSGRUPPE: **CLASS III treated with hybrid hyrax-facemask combination** N=16 (Anfang) / N=16 (Ende) / Alter = 9,5 ± 1,6 Jahre / ♂:♀ = 1:0,6 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **CLASS III untreated (control group)** N=16 (Anfang) / N=16 (Ende) / Alter = 9,4 ± 1,1 Jahre / ♂:♀ = 1:1 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: keine Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: sagittal skeletal and dental parameters (ANB, Wits appraisal, overjet and molar relationship) SEKUNDÄRZIELGRÖßE: mandibular length (Co-Gn) TERTIÄRZIELGRÖßE: Mandibular plane angle MPA
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	1. The hybrid hyrax-FM combination is an effective orthopedic treatment modality in growing Class III patients. 2. Significant advancement of the maxilla and significant improvement in the sagittal position of the mandible were achieved. 3. The need for surgical invasiveness is lower than that for purely bone-borne devices.

Zusammen-fassung der Ergebnisse	**Gruppe CLASS III treated with hybrid hyrax-facemask combination VS. Gruppe CLASS III untreated (control group)** ***PRIMÄRZIELGRÖßE*** Maxillary/mandibular sagittal skeletal and dental parameters (ANB, Wits appraisal, overjet and molar relationship)  ***SEKUNDÄRZIELGRÖßE*** Maxillary skeletal (SNA, Pt A to nasion perpendicular, Co-Pt A) 

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign: Kohortenstudie* *Durchführung:* **CLASS III treated with hybrid hyrax-facemask combination vs. untreated CLASS III** *Auswertung: Fehleranalyse durchgeführt, die Analyse valid und reproduzierbar* *Power der Studie/Patientenzahl: Sample size calculation (power analysis) was based on the results of a previous pilot study. Given a significant increase in SNA of 2.0u with a standard deviation of 1.9u, an alpha level of 0.05, and a power of 0.80, the required sample size was calculated to be 16 subjects in the treatment and control groups, respectively.* *Funding: None.* *Interessenkonflikte: B. W. ** *** Has a financial interest in the Benefit mini-implant system..* *Bias (SIGN/AMSTAR/EinzelstudienRoB –): High quality (++) X*
Schluss-folgerung des Begutachters	methodische Qualität: insgesamt hoch
	Klinische Aussagekraft: Die expansive, protraktive Behandlung der präpubertären Klasse-III Patienten (mean age 9.5 ± 1.6 years) mit der Hybrib-GNE-Apparatur und Delaire-Maske ein effektiver Behandlungsansatz. Nicht nur die signifikanten Verbesserungen der dentalen und skelettalen Parametern sondern die Behandlungszeit (5.8 ± 1.6 months) sprechen für die Wahl dieser Therapieoption bei der späten Wechselgebissphase. Der 3. Punkt aus den Schlussfolgerungen der Autoren “The need for surgical invasiveness is lower than that for purely bone-borne devices.” kann aus den Ergebnissen nicht entnommen werden. Insgesamt hohe Qualität der vorliegenden Kohortonstudie.
Evidenz-level (SIGN)	**2++**
Qualität **(RoB, SIGN /AMSTAR II)**	**High quality (++)**

Evidenztabelle Nucera et al. 2016

SYSTEMATIC REVIEW AJO-DO

Effectiveness of orthodontic treatment with functional appliances on maxillary growth in the short term: A systematic review and meta-analysis

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Introduction: The aim of this systematic review was to evaluate the treatment effects on maxillary growth of removable functional appliances that advance the mandible to a more forward position in patients with Class II malocclusion. **Methods:** Sixteen electronic databases and reference lists of studies were searched up to April 2015. Only randomized clinical trials and prospective controlled clinical trials investigating Class II growing patients treated with removable functional appliances were included. Two authors independently accomplished study selection, data extraction, and risk of bias assessment. All pooled analyses of data were based on random-effects models. Statistical heterogeneity was evaluated. **Results:** In total, 14 studies were included (5 randomized clinical trials, 9 prospective controlled clinical trials) that collected data from 765 patients (405 treated, 360 untreated controls). The mean differences in treatment effect of functional appliances, relative to the untreated controls, were −0.61° per year (95% CI, −0.69° to −0.25°) for SNA angle, −0.61 mm per year (95% CI, −0.90 to −0.32 mm) for anterior maxillary displacement, and +0.07° per year (95% CI, −0.17° to +0.32°) for maxillary plane rotation. **Conclusions:** Removable functional appliances in Class II growing patients have a slight inhibitory effect on the sagittal growth of the maxilla in the short term, but they do not seem to affect rotation of the maxillary plane. (Am J Orthod Dentofacial Orthop 2016;149:600-11)

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** • growing patients with Class II malocclusion
Schweregrad	nicht angegeben

Einschluss-kriterien *Bei Review: PICOS*	• population: growing patients with Class II malocclusion • intervention: orthodontic treatment conducted with a Class II RFA • comparison: comparable untreated control group • outcome: PRIMÄRZIELGRÖßE: **maxillary sagittal dimensions** (**SNA** angle, linear parameters: horizontal displacement of the anterior maxilla compared with a vertical reference line of the cranial base (A-point to OLp [line perpendicular to the occlusal line through sella point], A-point to N perpendicular, Ss [subspinale, the deepest point on the anterior contour of the maxillary alveolar projection determined by a tangent perpendicular to occlusal line] to OLp, ANS, and A-point horizontal displacement)) SEKUNDÄRZIELGRÖßE: **maxillary plane rotation** (Frankfort horizontal/maxillary plane, sella-nasion/maxillary plane, and nasion-sella line/NL (nasal line) in degrees) • study type: RCTs and pCCTs (human clinical trials)
Ausschluss-kriterien	1. craniofacial deformity, congential syndromes 2. orthodontic treatment conducted with a Class II RFA (intervention) 3. previous or concomitant treatment for Class II malocclusion 4. articles with a different aim 5. Abstracts, laboratory studies, descriptive studies, individual case reports, series ofcases, reviews, studies ofadults, retrospective longitudinal studies, and meta-analyses 6. periodontal diseases, orofacial inflammatory conditions 7. tooth agenesis
Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** VERSUCHSGRUPPE: **orthodontic treatment conducted with a Class II RFA** N=405 (Anfang) / N=?? (Ende) / Alter = 9-13 Jahre / ♂:♀ = ?:? • Gebissphase: frühes & spätes Wechselgebiss, permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: Frühbehanldung, reguläre Behandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Therapie** KONTROLLGRUPPE: **untreated control group** N=360 (Anfang) / N=?? (Ende) / Alter = 9-13 Jahre / ♂:♀ = ?:? • Gebissphase: frühes & spätes Wechselgebiss, permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: keine Behandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: **maxillary sagittal dimensions** (**SNA** angle, linear parameters: horizontal displacement of the anterior maxilla compared with a vertical reference line of the cranial base (A-point to OLp [line perpendicular to the occlusal line through sella point], A-point to N perpendicular, Ss [subspinale, the deepest point on the anterior contour of the maxillary alveolar projection determined by a tangent perpendicular to occlusal line] to OLp, ANS, and A-point horizontal displacement)) SEKUNDÄRZIELGRÖßE: **maxillary plane rotation** (Frankfort horizontal/maxillary plane, sella-nasion/maxillary plane, and nasion-sella line/NL (nasal line) in degrees)
Studientyp	**Systematisches Review mit Meta-Analyse** Inkludierte Studien in Bezug auf PICO: prospective trials (RCT, pCCT) N=14 (5 RCTs, 9 pCCTs) Gesamt-Teilnehmerzahl in Bezug auf PICO: N=765
Schluss-folgerungen der Autoren	RFAs in Class II growing patients appear **to inhibit sagittal maxillary growth slightly** in relation to untreated subjects in the short term. RFAs do **not seem to affect maxillary plane rotation.** The results of this study refer **only to the skeletal** alterations induced in the maxilla by RFAs in the **short term** and do **not take into account the role of treatment timing, considered as skeletal maturity at the start of treatment**. According to our findings, it could be suggested that the ideal candidate for RFA treatment is a patient with a Class II malocclusion and characterized by mandibular retrusion and maxillary protrusion. The conclusions of this systematic review and meta-analysis should be considered with some caution because of the **high level of heterogeneity** and the **low quality of evidence found among the original studies**. Thus, further high-quality studies, such as RCTs, are needed to elucidate the effects of RFAs in the long term and the possible different responses to treatment-timing variability.

Zusammen-fassung der Ergebnisse	**orthodontic treatment conducted with a Class II RFA VERSUS untreated control group** **maxillary sagittal dimensions (SNA angle, linear parameters: horizontal displacement of the anterior maxilla compared with a vertical reference line of the cranial base (A-point to OLp [line perpendicular to the occlusal line through sella point], A-point to N perpendicular, Ss [subspinale, the deepest point on the anterior contour of the maxillary alveolar projection determined by a tangent perpendicular to occlusal line] to OLp, ANS, and A-point horizontal displacement)):** The mean difference in treatment effect of functional appliances, relative to the untreated controls for **SNA angle was -0.61° per year** (95% CI, -0.69° to -0.25°; P < 0.01; I2 = 81%) These data were derived from a synthesis of 11 clinical trials with totals of 277 treated patients and 235 controls (Fig 4). Some clinical trials evaluated the **horizontal displacement of the anterior maxilla** compared with a vertical reference line traced from a point of the cranial base (A-point to OLp, A to N-perpendicular, Ss point to OLp, ANS, and A-point horizontal displacement). The mean difference in treatment effects of functional appliances, relative to the untreated controls for anterior maxillary displacement, was **-0.61 mm per yea**r (95% CI, -0.90 to -0.32 mm; P = 0.02; I2 = 59%). These data were derived from a synthesis of 8 clinical trials with totals of 280 treated patients and 263 controls (Fig 5). The **sensitivity analysis showed no differences between RCTs and pCCTs** regarding the anterior maxillary displacement outcomes (chi-square, 0.12; df 5 1; P 5 0.73; I2 5 0%) (Fig 7). The **post hoc subgroup analyses** performed to investigate the source of heterogeneity showed **no significant differences among the subgroups.** The comparison between monoblock and dual-block appliance designs showed no differences in means either for the SNA angle (Supplementary Fig 1) (chi-square, 0.04; df 5 1; P 5 0.84; I2 5 0%) or for anterior maxillary linear displacement (Supplementary Fig 2) (chi-square, 2.28; df5 1; P5 0.13; I2 5 56.2%). The comparison between early and late treatments failed to show a significant difference in the means for both SNA angle (Supplementary Fig 3) (chi-square, 1.07; df 5 1; P 5 0.30; I2 5 6.7%) and maxillary linear displacement (Supplementary Fig 4) (chi-square, 0.02; df 5 1; P 5 0.90; I2 5 0%). **maxillary plane rotation (Frankfort horizontal/maxillary plane, sella-nasion/maxillary plane, and nasion-sella line/NL (nasal line) in degrees):** Regarding the maxillary plane rotation after treatment with RFAs, **no significant mean difference**s were found between the treated and untreated groups (mean difference, 0.07°; 95% CI, -0.17° to +0.32°; P = 0.88; I2 = 0%). These data originated from a synthesis of 6 clinical trials with totals of 169 treated patients and 127 controls (Fig 6).

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign: Registrierung a priori bei PROSPERO, Meta-Analyse, RCTs eingeschlossen, ausführliche Suchstrategie ohne Limitationen, genaue Definition der Outcomes, Meta-Analsye mit random-effects-Modell* *Durchführung: Literatursichtung und Datenextrkation durch 2 unabhängige Auswerter* *Auswertung: RoB – Methodik validiert, Heterogenitäts-/ Subgruppen-/Sensitivitäsanalyse durchgeführt. Unterschiede der Einzelstudien hinsichtlich Apparatur/Beobachtungs-/Tragedauer/Patientenalter. Hohe Interrater-Reliabilität bei RoB-Analyse/Literatursichtung/Datenextraktion.* *Power der Studie/Patientenzahl: 14/765* *Funding:* This review was performed without sources of funding. *Interessenkonflikte:* All authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest, and none were reported. *Bias (SIGN/AMSTAR/EinzelstudienRoB – alle negativen Punkte aus Fragebogen auflisten):* **3. Did the review authors explain their selection of the study designs for inclusion in the review?** **7. Did the review authors provide a list of excluded studies and justify the exclusions?** **10. Did the review authors report on the sources of funding for the studies included in the** **12. If meta-analysis was performed, did the review authors assess the potential impact of I individual studies on the results of the meta-analysis or other evidence synthesis?** *Publikationsbias (Reviews):* Visual inspection of the **funnel plots** indicated no publication bias. In addition, the rank correlation test of **Begg and Mazumdar** indicated **no publication bias**, showing P values of 0.118 and 0.458 for SNA angle and anterior maxillary displacement, respectively. The regression test of **Egger** et al showed P values of 0.333 and 0.264 for the same outcomes. However, although the rank correlation test and the regression test showed no significant results, this does not necessarily guarantee the absence of publication bias. Because of the **small number of trials in this meta-analysis, it is possible that the power of these tests could be low.**
Schluss-folgerung des Begutachters	methodische Qualität: Review gut, Einzelstudien von unterschiedlicher Qualität (RCT: high-low RoB, pCCT: medium-low)
	Klinische Aussagekraft: Funktionskieferorthopädische Geräte scheinen in wachsenden Klasse-II-Patienten im short-term nicht die Inklination der Maxilla und damit die vertikale Relation zu beeinflussen. Dahingegen wird das Oberkieferwachstum in der sagittalen Ebene vermutlich gehemmt, was zu einer Korrektur der Dysgnathie führen kann.
Evidenz-level (SIGN)	**1+**
Qualität **(RoB, SIGN /AMSTAR II)**	**Moderat ⊕⊕**

Evidenztabelle O’Brien, MacFarlane et al. 2009

Early treatment for Class II malocclusion and perceived improvements in facial profile

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Introduction: The aims of this study were to assess whether early Twin-block appliance treatment improves the attractiveness of Class II profiles and to determine the orofacial features of a profile that most influence the perception of attractiveness. **Methods:** Silhouetted profiles of 20 treated patients and 20 untreated controls randomly selected from 174 subjects (ages, 8–10 years) of a randomized, controlled trial into the effectiveness of early Class II treatment were assessed by 30 children (ages, 10–11 years) and 24 teaching staff using a 5-point Likert scale. Independent samples *t* tests were used to compare attractiveness ratings between the treated and untreated groups. Linear regression was used to determine the features defining attractiveness. **Results:** Early orthodontic treatment resulted in improved perceptions of facial profile attractiveness. Profiles were likely to be rated as attractive if the overjet was smaller ($P = 0.001$) and no teeth showed ($P < 0.05$). **Conclusions:** Profile silhouettes of children who had received early orthodontic treatment for Class II malocclusion were perceived to be more attractive by peers than those of children who did not receive treatment. (Am J Orthod Dentofacial Orthop 2009;135:580–5)

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** Silhouetted profiles of 20 treated patients and 20 untreated controls randomly selected from 174 subjects of a randomized, controlled trial into the effectiveness of early Class II treatment. Randomly selected the patient photographs from the records of 174 Class II subjects from our multi-center, randomized, controlled trial into the effects of early orthodontic treatment for Class II malocclusion. (O’Brien et al. 2003, Effectiveness of early orthodontic treatment with the Twin-block appliance: a multicenter, randomized, controlled trial. Part 1: dental and skeletal effects. Am J Orthod Dentofacial Orthop 2003;124:234-43)
Schweregrad	Overjet ≥ 7 mm
Einschluss-kriterien *Bei Review: PICOS*	1. class II malocclusion; 2. with overjets of at least 7 mm
Ausschluss-kriterien	-

Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** Half of the subsample had been treated with Twin-block appliances. **Kointervention** Photographs were taken at the start of the study (DC1) and 15 months later (DC2). The photographs were taken with the lips relaxed in natural head position. VERSUCHSGRUPPE: **Twin Block treatment** N=20 (Anfang) / N=20 (Ende) / ♂:♀ = 14:6 / Alter: k.A. • Gebissphase: frühes Wechselgebiss, Ruhephase • KFO-Behandlung: Frühbehandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** KONTROLLGRUPPE: **unbehandelte Kontrolle** N=20 (Anfang) / N=20 (Ende) / ♂:♀ = 8:12 / Alter: k.A. • Gebissphase: frühes Wechselgebiss, Ruhephase • KFO-Behandlung: keine Therapie
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **dentofaziale Ästhetik** PRIMÄRZIELGRÖßE: *Attractiveness variables (Treatment (Control/Twin-Block), Sex (Male/Female), Front teeth showing (no/yes), Lips together (no/yes), Overjet, Skeletal discrepancy (length difference), labiomental angle, favial convexity (Proffit’s angle), Lower facial – height)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	1. Children with Class II malocclusion, treated with Twin-blocks in the mixed dentition, had profiles that were generally perceived as more attractive than those of an untreated cohort, by both peers and teachers. 2. Subjects whose profiles were perceived as more attractive tended to have smaller overjets, no visible teeth, and slightly more acute labiomental angles.
Zusammen-fassung der Ergebnisse	**GRUPPE Twin block treatment VS. GRUPPE control** ***PRIMÄRZIELGRÖßE*** The treated profiles were statistically significantly more appealing with a difference in means of 0.61 grade (P = 0.006); they received more grades of 1 and 2, and fewer grades of 4 and 5. Profiles were less attractive (higher scores) when front teeth were showing (P = 0.012). There was negative correlation (0.49, P = 0.001) also for overjet and skeletal discrepancy (0.33, P = 0.038). There was evidence of negative correlation of scores with the labiomental angle (0.28, P = 0.083).

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	Intra- und Interraterreliabilität ausgeführt *Power der Studie/Patientenzahl:* sample size was calculated on the basis of numbers needed to show a difference between treated and control subjects of 1 grade (assuming 1 SD) at a 2-way a of 0.05, with power of 80%. *Funding:* Funded by the Medical Research Council (G9410454) *Interessenkonflikte:* The authors report no commercial, proprietary, or financial interest in the products or companies described in this article.
Schluss-folgerung des Begutachters	methodische Qualität: insgesamt sehr gut
	Klinische Aussagekraft: Treatment with Twin-blocks in the mixed dentition had profiles that were generally perceived as more attractive than those of an untreated cohort, by both peers and teachers.
Evidenz-level (SIGN)	**2++**
Qualität **(RoB, SIGN /AMSTAR II)**	**High quality ⊕⊕**

Evidenztabelle O’Brien, Wright et al. 2003

Effectiveness of early orthodontic treatment with the Twin-block appliance: A multicenter, randomized, controlled trial. Part 1: Dental and skeletal effects

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This study evaluated the effectiveness of early orthodontic treatment with the Twin-block appliance for the developing Class II Division 1 malocclusion. This multicenter trial was carried out in the United Kingdom. A total of 174 children, aged 8 to 10 years old, with Class II Division 1 malocclusion were randomly allocated to receive treatment with a Twin-block appliance or to an untreated, control group. Data were collected at the start of the study and 15 months later. Results showed that early treatment with Twin-block appliances resulted in reduction of overjet, correction of molar relationships, and reduction in severity of malocclusion. Most of this correction was due to dentoalveolar change, but some was due to favorable skeletal change. Early treatment with the Twin-block appliance is effective in reducing overjet and severity of malocclusion. The small change in the skeletal relationship might not be considered clinically significant. (Am J Orthod Dentofacial Orthop 2003;124:234-43)

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** • This multicenter trial was carried out in the United Kingdom. A total of 174 children, aged 8 to 10 years old, with Class II Division 1 malocclusion were randomly allocated to receive treatment with a Twin-block appliance or to an untreated, control group. • Fourteen hospital-based orthodontic specialists in the United Kingdom (UK) agreed to take part in the study. Each had undergone basic specialty training followed by 3 years of advanced training in the treatment of severe malocclusion. All operators were based in their own orthodontic departments in the National Health Service of the UK.
Schweregrad	Overjet ≥ 7 mm
Einschluss-kriterien *Bei Review: PICOS*	1. Minimum of 7 mm overjet 2. Absence of craniofacial syndromes 3. Willingness of the patient and parent to take part in the study

Ausschluss-kriterien	-
Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** A modification of the Twin-block appliance, originally developed by Clark, was used in this study. This appliance consisted of maxillary and mandibular removable appliances retained with 0.7-mm Adams clasps on the first permanent molars and 0.9-mm ball clasps placed in the mandibular incisor interproximal areas. A passive maxillary labial bow was also used to aid anterior retention and retrocline the maxillary incisors if they were proclined. The jaw registration was taken with approximately 7 to 8 mm protrusion and the blocks 7 mm apart in the buccal segments. The steep inclined planes interlocked at about 70° to the occlusal plane. When necessary, compensatory lateral expansion of the maxillary arch was achieved with a maxillary expansion screw that was turned once a week. Reactivation of the blocks was carried out when necessary. All patients were instructed to wear the appliance for 24 hours per day (except for contact sports and swimming). They were asked to wear the appliance while eating. When the patient’s overjet had been fully reduced, he or she continued to wear the appliance as a retainer at night only or was fitted with a retainer with a steep inclined biteplane, depending on the operator’s preference. **Kointervention** Study models Lateral cephalograms at start of study T1 and 15 months later T2 VERSUCHSGRUPPE: **treatment with Twin Block** N=89 (Anfang) / N=89 (Ende) / Alter = 9,7 ± 0,98 Jahre / ♂:♀ = 48:41 • Gebissphase: Ruhephase, frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** Patients who met the inclusion criterias who have treatment delayed for at least 15 months. **Kointervention** Study models Lateral cephalograms at T1 and 15 months later T2 KONTROLLGRUPPE: **untreated control** N=85 (Anfang) / N=85 (Ende) / Alter = 9,8 ± 0,94 Jahre / ♂:♀ = 46:39 • Gebissphase: Ruhephase, frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** • **Okklusion, Kaufunktion, Funktion** PRIMÄRZIELGRÖßE: Changes in Overjet (Overjet) SEKUNDÄRZIELGRÖßE: Changes in Molar relation (Molar relation) TERTIÄRZIELGRÖßE: Skeletal changes (Maxillary base, mandibular base, condylar head, mandibular length) QUARTÄRZIELGRÖßE: Dental changes (Maxillary incisor, mandibular incisor, maxillary molar, mandibular molar)
Studientyp	**Randomisiert-kontrollierte Interventionsstudie (RCT)**
Schluss-folgerungen der Autoren	In a multicenter setting in the UK, early orthodontic treatment with the Twin-block appliance resulted in substantial reduction in the overjets of children with Class II malocclusion. This was mainly due to dentoalveolar change, with a small element of favorable skeletal change. The magnitude of the patient's initial discrepancy was related to the outcome of treatment. This study reinforces the findings of other, similar randomized, controlled trials that suggest that early functional appliance treatment does not, on average, influence the Class II skeletal pattern to a clinically significant degree.
Zusammen-fassung der Ergebnisse	**GRUPPE treatment with TwinBlock VS. GRUPPE untreated control** ***PRIMÄRZIELGRÖßE*** Overjet was significantly reduced (mean +10.33 mm to +3,70 in TwinBlock group, and mean +10,41 mm to +10,71 mm in untreated control group). ***SEKUNDÄRZIELGRÖßE*** Molar relation was significantly reduced (mean +2,05 to -2,88 in TwinBlock group, and mean +1,88 to +1,55 in untreated control group.) ***TERTIÄRZIELGRÖßE*** No significant changes in maxillary base. Significant changes in mandibular base and mandibular length. ***QUARTÄRZIELGRÖßE*** Changes in Maxillary incisor (mean +8,59 to +6,29), mandibular insicor (mean -1,64 to -0,26), maxillary molar (mean -22,71 to -23,48) and mandibular molar (mean -24,65 to -23,99).
Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Power der Studie/Patientenzahl:* We based our sample size calculation for the number of patients necessary to achieve an 80% power with an α of .05 on a clinically meaningful difference in PAR index scores of 15% between the study groups. The calculation showed that we needed to recruit 80 patients for each study group to allow for an estimated noncompletion rate of 15%. *Funding: keine Angabe* *Interessenkonflikte: keine Angabe*

Schluss-folgerung des Begutachters	methodische Qualität: insgesamt gut
	Klinische Aussagekraft: 1. Twin-block appliance resulted in substantial reduction in the overjets of children with Class II malocclusion 2. mainly due to dentoalveolar change, with a small element of favorable skeletal change.
Evidenz-level (SIGN)	**1+**
Qualität (RoB, SIGN /AMSTAR II)	**Acceptable ⊕**

Evidenztabelle O’Brien, Wright et al. 2003

Effectiveness of early orthodontic treatment with the Twin-block appliance: A multicenter, randomized, controlled trial. Part 2: Psychosocial effects

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Manchester, Chester, Pontefract, Leeds, Portsmouth, Stourbridge, Bristol, Bolton, Bradford, Derbyshire, Kettering, Chesterfield, and Sunderland, United Kingdom, and Pittsburgh, Pa

The aims of this project were to evaluate whether early orthodontic treatment with the Twin-block appliance for the developing Class II Division 1 malocclusion resulted in any psychosocial benefits. This multicenter trial was carried out in the United Kingdom, with 174 children aged 8 to 10 years with Class II Division 1 malocclusions randomly allocated to receive treatment with Twin-block appliances or to an untreated control group. Data were collected at the start of the study and 15 months later. Results showed that early treatment with Twin-block appliances resulted in an increase in self-concept and a reduction of negative social experiences. The subjects also reported treatment benefits that could be related to improved self-esteem. Further research is needed to determine the extent to which these effects translate into social behavior and experiences. (Am J Orthod Dentofacial Orthop 2003;124:488-95)

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** • This multicenter trial was carried out in the United Kingdom. A total of 174 children, aged 8 to 10 years old, with Class II Division 1 malocclusion were randomly allocated to receive treatment with a Twin-block appliance or to an untreated, control group. • Fourteen hospital-based orthodontic specialists in the United Kingdom (UK) agreed to take part in the study. • Patients were asked to evaluate their psychological benefits before and after treatment by completing several questionnaires
Schweregrad	Overjet ≥ 7 mm
Einschluss-kriterien *Bei Review: PICOS*	1. Minimum of 7 mm overjet 2. Absence of craniofacial syndromes 3. Willingness of the patient and parent to take part in the study
Ausschluss-kriterien	-

Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** Patients in the treatment group were treated with a Twin Block appliance. A modification of the Twin-block appliance, originally developed by Clark, was used in this study. When the patient’s overjet had been fully reduced, he or she continued to wear the appliance as a retainer at night only or was fitted with a retainer with a steep inclined biteplane, depending on the operator’s preference. **Kointervention** 4 Questionnaires 1. Piers-Harris Children’s Self-Concept Scale 2. Childhood Experience Questionnaire is a 20- item self-report instrument developed by Pertschuk and Whitaker to tap children’s negative social experiences, such as teasing and being pitied 3. modified questionnaire, subjects were asked to rate each item for how important it was to them. Ratings were done on a 4-point Likert scale with 1 “not a reason” to 4 “very much a reason.” This questionnaire was completed by all subjects at the start of the study only. 4. a modified version of the Perceptions of the Benefits of Orthodontic Treatment Scale; the phrasing of the items was changed to incorporate children’s perceptions of treatment impact VERSUCHSGRUPPE: **treatment with Twin Block** N=89 (Anfang) / N=64 (Ende) / Alter = 9,7 ± 0,982 Jahre / ♂:♀ = 48:41 • Gebissphase: Ruhephase, frühes Wechselgebiss KFO-Behandlung: • Frühbehandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** Patients who met the inclusion criterias who have treatment delayed for at least 15 months. **Kointervention** 4 Questionnaires 1. Piers-Harris Children’s Self-Concept Scale 2. Childhood Experience Questionnaire is a 20- item self-report instrument developed by Pertschuk and Whitaker to tap children’s negative social experiences, such as teasing and being pitied 3. modified questionnaire, subjects were asked to rate each item for how important it was to them. Ratings were done on a 4-point Likert scale with 1 “not a reason” to 4 “very much a reason.” This questionnaire was completed by all subjects at the start of the study only. KONTROLLGRUPPE: **untreated control** N=87 (Anfang) / N=68 (Ende) / Alter = 9,8 ± 0,94 Jahre / ♂:♀ = 46:41 • Gebissphase: Ruhephase, frühes Wechselgebiss • KFO-Behandlung: keine Behandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **mundgesundheitsbezogene Lebensqualität (MLQ), psychische Entwicklung** PRIMÄRZIELGRÖßE: Piers-Harris scores changes (Behavior, Intellectual and school status, physical appearance, anxiety, popularity, happiness and satisfaction) SEKUNDÄRZIELGRÖßE: children who believed that each item had improved after orthodontic treatment (General well-being, Confidence, health of teeth, mouth function)
Studientyp	**Randomisiert-kontrollierte Interventionsstudie (RCT)**
Schluss-folgerungen der Autoren	The results of this study suggest that early orthodontic treatment for Class II Division 1 malocclusion with a Twin-block appliance results in higher selfconcept scores and fewer negative social experiences. The patients also reported treatment benefits that might be related to improved self-esteem.
Zusammen-fassung der Ergebnisse	**GRUPPE treatment with Twin Block VS. GRUPPE untreated control** ***PRIMÄRZIELGRÖßE*** The results indicate that, when controlling for scores at baseline, the treatment group showed significantly better self-concept scores than the control group for global self concept (total score) and the domains of physical appearance, anxiety, popularity, and happiness and satisfaction. When we consider the size of the effect, it appears that Twin-block treatment results in increases in the total score by 4 points and in cluster scores from 0.99 to 1.4 for happiness and satisfaction and anxiety, respectively. ***SEKUNDÄRZIELGRÖßE*** Results of the factor analysis yielded 5 main factors that accounted for almost 60% of the variance. We categorized these factors as “general well-being” (eigenvalue of 7.64, accounting for 34.7% of the variance), “confidence” (eigenvalue of 1.99, accounting for 9.0% of the variance), “health of teeth” (eigenvalue of 1.57, accounting for 7.1% of the variance), and “mouth function” (eigenvalue of 1.17, accounting for 5.4% of the variance). Other factors with lower eigenvalues were not retained, and items in these factors were dropped from subsequent analyses. The reliability of the factors, as measured by the Cronbach, ranged from 0.86 for “general well-being” and “confidence” to 0.77 for “health of teeth.” The means and standard deviations for the items included in each factor are given in Table III. This shows that the subjects thought that most of the potential benefits of orthodontic treatment would occur, with particularly high scores for benefits such as “feeling more confident,” “feeling better about oneself,” “looking better,” “keeping gums healthy,” and “helping keep front teeth together.” When we considered the data derived from the modified version of the Perceptions of the Benefits of Treatment part of this questionnaire, we calculated the percentage of children who thought each item had improved. This is shown in Table IV. Findings showed that most children thought that benefits were gained in the factors associated with confidence, health of teeth, and mouth function. Particularly high proportions of them reported to have benefited in the areas related to “the fit of their front and back teeth,” “healthy gums,” “feeling better about themselves,” and “improvement in appearance.” The means and CI for the Twin-block group at the start and end of the study were 49.53 (95% CI = 47.58 to 51.49) and 44.99 (95% CI = 43.31 to 46.66), respectively. Means and CI for the control group were 47.68 (95% CI = 45.95 to 49.42) at the start and 46.18 (95% CI = 44.66 to 47.70) at the end of the study. The results of the regression analysis showed that the only variable, other than the baseline data, to have an effect in the model was treatment (beta 2.07 [CI= 4.00 to 0.17; *P* = .033; *R*2 0.3]). We can, therefore, conclude that if a patient received treatment with a Twin-block appliance, the childhood experience score was reduced by 2 points.

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Confidence intervals been provided.* *Power der Studie/Patientenzahl: limitiert, nicht spezifiziert bezogen auf Outcome* *Funding: keine Angabe* *Interessenkonflikte: keine Angabe*
Schluss-folgerung des Begutachters	methodische Qualität: insgesamt gut
	Klinische Aussagekraft: 1. early orthodontic treatment for Class II Division 1 malocclusion with a Twin-block appliance may results in higher selfconcept scores and fewer negative social experiences. 2. also reported treatment benefits that might be related to improved self-esteem.
Evidenz-level (SIGN)	**1+**
Qualität **(RoB, SIGN /AMSTAR II)**	**Acceptable ⊕**

Evidenztabelle Oh, Baumrind et al. 2017

A retrospective study of Class II mixed-dentition treatment

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ABSTRACT

Objective: To consider the effectiveness of early treatment using one mixed-dentition approach to the correction of moderate and severe Class II malocclusions.

Materials and Methods: Three groups of Class II subjects were included in this retrospective study: an early treatment (EarlyTx) group that first presented at age 7 to 9.5 years (n = 54), a late treatment (LateTx) group whose first orthodontic visit occurred between ages 12 and 15 (n = 58), and an untreated Class II (UnTx) group to assess the pretreatment comparability of the two treated groups (n = 51). Thirteen conventional cephalometric measurements were reported for each group and Class II molar severity was measured on the study casts of the EarlyTx and LateTx groups.

Results: Successful Class II correction was observed in approximately three quarters of both the EarlyTx group and the LateTx group at the end of treatment. EarlyTx patients had fewer permanent teeth extracted than did the LateTx patients (5.6% vs 37.9%, $P < .001$) and spent less time in full-bonded appliance therapy in the permanent dentition than did LateTx patients (1.7 ± 0.8 vs 2.6 ± 0.7years, $P < .001$). When supervision time is included, the EarlyTx group had longer total treatment time and averaged more visits than did the LateTx group (53.1 ± 18.8 vs 33.7 ± 8.3, $P < .0001$). Fifty-five percent of the LateTx extraction cases involved removal of the maxillary first premolars only and were finished in a Class II molar relationship.

Conclusion: EarlyTx comprehensive mixed-dentition treatment was an effective modality for early correction of Class II malocclusions. (*Angle Orthod.* 2017;87:56–67)

KEY WORDS: Class II malocclusion; Mixed dentition; Early treatment; Retrospective study

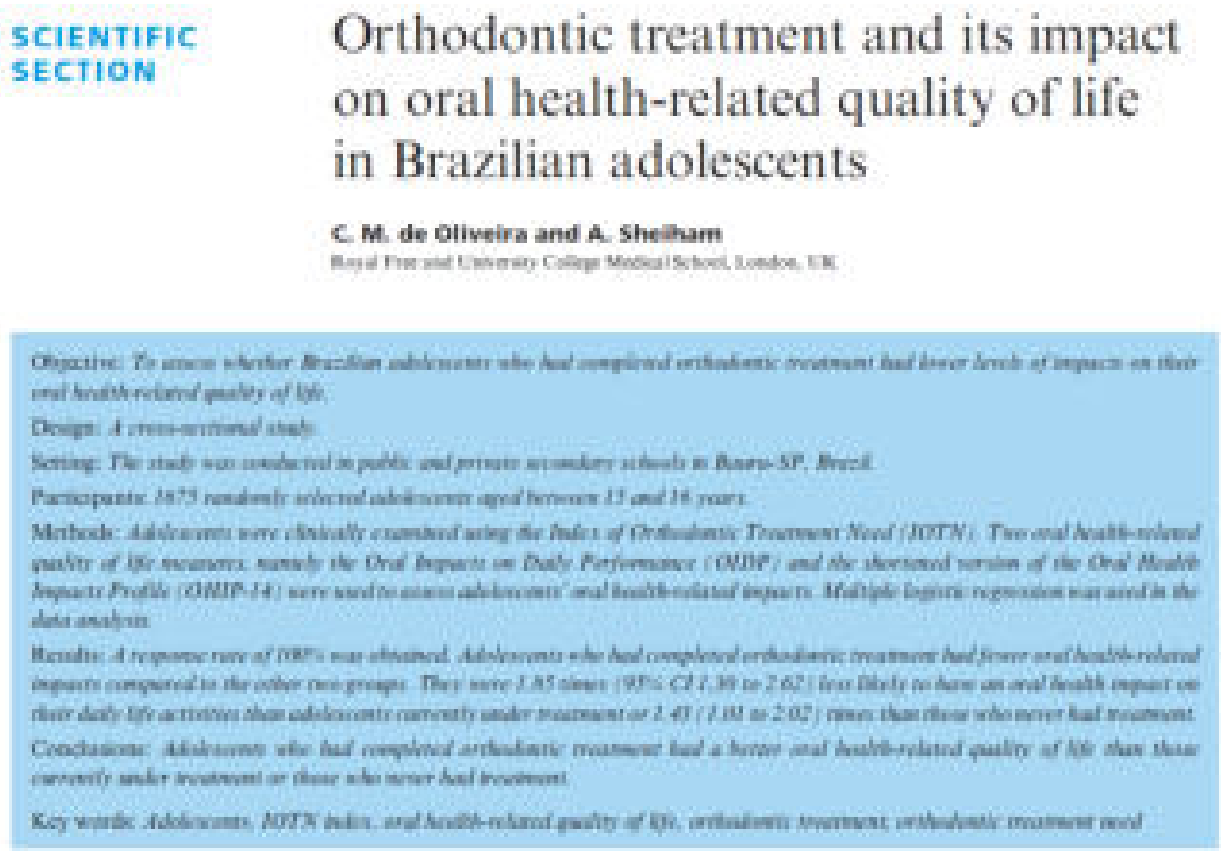
Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** • Patients from three different practices with many years of experience showing skeletal class two with a malocclusion greater than end-on class II molar relationships regardless of insicor relationship. • Practices in San Francisco, USA
Schweregrad	Nicht spezifiziert
Einschluss-kriterien *Bei Review: PICOS*	• malocclusion greater than end-on Class II molar relationship regardless of incisor relationship
Ausschluss-kriterien	1. still in active treatment 2. incomplete records 3. chart missing 4. transferred during treatment 5. incomplete treatment 6. miscellaneous conditions (eg. Multiple missing teeth, craniofacial, previous treatment, etc)

Intervention Versuchsgruppe 1	**Kieferorthopädische Behandlung** An initial phase of comprehensive mixed dentition treatment (phase 1) for Class II malocclusions typically employed headgear, a maxillary 2 3 4 appliance, and a mandibular lingual arch (Figure 3). The aim of phase 1 treatment was complete correction of the malocclusion, which included obtaining a Class I molar relationship, reduction in skeletal jaw discrepancy, ideal overjet and overbite, proper incisor alignment, and adequate arch length and width. Following phase 1 treatment, retainers were delivered and the patients were seen regularly every 2–4 months during a supervision phase, which was designed to monitor the patient’s growth and occlusal development to preserve the gains made in phase 1 treatment. Upon eruption of the permanent second molars, the patients who underwent phase 1 treatment were reexamined, and a decision was made as to further treatment. Phase 2 treatment ranged from partial fixed appliances in a single arch to full fixed appliances in both arches with or without extractions. **Kointervention 1** Lateral cephalograms at timepoints T1 (mixed dentition), T2 early permanent dentition and T3 End of Tx **Kointervention 2** Study casts at T1, T2 and T3 VERSUCHSGRUPPE: **early treatment Group (EarlyTx)** N=54 (Anfang) / N=54 (Ende) / Alter = 8,3 ± 0,7 Jahre / ♂:♀ = 19:35 • Gebissphase: Ruhephase, frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung
Intervention Versuchsgruppe 2	**Kieferorthopädische Behandlung** Starting at timepoint T2: Phase 2 treatment ranged from partial fixed appliances in a single arch to full fixed appliances in both arches with or without extractions. **Kointervention 1** Lateral cephalograms at timepoints T2 early permanent dentition and T3 End of Tx **Kointervention 2** Study casts at T2 and T3 VERSUCHSGRUPPE: **late treatment Group (LateTx)** N=58 (Anfang) / N=58 (Ende) / Alter = 13,0 ± 1,0 Jahre / ♂:♀ = 30:28 • Gebissphase: permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: reguläre Behandlung

Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** Fifty-one untreated Class II subjects were selected from the AAOF Craniofacial Legacy Growth Collection (http://www.aaoflegacycollection.org) to serve as an untreated comparison Class II group (UnTx). **Kointervention 1** To qualify for inclusion in this group, lateral cephalograms of prospective candidates from the Web site were matched by age and Class II severity by visual comparison with lateral cephalograms of the previously selected EarlyTx group. KONTROLLGRUPPE: **untreated control (UnTx)** N=51 (Anfang) / N=51 (Ende) / Alter = age matched / ♂:♀ = 30:21 • Gebissphase: Ruhephase, frühes Wechselgebiss, spätes Wechselgebiss, permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: keine Therapie
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** • **Okklusion, Kaufunktion, Funktion** PRIMÄRZIELGRÖßE: Changes in Class II relationship *(*Class II molar severity, Overjet, ANB angle, Angle of convexity*)* SEKUNDÄRZIELGRÖßE: Changes Skeletal relationship *(*SNa angle, SNB angle, SNPog angle) TERTIÄRZIELGRÖßE: Changes in vertical relationship *(*Mandibular plane – SN angle, occlusal plane – Sn angle*)* QUARTÄRZIELGRÖßE: Changes in dental relationship *(*Overbite, IMPA, Maxillary incisor to SN angle, interincisal angle*)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	1. Successful Class II correction during early treatment was achieved for three quarters of the EarlyTx patients. Sixteen of the 54 EarlyTx patients (28%) were deemed by their clinicians not to require a second phase of treatment. 2. EndTx cephalometric measurements not involving molar relationship were generally similar for both the EarlyTx and LateTx groups

Zusammen-fassung der Ergebnisse	**GRUPPE early treatment group (EarlyTx) VS. GRUPPE late treatment group (LateTx)** ***PRIMÄRZIELGRÖßE*** Of EarlyTx group changes through time. At T1, EarlyTx group Class II molar severity averaged 0.7 ± 1.4 mm, overjet 6.3 ± 2.3 mm, and ANB angle 5.3 6 1.78. During phase 1, mean Class II molar severity was reduced to 1.6 ± 1.4mm, overjet to 3.1 ± 1.1 mm, and ANB angle to 2.5 ± 2.38. Thus on average, successful Class II correction was achieved during early treatment. In patients who had a second phase of treatment, there was a further reduction in Class II molar severity (T3 minus T2 = -0.8 ± 1.4) but no further average improvement in overjet or ANB angle. At StartTx, Class II severity averaged 3.9 ± 1.3 mm for the EarlyTx group and 3.4 ± 1.1 mm for the LateTx group. At EndTx, patients in the EarlyTx group had mean residual Class II severity of less than 1 mm on the more severely affected side (0.6 ± 0.8 mm for the Phase 1 only and 0.1 ± 0.7 for the twophase groups). Since molar correction was effectively achieved at the end of the initial treatment phase in both the phase 1 only and the two-phase groups, molar severity did not appear to be a major contributing factor in the decision for phase 2 treatment. ***SEKUNDÄRZIELGRÖßE*** In contrast, SNB and SN-Pog angles increased and MPA decreased continuously throughout the observation period. We conclude that substantial dental and skeletal Class II correction occurred before the second phase of treatment was initiated and was maintained through the supervision period. ***TERTIÄRZIELGRÖßE*** No significant changes occuring ***QUARTÄRZIELGRÖßE*** No significant changes occuring
Angaben auffälliger positiver und/oder negativer Aspekte	*Power der Studie/Patientenzahl: limitiert, keine spezifizierte Angabe* *Funding:* This study was supported in part by a grant of Orthodontic Faculty Development Fellowship Award from the American Association of Orthodontists Foundation and a three-year, FullTime Faculty Teaching (FFT) Fellowship Award from the American Association of Orthodontists *Interessenkonflikte: keine Angabe* No confidence intervals provided. No evidence from other sources is used to demonstrate that the method of outcome assessment is valid and reliable.
Schluss-folgerung des Begutachters	<u>methodische Qualität:</u> insgesamt gut
	<u>Klinische Aussagekraft:</u> 1. Based on cephalometric and study cast measurements, Class II correction in the EarlyTx and LateTx groups were comparable. 2. comprehensive early treatment can be an effective treatment modality for the correction of Class II malocclusions in many patients.
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN /AMSTAR II)	**Acceptable ⊕**

Evidenztabelle Oliveira and Sheiham 2004



SCIENTIFIC SECTION

Orthodontic treatment and its impact on oral health-related quality of life in Brazilian adolescents

C. M. de Oliveira and A. Sheiham

Royal Free and University College Medical School, London, UK

Objective: To assess whether Brazilian adolescents who had completed orthodontic treatment had lower levels of impacts on their oral health-related quality of life.

Design: A cross-sectional study.

Setting: The study was conducted in public and private secondary schools in Bauru-SP, Brazil.

Participants: 1675 randomly selected adolescents aged between 15 and 16 years.

Methods: Adolescents were clinically examined using the Index of Orthodontic Treatment Need (IOTN). Two oral health-related quality of life measures, namely the Oral Impacts on Daily Performance (OIDP) and the shortened version of the Oral Health Impacts Profile (OHIP-14), were used to assess adolescents' oral health-related impacts. Multiple logistic regression was used in the data analysis.

Results: A response rate of 98% was obtained. Adolescents who had completed orthodontic treatment had fewer oral health-related impacts compared to the other two groups. They were 1.85 times (95% CI 1.30 to 2.62) less likely to have an oral health impact on their daily life activities than adolescents currently under treatment or 1.43 (1.03 to 2.02) times than those who never had treatment.

Conclusions: Adolescents who had completed orthodontic treatment had a better oral health-related quality of life than those currently under treatment or those who never had treatment.

Key words: Adolescents, IOTN index, oral health-related quality of life, orthodontic treatment, orthodontic treatment need

Population *Setting* *Komorbiditäten*	**„Malokklusion/Dysgnathie“ allg.** • Brazilian Adolescents (15- 16years of age) • São Paulo, Brazil
Schweregrad	The Index of Orthodontic Treatment Need (IOTN): ‘ no need ’ (IOTN 1 or 2), ‘ moderate need ’ (IOTN 3), or ‘ definite need ’ (IOTN 4 or 5) alle inkludiert
Einschluss-kriterien	- 15- to 16-year old adolescents - attending schools in Bauru, São Paulo, Brazil
Ausschluss-kriterien	Not fulfilling inclusion criteria

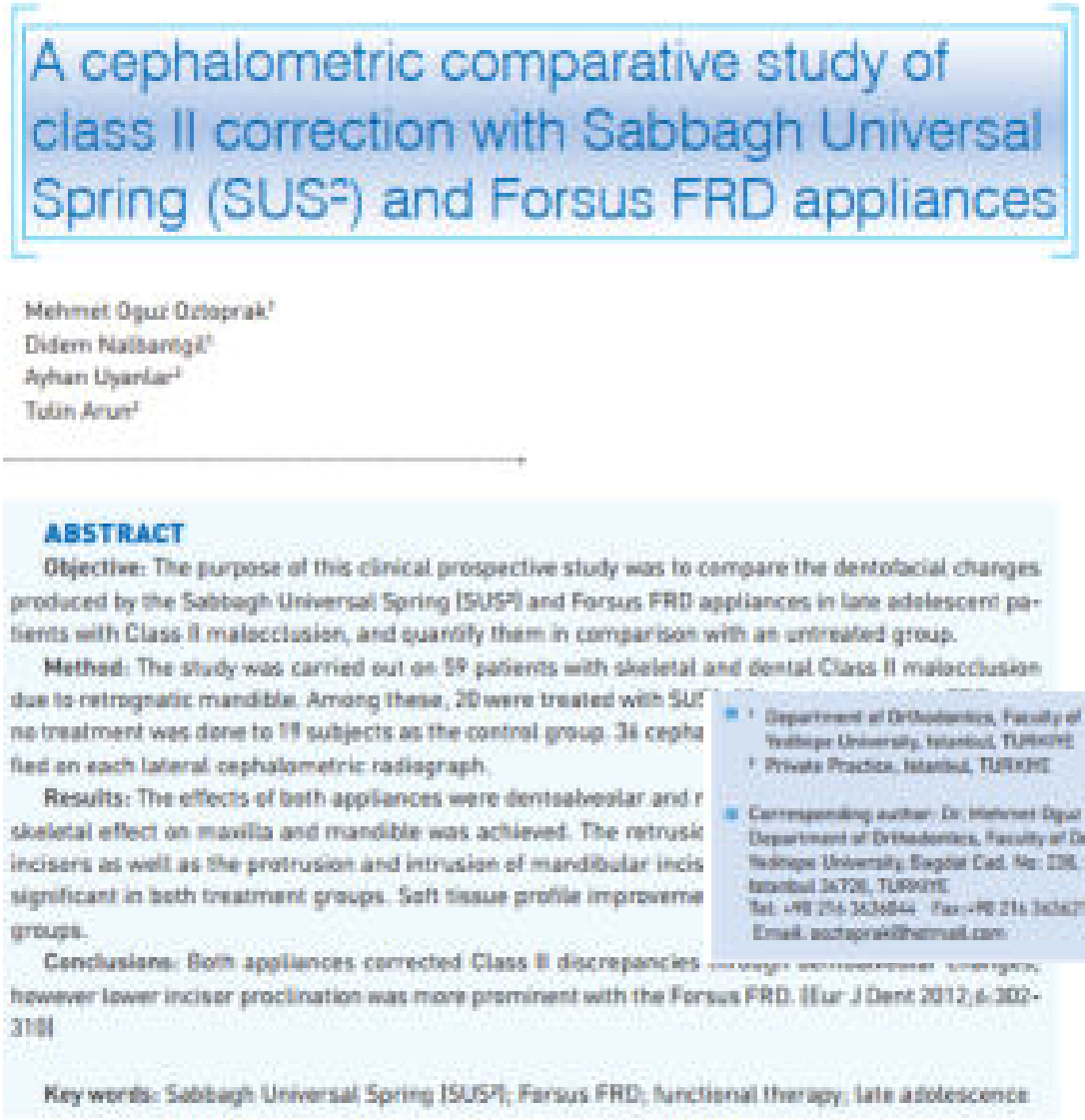
Intervention Versuchsgruppe	**kieferorthopädische Behandlung** **Treated (previous orthodontic treatment)** VERSUCHSGRUPPE 1 **Treated (previous orthodontic treatment)** N= 258 (Anfang) / N=258 (Ende) / Alter = 15- 16 years ♂:♀ = ?:? • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** **Untreated (no orthodontic treatment)** **Undergoing (current orthodontic treatment)** KONTROLLGRUPPE 1: **Untreated (no orthodontic treatment)** N= 1060 (Anfang) / N=1060 (Ende) / Alter = 15- 16 years ♂:♀ = ?:? • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: keine Behandlung KONTROLLGRUPPE 2: **Undergoing (current orthodontic treatment)** N= 357 (Anfang) / N=357 (Ende) / Alter = 15- 16 years ♂:♀ = ?:? • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • mundgesundheitsbezogene Lebensqualität (MLQ), psychische Entwicklung PRIMÄRZIELGRÖßE: **Oral Impact on Daily Performances (OIDP),** **Oral Health Impacts Profile (OHIP-14)**
Studientyp	**Querschnittsstudie**

Schluss-folgerungen der Autoren	**Adolescents who had completed orthodontic treatment had a better oral health-related quality of life than those currently under treatment or those who never had treatment.** Orthodontic treatment clearly reduced the oral health impacts among adolescents. However, orthodontic treatment **may have negative impacts on quality of life during the treatment.** Orthodontists should be aware of this impact caused by treatment and regularly remind patients of the positive outcomes. Normatively assessed need, using the IOTN system does not capture important psychosocial dimensions related to oral health-related quality of life. Oral health-related quality of life measures encapsulate more aspects of adolescents' perceptions about their mouths and teeth. Inconsistencies between normative orthodontic need as assessed by IOTN, and **psychosocial and oral health-related quality of life measures should be addressed by developing a more comprehensive measure of orthodontic need.**

Zusammen-fassung der Ergebnisse	**GRUPPE Treated (previous orthodontic treatment) VS. GRUPPE Untreated (no orthodontic treatment)** **GRUPPE Treated (previous orthodontic treatment) VS. GRUPPE Undergoing (current orthodontic treatment)** T1: 15- 16 years of age **Oral Impact on Daily Performances (OIDP),** **Oral Health Impacts Profile (OHIP-14)** **ODIP** 32.8% of adolescents reported having experienced one or more dental impacts on their daily life activities in the past 6 months according to the OIDP oral health-related quality of life measure. Overall, adolescents who never had orthodontic treatment reported more oral health impacts than those treated or currently under treatment. A statistically significant difference was found among the three groups concerning the reported OIDP impact, namely ‘smiling, laughing and showing teeth without embarrassment’ (p<0.001). Adolescents who never had orthodontic treatment were 1.43 times (95% CI 1.01 to 2.02) more likely to report one or more dental impacts than those adolescents who had completed orthodontic treatment. Those who were currently under orthodontic treatment were 1.84 (1.25 to 2.72) times more likely to have an impact than those who had completed treatment. **Orthodontic treatment status remained significant after adjusting for all variables (p=0.008).** **The association between social class and adolescent’s overall oral health impact was not significant (p<0.244). The probability of reporting more dental impacts was higher among adolescents with a clinically-assessed need for orthodontic treatment according to the dental health component of the IOTN index (OR=2.65, 95% CI 1.97 to 3.56).** **OHIP** 43.0% of adolescents reported having experienced one or more dental impacts on their daily life activities in the past 6 months according according to the OHIP-14. Overall, adolescents who had completed orthodontic treatment experienced fewer oral health impacts according to the OHIP-14 measure than those who were under treatment or who never had orthodontic treatment. **Adolescents who never had orthodontic treatment (OR=1.39, 95% CI 1.01 to 1.90) and those who were under treatment (OR=1.85, 95% CI 1.30 to 2.62) were more likely to report one or more dental impacts than those adolescents who had orthodontic treatment.** **The probability of reporting more OHIP oral health impacts was higher among adolescents with a need for orthodontic treatment according to the dental health component of the IOTN index (OR=1.46, 95% CI 1.09 to 1.94).**

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN)	Querschnittstudie. Große Gesamtpopulation und zufällige (Prozedur nicht spezifiziert) Auswahl der untersuchten Population. Gut durchgeführte Querschnittstudie. Studienabhängig fehlen longitudinale Vergleiche. Aufgrund des Studiendesigns ist die Aussagekraft eingeschränkt. Die ordentliche Durchführung sowie die Größe der untersuchten Population unterstützen jedoch die klinische und Leitlinienrelevanz. Power/ Sample Size Berechnungen wurden durchgeführt. Die Auswertung war nicht verblindet. Fall-Kontrollstudie mit guter Durchführung und großer untersuchter Population. Bedingt durch das Studiendesign fehlen longitudinale Vergleiche. Daher ist die Aussagekraft eingeschränkt. Die ordentliche Durchführung sowie die Größe der untersuchten Population unterstützen jedoch die klinische und Leitlinienrelevanz. *Funding:* The authors are grateful to the Fundação Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES), Brazilian Government, for their financial support. *Interessenkonflikte:* Keine Angabe *Bias (SIGN):Querschnittstudie*. Große Gesamtpopulation ohne Attrition. Eine Verblindung fand nicht statt. Power/ Sample Size Berechnungen wurden durchgeführt.
Schluss-folgerung des Begutachters	methodische Qualität: akzeptabel Klinische Aussagekraft: Fall-Kontrollstudie mit guter Durchführung und großer untersuchter Population. Bedingt durch das Studiendesign fehlen longitudinale Vergleiche. Daher ist die Aussagekraft eingeschränkt. Die ordentliche Durchführung sowie die Größe der untersuchten Population unterstützen jedoch die klinische und Leitlinienrelevanz. Die Übertragbarkeit auf die deutsche Bevölkerung ist möglicherweise eingeschränkt.
Evidenz-level (SIGN)	**3**
Qualität (RoB, SIGN)	**acceptable (+)**

Evidenztabelle Oztoprak, Nalbantgil et al. 2012



A cephalometric comparative study of class II correction with Sabbagh Universal Spring (SUS²) and Forsus FRD appliances

Mehmet Oguz Oztoprak[1]
Didem Nalbantgil[1]
Ayhan Uyanlar[2]
Tulin Arun[2]

ABSTRACT

Objective: The purpose of this clinical prospective study was to compare the dentofacial changes produced by the Sabbagh Universal Spring (SUS²) and Forsus FRD appliances in late adolescent patients with Class II malocclusion, and quantify them in comparison with an untreated group.

Method: The study was carried out on 59 patients with skeletal and dental Class II malocclusion due to retrognatic mandible. Among these, 20 were treated with SUS
no treatment was done to 19 subjects as the control group. 36 cepha
fied on each lateral cephalometric radiograph.

Results: The effects of both appliances were dentoalveolar and r
skeletal effect on maxilla and mandible was achieved. The retrusi
incisors as well as the protrusion and intrusion of mandibular incis
significant in both treatment groups. Soft tissue profile improveme
groups.

Conclusions: Both appliances corrected Class II discrepancies
however lower incisor proclination was more prominent with the Forsus FRD. (Eur J Dent 2012;6:302-318)

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Key words: Sabbagh Universal Spring (SUS²); Forsus FRD; functional therapy; late adolescence

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** • The study sample consisted of 59 patients (40 treated, 19 untreated) with skeletal and dental Class II malocclusion. All patients were treated in the Yeditepe University clinic with same treatment protocols. • Yeditepe University clinic, Turkey
Schweregrad	SN/MP angle was in 25°- 35° range

Einschluss-kriterien *Bei Review: PICOS*	1. skeletal and dental Class II malocclusion due to mandibular retrognathia 2. normal or lowangle growth pattern (SN/MP angle was in 25°- 35° range) 3. postpeak growth period 4. no extracted or congenitally missing permanent teeth (third molars were not included) 5. minimum crowding in the lower arch (0-5mm crowding was assigned as minimum crowding) 6. Cervical vertebrae maturation index (CVMI) was used for selecting the patients, and CVMI 5 and CVMI 6 stages which correspond to post-peak growth period was defined by lateral cephalometric radiographs.
Ausschluss-kriterien	-
Intervention Versuchsgruppe 1	**Kieferorthopädische Behandlung** In both study groups, same straightwire brackets with a 0.022-inch slot and same prescription were used. Bands were placed with a transpalatal arch in the upper jaw to minimize the anticipated side effects at the upper posterior segment. After the leveling, 0.019 x 0.025 inch stainless steel continuous archwires were inserted and cinched back in the upper and lower arches before the insertion of the appliances. No extra torque was given to upper and lower arches. According to the manufacturer’s instructions the SUS’ s were connected to the headgear tube of the upper first molars and the lower arch between the first premolar and the canine. In order to obtain a rigid telescope effect, the spring force was minimized by inserting and turning the middle telescope tube into the guide tube (unscrew the slotted screw anticlockwise with the activation screw) as described by Sabbagh. In SUS group the assembled arch adapter was inserted into the lower stainless steel arch between lower 3 and 4 when tightening the hexagonal screw with the hexagon socket screw key. There is no way to use bypass wire. The patients were seen every 4 weeks and the appliances were activated every eight weeks by a piece of spacer (closed) spring, with steps not exceeding 5 mm. The appliances was removed when a Class I or overcorrected Class I canine and molar relationship was achieved which eventuated in a mean time of 5 months 5 days ± 2 months 3 days. **Kointervention** Lateral cephalograms at placement T1 and after removal T2 of appliance. VERSUCHSGRUPPE: **treatment with SUS** N=20 (Anfang) / N=20 (Ende) / Alter = 15,3 ± 1,2 Jahre / ♂:♀ = 9:11 • Gebissphase: permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: reguläre Behandlung

Intervention Versuchsgruppe 2	**Kieferorthopädische Behandlung** In both study groups, same straightwire brackets with a 0.022-inch slot and same prescription were used. Bands were placed with a transpalatal arch in the upper jaw to minimize the anticipated side effects at the upper posterior segment. After the leveling, 0.019 x 0.025 inch stainless steel continuous archwires were inserted and cinched back in the upper and lower arches before the insertion of the appliances. No extra torque was given to upper and lower arches. In the FRD group, the appliance was attached to the maxillary first molar headgear tube with an L shaped ball-pin and to the mandibular archwire through a bypass archwire. FRD consists of a universal spring module, a ‘L’ pin and a pushrod that is available in five different sizes. The force level can be modified by varying the pushrod size to the desired force level. The first activation was done by inserting wedges on pushrods. Other activations were done by placing pushrods in bigger sizes. The appropriate length of the rod was selected according to the manufacturer’s instructions and connected to the lower arch between the first premolar and the canine. The patients were seen every four weeks, and the appliances were activated every eight weeks through wedges placed on the pushrod. The appliances was removed when a Class I or overcorrected Class I canine and molar relationship was achieved which eventuated in a mean time of 5 months 6 days ± 1 month 6 days in the Forsus FRD group, respectively. **Kointervention** Lateral cephalograms at placement T1 and after removal T2 of appliance VERSUCHSGRUPPE: **treatment with Forsus** N=20 (Anfang) / N=20 (Ende) / Alter = 15,1 ± 1,0 Jahre / ♂:♀ = 8:12 • Gebissphase: permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** To eliminate the effects of growth over the treatment period, an untreated, age-matched Class II control group with skeletal and dental characteristics as similar as possible was obtained from the Faculty of Dentistry Archieve, University of Yeditepe, in department of orthodontics. **Kointervention** Lateral cephalograms at beginning T1 and after 6 months T2 KONTROLLGRUPPE: **untreated control** N=19 (Anfang) / N=19 (Ende) / Alter = 14,9 ± 1,3 Jahre / ♂:♀ = 5:14 • Gebissphase: permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: keine Behandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** • **Okklusion, Kaufunktion, Funktion** PRIMÄRZIELGRÖßE: Changes in cephalometric measurements *(*SNA, SNB, ANB, SN/PP, SN/MP, SE, SL, Pg-NB, Ar-Pg, A-RL2, B-RL2, A-RL1, ANS-Me/N-Me, Jarabak Ratio, Gonial Ratio, S-Ar/Ar-Go, U1/SN, U1/RL1, IMPA, L1/RL2, Interincisal Angle, SN/OP, L1-NB, U6-RL1, U1-RL1, Overjet, Overbite, H Angle, Nasolabial Angle, N-A-Pg, A-labialis superior, E line-labialis superior, E line-labialis inferior, Labialis superior RL2, Labialis inferior RL2, Lip strain*)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	1. In the SUS² and Forsus FRD groups, no statistically significant vertical and sagittal skeletal effect on the maxilla and the mandible were present. Since no vertical changes were observed, the appliances can be used in high angle patients without gummy smile 2. In both study groups, the changes that took place in post peak growth period were achieved by only dentoalveolar changes. Thus, these appliances can be an acceptable substitute to Class II elastics for patients who appear to be noncompliant. 3. In study groups, upper incisor retrusion and extrusion and lower incisor protrusion and intrusion were observed. SUS² group demonstrated lesser lower incisor protrusion and upper molar intrusion when compared with Forsus FRD group 4. The changes related to the soft tissue profile were limited, so both appliances may not compensate the esthetic facial outcome that can be achieved by orthognathic surgery in Class II adult patients
Zusammen-fassung der Ergebnisse	**GRUPPE treatment with SUS VS. GRUPPE treatment with Forsus VS. GRUPPE untreated control** ***PRIMÄRZIELGRÖßE*** The result of T1 and T2 difference comparison between groups are presented in Table 4. When two treatment groups were compared, increase of the SNA angle and lip strain measurements in Forsus FRD group in contrast to SUS² group and increase of the N-A-Pg and A-labialis superior measurements in SUS² group in contrast to Forsus FRD group were found significant during treatment. Increase in the IMPA, L1/RL2, SN/OP and L1-NB angles and decrease in the interincisal angle were also more prominent in Forsus FRD group. On the other hand, increase of the Ar-Pg measurement of SUS² group was higher than Forsus FRD group. (Table 4) SN/PP, IMPA, L1/RL2 and SN/OP angles and L1-NB and U1-RL1 linear measurements of SUS² group showed significant increase when compared with the control group. On the other hand, decrease of U1/SN and U1/RL1 angles and U6- RL1, overjet, overbite, labialis superior-RL2 linear measurements were also significant compared with the control group (Table 4). Comparison of Forsus FRD and control group revealed signifcant increase of the A-RL1, L1-NB and lip strain linear measurements and IMPA, L1/ RL2, SN/OP angles and significant decrease in the U1/SN, U1/RL1 and interincisal angles and U6- RL1, Labialis superior-RL2, overjet and overbite linear measurements in Forsus FRD group. (Table 4).

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Power der Studie/Patientenzahl: limitiert, nicht spezifiziert* *Funding: keine Angabe* *Interessenkonflikte: keine Angabe* If randomisation is mentioned, but method not specified. No confidence intervals been provided.
Schluss-folgerung des Begutachters	methodische Qualität: insgesamt gut
	Klinische Aussagekraft: In both study groups, the changes that took place in post peak growth period were achieved by only dentoalveolar changes. Appliances can be an acceptable substitute to Class II elastics for patients who appear to be noncompliant.
Evidenz-level (SIGN)	**2+**
Qualität **(RoB, SIGN /AMSTAR II)**	**Acceptable ⊕**

Evidenztabelle **Palomares et al. 2012**

How does orthodontic treatment affect young adults' oral health-related quality of life?

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Rio de Janeiro and Porto Alegre, Brazil

Introduction: Studies in the dental literature do not yet provide conclusive evidence for the functional and psychosocial benefits of orthodontic treatment. In this cross-sectional study, we aimed to assess the oral health-related quality of life of young Brazilian adults, aged 18 to 30 years, who had completed orthodontic treatment compared with untreated subjects waiting for treatment. **Methods:** The subjects were recruited at a state-funded university clinic. The sample comprised 100 patients in the retention phase of orthodontic treatment for more than 6 months (treated group) and 100 persons who were seeking orthodontic treatment and were still on a waiting list (nontreated group). Data were collected by using the oral health impact profile, the index of orthodontic treatment need (malocclusion severity and esthetic impairment), the Brazilian economic classification criteria (socioeconomic status), and the index of decayed, missing, and filled teeth (oral health status). Statistical analyses were performed by using chi-square and Fisher exact tests and negative binomial regression. **Results:** The mean oral health impact profile scores were 3.1 (SD = 2.99) and 15.1 (SD = 8.02) in the treated and nontreated groups, respectively. The most frequent impacts in the treated and nontreated groups were "painful aching" and "been self-conscious," respectively. Comparisons between the groups were controlled for malocclusion severity, clinician-assessed esthetic impairment, age, sex, socioeconomic status, and oral health status. Nontreated young adults had mean oral health impact profile scores 5.3 times higher than did the treated subjects. **Conclusions:** Young Brazilian adults who received orthodontic treatment had significantly better oral health-related quality of life scores in the retention phase, after treatment completion, than did nontreated subjects. (Am J Orthod Dentofacial Orthop 2012;141:751-8)

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Population *Setting* *Komorbiditäten*	**Malokklusion/Dysgnathie allgemein** recruited at the orthodontic clinic of the Faculty of Dentistry, State University of Rio de Janeiro; 200 young adults age 18-30 years
Schweregrad	Keine Angabe
Einschluss-kriterien	• age between 18 and 30 years
Ausschluss-kriterien	craniofacial anomalies (eg cleft lip or palate); previous orthodontic therapy
Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** The treated group consisted of 100 consecutive patients who concluded their orthodontic treatment at the university at least 6 months before the study. The patients in this group were contacted at their retention maintenance appointments. In the treated group, the mean time after completion of treatment was 3.8 years (SD, 6 2.2 years; minimum, 0.6 year; maximum, 10.5 years). VERSUCHSGRUPPE 1: **Treated Group (after orthodontic treatment)** N=100 (Anfang) / N=100 (Ende) / Alter = 18-30 Jahre / ♂:♀ =32:68 • Gebissphase: permanentes Gebiss ≥ 18.Lebensjahr • KFO-Behandlung: Spätbehandlung (Erwachsenenbehandlung
Kontrolle Kontrollgruppe	**Keine Kieferorthopädische Therapie** The nontreated group included 100 subjects seeking orthodontic treatment but had yet to start it. They were selected consecutively from a waiting list, according to the following inclusion criteria. KONTROLLGRUPPE: **Control group** N=100 (Anfang) / N=100 (Ende) / Alter = 18-30 Jahre / ♂:♀ = 31:69 • Gebissphase: permanentes Gebiss ≥ 18.Lebensjahr • KFO-Behandlung: keine Behandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **dentofaziale Ästhetik** • **mundgesundheitsbezogene Lebensqualität (MLQ), psychische Entwicklung** PRIMÄRZIELGRÖßE - oral health impact profile SEKUNDÄRZIELGRÖßE - Baseline Index of orthodontic treatment need – dental health component TERTIÄRZIELGRÖßE - Baseline Index of orthodontic treatment need – aesthetic component QUARTÄRZIELGRÖßE - age QUINTÄRZIELGRÖßE – sex SEXTÄRZIELGRÖßE – DMFT-Index SEPTIMÄRZIELGRÖßE – socioeconomic status
Studientyp	**Querschnittsstudie**
Schluss-folgerungen der Autoren	1. The findings of this cross-sectional study indicate that young Brazilian adults who completed orthodontic treatment and were in the retention phase of treatment for at least 6 months had a significantly better oral health-related quality of life than did the nontreated subjects who were waiting for treatment, independently of malocclusion severity, esthetic impairment, sex,socioeconomic condition, and dental health status.

Zusammen-fassung der Ergebnisse	**GRUPPE treated group (after orthodontic treatment) VS. GRUPPE nottreated group** ***PRIMÄRZIELGRÖßE*** Statistically significant differences between the treated and nontreated subjects (P <0.01) were found for mean oral health impact profile (short form) scores (Table I). The oral health impact profile scores ranged from 0 to 36. The means and standard deviations were 3.1 (SD ± 2.99) and 15.1 (SD ± 8.02) for the treated and nontreated groups, respectively. The most frequent impacts in the treated and nontreated groups were “painful aching” and “been self-conscious,” respectively. The Figure presents the oral health impact profile (short form) scores of both groups. There was a concentration at the left side of the distribution of the scores for the treated group, with a high percentage of low scores. The nontreated group's scores were more distributed and included higher scores (range, 1-36). A negative binomial regression analysis controlling for malocclusion severity, clinician-assessed esthetic impairment, age, sex, socioeconomic status, and oral health status indicated that the nontreated young adults had mean oral health impact profile scores 5.3 times higher than did the treated subjects. ***SEKUNDÄRZIELGRÖßE*** Descriptive statistics indicated no significant differences between the treated and nontreated groups for the baseline dental health component (P = 0.09).Severe malocclusion(dental health component, 4 and 5) was correlated to a greater negative impact on oral health-related quality of life. ***TERTIÄRZIELGRÖßE*** Statistically significant differences between the treated and nontreated subjects were found for examiner assessed index of orthodontic treatment need-aesthetic component scores, and socioeconomic status (P<0.01). Normative esthetic impairment (scores, 8-10) were correlated to a greater negative impact on oral health-related quality of life. **QUARTÄRZIELGRÖßE** siehe Tabelle **QUINTÄRZIELGRÖßE** Descriptive statistics indicated no significant differences between the treated and nontreated groups for sex (P =0.88). **SEXTÄRZIELGRÖßE** Descriptive statistics indicated no significant differences between the treated and nontreated groups for the mean index of decayed, missing, and filled teeth (P = 0.57). The index of decayed, missing, and filled teeth was removed from the final model (P>0.20). **SEPTIMÄRZIELGRÖßE** Statistically significant differences between the treated and nontreated subjects was found socioeconomic status (P<0.01). The socioeconomic status were removed from the final model (P>0.20).

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN,	*Studiendesign: Querschnittsstudie/Beobachtungsstudie* *Durchführung:* The 2 groups of subjects studied were reasonably comparable, since there were no significant differences between them at baseline with regard to the dental health component, sex, and the index of decayed, missing,and filled teeth. *Auswertung:* Data were collected through face-to-face interviews, self-completed questionnaires, and oral examinations performed by a trained orthodontist (N.B.P.) at the same orthodontic clinic. The examiner was trained by a gold-standard researcher with broad experience with the index of orthodontic treatment need (J.A.M.). The calibration was done through comparison of the results from 20 plaster casts by the examiner and the gold-standard researcher. *Power der Studie/Patientenzahl: unklar* *Funding:* Supported by the Carlos Chagas Filho Foundation; State University of Rio de Janeiro is publicly funded by the state of Rio de Janeiro *Interessenkonflikte: keine* *Bias: keine ITT oder PP Analyse*
Schluss-folgerung des Begutachters	methodische Qualität: insgesamt gut
	Klinische Aussagekraft: junge brasilianische Erwachsene haben nach einer kieferorthopädischen Therapie (in der Retentionsphase) eine signifikant bessere Lebensqualität bezogen auf die Mundgesundheit als junge brasilianische Erwachsene die noch nicht kieferorthopädisch therapiert wurde. Dieses Ergebnis zeigt sich unabhängig von dem Ausmaß der Malokklusion, der Mundhygiene, des Geschlecht, der ästhetischen Beeinträchtigung und des sozioökonomischen Statuses.
Evidenz-level (SIGN)	**3**
Qualität **(RoB, SIGN /AMSTAR II)**	Acceptable +

Evidenztabelle Pancherz 1979

Treatment of Class II malocclusions by jumping the bite with the Herbst appliance

A cephalometric investigation

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The possibility of affecting condylar growth in the treatment of Class II malocclusion is still a highly debated subject. Experimental studies on growing monkeys have shown that a functional forward displacement of the mandible can stimulate growth in the condylar cartilage.[1–3] Clinical studies in man, on the other hand, give some contradicting results. Some investigators claim that during activator treatment of Class II malocclusions in children mandibular growth could be stimulated,[4–10] while others are of the opinion that functional therapy has no effect on condylar growth.[11–14] However, when the above-mentioned studies in the animals were compared with those in man, some important differences were noted. In the animal experiments the appliances used were fixed intermaxillary splints with inclined planes forcing the mandible anteriorly during closure. The activator, on the other hand, is a removable appliance used mainly at night and requiring perfect cooperation from the patient.

In 1905 Herbst[15] introduced a fixed appliance for Class II treatment which did not require the patient's cooperation. The appliance kept the mandible in a continuous protruded position both during jaw closure and when the teeth were not in occlusion, for example, all function (speech, chewing, swallowing) was performed with the mandible in an anterior jumped position. Herbst claimed that condylar growth could be stimulated by his method of treatment, but no real proof could be presented.

The aim of the present investigation was to analyze the effect of continuous bite jumping with the Herbst appliance on the occlusion and craniofacial growth during treatment of Class II malocclusions in growing children. The investigation attempted especially to determine whether sagittal mandibular growth could be stimulated by treatment. The effect of continuous bite jumping on the activity of the masticatory muscles will be considered in a later report.

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** For this specific experimental set-up, twenty boys with Class II, Division 1 malocclusion were selected from the patients registered for treatment at the Department of Orthodontics, School of Dentistry, University of Lund. The subjects were divided into a treatment group (Herbst appliance) and a control group, with ten subjects in each group.
Schweregrad	ANB > 4 degrees

Einschluss-kriterien *Bei Review: PICOS*	1. one full-unit Class II molar relationship, 2. skeletal Class II pattern (ANB >4 degrees), 3. deep anterior overbite 4. maximal pubertal growth not yet reached (assessed by a roentgenographic examination of the hand) The dental stage was decisive for group selection. Complete eruption of the maxillary permanent first molars and maxillary and mandibular permanent first premolars was necessary in order for the appliance to be attached to the teeth safely.
Ausschluss-kriterien	-
Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** Treatment with the Herbst appliance: The Herbst appliance is a fixed appliance and works as an artificial joint between the maxilla and the mandible. A telescope mechanism on either side of the jaws attached to bands on maxillary permanent first molars and mandibular permanent first premolars keeps the mandible in a continuous anterior jumped position. Each telescope consists of a tube and a plunger which fit together. The tube is attached to the maxillary molar band and the plunger to the mandibular premolar band. The tube and plunger are attached to their respective bands with screws and can freely rotate around their point of attachment. The length of the tube determines the amount of anterior bite jumping. The length of the plunger is adjusted to the length of the tube. If the plunger is too long, it protrudes behind the tube distally to the maxillary permanent first molar and may injure the buccal mucosa. If the plunger is too short, on the other hand, it may slip out of the tube when the mouth is opened wide. Besides opening movements, small lateral movements of the mandible can be performed with the Herbst appliance. This is possible because of a loose fit of the tube and plunger at their sites of attachment. In construction of the appliance, the overjet determines the amount of anterior bite jumping and the overbite determines the amount of vertical bite opening. In this investigation the construction bite in all cases was taken with the incisors in an edge-to-edge position. fixed time period of 6 months (mean = 6 months, 4 days; S.D. = 5 days) **Kointervention** Cephalometric lateral roentgenograms (before and after treatment period) Dental casts (before and after treatment periods) VERSUCHSGRUPPE: **Herbst appliance** N=10 (Anfang) / N=10 (Ende) / ♂:♀ = 10:0 / Alter 10,6-13,7 Jahre • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung

Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** The control group was followed parallel with the treatment group during the same time period. During that period no orthodontic treatment was performed. **Kointervention** Cephalometric lateral roentgenograms, Dental casts; both age and sex matched KONTROLLGRUPPE: **control** N=10 (Anfang) / N=10 (Ende) / ♂:♀ = 10:0 / Alter 10,1-12,7 Jahre • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: keine kieferorthopädische Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** • **Okklusion, Kaufunktion, Funktion** PRIMÄRZIELGRÖßE: *sagittal relationships (s-n-ss (SNA), s-n-sm (SNB), ss-n-sm (ANB))* SEKUNDÄRZIELGRÖßE: *vertical relationships (*NSL/ML, NSL/NL, NL/ML, n-sp’, sp’-gn) TERTIÄRZIELGRÖßE: *dental relationships (IL(s)/NL, IL(i)/ML)* QUARTÄRZIELGRÖßE: *Mandibular configuration / mandibular length (RL/ML, ß-angle, pgn-cond, Overjet, Overbite)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	1. Normal occlusal conditions occurred in all patients. 2. Maxillary growth may have been inhibited or redirected. The SNA angle was reduced slightly. 3. Mandibular growth was greater than average. The SNB angle increased. 4. Mandibular length increased, probably because of condylar growth stimulation. 5. Lower facial height increased. The mandibular plane angle, however, remained unchanged. 6. The convexity of the soft- and hard-tissue profile was somewhat reduced

Zusammen-fassung der Ergebnisse	**GRUPPE Herbst appliance VS. GRUPPE control** ***PRIMÄRZIELGRÖßE*** In the Herbst appliance group the ANB angle was significantly ($p < 0.001$) reduced (mean = 2.0 degrees; S.D. = 0.5 degree). This was due to a reduction ($p < 0.01$) in the SNA angle (mean = 0.7 degree; S.D. = 0.5 degree) and an increase ($p < 0.001$) in the SNB angle (mean = 1.2 degrees, S.D. = 0.5 degree). On comparison with the control group, the changes seen in the treatment group were significantly larger (SNA: $p < 0.05$; SNB: $p < 0.001$; ANB: $p < 0.001$). ***SEKUNDÄRZIELGRÖßE*** During the examination period the inclination of the mandible (NSL/ML) and the maxilla (NSL/NL) was unchanged in both the treatment and control groups. Lower facial height (sp'-gn) increased an average of 1.8 mm. (S.D. = 0.7 mm.) in the treatment group and 0.7 mm. (S.D. = 0.8 mm.) in the control group. The difference between the groups was statistically significant ($p < 0.01$). The increase in upper facial height (n-sp'), on the other hand, was the same in both groups (mean = 0.8 mm; S.D. = 0.8 mm.). ***TERTIÄRZIELGRÖßE*** The position of the upper incisors (IL(s)/NL) remained unchanged in both groups during the examination period. The lower incisors, on the other hand, proclined considerably in the patients treated with the Herbst appliance. The angle IL(i)/ML increased an average of 5.4 degrees (S.D. = 3.2 degrees), which was statistically significant ($p < 0.001$). In the control group, however, no changes in lower incisor inclination were found. ***QUARTÄRZIELGRÖßE*** The form of the mandible was unaffected by treatment with the Herbst appliance for 6 months. The gonion angle (RL/ML) increased insignificantly (mean = 1.0 degree; S.D. = 6.0 degrees) and the β-angle remained unchanged. Mandibular length (pgn - cond) increased an average of 3.2 mm. (S.D. = 1.1 mm.) in the patients treated with the Herbst appliance. In the control patients the average increase in mandibular length was 1.0 mm. (S.D. = 0.6 mm.). The difference between the groups was statistically significant ($p < 0.001$).
Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	No female subjects investigated. Control group is younger than study group. *Power: limitiert, nicht spezifiziert* *Funding: keine Angabe* *Interessenkonflikte: keine Angabe* The study does not indicate how many of the people asked to take part did so, in each of the groups being studied. No confidence intervals provided. The main potential confounders are not clearly identified and taken into account in the design and analysis.
Schluss-	methodische Qualität: insgesamt akzeptabel

folgerung des Begutachters	Klinische Aussagekraft: bedingt. 1. Maxillary growth may have been inhibited or redirected. The SNA angle was reduced slightly. 2. SNB angle increased 3. Lower facial height increased 4. The convexity of the soft- and hard-tissue profile was reduced.
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN /AMSTAR II)	**Acceptable ⊕**

Evidenztabelle Pancherz 1982

Dr. Pancherz

The mechanism of Class II correction in Herbst appliance treatment

A cephalometric investigation

Hans Pancherz, D.D.S., Odont. Dr.

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Sagittal skeletal and dental changes contributing to Class II correction in Herbst appliance treatment were evaluated quantitatively on lateral roentgenograms. The material consisted of forty-two Class II, Division 1 malocclusion cases. Twenty-two of these were treated with the Herbst appliance for 6 months. The other twenty cases served as a control group. The results of the investigation revealed the following: (1) Bite jumping with the Herbst appliance resulted in Class I occlusal relationships in all treated cases. (2) The improvement in occlusal relationships was about equally a result of skeletal and dental changes. (3) Class II molar correction averaging 6.7 mm. was mainly a result of a 2.2 mm. increase in mandibular length, a 2.8 mm. distal movement of the maxillary molars, and a 1.0 mm. mesial movement of the mandibular molars. (4) Overjet correction averaging 5.2 mm. was mainly a result of a 2.2 mm. increase in mandibular length and a 1.8 mm. mesial movement of the mandibular incisors. (5) Anterior condylar displacement (0.3 mm.), redirection of maxillary growth (0.4 mm.), and distal movement of the maxillary incisors (0.5 mm.) were of minor importance in the improvement in molar and incisor relationships seen. (6) A direct relationship existed between the amount of bite jumping at the start of treatment and the treatment effects on the occlusion and on mandibular growth. For a maximal treatment response, it is suggested that the Herbst appliance be constructed with the mandible jumped anteriorly as much as possible, namely, to an incisal edge-to-edge position. The clinician should be aware of the dental changes occurring during Herbst appliance treatment and make sure that these changes are not incongruous with his over-all treatment goal.

Key words: Bite jumping, Herbst appliance, malocclusion, skeletal changes, dental changes

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** The material consisted of forty-two Class II, Division 1 malocclusion cases. Twenty-two of these were treated with the Herbst appliance for 6 months. The other twenty cases served as a control group.
Schweregrad	Nicht spezifiziert
Einschluss-kriterien *Bei Review: PICOS*	1. a bilateral Class II molar (Divison 1) relationship 2. a deep anterior overbite None of the subjects had passed maximal pubertal growth, as assessed by a radiographic examination of the hand. Control group: with the same type of malocclusion and skeletal morphology as the treated cases
Ausschluss-kriterien	-

Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** Treatment by bite jumping with the Herbst appliance during a time period of 6 months (mean = 6 months 7 days; S.D. = 14 days). The Herbst appliance is a fixed functional appliance working as an artificial joint between the maxilla and the mandible. A telescope mechanism on either side of the jaw, attached to orthodontic bands, keeps the mandible continuously in an anterior jumped position during all mandibular functions. The telescope tube was attached to the maxillary permanent first molar band and the telescope plunger to the mandibular first premolar band. Anchorage in the upper dental arch was the same in all cases, consisting of a lingual or buccal sectional arch wire connecting the first molar to the first premolar. Anchorage in the lower dental arch consisted in Cases 1 to 18 of a lingual arch wire connecting the first premolars. In Cases 19 to 22 lower anchorage was increased by extending the lingual wire to the first permanent molars. At the start of treatment, the mandible in each patient was jumped anteriorly to an edge-to-edge position between the central or lateral incisors. In this way the dental arches were placed in a Class I or overcorrected Class I relationship with the posterior teeth out of occlusion. **Kointervention** In the treatment group roentgenograms (cephalogram lateral) were taken before treatment; at the start of treatment, when the appliance was inserted; and after 6 months of treatment, with the appliance removed. VERSUCHSGRUPPE: **Herbst appliance** N=22 (Anfang) / N=22 (Ende) / Alter = 12 yrs. 1 month ± 11 months / ♂:♀ = 19:3 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** The control subjects were followed on a parallel basis with the treated subjects during a time period of 6 months (mean = 6 months 6 days; S.D. = 11 days). **Kointervention** In the control group profile roentgenograms were taken before and after the examination period of 6 months. KONTROLLGRUPPE: **control** N=20 (Anfang) / N=20 (Ende) / Alter = 11 yrs. 2 months ± 9 months / ♂:♀ = 17:3 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: keine kieferorthopädische Behandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** • **Okklusion, Kaufunktion, Funktion** PRIMÄRZIELGRÖßE: *Dentofacial morphology (SNA, SNB, ANB; ML/NSL, NL/NSL, ML/NL, OL/NSL)* SEKUNDÄRZIELGRÖßE: *Cephalometric records (Overjet, Molar relation, Maxillary base, Mandibular base, Condylar head, Mandibular length, Maxillary incisor, Mandibular incisor, Maxillary molar, Mandibular molar)* TERTIÄRZIELGRÖßE: *Changing in cephalometric records (Overjet, Molar relation, Maxillary base, Mandibular base, Condylar head, Mandibular length, Maxillary incisor, Mandibular incisor, Maxillary molar, Mandibular molar)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	1. Six months of treatment resulted in Class I dental arch relationships in all twenty-two cases. 2. The improvement in occlusal relationships was about equally a result of skeletal and dental changes 3. Class II molar correction was mainly the result of an increase in mandibular length, distal movement of the upper molars, and mesial movement of the lower molars. 4. Overjet correction was mainly the result of an increase in mandibular length and mesial movement of the lower incisors. 5. The restraining effect of treatment on maxillary growth, distal movement of the maxillary incisors and anterior condylar displacement was of minor importance for the improvement in occlusal relationship seen. 6. A direct relationship existed between the amount of bite jumping at the start of treatment and the treatment effects on the occlusion and on mandibular growth For a maximal treatment response, it is suggested that in contruction of the Herbst appliance the mandible should be jumped anteriorly as much as possible, namely, to an incisal edge-to-edge position. The clinician should be aware of the dental changes occurring during Herbst appliance treatment and consider these changes when designing his treatment strategy and planning posttreatment retention.

Zusammen-fassung der Ergebnisse	**GRUPPE Herbst appliance VS. GRUPPE control** ***PRIMÄRZIELGRÖßE*** The angle ML/NSL was, on the average, unchanged during the examination period ***SEKUNDÄRZIELGRÖßE*** Molar correction was mainly accomplished by an increase in mandibular length, distal movement of the maxillary molars and mesial movement of the mandibular molars. Overjet correction was also largely a result of an increase in mandibular length in combination with mesial movement of the lower incisors. With insertion of the Herbst appliance at the start of treatment, the mandible was jumped anteriorly (measured at the pg point) an average of 6.7 mm. (4.5 mm.-11.5 mm.). During treatment an average of 3.6 mm. (54 percent) of the original bite jumping “relapsed”. ***TERTIÄRZIELGRÖßE*** Molar correction was mainly accomplished by an increase in mandibular length, distal movement of the maxillary molars and mesial movement of the mandibular molars. Overjet correction was also largely a result of an increase in mandibular length in combination with mesial movement of the lower incisors. With insertion of the Herbst appliance at the start of treatment, the mandible was jumped anteriorly (measured at the pg point) an average of 6.7 mm. (4.5 mm.-11.5 mm.). During treatment an average of 3.6 mm. (54 percent) of the original bite jumping “relapsed”.
Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Power: limitiert, nicht spezifiziert* *Funding: nicht angegeben* *Interessenkonflikte: nicht angegeben* The study does not indicate how many of the people asked to take part did so, in each of the groups being studied. No confidence intervals.
Schluss-folgerung des Begutachters	methodische Qualität: insgesamt akzeptabel
	Klinische Aussagekraft: The improvement in occlusal relationships was about equally a result of skeletal and dental changes**.** Class II molar correction was mainly the result of an increase in mandibular length, distal movement of the upper molars and mesial movement of the lower molars. Overjet correction was mainly the result of an increase in mandibular length and mesial movement of the lower incisors.
Evidenz-level (SIGN)	**2+**
Qualität **(RoB, SIGN /AMSTAR II)**	**Acceptable ⊕**

Evidenztabelle Pangrazio et al. 2012

Treatment effects of the mandibular anterior repositioning appliance in patients with Class II skeletal malocclusions

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ABSTRACT

Objective: To examine the changes produced by the mandibular anterior repositioning appliance (MARA) appliance and compare the treatment effects to an untreated Class II control group.

Materials and Methods: Thirty consecutively treated patients were matched with an untreated control group. Lateral cephalograms were taken at T1, 5 months pre-MARA (CVMS 2.7); T2, immediately after MARA removal and prior to placement of full fixed edgewise appliances (CVMS 4.2); and T3, at least 2 years after MARA removal and completion of edgewise treatment (CVMS 5.4). The mean age of the MARA patients was 11.9 years for boys and 10.8 years for girls. Repeated-measures analysis of variance (ANOVA) was used to assess if the samples were morphologically comparable at the outset and to test if there were significant differences between the groups for the various increments of change. Given a significant ANOVA, the source of the difference was explored via Tukey-Kramer tests.

Results: Restriction of maxillary growth and no significant mandibular growth were observed with the MARA appliance. The Class II correction was obtained mainly by slight maxillary molar distalization and intrusion, in addition to mesial migration of the lower molars and flaring of the lower incisors. No vertical effect was observed with this appliance.

Conclusion: The MARA appliance was effective in the treatment of Class II malocclusions. Restriction of maxillary growth and dentoalveolar changes in the maxillary and mandibular arches were responsible for the correction of the Class II malocclusion. Significant mandibular growth did not contribute to this correction. (*Angle Orthod.* 2012;82:971–977.)

KEY WORDS: MARA; Maxillary growth restriction; Dentoalveolar changes; Molar distalization

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** Treated group: 30 consecutively treated patients involving 12 boys and 18 girls with MARA (mandibular advancement appliance) and later fixed appliance (edgewise). The control group was composed of 21 subjects from the Michigan Growth Study who conformed to the inclusion criteria. They were matched to the MARA group by skeletal age and their skeletal characteristics.
Schweregrad	SNA: 80° to 84°, SNB < 76°, ANB > 4.5°, SN-GoGn 30° to 35°
Einschluss-kriterien *Bei Review: PICOS*	1. SNA: 80° to 84°, 2. SNB < 76°, 3. ANB > 4.5°, 4. SN-GoGn 30° to 35°, 5. Class II molar relation, 6. Easily identifiable cephalometric landmarks
Ausschluss-kriterien	-

Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** Treatment with MARA, mandibular anterior repositioning appliance (MARA). This device was used concomitantly with full fixed appliances while the skeletal correction is being achieved. Some patients were treated with upper partial fixed appliances to increase the overjet and decrease the overbite prior to the MARA therapy. A stepwise advancement protocol of 2–3 mm every 2–3 months was used until the overjet was slightly overcorrected. Full edgewise brackets were placed at the time of the MARA removal. The mean treatment time interval with the MARA (T1–T2) was 1.3 years +- 6 months, the mean T2–T3 interval with full edgewise treatment was 1.5 years +- 3.2 months, and the mean T1–T3 time interval was 3.5 years +- 6 months. Two orthodontists, who shared the same treatment approach with the MARA, treated these patients. **Kointervention** - Lateral cephalometric x-rays were taken at T1 (5 months pre-MARA), T2, immediately after MARA removal and prior to placement of full fixed edgewise appliances, after completion of edgewise treatment (T3). VERSUCHSGRUPPE: **MARA** N=30 (Anfang) / N=30 (Ende) / ♂:♀ = 12:18 / Alter = ♂ 11,9 (10y2m-14y4m) :♀ 10,8 (8y0m-13y6m) • Gebissphase: Ruhephase, frühes Wechselgebiss bis permanentes Gebiss <18 • KFO-Behandlung: Frühbehandlung bis reguläre Behandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** The control group was composed of 21 subjects from the Michigan Growth Study who conformed to the inclusion criteria. They were matched to the MARA group by skeletal age and their skeletal characteristics. **Kointervention** Age-matched lateral cephalograms KONTROLLGRUPPE: **control** N=21 (Anfang) / N=21 (Ende) / Alter = age-matched • Gebissphase: Ruhephase, frühes Wechselgebiss bis permanentes Gebiss <18 • KFO-Behandlung: keine Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** • **Okklusion, Kaufunktion, Funktion** *PRIMÄRZIELGRÖßE: Maxillary Dental/Skeletal (SNA, Co-A pt, A-Nperp, U1-FH, U6-PTV, U6-PP)* *SEKUNDÄRZIELGRÖßE: Mandibular Dental/Skeletal (SNB, Gonial angle, Co-Go, Go-Gn, Co-Gn, SN-GoGn, Pog-Nperp, IMPA, L6-Crown-symphysis)* *TERTIÄRZIELGRÖßE: Intermaxillary Dental/Skeletal (ANB, Wits, Overjet, SN-Occl Pl.)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**

Schluss-folgerungen der Autoren	The MARA was effective in the treatment of the Class II malocclusions by: 1. Maxillary growth restriction, slight maxillary molar distalization, and intrusion 2. No significant effect on mandibular growth 3. Mesial migration of the lower molars and flaring of the lower incisors 4. No significant vertical changes 5. Restriction of maxillary growth and dentoalveolar changes in the maxillary and mandibular arches, without a significant effect on mandibular growth, were responsible for the correction of Class II malocclusion

Zusammen-fassung der Ergebnisse	**GRUPPE MARA VS. GRUPPE control** ***PRIMÄRZIELGRÖßE*** When comparing the differences between the MARA and the control groups, all of the maxillary skeletal measurements showed no statistically significant differences at any of the time intervals studied. However, a slight growth restriction was observed over time The upper incisors were flared after MARA treatment (T2–T1), but their inclination was not significantly different from the controls after edgewise therapy (T3– T2) and over the entire observation period (T3–T1). The horizontal position of the upper molars (U6- PTV) was not significantly different between the treatment and control groups after MARA therapy (T2–T1). When the differences were examined longterm (T3–T1), the control group showed a larger mesial displacement of the upper molars (6.19 mm), which paralleled the anterior growth of the maxilla (CoApt, 5.94 mm). In the MARA sample, the mesial displacement of the molars (3.23 mm) was less than that of the anterior displacement of the maxilla (CoApt, 4.26 mm), thus indicating a restrictive effect on anterior molar movement. The vertical distance of the upper molars to the palatal plane (U6-PP) was significantly larger in the MARA group than the controls at T1. This difference decreased 1.3 mm after MARA treatment (T2–T1) when compared with the controls. Therefore, a restraining effect on molar eruption occurred during MARA treatment. This effective intrusion was maintained during the edgewise phase (T3–T2) and longterm (T3–T1). ***SEKUNDÄRZIELGRÖßE*** The SNB angle decreased 1.04° during MARA treatment (T2–T1) for an overall decrease of 1.5° (T3–T1). The mandibular length (Co-Gn) showed a slight decrease during the MARA treatment (T2–T1). A larger increment of growth (1.9 mm) was observed during the edgewise phase (T3–T2), resulting in a slight nonsignificant increase in total mandibular length of 1.0 mm from T3–T1. However, corpus length (Go-Gn) increased during all the time points studied for a total change of 3.05 mm. The distance of Pog-Nperp decreased 4.47 mm, indicating an anterior displacement of the mandible. The SN-GoGn showed an increase of 1.92° after MARA therapy (T2–T1). This initial increase was reduced at T3 for a total overall change of 1.12° (T3– T1). The 1.5° decrease in SNB could be attributed to the opening of the mandibular plane angle. The lower incisors (IMPA) flared significantly 4.88° during MARA treatment (T2–T1). This initial flaring was corrected during the edgewise phase (T3–T2) and remained stable thereafter (T3–T1), for a nonsignificant difference of 2.81° from the controls. A 2-mm mesial movement of the lower molars (L6-Crownsymphysis) was observed with the MARA treatment (T2–T1) and at the end of the observation period (T3– T1), which paralleled the flaring of the lower incisors. ***TERTIÄRZIELGRÖßE*** The ANB angle had a statistically significant reduction with the MARA treatment (T2–T1). No statistically significant differences were found between the groups overtime. The Wits appraisal did not change significantly from the controls at all time points studied, during MARA treatment (T2–T1). The overjet showed a statistically significant decrease of 2.3 mm immediately after MARA treatment (T2–T1), for a total decrease of 1.93 mm long-term (T3–T1) when compared with the controls. The SNOcc Pl increased significantly during MARA treatment (T2–T1). During the edgewise phase (T3–T2), there were no statistically significant differences in the amount of change between the groups. When the changes in the occlusal plane were evaluated longterm (T3–T1), a significantly steeper occlusal plane remained in the MARA sample.

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	Keine Geschlechterspezifizierung der Control-Gruppe, ledigilich die Angabe „age-matched“. *Power der Studie/Patientenzahl:* limitiert *Funding:* keine Angabe *Interessenkonflikte:* keine Angabe The study does not indicate how many of the people asked to take part did so, in each of the groups being studied. No confidence intervals provided.
Schluss-folgerung des Begutachters	methodische Qualität: insgesamt gut
	Klinische Aussagekraft: MARA probably restricts the maxillary growth with a slight maxillary molar distalization. Mesial migration of lower molars. Multiple dentoalveolar changes.
Evidenz-level (SIGN)	**2+**
Qualität **(RoB, SIGN /AMSTAR II)**	**Acceptable ⊕**

Evidenztabelle Papadopoulos, Melkos et al. 2010

Noncompliance maxillary molar distalization with the First Class Appliance: A randomized controlled trial

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Introduction: The aim of this study was to evaluate the treatment effects of the First Class Appliance (FCA) (Leone, Firenze, Italy) used for the distalization of maxillary first molars in patients with Class II malocclusion and mixed dentition. **Methods:** According to the results of the power analysis for sample size calculation, 32 consecutive patients with bilateral Class II molar relationships were initially included in the study. After application of the inclusion and exclusion criteria, 26 patients remained for the final evaluation. They were randomized into 2 groups: treatment group (n = 15) and untreated control group (n = 11). Lateral cephalograms and dental casts were obtained before and immediately after distalization for the treatment group, and initially and approximately 22 weeks later for the control group. Statistical evaluation of the variables included the mixed 2-way analysis of variance at $P < 0.05$. The method error was also estimated. **Results:** The mean treatment period to achieve a full Class I molar relationship was 17.2 weeks. Analysis of the data showed significant distalization of the maxillary first molars produced by the FCA (mean: 4.00 mm) when compared with the untreated group (mean: 0.95 mm). The rate of molar movement was 1.00 mm per month, which, however, was associated with distal tipping of the first molars (8.56°) and anchorage loss of the anterior dental unit in terms of overjet increase (0.68 mm), and mesial movement (1.86 mm) and inclination (1.85°) of the first premolars or first deciduous molars. The maxillary first molars also moved buccally (1.37 mm), but no significant distal rotation occurred. **Conclusions:** The FCA is an efficient noncompliance appliance to distalize molars in the mixed dentition without distal rotations. However, these movements are associated with distal molar tipping and anchorage loss of the anterior teeth. (Am J Orthod Dentofacial Orthop 2010;137:586.e1-586.e13)

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** • patients with Class II malocclusion • All patients were in the mixed dentition and were treated at the Department of Orthodontics, School of Dentistry, Aristotle University of Thessaloniki in Greece
Schweregrad	Class II molar relationships (quarter to 1 molar cusp
Einschluss-kriterien *Bei Review: PICOS*	• all patients had bilateral Class II molar relationships (quarter to 1 molar cusp)
Ausschluss-kriterien	1. past orthodontic treatment 2. crossbites 3. severe carious lesions 4. poor oral hygiene 5. mobility of the maxillary deciduous second molars 6. flat palate 7. ectopic maxillary canines 8. anterior open bites 9. vertical growth pattern 10. tongue habits

Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** Treatment with the First Class Appliance (FCA) (Leone, Firenze, Italy) used for the distalization of maxillary first molars in patients. The FCA consists of 4 bands (2 on the maxillary first molars and 2 on either the second deciduous molars or the maxillary second premolars), 2 buccally positioned activation screws (10 mm long) that are soldered to the first molar bands and seated into closed rings welded to the second deciduous molar or the second premolar bands, two 0.010 X 0.045-in palatally positioned open nickel-titanium coil springs (10 mm long), buccal and palatal tubes, and a large modified Nance butterflyshaped button. Two 0.045-in wires embedded in the acrylic connect the Nance button with the bands. These wires are soldered to the palatal surfaces of the second deciduous molar or the premolar bands and placed into 0.045-in tubes welded to the palatal surfaces of the first molar bands. The Nance button is large to enhance anchorage control during the active phase of treatment and the retention phase that follows. The open nickel-titanium coil springs are fully compressed between the solder joint on the second deciduous molar or the premolar bands and the tube on the first molar bands. The patients’ guardians activated the appliance by turning the buccally positioned screws a quarter turn in a counterclockwise direction once a day (widening of 0.1 mm). Distal molar movement takes place in a ‘‘double-track’’ system that might prevent rotation of the molars. The palatally positioned nickel-titanium coil springs deliver a force of 200 g. However, the amount of force is not of significant importance because the activation of the coil springs just follows and is limited by the activation of the buccally positioned screws; thus, the springs do not play an active role during molar distalization. The continuous forces exerted by the springs aim to counterbalance the action of the screws, preventing molar rotation during distalization. After banding the FCA, activation of the left and right screws of a quarter turn per day (0.1 mm lengthening) was instructed. After distalization, the FCA could be modified to a Nance button for retention. However, in this study and for oral-hygiene reasons, it was decided to remove the appliance after distalization and replace it with a new Nance button, acting as a retention device until eruption of all permanent teeth. Kointervention Lateral cephalometric radiographs and dental casts were obtained for the treatment group before and immediately after distalization and approximately 22 weeks later (mean age at start, 9.7 years). VERSUCHSGRUPPE: **First class appliance** N=16 (Anfang) / N=15 (Ende) / Alter = 9,2 ± ?? Jahre / ♂:♀ = 8:7 • Gebissphase: Ruhephase, frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Therapie** **Kointervention** Lateral cephalometric radiographs and dental casts were obtained for the treatment group before and immediately after distalization and approximately 22 weeks later (mean age at start, 9.7 years). KONTROLLGRUPPE: **untreated/control** N=11 (Anfang) / N=11 (Ende) / Alter = 9,7 ± ?? Jahre / ♂:♀ = 5:6 • Gebissphase: Ruhephase, frühes Wechselgebiss • KFO-Behandlung: keine Therapie

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** • **Okklusion, Kaufunktion, Funktion** PRIMÄRZIELGRÖßE: *Skeletal sagittal and vertical measurements (SNA, SNB, ANB, Sn-palatal plane, SN-mandibular plane, SN-occlusal plane)* SEKUNDÄRZIELGRÖßE: *Dentoalveolar angular, linear sagittal and vertical measurements (SN-6/, SN-5/ or SN-E/, SN-1/, PTV-6/ centroid, PTV-5/ or PTV-E/ centroid, PTV-1/, Overjet, Palatal-plane-6/ centroid, Palatal-plane-5/ or palatal-plane-E/ centroid, Palatal-plane-1/, Overbite)* TERTIÄRZIELGRÖßE: *Dental cast variables (6/-RP; 5/-RP or E/-RP, 6/-ML, 6/-ML, 6/-ML rotation, 1/-RP)*
Studientyp	**Randomized controlled trial (RCT)**
Schluss-folgerungen der Autoren	According to the results of this study, it can be concluded, the FCA is an efficient appliance to distalize the maxillary first molars in patients with Class II malocclusion in the mixed dentition without patient compliance. This distalization takes place without distal rotation and extrusion of the molars and with minimal, nonsignificant proclination of the incisors. However, distal tipping of the molar crowns, and mesial movement and proclination of the premolars are associated with its use; these are side effects similar to those produced with other noncompliance distalization appliances.
Zusammen-fassung der Ergebnisse	**First class appliance VS. Control/untreated** ***PRIMÄRZIELGRÖßE*** Changes in skeletal sagittal and vertical variables are not significant. ***SEKUNDÄRZIELGRÖßE*** Statistical elaboration of our data showed significant distalization of the maxillary first molars produced by the FCA (mean: 4.00 mm) compared with the untreated group (mean: 0.04 mm) (P = 0.000). The rate of molar movement was 1.00 mm per month, associated with significant distal tipping of the first molars (8.56°, P = 0.000), anchorage loss of the anterior dental unit with an increase of overjet (0.68 mm, P = 0.039), and mesial movement (1.86 mm, P = 0.001) of the first premolars or first deciduous molars. The corresponding changes of maxillary first molar movement for the untreated group were 0.04 and 0.39 mm, respectively. ***SEKUNDÄRZIELGRÖßE*** In detail, this anterior anchorage loss after use of the FCA was expressed as a significant increase of overjet of 0.68 mm compared with the patients' pretreatment condition; however, this effect was not significant when evaluating the corresponding variable (1-RP) on dental casts. In addition, nonsignificant mesial movement of the incisors on the cephalograms (1.60 mm) and the dental casts (0.06 mm), and proclination of the incisors (2.00) were evident in relation to the patients' pretreatment condition and the changes in the control group (0.28 mm, –0.28 mm, and 0.45, respectively).

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Power der Studie/Patientenzahl:* The sample size of this investigation was calculated with a power analysis that evaluated the primary hypothesis concerning the interaction effect (time 3 group) with η^2 = 0.1, correlation coefficient = 0.5, and probability of type I error, α = 0.05. The power analysis showed that 26 patients were needed to achieve 89% power to detect clinically meaningful differences of the tooth movements between the 2 groups. To compensate for possible dropouts during the trial, we decided to enroll more patients. *Funding:* The authors report no commercial, proprietary, or financial interest in the products or companies described in this article. *Interessenkonflikte:* The authors report no commercial, proprietary, or financial interest in the products or companies described in this article. The method of randomisation is not mentioned. The exact adequate concealment method is not mentioned.
Schluss-folgerung des Begutachters	methodische Qualität: insgesamt gut
	Klinische Aussagekraft: The FCA kann probably distalize the maxillary first molars in patients with class-II-malocclusions. Overjet increases.
Evidenz-level (SIGN)	**1+**
Qualität (RoB, SIGN /AMSTAR II)	**Acceptable ⊕**

Evidenztabelle Papageorgiou, S. N. et al., 2017

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Systematic Review

Effectiveness of early orthopaedic treatment with headgear: a systematic review and meta-analysis

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Summary

Background: Although the headgear appliance has been used extensively to correct anteroposterior discrepancies, its treatment effects have not yet been adequately assessed in an evidence-based manner.

Objective: Aim of this systematic review was to assess the therapeutic and adverse effects of early headgear treatment from controlled clinical trials on human patients in an evidence-based manner.

Search methods: An unrestricted electronic search of six databases from inception to December 2015.

Selection criteria: Randomized and prospective non-randomized controlled trials assessing the effects of headgear treatment on human patients.

Data collection and analysis: After duplicate study selection, data extraction, and risk of bias assessment according to the Cochrane guidelines, random-effects meta-analyses of mean differences (MDs) and relative risks (RRs), including their 95% confidence intervals (CIs) were performed, followed by subgroup and sensitivity analyses.

Results: A total of 18 unique studies with a total of 930 (56% male/44% female) patients were included. Headgear treatment was associated with a posterior translation of the anterior maxilla border in the short term, as seen by the mean annualized change in the SNA angle (MD = −1.62°/year; 95% CI = −2.20 to −1.06°/year; high quality evidence) compared to untreated patients. This effect was independent of the rotation of the palatal plane and the inclination of the upper incisors, while a proportional relationship with the initial discrepancy in SNA was seen. The clinical significance of this improvement diminished in the long term, although only limited evidence existed. Additionally, early headgear treatment might decrease the risk of dental trauma during the following years (RR = 0.34; 95% CI = 0.14 to 0.80; moderate quality evidence). Low quality evidence on the effect of headgear on the rotation of the palatal plane, the nasolabial angle, the occlusal outcome, and signs of temporomandibular disorders precluded robust assessments, due to risk of bias, inconsistency, imprecision, and small-study effects.

Conclusions: Based on existing trials, headgear is a viable treatment option to modify sagittal growth of the maxilla in the short term in Class II patients with maxillary prognathism.

Registration: PROSPERO (CRD42015020637).

Funding: None.

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** • Human Class II patients
Schweregrad	nicht angegeben und unterschiedlich für verschiedene Einzelstudien (Overjet, ANB, oder nicht angegeben)
Einschluss-kriterien *Bei Review: PICOS*	• Population: Human Class II patients • Intervention: Any kind of headgear attached intraorally at band or biteplane tubes; Any kind of headgear combined to a fixed orthodontic appliance (but only if the control group received also the same orthodontic appliance without the headgear) – nur 1/18 Studien, nicht LL-relevant • Comparison: Class II untreated patients • Outcome: PRIMÄRZIELGRÖßE: cephalometric measurements (SNA, inclination of the palatal plane (SN-NL and FH-NL), sagittal position of the A point (Co-A and Nperp-A), nasolabial angle) SEKUNDÄRZIELGRÖßE: non-cephalometric measurements (incidence of dental trauma, Peer assessment rating PAR index, temporomandibular joint pain) TERTIÄRZIELGRÖßE: Effect of headgear treatment on quality of life QUARTÄRZIELGRÖßE: Adverse effects (effect on upper airways, temporomandibular disorders, root resorption, dental trauma, etc) • Study type: parallel randomized or prospective non-randomized controlled trials
Ausschluss-kriterien	1. non-clinical studies, retrospective studies, Case reports/ case series, Systematic reviews (checked for additional studies) 2. studies where headgear was combined with other appliancess 3. studies with purely dental effects of headgear (including molar distalization, tooth retraction, anchorage reinforcement, etc)
Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** VERSUCHSGRUPPE: **Any kind of headgear attached intraorally at band or biteplane tubes** N=?? (Anfang) / N=?? (Ende) / Alter = 8,4-12,9 Jahre / ♂:♀ = ?:? • Gebissphase: frühes & spätes Wechselgebiss • KFO-Behandlung: Frühbehandlung, reguläre Behandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Therapie** KONTROLLGRUPPE: **Class II untreated patients** N=?? (Anfang) / N=?? (Ende) / Alter = 8,3-12,6 Jahre / ♂:♀ = ?:? • Gebissphase: frühes & spätes Wechselgebiss • KFO-Behandlung: keine Behandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** • **Okklusion, Kaufunktion, Funktion** • **Traumaprophylaxe (dentales Frontzahntrauma)** • **Reduktion eines weiteren Therapiebedarfs** PRIMÄRZIELGRÖßE: cephalometric measurements (SNA, inclination of the palatal plane (SN-NL and FH-NL), sagittal position of the A point (Co-A and Nperp-A), nasolabial angle) SEKUNDÄRZIELGRÖßE: non-cephalometric measurements incidence of dental trauma (incidence of dental trauma, Peer assessment rating PAR index, temporomandibular joint pain) TERTIÄRZIELGRÖßE: Effect of headgear treatment on quality of life QUARTÄRZIELGRÖßE: Adverse effects (effect on upper airways, temporomandibular disorders, root resorption, dental trauma, etc)
Studientyp	**Systematisches Review mit Meta-Analyse** Inkludierte Studien in Bezug auf PICO: 5 RCTs, 12 prospective non-randomized clinical trials N=17 (laut Review 18, aber eine Studie (pCCT) mit nicht LL-relevanter Kontrollgruppe) Gesamt-Teilnehmerzahl in Bezug auf PICO: **N=875** für 17 LL-relevante Studien (N=930 für 18 Studien)
Schluss-folgerungen der Autoren	Based on high quality evidence, headgear treatment is associated with a **short-term reduction of the SNA angle**, which is **independent of confounding effects on the subspinale point and is proportional to the degree of the initial discrepancy in the SNA** angle. Therefore, headgear might seem like a viable and effective treatment option for the management of Class II malocclusion **with maxillary prognathism**. Based on evidence of moderate quality, treatment with headgear **might decrease the risk of dental trauma** during the subsequent years, so this should be taken into account when planning the Class II treatment of patients in high risk of dental trauma. The effect of headgear on the maxillary rotation, the nasolabial angle, the reduction in PAR scores, and signs of temporomandibular disorders could not be robustly assessed, due to limited evidence of low quality. Recommendations for further research **Parallel randomized controlled trials or well-designed prospective non-randomized trials with blinded outcome assessment** are needed in order to robustly assess the effects of headgear treatment for Class II malocclusion, especially in the long term. Primary focus should be thrown into **objective measurements** of therapeutic effects (such as patient satisfaction and quality of life, the quality of final occlusion measured with the American Board of Orthodontics Objective Grading System, treatment duration, and relapse) or adverse effects (including effect on upper airways, signs of temporomandibular disorders, root resorption, oral discomfort, functional impairment, and cost of treatment).

Zusammen-fassung der Ergebnisse	**Any kind of headgear attached intraorally at band or biteplane tubes VERSUS Class II untreated patients** **cephalometric measurements (SNA, inclination of the palatal plane (SN-NL and FH-NL), sagittal position of the A point (Co-A and Nperp-A), nasolabial angle):** *Subgruppenanalyse:* *A. Baseline: age, m/f ratio, baseline SNA, baseline SN-NL, baseline 1s-NL* *B. Treatment factors* *a. Force magnitude* *b. Force direction: high-pull, cervical, combination* *c. Appliance: bands, biteplane* *Zeitpunkt/ Zeitraum des Vergleiches:* *1. Early treatment* *2. Late treatment* Zeitraum: 1. the early headgear treatment: **significant reduction in the SNA** angle (MD = −1.63°/year; 95% CI = −2.20 to −1.06°/year), a **significant posterior rotation of the palatal plane** (SN-NL and FH-NL angles), and a **significant backward repositioning of the anterior maxilla border** (Co-A and Nperp-A distances), while **no effect on the nasolabial** angle was found 2. long-term cephalometric effects after a subsequent phase 2 fixed appliance treatment: headgear treatment was associated with a **minimal reduction in the SNA angle** (MD = −0.14°/year; 95% CI = −0.26 to −0.02°/year) and a **considerable retraction of the anterior maxilla border** (measured with Co-A and Nperp-A; SMD = −0.46/year; 95% CI = −0.75 to −0.17/year) Subgruppen: B. **no statistically significant modifying effects could be found regarding age, gender, force magnitude, and appliance** (bands or biteplanes). However**, increased posterior rotation of the maxilla was found for cervical headgear compared to combiheadgear or high-pull headgear** (SMD of 1.50 compared to 0.87 and 0.11, respectively). Although the difference in the magnitude of the effects was clinically significant, **no statistical significance** was reached, presumably due to the small number of contributing studies. A. Explorative analysis of the **effect of baseline SNA on the treatment-induced annual SNA reduction** among headgear patients based on re-analysis of raw trial data revealed a statistically significant modifying effect (coefficient = −0.18; 95% CI = −0.25 to −0.10). Based on these data, stratified metaanalysis of the three trials with available raw data selecting patients with increasing SNA showed that the annual reduction in SNA compared to the no-treatment group **increases proportionally to the initial SNA discrepancy** (Supplementary Table 9). This indicates that the skeletal effects of headgear might be more pronounced, when used in patients with an increased degree of maxillary prognathism.

	non-cephalometric measurements (incidence of dental trauma, Peer assessment rating PAR index, temporomandibular joint pain): Regarding non-cephalometric outcomes, headgear treatment was associated with a **statistically significant, but clinically irrelevant**, **reduction** in the peer assessment rating (**PAR) index** and a **slight reduction in the incidence of dental trauma and temporomandibular joint pain, both of which were not statistically significant.** Finally, **headgear treatment was associated with a reduction in the risk of dental trauma during the phase 2 fixed appliance treatment** (RR = 0.34; 95% CI = 0.14 to 0.80). The NNT (i.e. = 9) indicated that an additional dental trauma incident during the fixed appliance phase would be avoided for every nine patients that were treated early with headgear.
Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign: PROSPERO-Registrierung a priori, umfangreiche Literaturrecherche, detaillierte Beschreibung der PICOS, gut durchgeführte Meta-Analyse mit verschiedenen Tests möglicher Bias, nur RCTs & pCCT – keine retrospektiven Studien zur Verringerung der RoB* *Durchführung: Literatursichtung und Datenextraktion durch zwei unabhängige Auswerter, final vorwiegend zwei Outcomes analysiert – Tertiär-/Quartäroutcomes nur im Supplementary material erwähnt* *Auswertung: comparison schließt neben unbehandelten Patienten acu Patienten mit einer festsitzenden Appratur ohne Headgear ein – Auswertung könnte dadurch verzerrt sein* *Power der Studie/Patientenzahl: 17/875 (für alle LL-relevanten Studien, sonst 18/930)* *Funding:* No funding specific for this research project. Mr. Papageorgiou, Dr. Gölz, and Dr. Memmert have received funds in the past from the Clinical Research Unit 208; no role on any stage with the current research project. *Interessenkonflikte:* None. *Bias (SIGN/AMSTAR/EinzelstudienRoB – alle negativen Punkte aus Fragebogen auflisten):* **10. Did the review authors report on the sources of funding for the studies included in the review?** **11. If meta-analysis was performed did the review authors use appropriate methods for st combination of results? – No only for NRSI** *Publikationsbias (Reviews):* **No signs of bias were found for the SNA** angle (Egger's coefficient = −0.04; 95% CI = −5.25 to 5.17; *P* = 0.986). However, s**ignificant** signs of reporting bias were seen for the **combined SN-NL & FH-NL analysis** (Egger's coefficient = 5.18; 95% CI = 1.61 to 8.75; *P* = 0.009), which indicated that small/imprecise studies tend to exaggerate the effects of headgear treatment on maxillary inclination (i.e. **'small-study effects'**). When looking at the most precise third of the available studies through a *post hoc* stratified analysis, a considerably smaller and clinically irrelevant effect of headgear treatment on the maxillary inclination was seen (Supplementary Figure 2).
Schluss-folgerung	methodische Qualität: Review sehr gut, Einzelstudien unterschiedlich je nach Studiendesign (pCCT high RoB, 4/5 RCT mit je einer high RoB-Domäne

des Begutachters	Klinische Aussagekraft: Der Headgear scheint, v.a. im short-term, in Klasse-II-Patienten die skelettale Anomalie effektiv zu beheben, indem es zu einer Wachstumshemmung der Maxilla kommt. Dabei korreliert das Ausmaß der Korrektur (der SNA-Verkleinerung) vermutlich mit der ursprünglichen Ausprägung der OK-Prognathie (SNA): je prognather der Oberkiefer, desto größer die SNA-Verkleinerung durch eine Headgear-Therapie. Darüber hinaus ist zu vermuten, dass die Headgear-Behandlung auch zu einer Abnahme des PAR-Indexes, des FZ-Trauma-Risikos und CMD-Beschwerden. Aufgrund unzureichender Datenlage der Einzelstudien kann diesbezüglich aber keine definitive Aussage getroffen werden.
Evidenz-level (SIGN)	**1+**
Qualität (RoB, SIGN /AMSTAR II)	**Moderat ⊕⊕**

Evidenztabelle Pavoni et al. 2017

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OSAHS

Orthopaedic treatment effects of functional therapy on the sagittal pharyngeal dimensions in subjects with sleep-disordered breathing and Class II malocclusion

Effetti del trattamento ortopedico-funzionale sulle dimensioni sagittali faringee in soggetti con disturbi respiratori del sonno e malocclusione di Classe II

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SUMMARY

The purpose of this cephalometric study was to evaluate the craniofacial changes induced by functional treatment of mandibular advancement with special regard to pharyngeal sagittal airway dimensions, tongue and hyoid bone position in subjects with sleep-disordered breathing (SDB) and dentoskeletal Class II malocclusions compared with an untreated Class II control group. 51 subjects (24 female, 27 male; mean age 9.9 ± 1.3 years) with Class II malocclusion and SDB consecutively treated with a functional appliance (Modify Monobloc, MM) were compared with a control group of 31 subjects (15 males, 16 females; mean age: 10.1 ± 1.1) with untreated Class II malocclusion. For the study group, mode of breathing was defined by an otorhinolaryngologist according to complete physical examination. The parents of all participants completed a modified version of the paediatric sleep questionnaire, PSQ-SRBD Scale, by Ronald Chervin (the Italian version in 22 items form) before and after the trial. Lateral cephalograms were available at the start and end of treatment with the MM. Descriptive statistics were used for all cephalometric measurements in the two groups for active treatment changes. Significant, favourable skeletal changes in the mandible were observed in the treated group after T2. Significant short-term changes in sagittal airway dimensions, hyoid position and tongue position were induced by functional therapy of mandibular advancement in subjects with Class II malocclusion and SDB compared with untreated controls. After orthodontic treatment, a significant reduction in diurnal symptoms was observed in 45 of the 51 participants who had received an oral appliance. Orthodontic treatment is considered to be a potential therapeutic approach for SDB in children. Orthodontists are playing an increasingly important role in managing snoring and respiratory problems by oral mandibular advancement devices and rapid maxillary expansion.

KEY WORDS: Sleep-disordered breathing • Mandibular advancement device • Functional treatment

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** • 51 consecutive subjects who were seen for sleep-disordered breathing, were selected for the study group and were treated with a monoblock appliance. 31 Class II subjects without SDB were selected for comparison and were observed. • Department of Orthodontics at the University of Rome Tor Vergata
Schweregrad	ANB > 4°, overjet > 5 mm

Einschluss-kriterien *Bei Review: PICOS*	1. Class II malocclusion characterised 2. ANB of 4° or more 3. overjet greater than 5 mm 4. full Class II or end-to-end molar relationships 5. deep overbite 6. normo-hypo divergence 7. no adenoidectomy or tonsillectomy 8. absence of previous orthodontic treatment 9. absence of craniofacial syndromes
Ausschluss-kriterien	-
Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** Class II malocclusion patients with sleep-disordererd breathing treated with monoblock appliance. The treatment protocols consisted of a modifed monoblock (MM) made by a construction bite that positioned the mandible anteriorly in an edge to edge incisor relationship. It was fabricated from acrylic resin which is physiologically harmless, insoluble in water, odour free and inactive. The central screw was activated only once a month to follow maxillary transversal growth. Appliances were checked at regular recall. During treatment, the absence of acrylic on the occlusal surface of posterior mandibular teeth encouraged them to erupt. The MM appliance also incorporated a Tucat’s pearl on a sliding wire to determine the reference point for the tip of the tongue. Tucat’s pearl allows the placement of the tongue tip against the palatal aspect of the alveolar process, behind the maxillary incisors, to improve muscle function and the habitual position of the tongue. The subjects were instructed to wear their appliances fulltime. Treatment with the MM appliance ended with the achievement of Class I molar relationship. After this period, subjects used the appliance at night only. **Kointervention** To be included in the study, all the subjects had to present with lateral cephalograms available at two time periods: T1, at the start of treatment/observation period and T2, at the end of therapy/observation period. Mean period was 1.8 years. VERSUCHSGRUPPE: **treatment with monoblock** N=51 (Anfang) / N=51 (Ende) / Alter = 9,9 ± 1,3 Jahre / ♂:♀ = 27:24 • Gebissphase: Ruhephase, spätes Wechselgebiss • KFO-Behandlung: Frühbehandlung

Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** Class II subjects, untreated control, Patients without sleep disordered breathing **Kointervention** Age-matched lateral cephalograms available KONTROLLGRUPPE: **untreated control** N=31 (Anfang) / N=31 (Ende) / Alter = 10,1 ± 1,1 Jahre / ♂:♀ = 15:16 • Gebissphase: Ruhephase, spätes Wechselgebiss • KFO-Behandlung: keine Therapie
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **Atmung und Luftraum (Airway space, Schlafapnoe), Schlucken und Sprechen** PRIMÄRZIELGRÖßE: *sagittal and vertical changes (SNA, SNB, ANB, Co-Me, FMA, SN^GoGn, CoGoMe)* SEKUNDÄRZIELGRÖßE: *dental changes (Overjet, Overbite)* TERTIÄRZIELGRÖßE: *Hyoid, soft palate and pharynx and tongue changes (AH-C3 hor., AH-C3 ver., AH-FH, AH-RGn, AH-AH1, AH-SN, U-PNS, Phw1-Psp, Phw2-Tb, MPW, PNS-AD1, PNS-AD2, AD1-Ba, AD2-H, VT, H perp VT, VT^FH)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	1. Mandibular advancement appliances in Class II malocclusion subjects with sleep disorder breathings increases the airway dimensions and improved nasal breathing. 2. The hyoid bone was found to adopt a more anterior and lower position at the end of treatment. 3. The dimension of upper and lower airways increased significantly in the treatment group subjects compared to the control group. 4. The tongue was found to adopt a more anterior and lower position at the end of treatment. In addition, treated patients presented a significant reduction in tongue height.

Zusammen-fassung der Ergebnisse	**GRUPPE treatment with monoblock VS. GRUPPE untreated control** ***PRIMÄRZIELGRÖßE*** When compared with controls, the treated group presented a significant decrease of -1.7° in ANB°, while mandibular length was significantly increased by + 4.0 mm (Co-Me). No significant differences were found between the two groups in vertical analysis. ***SEKUNDÄRZIELGRÖßE*** Both overjet and overbite exhibited a signifcant improvement in treated subjects (-2.8 mm and - 1.3 mm respectively) compared to the control group. ***TERTIÄRZIELGRÖßE*** The hyoid was located more anteriorly in treated patients: the value of AH-C3 horizontal presented a signifcant increase of + 3.6 mm in the T1-T2 period. In addition, the hyoid was found in a lower position at the end of treatment as determined from the increase of distance AH-SN and AH-FH (+ 7.2 mm and + 6.4 mm respectively). The treated group exhibited a significant increase of the length of the soft palate (U-PNS: + 1.6 mm) and an increase of superior posterior and inferior airway space (Phw1-Psp: + 4.5 mm and Phw2-Tb: + 4.3 mm). Middle pharyngeal width and upper airway thickness were significantly increased (MPW: + 2.1 mm; PNS-AD1: + 1.2 mm) and a reduction of upper and lower adenoid thickness (AD2-H, - 1.0 mm e AD1-Ba, - 0.4 mm) was observed. The comparisons between the two groups showed that treated patients presented a more anterior position of the tongue (V-T, + 5.7 mm) and a reduction of its height (H perp VT, -4,5 mm). Moreover, treated subjects presented a more lower position of the tongue as determined from the value of VT^FH (-2.2°).
Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Nur Intrarater-Reliabilität durchgeführt, keine Interrater-Reliabilität.* *Power der Studie/Patientenzahl: limitiert, nicht angegeben* *Funding: keine Angabe* *Interessenkonflikte: keine Angabe* *Bias (SIGN/AMSTAR/EinzelstudienRoB – alle negativen Punkte aus Fragebogen auflisten):* *Publikationsbias (Reviews):* *No confidence intervals been provided.*
Schluss-folgerung des Begutachters	methodische Qualität: insgesamt gut
	Klinische Aussagekraft: Therapy of mandibular retrusion by using mandibular advancement appliances may increases the airway space within patients with sleep disordered breathing.
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN /AMSTAR II)	**Acceptable ⊕**

Evidenztabelle Pavoni, Gazzani et al. 2019

Soft tissue facial profile in Class III malocclusion: long-term post-pubertal effects produced by the Face Mask Protocol

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Summary

Objectives: The objective of this study was to analyze soft tissue changes produced by rapid maxillary expansion and facial mask therapy in growing Class III patients.

Materials: The treated group consisted of 32 Caucasian patients (15 females and 17 males) with dentoskeletal Class III malocclusion treated with the Face Mask Protocol (FMP, rapid maxillary expander, facial mask, and removable lower bite-block). All patients were evaluated before treatment (T1; mean age, 8.4 years), at the end of active treatment (T2; mean age, 10.7 years), and at a post-pubertal follow-up observation (T3; mean age, 15.8 years). The treated group was compared with a matched control group of 20 untreated subjects (10 females and 10 males) with dentoskeletal Class III malocclusion. Statistical comparisons between two groups were performed with the independent samples *t*-test ($P < 0.05$).

Results: Significant improvements were found during the long-term T1–T3 interval for profile facial angle (–5.8°), nasolabial angle (–4.4°), mandibular sulcus (–10.3°), upper lip protrusion (+0.7 mm), and lower lip protrusion (–1.1 mm) in the treated group. No significant post-pubertal effects were found in terms of lower face percentage between two groups.

Limitations: This study has a retrospective design and it used a historical control sample.

Conclusion: The FMP induced positive effects on soft tissue facial profile with a good long-term post-pubertal stability.

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie (inkl. LKG)** - Patients with Class III malocclusion in mixed dentition anterior crossbite or incisor end-to-end relationship, and Class III molar relationship. • Italy
Schweregrad	Wits appraisal of –2 mm or less

Einschluss-kriterien	- Class III malocclusion in mixed dentition - Wits appraisal of –2 mm or less, - anterior crossbite or incisor end-to-end relationship, - Class III molar relationship. - Caucasian origin, - pre-pubertal stage of skeletal maturity according to the cervical vertebral maturation method (CS 1–CS 3)
Ausschluss-kriterien	- permanent teeth congenitally missing or extracted before or during treatment. - discrepancy between centric occlusion and centric relation (indicating pseudo-Class III malocclusion)
Intervention Versuchsgruppe	**kieferorthopädische Behandlung** **RME/FM:** The FMP used in this study consisted of a maxillary expander, a facial mask with heavy elastics and a lower removable bite-block. Treatment started with the placement of a banded maxillary expander soldered to bands placed on the maxillary first permanent molars (Leone A2620; Leone Orthodontic Products, Sesto Fiorentino, Florence, Italy) with two vestibular hooks in the maxillary canine region to attach the elastics. The patients' parents were instructed to activate the expander once or twice daily**.** At the end of the expansion phase, the patients received a facial mask (Dynamic Facemask; Leone Orthodontic Products) with pads fitted to the chin and forehead for support. Elastics were attached from soldered hooks on the expander to the support bar of the facial mask in a downward and forward direction, producing orthopaedic force levels up to 400–500 g per side. Inclination of the extraoral elastics was about 30° to the occlusal plane to counteract. Patients were instructed to wear the facial mask for a minimum of 14 hours per day. During facial mask treatment, a lower removable bite-block (with 3 mm-thick posterior splints) was used on all treated patients, with the aim to facilitate correction of occlusal relationships in the presence of anterior or posterior crossbite . The patients were instructed to wear the bite-block 24 hours a day. **No retention appliance was worn after FMP.** VERSUCHSGRUPPE 1 **RME/FM** N= 32 (Anfang) / N=32 (Ende) / Alter = 8,4 ± 1,2 years / ♂:♀ = 17:15 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: frühe Behandlung

Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** **untreated Class III:** A historical control group of 20 untreated subjects with dentoskeletal Class III malocclusion was selected from a collection of lateral cephalometric longitudinal series. KONTROLLGRUPPE 1: **untreated Class III** N=20 (Anfang) / N=20 (Ende) / Alter = 8,7 ± 1,0 years / ♂:♀ = 10:10 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) • dentofaziale Ästhetik PRIMÄRZIELGRÖßE: **Soft tissue: profile facial angle, nasolabial angle, mandibular sulcus, upper/ lower lip protrusion** SEKUNDÄRZIELGRÖßE: **Skeletal: SNA, SNB, ANB, Wits**
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	The FMP induced **positive effects on soft tissue facial profile with a good stability** when re-evaluated at a post-pubertal stage. In particular, the treated group showed a **significant improvement of the Class III concave profile** that was associated with favourable softtissue changes at the lower third of the face.

Zusammen-fassung der Ergebnisse	**GRUPPE RME/FM VS. GRUPPE untreated Class III** T1: 8,4, 1,2 years RME/FM; 8,7, 1,0 years Control T2: 10,7, 1,3 years RME/FM; 10,8, 1,3 years Control T3: 15,8, 2,5 years RME/FM; 16,1, 1,3 years Control T1-T3

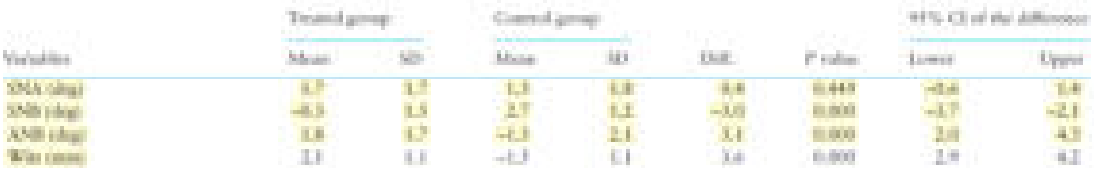
	Treated group		Control group				95% CI of the difference	
Variables	Mean	SD	Mean	SD	Diff.	P value	Lower	Upper
Age (y)	7.4	2.0	7.6	1.4	0.0	0.934	−1.0	1.1
Profile facial angle (deg)	−3.9	4.2	3.9	3.9	−7.8	0.000	−9.2	−6.3
Nasolabial angle (deg)	−2.8	6.7	2.0	8.2	−4.8	0.083	−9.3	−0.3
Lower face %	0.3	2.1	0.4	2.6	−0.1	0.928	−1.4	1.1
Upper lip protrusion (mm)	0.3	1.3	−0.2	1.2	0.7	0.044	0.0	1.4
Mandibular sulcus (deg)	−7.9	5.7	2.4	3.5	−10.3	0.000	−13.1	−7.4
Lower lip protrusion (mm)	0.0	1.3	1.1	1.2	−1.1	0.007	−2.0	−0.3

T1-T2

	Treated group		Control group				95% CI of the difference	
Variables	Mean	SD	Mean	SD	Diff.	P value	Lower	Upper
Age (y)	2.2	1.0	2.1	0.8	0.1	0.343	−0.4	0.7
Profile facial angle (deg)	−1.6	4.3	0.8	2.1	−4.4	0.000	−6.4	−2.2
Nasolabial angle (deg)	−4.3	6.7	0.3	8.3	−4.6	0.035	−8.9	−0.4
Lower face %	0.6	2.0	1.0	2.1	−0.4	0.739	−1.7	0.8
Upper lip protrusion (mm)	1.7	1.7	0.0	1.4	1.7	0.001	0.8	2.6
Mandibular sulcus (deg)	−4.4	4.0	1.6	5.4	−5.8	0.000	−8.0	−3.7
Lower lip protrusion (mm)	0.8	1.4	1.6	1.4	−0.8	0.036	−1.6	−0.1

T2-T3

	Treated group		Control group				95% CI of the difference	
Variables	Mean	SD	Mean	SD	Diff.	P value	Lower	Upper
Age (y)	5.2	2.1	5.3	1.9	−0.1	0.839	−1.1	1.0
Profile facial angle (deg)	−0.4	3.9	1.2	2.3	−1.6	0.121	−3.5	0.4
Nasolabial angle (deg)	2.0	6.3	1.7	9.0	0.3	0.890	−4.2	4.8
Lower face %	−0.3	2.4	−0.6	2.2	0.3	0.654	−1.9	1.6
Upper lip protrusion (mm)	−1.2	1.4	−0.2	1.2	−1.0	0.013	−1.7	−0.2
Mandibular sulcus (deg)	−3.3	4.5	1.0	2.0	−4.3	0.000	−6.6	−2.1
Lower lip protrusion (mm)	0.3	1.5	0.5	1.3	−0.2	0.449	−1.1	0.7

Zusammen-fassung der Ergebnisse	**Skeletal: SNA, SNB, ANB, Wits** **SNA, SNB, ANB, Wits** T1-T3  T1-T2  T2-T3 
Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung <u>Funding</u> <u>Interessen-konflikte</u> <u>Bias (SIGN)</u>	Die Äquivalenz von Versuch- und Kontrollgruppe ist gegeben. Die Kontrollgruppe ist historisch, dies könnte möglicherweise zu Verzerrungen führen. Insgesamt sehr ordentlich durchgeführte retrospektive Kohortenstudie. Power/ Sample Size Berechnungen wurden durchgeführt und Konfidenzintervalle sind angegeben. Es fehlt eine Verblindung, die technisch bei der Auswertung wohl möglich gewesen wäre. Ordentlich durchgeführte Studie mit klinischer Relevanz, insbesondere auch wegen des langen Beobachtungszeitraums ohne Retention. *Funding:* keine Angabe *Interessenkonflikte:* The authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this article. *Bias (SIGN):* Die Äquivalenz von Versuch- und Kontrollgruppe ist gegeben. Power/ Sample Size Berechnungen wurden durchgeführt. Konfidenzintervalle sind angegeben. Eine Verblindung fand nicht statt.
Schluss-folgerung des Begutachters	<u>methodische Qualität: akzeptabel</u> <u>Klinische Aussagekraft:</u> Ordentlich durchgeführte Studie mit klinischer Relevanz, insbesondere auch wegen des langen Beobachtungszeitraums ohne Retention.
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN)	**acceptable (+)**

Evidenztabelle Pavoni, Lombardo et al. 2017

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Treatment and post-treatment effects of functional therapy on the sagittal pharyngeal dimensions in Class II subjects

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Keywords:
Sagittal pharyngeal dimensions
Functional therapy
Class II malocclusion

ABSTRACT

Objective: To evaluate the craniofacial changes induced by functional appliances with special regard to the oro and nasopharyngeal sagittal airway dimensions in subjects with dentoskeletal Class II malocclusions when compared with an untreated Class II control group immediately after therapy and at long-term observation.
Methods: A group of 40 patients (21 females and 19 males) with Class II malocclusions treated consecutively either with a Bionator or an Activator followed by fixed appliances was compared with a matched control group of 31 subjects (16 females and 15 males) with untreated Class II malocclusion. The treated sample was evaluated at T1, start of treatment (mean age: [illegible] years); T2, end of functional treatment and prior to fixed appliances (mean age: [illegible] years), and T3, long-term observation at the end of growth (mean age: [illegible] years). Statistical comparisons were performed with independent sample t tests at T1 (baseline characteristics) and for the T1–T2, T2-T3, and T1-T3 changes.
Results: During active treatment the treated group showed a significant increment in lower airway dimension (PNS-AD1), as well as a significant improvement in the upper airway dimension (PNS-AD2). A significant decrease in the upper adenoid size (AD2-H) was also found. In the longterm evaluation, a significant increase in both lower and upper airway thickness (PNS-AD1, PNS-AD2) and a significant decrease in the upper adenoid thickness were still present in the treated group.
Conclusion: The treatment with functional appliances produced significant favorable changes during active treatment in the oro- and nasopharyngeal sagittal airway dimensions in dentoskeletal Class II subjects when compared with untreated controls, and these changes were stable in the long-term.

<table>
<tr><td>Population
Setting
Komorbiditäten</td><td>Klasse-II-Anomalie

A group of 40 patients with Class II malocclusion treated consecutively either with a Bionator or an Activator followed by fixed appliances was compared with a matched control group of 31 subjects with untreated Class II malocclusion. The treated subjects were collected from an orthodontic practice (Bionator) and from the records of patients treated in the Department of Orthodontics of the University of Rome Tor Vergata (Activator). Thirty-one subjects with untreated Class II division 1 malocclusion were selected from the American Association of Orthodontists Foundation Craniofacial Growth Legacy Collection (http://www.aaoflegacycollection.org, Boltone Brush Growth Study, Michigan Growth Study, Denver Growth Study, Oregon Growth Study, and Iowa Growth Study) to comprise the control group.</td></tr>
<tr><td>Schweregrad</td><td>Overjet > 5 mm, ANB > 4 °</td></tr>
</table>

Einschluss-kriterien *Bei Review: PICOS*	Treated group: 1. Class II division 1 malocclusion (full Class II or end-to-end molar relationships) 2. overjet greater than 5 mm 3. ANB angle greater than 4 4. improvement in facial profile when the lower jaw was postured in a forward position 5. nonextraction treatment protocols control: untreated Class II division 1 malocclusion
Ausschluss-kriterien	-
Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** The nonextraction treatment protocols consisted either of Activator or Bionator constructed without coverage of the lower incisors or of an acrylic monobloc attached to the upper arch by Adams clasps and with capping of the upper and lower incisors. Treatment with functional appliances finished with the achievement of Class I molar relationship and was followed by fixed appliance therapy in the permanent dentition. **Kointervention** Lateral cephalograms available at three time periods: T1, at the start of treatment; T2, at the end of FJO; and T3, at longterm observation after completion of growth, including the phase with fixed appliances. VERSUCHSGRUPPE: **treated group** N=40 (Anfang) / N=40 (Ende) / Alter = 9,9 ± 1,3 Jahre / ♂:♀ = 19:21 • Gebissphase: Ruhephase, frühes Wechselgebiss (bis permanentes Gebiss) • KFO-Behandlung: Frühbehandlung bis reguläre Behandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** untreated Class II division 1 malocclusion **Kointervention** age-matched lateral cephalograms available KONTROLLGRUPPE: **control** N=31 (Anfang) / N=31 (Ende) / Alter = 10,1 ± 1,1 Jahre / ♂:♀ = 15:16 • Gebissphase: Ruhephase, frühes Wechselgebiss (bis permanentes Gebiss) • KFO-Behandlung: keine Therapie
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **Atmung und Luftraum (Airway space, Schlafapnoe), Schlucken und Sprechen** PRIMÄRZIELGRÖßE: *Airway, sagittal pharyngeal dimensions (PNS-AD1, AD1-Ba, PNS-AD2, AD2-H, McNamara upper pharynx dimension, McNamara lower pharynx dimension)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**

Schluss-folgerungen der Autoren	1. The treatment with functional appliances produced significant favorable changes during active treatment (T1-T2) in the oroand nasopharyngeal sagittal airway dimensions in subjects with dentoskeletal Class II subjects when compared with untreated controls. 2. The favorable changes obtained during T1-T2 interval were maintained in the long-term observation after puberty (T1-T3 interval)
Zusammen-fassung der Ergebnisse	**GRUPPE treated VS. GRUPPE control** ***PRIMÄRZIELGRÖßE*** During active treatment (T1-T2), the treated group showed a significant increment in lower airway size (PNS-AD1), as well as a significant improvement in the upper airway size (PNSAD2). A significant decrease in the upper adenoid size (AD2-H) was also found. No statistically significant differences were observed for any of the other analyzed variables for upper and lower sagittal airway dimensions. No significant differences between the treated and the control were found for any airway measurement in the T2-T3 interval. In the long-term evaluation (T1-T3), a significant increase in both lower and upper airway size (PNS-AD1; PNS-AD2) and a significant decrease in the upper adenoid size were still present in the treated group. No statistically significant differences were found for any of the other analyzed variables.
Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	Although historical control groups may be a limitation, historical controls were used in the current study for ethical reasons, as it would have been impossible to recruit a contemporary control group of subjects with untreated Class II malocclusion for long-term observation. A recent investigation showed that historical controls tend to show smaller treatment effects than concurrent controls. Study evaluated of long term effects of stability. *Power der Studie/Patientenzahl: limitiert* *Funding: keine Angabe* *Interessenkonflikte: keine Angabe* The study does not indicate how many of the people asked to take part did so, in each of the groups being studied.
Schluss-folgerung des Begutachters	methodische Qualität: insgesamt gut
	Klinische Aussagekraft: Functional appliances lead to significant changes in airway space during active treatment. The changes may obtain in long-term observation after puberty.
Evidenz-level (SIGN)	**2+**
Qualität **(RoB, SIGN /AMSTAR II)**	**Acceptable ⊕**

Evidenztabelle Pavoni, Lombardo et al. 2018

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Original article

Treatment timing for functional jaw orthopaedics followed by fixed appliances: a controlled long-term study

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Summary

Objective: To evaluate the role of treatment timing on long-term dentoskeletal effects of Class II treatment with removable functional appliances followed by full-fixed appliance therapy.

Materials and methods: A group of 46 patients (23 females and 23 males) with Class II malocclusion treated consecutively with either Bionator or Activator, followed by fixed appliances was compared with a matched control group of 31 subjects (16 females and 15 males) with untreated Class II malocclusion. The treated sample was evaluated at T1, start of treatment (mean age: 9.9 ± 1.3 years); T2, end of functional treatment and prior to fixed appliances (mean age: 11.9 ± 1.3 years); and T3, long-term observation (mean age: 18.3 ± 2.1 years). The treated and the control samples were divided into pre-pubertal and pubertal groups according to skeletal maturity observed at the start of treatment. Statistical comparisons were performed with independent sample *t*-tests.

Results: When treatment was initiated before puberty, Class II correction was mostly confined to the dentoalveolar changes, with significant improvements of both overjet and molar relationships. On the other hand, treatment with the outset at puberty produced significant long-term improvement of sagittal skeletal relationships, which were mainly sustained by mandibular changes.

Conclusions: Treatment with removable functional appliances (Bionator or Activator) followed by full-fixed appliances produced significant skeletal long-term changes when it begins at puberty. Prepubertal Class II treatment results primarily in dentoalveolar changes.

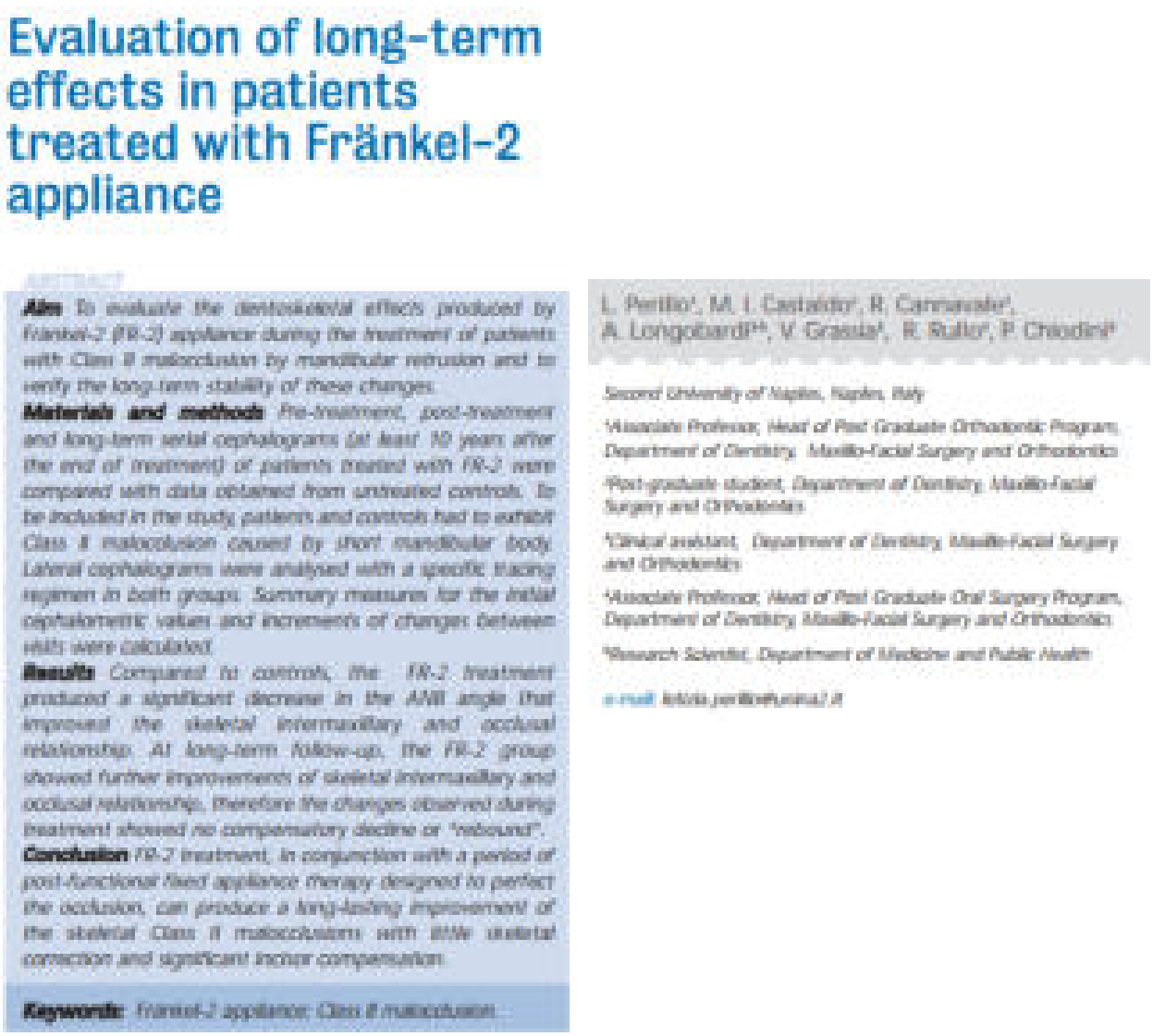
Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** • Cephalometric records of 46 patients (23 females and 23 males) with Class II division 1 malocclusion consecutively treated either with the Bionator (26 subjects) or Activator (20 subjects) were collected. Thirty-one subjects (16 females, 15 males) with untreated Class II division 1 malocclusion were selected from the American Association of Orthodontists Foundation Craniofacial Growth Legacy Collection (Bolton– Brush Growth Study, Michigan Growth Study, Denver Growth Study, Oregon Growth Study, and Iowa Growth Study) to comprise the control group. • were retrieved from an orthodontic practice (Bionator) and from the records of patients treated in the Department of Orthodontics at the University of Rome Tor Vergata (Activator)
Schweregrad	Overjet > 5 mm, ANB > 4 °
Einschluss-kriterien *Bei Review: PICOS*	1. an overjet greater than 5 mm 2. full Class II or end-to-end molar relationships 3. ANB angle greater than 4 degrees 4. improvement in facial profile when the lower jaw was postured in a forward position
Ausschluss-kriterien	-

Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** Class II division 1 malocclusion consecutively treated either with the Bionator (26 subjects) or Activator (20 subjects) were collected. Class II patients were retrieved from an orthodontic practice (Bionator) and from the records of patients treated in the Department of Orthodontics at the University of Rome Tor Vergata (Activator). Class II patients received non-extraction treatment protocols consisting of either a Bionator constructed without coverage of the lower incisors or an acrylic monobloc attached to the upper arch by Adams clasps and with capping of the upper and lower incisors. Treatment with functional appliances was discontinued with the achievement Class I molar relationships; the second phase of treatment consisted of full-fixed appliance therapy in the permanent dentition. Each Bionator and Activator was constructed with the same amount of mandibular advancement, and the construction bites were obtained in the same way in both groups. In that both the mechanism of action and the efficiency in stimulating mandibular growth of these two monobloc appliances are similar, the decision was made to combine patients treated with the two functional appliances. All patients involved in the study were asked to wear the appliance 16 hours a day until the end of treatment. As occurs in studies involving any removable device, compliance with the instructions of the orthodontist and staff varied among the patients. **Kointervention** lateral cephalograms at three time points: T1, at the start of treatment (mean age: 9.9 ± 1.3 years); T2, at the end of FJO and before fixed appliance insertion (mean age: 11.9 ± 1.3 years); and T3, at long-term observation after completion of growth (CS5 or CS6 according to the cervical vertebral maturation method) (mean age: 18.3 ± 2.1 years). VERSUCHSGRUPPE: **Bionator/Activator treatment (early treatment group [ETG]/later treatment group [LTG])** N=46 (Anfang) / N=46 (Ende) / Alter = 9,9 ± 1,3 Jahre / ♂:♀ = 23:23 • Gebissphase: Ruhephase, frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** **Kointervention** Age and sex matched lateral cephalograms KONTROLLGRUPPE: **untreated control (early control group [ECG], later control group [LCG])** N=31 (Anfang) / N=31 (Ende) / Alter = 9,4 / ♂:♀ = 15:16 • Gebissphase: Ruhephase, frühes Wechselgebiss • KFO-Behandlung: keine Therapie

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** • **Okklusion, Kaufunktion, Funktion** PRIMÄRZIELGRÖßE: Descriptive variables changes in the early treated group (ETG) compared to early control group (ECG) *(*SNA, SNB, Pg to N perp, Co-Gn, ANB, Wits, SN to Pal. Pl., SN to Mand. Pl., Pal. Pl. to Mand. Pl., ANS–Me, Co–Go, CoGoMe, OVJ, OVB, Molar relationship, Upper Inc. to Pal. Pl., Lower Inc. to Mand. Pl.*)* SEKUNDÄRZIELGRÖßE: Descriptive variables changes in the late treated group (ETG) compared to late control group (ECG) *(*SNA, SNB, Pg to N perp, Co-Gn, ANB, Wits, SN to Pal. Pl., SN to Mand. Pl., Pal. Pl. to Mand. Pl., ANS–Me, Co–Go, CoGoMe, OVJ, OVB, Molar relationship, Upper Inc. to Pal. Pl., Lower Inc. to Mand. Pl.*)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	1. Treatment with removable functional appliances at puberty induced a significant long-term enhancement of mandibular growth with an increase in mandibular ramus height and protrusion of the chin. 2. When treatment was performed before puberty, Class II correction was mostly confined to the dentoalveolar level, with significant improvements of both overjet and molar relationships.
Zusammen-fassung der Ergebnisse	**GRUPPE early treated group (ETG) VS. GRUPPE early control group (ECG)** **GRUPPE late treated group (LTG) VS. GRUPPE late control group (LCG)** ***PRIMÄRZIELGRÖßE + SEKUNDÄRZIELGRÖßE*** In the long-term evaluation (T1–T3), ETG showed a significant decrease in the OVJ (-3.6 mm), as well as a significantly higher improve in molar relationship (+3.9 mm), as compared with respect to ECG. There were no significant between-group differences or any of the skeletal sagittal maxillary and mandibular measures, while a significant increase in facial divergency (SN to Mand Pl +1.9 degrees) was recorded in ETG. As for the comparisons between LTG and LCG in the longterm interval (T1–T3), a significantly higher increase in total mandibular length (Co–Gn +5.5 mm), in addition to a significantly higher increase in chin projection (Pg to N perp +3.1 mm) were observed in LTG. The intermaxillary skeletal sagittal changes were significantly different between groups, as the treated one demonstrated a decrease in Wits measurement (-5.8 mm), as well as a higher decrease in ANB angle (-1.8°). Both lower anterior facial height (ANS–Me) and the mandibular ramus (Co–Go) increased significantly more in LTG (+3.8 and +2.4 mm, respectively). LTG showed a significantly higher decrease in overjet (-3.0 mm) and a significantly higher improvement in molar relationship (+4.4 mm) with respect to LCG.

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Confidence intervals been provided.* *Power der Studie/Patientenzahl:* Sample size was calculated using the sagittal position of the chin (Pg to Nasion perpendicular) as the primary outcome variable. In a previous long-term study, the combined standard deviation between early treated and late treated groups was 2.8 mm. *Funding:* keine Angabe *Interessenkonflikte:* None to declare.
Schluss-folgerung des Begutachters	methodische Qualität: insgesamt sehr gut
	Klinische Aussagekraft: 1. removable functional appliances while puberty seems to induce a significant long-term enhancement of growth of the mandible 2. treatment before puberty peak seems to be mostly on a dentoalveolar level
Evidenz-level (SIGN)	**2++**
Qualität **(RoB, SIGN /AMSTAR II)**	**High quality ⊕⊕**

Evidenztabelle Perillo, Castaldo et al. 2011



Evaluation of long-term effects in patients treated with Fränkel-2 appliance

Aim To evaluate the dentoskeletal effects produced by Fränkel-2 (Fr-2) appliance during the treatment of patients with Class II malocclusion by mandibular retrusion and to verify the long-term stability of these changes.

Materials and methods Pre-treatment, post-treatment and long-term serial cephalograms (at least 10 years after the end of treatment) of patients treated with Fr-2 were compared with data obtained from untreated controls. To be included in the study patients and controls had to exhibit Class II malocclusion caused by short mandibular body. Lateral cephalograms were analysed with a specific tracing regimen in both groups. Summary measures for the initial cephalometric values and increments of changes between visits were calculated.

Results Compared to controls, the Fr-2 treatment produced a significant decrease in the ANB angle that improved the skeletal intermaxillary and occlusal relationship. At long-term follow-up, the Fr-2 group showed further improvements of skeletal intermaxillary and occlusal relationship, therefore the changes observed during treatment showed no compensatory decline or "rebound".

Conclusion Fr-2 treatment, in conjunction with a period of post-functional fixed appliance therapy designed to perfect the occlusion, can produce a long-lasting improvement of the skeletal Class II malocclusions with little skeletal correction and significant incisor compensation.

Keywords: Fränkel-2 appliance; Class II malocclusion

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Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** • Treated group: treatment with Fr-2 appliance during 1984 to 1998 at the Second University of Naples • Untreated control sample, studied 1982 to 1993
Schweregrad	Overjet > 4 mm, ANB > 4°, SNB < 78°
Einschluss-kriterien *Bei Review: PICOS*	1. Class II, Division 1 malocclusion 2. mandibular retrusion by mandibular short body 3. at least an end-to-end molar relationship 4. overjet more than 4 mm 5. ANB angle larger than 4° 6. SNB angle less than 78°

Ausschluss-kriterien	All patients with maxillary protrusion (SNA>84°) or mandibular retrusion by retropositioned mandible (NSAr>128°) or clockwise rotation (SN^GoMe>36°) were excluded.
Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** The sample was selected from patients treated with the FR-2 appliance at the Second University of Naples from 1984 to 1998. The FR-2 appliance was used according to the following protocol: full time wear with a gradual increase in wearing time and light activations, no more than 2-3 mm, every six months. All patients were treated for at least 1 year with FR-2 appliance. The appliances were constructed according to the design recommended by Fränkel and featured a mandibular advancement that did not exceed 2 to 3 mm. None of patients had undergone previous orthodontic treatment. After FR-2 treatment, some patients had a phase of fixed appliance with headgear or received “Cetlin mechanics” to correct residual crowding. **Kointervention** Each subject had two high quality lateral cephalograms, taken before and after FR-2 treatment. The first film was obtained not more than 4 months before the onset of the treatment (baseline visit, V0); the second not more than 1 month after the end of treatment (visit 1, V1). To verify the long-term stability, three or more attempts were made to contact and recall all patients (visit 2, V2) to obtain high quality lateral cephalograms taken at least 10 years after FR-2 treatment. VERSUCHSGRUPPE: **treated with FR-2** N=19 (Anfang) / N=19 (Ende) / Alter = 9,0 ± 1,09 Jahre / ♂:♀ = 8:11 • Gebissphase: Ruhephase, frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** comparable sample of untreated skeletal Class II subjects studied at the Second University of Naples from 1982 to 1993 **Kointervention** age-matched lateral cephalograms available KONTROLLGRUPPE: **untreated control** N=9 (Anfang) / N=9 (Ende) / Alter = 8,5 ± 0,78 Jahre / ♂:♀ = 6:3 • Gebissphase: Ruhephase, frühes Wechselgebiss • KFO-Behandlung: keine Behandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** • **Okklusion, Kaufunktion, Funktion** PRIMÄRZIELGRÖßE: *Cranial base, maxillary and mandibular skeletal and Intermaxillary measurements (NSBa, NSAr, Se-N, SNA, A to N perp, PNS-Ai, SNB, Pg to N perp, Co-Gn, Go-Pg, GoPg/SeN diff, ANB, AOBO)* SEKUNDÄRZIELGRÖßE: *Vertical skeletal measurements (FH^OP, FH^PP, FH^ML, SN^GoMe, PP^ML, N-ANS, ANS-Me, N-Me, Co-Go, ArGoMe)* TERTIÄRZIELGRÖßE: *Interdental, Maxillary and Mandibular dento-alveolar measurements (OVJ, OVB, Interincisal angle, Molar relationship, UI-A perp, I-SN; Li-APg, I-ML)* QUARTÄRZIELGRÖßE: *Soft tissue measurements (UL-E, LL-E, NL Angle)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	The FR-2 in Class II growing patients with mandibular retrusion, treated at prepubertal stage of skeletal development, was associated with: 1. small improvement of intermaxillary discrepancy 2. no statistically significant skeletal mandibular effects 3. significant incisor compensation to camouflage the skeletal Class II malocclusion. The comparison between FR-2 effects immediately after treatment and at long-term (after 13.8 years on average from the end of FR-2 treatment) showed: 1. further improvement of skeletal discrepancy; 2. significant skeletal mandibular increments 3. further lower and upper incisor compensation 4. long-term stability
Zusammen-fassung der Ergebnisse	**GRUPPE treated with Fr-2 VS. GRUPPE untreated control** ***PRIMÄRZIELGRÖßE*** The post-treatment changes in the FR-2 sample (over an average time period of 13.8 years) showed a significant increase (P <.0001) of numerous linear variables as the anterior cranial base (Se-N), the maxillary body (PNS-Ai) and the mandibular ramus (Co-Go), body (Go-Pg) and total length (Co-Gn) associated to the craniofacial growth that occurred over the very long period of posttreatment. ***SEKUNDÄRZIELGRÖßE*** A significant decrease of ANB and increase of SNB indicated that the mandible continued to grow in a favorable direction with slight decrease of vertical skeletal angles (FH^ML, SN^GoMe, PP^ML, ArGoMe). ***TERTIÄRZIELGRÖßE*** The overjet continued to decline, and the molar relationship had a slight further improvement. I-ML and LI-APg continued to increase as the values for UL-E, LL-E and NL-angle were significantly decreased. ***QUARTÄRZIELGRÖßE*** The values for UL-E, LL-E and NL-angle were significantly decreased.

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	Treatment group ist wesentlich größer als control group. Cephalometric records were not available from the control sample at the ages corresponding to the long-term evaluation of the patients. *Power der Studie/Patientenzahl: limitiert* *Funding: nicht angegeben* *Interessenkonflikte: nicht angegeben* *No confidence intervals been provided.*
Schluss-folgerung des Begutachters	methodische Qualität: insgesamt gut
	Klinische Aussagekraft: The Fr-2 group showed after long term further improvement of skeletal discrepancy, long –term stability.
Evidenz-level (SIGN)	**2+**
Qualität **(RoB, SIGN /AMSTAR II)**	**Acceptable ⊕**

Evidenztabelle Perillo, Johnston, et al. 1996

Permanence of skeletal changes after function regulator (FR-2) treatment of patients with retrusive Class II malocclusions

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The purpose of this study was to examine the skeletal changes produced by the Fränkel function regulator (FR-2) appliance during the treatment of patients with mandibular retrusive Class II malocclusions and to characterize the permanence of these changes in the years after treatment (5 years, on average). Data from the pretreatment, posttreatment, and long-term serial cephalograms of 14 patients who received FR-2 treatment were compared with data obtained from untreated controls and from published standards. Relative to controls, FR-2 therapy produced a statistically significant decrease in the ANB angle and an increase in the rate of mandibular growth. At the same time, no maxillary effect was noted. During the post-FR-2 period, the rate of mandibular growth showed no compensatory decline or "rebound." Instead, it was remarkably similar to that inferred from age-matched and sex-matched normative standards. The present study thus supports the conclusion that FR-2 therapy, in conjunction with a period of postfunctional fixed- or removable-appliance therapy designed to perfect the occlusion, can produce a statistically and perhaps clinically significant relative increase in mandibular length. (Am J Orthod Dentofac Orthop 1996;109:132-9.)

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** Fränkel group: treated with the FR-2, appliance were obtained from the University of Naples and from the private practice of one of the authors (A.F.) Control group: age-matched and sex-matched normative increments inferred by interpolation from the cephalometric standards of the University of Michigan Elementary and Secondary School Growth Study. The mixed cross-sectional and longitudinal "Michigan" data cover ages 6 to 16 years and were derived from cephalograms of untreated children, many of whom had Class II malocclusions
Schweregrad	More than 4 mm of overjet, SNA and SNB less than 82° and 78°, ANB angle larger than 4°
Einschluss-kriterien *Bei Review: PICOS*	1. initially exhibited Class II, Division 1 2. malocclusions class II associated with mandibular retrusion caused by a relatively short mandibular body 3. at least end-to-end molar relationship, 4. more than 4 mm of overjet 5. an ANB angle larger than 4° 6. and SNA and SNB less than 82° and 78° 7. at least 1 year with an FR-2 appliance 8. no previous orthodontic treatment 9. FR-2 treatment had to have been completed at least 3 years before the beginning of this study
Ausschluss-kriterien	1. Patients with maxillary protrusion

Intervention Versuchsgruppe	**KIeferorthopädische Behandlung** Treated with the FR-2, appliance were obtained from the University of Naples and from the private practice of one of the authors (A.F.). The appliances were constructed according to the design recommended by Fränkel and featured a mandibular advancement that did not exceed 2 to 3 mm. After FR-2 treatment, care was taken to ensure that the mandible could not be retruded clinically (i.e., that there was no dual bite). Moreover, the FR-2 treatment had to have been completed at least 3 years before the beginning of this study, During the posttreatment interval, the patients commonly received supplemental treatments to refine the occlusion, but not to achieve any additional mandibular advancement. Specifically, most patients had a phase of fixed or removable appliance therapy (usually 6 to 12 months): One patient had simple edgewise finishing mechanics; five received "Cetlin mechanics" to correct residual crowding; and six were retained with an activator used to maintain, but not improve, the sagittal jaw relationships. All patients were treated for at least 1 year with Fr-2. All patients had to have cooperated by wearing the appliance for at least 18 hours a day during the first 12 months of the treatment. **Kointervention** Required that each patient's treatment be documented by high quality lateral cephalograms taken in centric occlusion. The first film was obtained not more than 4 months before the onset of the FR-2 treatment; the second, not more than 1 month after the end of treatment; and the third, at least 3 years after the end of FR-2 treatment VERSUCHSGRUPPE: **Fränkel group** N=14 (Anfang) / N=14 (Ende) / Alter = 8 years 7 months ± ?? Jahre / ♂:♀ = 8:6 • Gebissphase: frühes Wechselgebiss bis Ruhephase • KFO-Behandlung: Frühbehandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** These children were subjected to the same exclusionary rules as those applied to the treatment sample, thereby resulting in a sample of untreated Class II subjects who were equivalent to the treated sample, not only in terms of age and sex, but also in facial form. **Kointervention** Cephalometric records (sex and age-matched with Fränkel group) KONTROLLGRUPPE: **control group** N=14 (Anfang) / N=14 (Ende) / Alter = 8 years 7 months ± ?? Jahre / ♂:♀ = 7:7 • Gebissphase: frühes Wechselgebiss bis Ruhephase • KFO-Behandlung: keine kieferorthopädische Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: *Angular measures initial and changes (SNA, SNB, ANB, SN/palatal plane, SN/Go-Me, Ar-Go-Me)* SEKUNDÄRZIELGRÖßE: *Linear measures initial and changes (Ar-Go, Go-Pg, Ar-gn)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**

Schluss-folgerungen der Autoren	1. The Fränkel appliance achieved a skeletal Class II correction in part by producing a statistically significant increase in mandibular length. 2. No maxillary skeletal effects were noted. 3. The skeletal changes observed here were not lost during a posttreatment period that averaged 5 years.
Zusammen-fassung der Ergebnisse	**GRUPPE Fränkel group VS. GRUPPE control group** ***PRIMÄRZIELGRÖßE*** The Fränkel appliance appears to have had an effect on the anteroposterior growth of the mandible. Specifically, the decrease in the ANB angle in the FR-2 sample was significantly greater than that seen in the control group (about 0.97° versus -0.20 °, $p < 0.05$). ***SEKUNDÄRZIELGRÖßE*** Significant differences were seen in the rate of mandibular growth: The annual rate of increase in the control sample was 1.06 mm for the corpus (Go-Pg) and 1.81 mm for overall length (Ar-Gn); in the FR-2 group, these dimensions increased 2.53 mm and 3.28 mm per year, respectively. ***BOTH OUTCOMES*** The various posttreatment changes in the FR-2 sample (over an average time period of 5.2 years) were remarkably similar to increments of change inferred from the Michigan control data. There were no significant between-group differences. In other words, the significantly greater rate of decrease in the ANB angle and the concomitant elevation in the rate of mandibular growth that occurred during the FR-2 treatment were not followed by any apparent compensatory "rebound." The posttreatment changes seen in the FR-2 group were almost the same as could be expected of untreated controls.
Angaben auffälliger positiver und/oder negativer Aspekte	Keine Intrarater-Reliabilität *Power der Studie/Patientenzahl:* limitiert, nicht spezifiziert *Funding:* keine Angabe *Interessenkonflikte:* kein Angabe *No confidence intervals provided.*
Schluss-folgerung des Begutachters	<u>methodische Qualität:</u> insgesamt gut <u>Klinische Aussagekraft:</u> The Fränkel appliance achieved a skeletal Class II correction in part by producing a statistically significant increase in mandibular length. No maxillary skeletal effects were noted. The skeletal changes observed here were not lost during a posttreatment period that averaged 5 years.
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN /AMSTAR II)	**Acceptable ⊕**

Evidenztabelle Perillo, Vitale et al. 2016

Original article

Comparisons of two protocols for the early treatment of Class III dentoskeletal disharmony

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Summary

Objective: To assess the short-term outcomes of splints, Class III elastics, and chincup (SEC III) and rapid maxillary expansion and facial mask (RME/FM) protocols.

Materials and methods: 25 patients with Class III dentoskeletal disharmony (10 males, 15 females) treated with the SEC III protocol were evaluated at the beginning (T1, mean age 7.5 ± 1.4 years) and at the end of treatment (T2, mean age 8.7 ± 1.4 years). The SEC III group was compared to a matched sample of 32 Class III patients (16 males, 16 females) treated with the RME/FM protocol and to a matched control group (CG) consisting of 23 subjects (12 males, 11 females) with untreated Class III dentoskeletal disharmony. The statistical comparisons between the three groups were performed with analysis of variance with Tukey's *post hoc* tests.

Results: With respect to the CG the SEC III and the RME/FM groups showed significantly favourable effects in terms of maxillary advancement (SNA +1.2 and +1.4 degrees, respectively), control of mandibular projection (SNB −1.3 and −1.6 degrees, respectively), and intermaxillary relationships (ANB +2.6 and +2.9 degrees, respectively; WITS +3.7 and +2.6 mm, respectively). The RME/FM group showed a significantly greater increase in the intermaxillary divergency than the SEC III group (+1.8 degrees) and the CG (+2.0 degrees).

Limitations: A limitation of this study is its short-term nature.

Conclusions: Both SEC III and RME/FM protocols are efficient treatments for Class III dentoskeletal disharmony. The SEC III protocol produces more favourable control in intermaxillary vertical relationships than the RME/FM therapy.

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie (inkl. LKG)** - Children in deciduous or mixed dentition with Class III dentoskeletal malocclusion, anterior crossbite or edge-to-edge incisor relationship andClass III molar relationship • European
Schweregrad	WITS appraisal of −2.0 mm or less
Einschluss-kriterien	- in deciduous or mixed dentition - Class III dentoskeletal malocclusion - Anterior crossbite or edge-to-edge incisor relationship; - Class III molar relationship; - WITS appraisal of −2.0 mm or less; - Prepubertal skeletal maturation (CS1 or CS2)
Ausschluss-kriterien	- CO-CR discrepancy (indicating pseudo-Class III malocclusion)

Intervention Versuchsgruppe	**kieferorthopädische Behandlung** **SEC III** (splints, Class III elastics, and chincup**):** The SEC III protocol (2) included two occlusal splints, Class III elastics, and chincup. The two removable acrylic splints had a flat occlusal plane. The Class III elastics with a force of 200–300 g per side, were attached to vestibular hooks placed on each side of the splint, distal to the maxillary last molars and between the mandibular canines and lateral incisors. Force levels depended mainly on splint stability. Patients were instructed to wear the splints and the elastics for a minimum of 16 hours per day and to change the elastics at least twice a week. The chincup used in combination with the splints and the Class III elastics developed a force ranging from 400 to 600 g per side with the force vector passing through the maxillary first molars to avoid their extrusion and consequent clockwise mandibular rotation. Patients were asked to wear the chincup for a minimum of 14 hours per day. The active phase was performed until a positive overjet (2–3 mm) was reached. The average SEC III treatment duration was about 1 year. **RME/FM** (rapid maxillary expansion and facial mask)**:** The RME/FM therapy included three components: maxillary expansion appliance, facial mask, and heavy elastics. The acrylic splint expander, with vestibular hooks for protraction with the facial mask, was bonded on the deciduous canines and the first and second deciduous molars. When the permanent first molars were erupted, the expander was bonded on the first and second deciduous molars and the permanent first molars. The expansion screw (Leone A2620; Leone Orthodontic Products, Sesto Fiorentino, Firenze, Italy) was activated by the patients’ parents one or two times per day until overcorrection of transverse occlusal relationships was achieved (palatal cusps of the upper posterior teeth approximating the buccal cusps of the lower posterior teeth). Immediately after the conclusion of the expansion phase the patients were instructed to wear a facial mask according to the design of Petit (Dynamic Face Mask; Leone Orthodontic Products) in order to perform the maxillary protraction. Elastics were attached from the vestibular hooks of the expander to the horizontal bar of the facial mask and they were inclined downward and forward at about 30 degrees to the occlusal plane. The extraoral elastics generated forces of 400–500 g per side. Patients were asked to wear the facial mask for a minimum of 14 hours per day for 6 months, then only at night for another 6 months. The active orthopaedic phase was discontinued when the patient showed at least a positive overjet. An overcorrection towards Class II occlusal relationships was achieved in most of the patients. The average duration of the RME/FM therapy was about 1 year. VERSUCHSGRUPPE 1: **SEC III** N= 25 (Anfang) / N=25 (Ende) / Alter = 7,5 ± 1,4 / ♂:♀ = 10:15 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: frühe Behandlung VERSUCHSGRUPPE 2: **RME/FM** N= 32 (Anfang) / N=32 (Ende) / Alter = 7,5 ± 1,7 / ♂:♀ = 16:16 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: frühe Behandlung

Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE 1: **untreated Class III (CG)** N=23 (Anfang) / N=23 (Ende) / Alter = 7,0 ± 1,0 / ♂:♀ = 12:11 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: frühe Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) PRIMÄRZIELGRÖßE: **Skeletal: SNA, SNB, ANB, Wits**
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	- Early treatment of Class III dentoskeletal disharmony with **both SEC III and RME/FM protocols produce favourable maxillary and mandibular skeletal changes**. - The **RME/FM protocol induces a significant increase of the intermaxillary vertical relationships** with respect to the SEC III protocol and to the growth changes. - The **SEC III protocol is able to produce more favourable control in intermaxillary vertical relationships** with respect to RME/FM therapy. - A limitation of this study is its **short-term nature**
Zusammen-fassung der Ergebnisse	**GRUPPE SEC III VS.GRUPPE untreated Class III (CG)** **GRUPPE RME/FM VS.GRUPPE untreated Class III (CG)** T1 (pre-treatment): 7,5, 1,4 years, SEC III; 7,5, 1,7 years, RME/FM; 7,0, 1,0 Class III untreated (CG) T2 (post-treatment/ observation): 8,7, 1,4 years, SEC III; 8,8, 1,6 years, RME/FM; 8,4, 0,9 Class III untreated (CG) **Skeletal: SNA, SNB, ANB, Wits** 

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN)	Die Äquivalenz von Versuch- und Kontrollgruppe wurde nachvollziehbar überprüft. Die beobachteten Unterschiede bestehen zwischen der SEC III und der Kontrollgruppe (CG), dies sollte bei Vergleichen dieser beiden berücksichtigt werden. Power/ Sample Size Berechnungen wurden durchgeführt. Eine Verblindung fand nicht statt. Die Kontrollgruppe ist allerdings aus verschiedenen internationalen Wachstumsstudien zusammengesetzt und daher möglicherweise heterogen. Die Kohortenstudie hat methodische Schwächen, besonders in Bezug auf die Rekrutierung der Gruppen und Gruppenäquivalenz. Der Vergleich der SEC III mit der Kontrollgruppe ist nur eingeschränkt möglich. Insgesamt ist das Studiendesign jedoch sinnvoll und die Studie sonst ordentlich durchgeführt. Die klinische Relevanz ist daher mit Einschränkungen gegeben. *Funding:* keine Angabe *Interessenkonflikte:* keine Angabe *Bias (SIGN):* Die Äquivalenz von Versuch- und Kontrollgruppe wurde nachvollziehbar überprüft. Die beobachteten Unterschiede bestehen zwischen der SEC III und der Kontrollgruppe (CG), dies sollte bei Vergleichen dieser beiden berücksichtigt werden. Power/ Sample Size Berechnungen wurden durchgeführt. Eine Verblindung fand nicht statt. Die Kontrollgruppe ist allerdings aus verschiedenen internationalen Wachstumsstudien zusammengesetzt und daher möglicherweise heterogen.
Schluss-folgerung des Begutachters	methodische Qualität: akzeptabel
	Klinische Aussagekraft: Insgesamt ist das Studiendesign jedoch sinnvoll und die Studie sonst ordentlich durchgeführt. Die klinische Relevanz ist daher mit Einschränkungen gegeben.
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN)	**Acceptable (+)**

Evidenztabelle Perinetti, G. et al., 2015

PLOS | ONE

RESEARCH ARTICLE

Treatment Effects of Removable Functional Appliances in Pre-Pubertal and Pubertal Class II Patients: A Systematic Review and Meta-Analysis of Controlled Studies

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Abstract

Background

Treatment effects of removable functional appliances in Class II malocclusion patients according to the pre-pubertal or pubertal growth phase has yet to be clarified.

Objectives

To assess and compare skeletal and dentoalveolar effects of removable functional appliances in Class II malocclusion treatment between pre-pubertal and pubertal patients.

Search methods

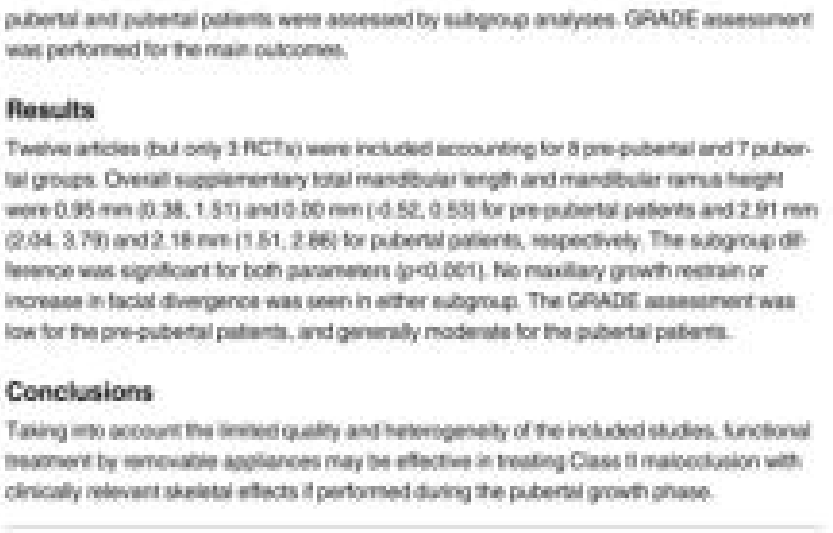
Literature survey using the Medline, SCOPUS, LILACS and SciELO databases, the Cochrane Library from inception to May 31, 2015. A manual search was also performed.

Selection criteria

Randomised (RCTs) or controlled clinical trials with a matched untreated control group. No restrictions were set regarding the type of removable appliance whenever used alone.

Data collection and analysis

For the meta-analysis, cephalometric parameters on the supplementary mandibular growth were the main outcomes, with other cephalometric parameters considered as secondary outcomes. Risk of bias in individual and across studies were evaluated along with sensitivity analysis for low quality studies. Mean differences and 95% confidence intervals for annualised changes were computed according to a random model. Differences between pre-



pubertal and pubertal patients were assessed by subgroup analyses. GRADE assessment was performed for the main outcomes.

Results

Twelve articles (but only 3 RCTs) were included accounting for 8 pre-pubertal and 7 pubertal groups. Overall supplementary total mandibular length and mandibular ramus height were 0.95 mm (0.38, 1.51) and 0.00 mm (-0.52, 0.53) for pre-pubertal patients and 2.91 mm (2.04, 3.79) and 2.18 mm (1.51, 2.86) for pubertal patients, respectively. The subgroup difference was significant for both parameters (p<0.001). No maxillary growth restrain or increase in facial divergence was seen in either subgroup. The GRADE assessment was low for the pre-pubertal patients, and generally moderate for the pubertal patients.

Conclusions

Taking into account the limited quality and heterogeneity of the included studies, functional treatment by removable appliances may be effective in treating Class II malocclusion with clinically relevant skeletal effects if performed during the pubertal growth phase.

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** • healthy patients treated for skeletal Class II malocclusion due to mandibular retrusion treated during the pre-pubertal or pubertal growth phases
Schweregrad	Nicht angegeben
Einschluss-kriterien *Bei Review: PICOS*	• population: healthy patients treated for skeletal Class II malocclusion due to mandibular retrusion treated during the pre-pubertal or pubertal growth phases • intervention: removable functional orthodontic appliance (No restrictions were set regarding the type of removable appliance whenever used alone) • comparison: untreated Class II malocclusion subjcets with similar growth phase • outcome: PRIMÄRZIELGRÖßE: cephalometric parameters related to mandibular growth, expressed as supplementary growth in comparison to the untreated controls. (1) total mandibular length, 2) mandibular ramus height, 3) composite mandibular length (according to Pancherz Analysis) [27], and 4) mandibular base (according to Pancherz Analysis)) SEKUNDÄRZIELGRÖßE: supplementary changes in comparison to the untreated controls (1) SNA, 2) SNB and 3) ANB angles, 4) maxillary base (according to Pancherz Analysis) [27], 5) total facial divergence, and 6) mandibular incisor proclination (relative to the mandibular plane)) • study type: RCTs or either prospective or retrospective CCTs

Ausschluss-kriterien	1. No reliable indicator of growth phase (hand-and-wrist maturation [HWM] method or cervical vertebral maturation [CVM] method) 2. Case reports, case series with no statistical analysis, comments, letters to the Editor, reviews 3. Studies using the headgear alone or in combination with other functional appliances 4. Studies in which the compared treated groups were subjected to different treatment modalities 5. Studies in which treatment length was significantly different than the observational time length of the control group 6. Studies in which orthodontic treatment was combined with fixed appliances, mini-implants or surgery 7. Studies without cephalometric analyses or without measures defined herein as primary outcomes 8. Studies in which a favourable response to treatment (according to the Authors' definition) was an inclusion criterion 9. Studies in which skeletal maturation was assessed but subjects with different stages were pooled in the same treated or control group 10. Studies in which the control group was based on published reference standards without a specific matching of the groups by age, gender, and other features 11. studies including two or more treated groups compared to a single control group
Intervention Versuchsgruppe	**Kieferorthopädische Behadnlung** VERSUCHSGRUPPE: **removable functional orthodontic appliance (No restrictions were set regarding the type of removable appliance whenever used alone)** N=371 (Anfang) / N=?? (Ende) / Alter = ?? ± ?? Jahre / ♂:♀ = ?? • Gebissphase: frühes & spätes Wechselgebiss, permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: Frühbehandlung (interzeptiv), reguläre Behandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **untreated Class II malocclusion subjcets with similar growth phase** N=361 (Anfang) / N=?? (Ende) / Alter = ?? ± ?? Jahre / ♂:♀ = ?? • Gebissphase: frühes & spätes Wechselgebiss, permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: keine Behandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: cephalometric parameters related to mandibular growth, expressed as supplementary growth in comparison to the untreated controls. (1) total mandibular length, 2) mandibular ramus height, 3) composite mandibular length (according to Pancherz Analysis) [27], and 4) mandibular base (according to Pancherz Analysis)) SEKUNDÄRZIELGRÖßE: supplementary changes in comparison to the untreated controls (1) SNA, 2) SNB and 3) ANB angles, 4) maxillary base (according to Pancherz Analysis) [27], 5) total facial divergence, and 6) mandibular incisor proclination (relative to the mandibular plane))
Studientyp	**Systematisches Review mit Meta-Analyse** Inkludierte Studien in Bezug auf PICO: RTCs, pro- & retrospective CCTs N=12 for qualitative and N = 11 for quantitative analysis; 2 articles were clearly derived from the same study sample reporting either the results about soft tissues and SNA, SNB and ANB angles [41] or other dentoskeletal effects [44] and may be considered as a single study. → **N = 11 (3 RCTs, 3 prospective & 5 retrospective CCTs)** Gesamt-Teilnehmerzahl in Bezug auf PICO: N=664
Schluss-folgerungen der Autoren	Taking into account the still limited quality ofthe reported studies, and their heterogeneity in terms ofstudy designs, treatment protocols and appliances used, the following conclusion may be drawn: • **Functional treatment by removable appliances may be effective** in correcting Class II malocclusion with relevant skeletal effects if performed during the **pubertal growth** phase. Skeletal effects of functional treatment were seen at the mandibular level and consist mainly **in mandibular elongation and increase in ramus height**, although dentoalveolar effects were detected even in pubertal patients. • However, both the increases in total mandibular length and in ramus height showed a noteworthy individual variation to treatment responsiveness in pubertal patients. • Irrespective ofthe growth phase, no or very minimal effects were seen in terms of maxillary growth restrain or increase in facial divergence • Further high quality RCTs with proper inclusion criteria for skeletal Class II malocclusion are needed to fully elucidate the role ofgrowth phase in the efficiency offunctional treatment with removable appliances

Zusammen-fassung der Ergebnisse	**removable functional orthodontic appliance (No restrictions were set regarding the type of removable appliance whenever used alone) VERSUS untreated Class II malocclusion subjcets with similar growth phase** ***Subgruppenanalyse: Subgroup analyses were performed whenever possible according to the growth phase, pubertal or post-pubertal,*** ***Zeitpunkt des Vergleiches: when not already reported in the articles, annualised changes for all the parameters were calculated and used for meta-analysis*** **cephalometric parameters related to mandibular growth, expressed as supplementary growth in comparison to the untreated controls. (1) total mandibular length, 2) mandibular ramus height, 3) composite mandibular length (according to Pancherz Analysis) [27], and 4) mandibular base (according to Pancherz Analysis)):** For the **total mandibular length,** no study made use of the Articulare as the endpoint. The **overall annualised changes were 0.95 mm (0.38, 1.51) and 2.91 mm (2.04, 3.79) in the pre-pubertal and pubertal subgroups, respectively**. The difference between the subgroups was significant at p<0.01 (Fig 2). The prediction intervals of the annualised changes ranged from -0.30 to 2.20 mm and from 1.04 to 4.78 mm in the prepubertal and pubertal subgroups, respectively. Regarding the **mandibular ramus height**, the **overall annualised change in pre-pubertal patients was 0.00 mm (-0.52, 0.53**). While in **pubertal patients, the overall annualised change was 2.18 mm** (1.51, 2.86). The difference between the subgroups was significant at p<0.01 (Fig 3). The prediction intervals of the annualised changes ranged from -1.69 to 1.69 mm and from 1.17 to 3.19 mm in the pre-pubertal and pubertal subgroups, respectively. For the **composite mandibular length**, the overall **annualised change in pre-pubertal patients was 0.94 mm** (0.25, 1.63), while in **pubertal** patients, the overall annualised change was **2.10 mm** (1.02, 3.18). The difference between the subgroups was **not significant** even though the p value was close to significance at 0.08 (Fig 4). The prediction intervals of the annualised changes ranged from -1.28 to 3.16 mm and from -0.78 to 4.98 mm in the prepubertal and pubertal subgroups, respectively. Regarding the **mandibular base** (Pancherz Analysis), the overall annualised change in **pre-pubertal patients was 1.01 mm (0.21, 1.80), while in pubertal patients, the overall annualised change was 1.63 mm** (0.98, 2.28), without significant differences between subgroups (p = 0.24; Fig 3). The prediction intervals of the annualised changes ranged from -2.47 to 4.49 mm and from 0.26 to 3.00 mm in the pre-pubertal and pubertal subgroups, respectively.

	supplementary changes in comparison to the untreated controls (1) SNA, 2) SNB and 3) ANB angles, 4) maxillary base (according to Pancherz Analysis) [27], 5) total facial divergence, and 6) mandibular incisor proclination (relative to the mandibular plane)): For the **SNA** angle, the overall annualised change in pre-pubertal patients was **-0.02°** (-0.29, 0.25). While in **pubertal** patients, the overall annualised change was **-0.05**° (-1.02, 0.08), but the **difference between the two subgroups was not significant** at p = 0.15, and the I2 values were 0% and 56% for the pre-pubertal and pubertal subgroups, respectively (Fig 6). The prediction intervals ofthe annualised changes ranged from -0.89° to 0.85° and from -3.35° to 2.41° in the pre-pubertal and pubertal subgroups, respectively. Regarding the **SNB** angle, the overall annualised change in **pre-pubertal patients was 0.56°** (0.11, 1.01) **and of 1.00° (0.60, 1.39) in pubertal patients**, with **no significant (p = 0.15) differences** between the subgroups, and the I2 values were 72% and 0% for the pre-pubertal and pubertal subgroups, respectively (Fig 7). The prediction intervals of the annualised changes ranged from -2.06° to 3.18° and from -0.27° to 2.27° in the pre-pubertal and pubertal subgroups, respectively. For the **ANB** angle, the overall annualised change in **pre-pubertal patients was -0.73°** (-0.95, -0.50) while, in **pubertal** patients, the overall annualised change was **-2.14°** (-3.09, -1.18). The difference between the subgroups was **significant** at p<0.01, and the I2 values were 0% and 88% for the pre-pubertal and pubertal subgroups, respectively (Fig 8). The prediction intervals of the annualised changes ranged from -1.45° to -0.01° and from -8.02° to 3.74° in the pre-pubertal and pubertal subgroups, respectively. Regarding **the Maxillary base** (Pancherz Analysis), the overall annualised change in **pre-pubertal patients was -0.62 mm** (-0.97, -0.27) and **-0.49 mm (-0.84, -0.15) in pubertal patients.** The difference between the subgroups was **not significant** at p = 0.66, and the I2 values were 0% for both the subgroups (Fig 9). The prediction intervals of the annualised changes ranged from –1.75 to 0.51 mm and from -1.00 to 0.02 mm in the pre-pubertal and pubertal subgroups, respectively. For the **facial divergence**, the overall annualised change in **pre-pubertal patients was 0.27°** (-0.25, 0.79), while in **pubertal** patients, the overall annualised change **was 0.80°** (0.34, 1.26). The difference between the subgroups was **not significant** at p = 0.14, and the I2 values were 55% and 0% for the prepubertal and pubertal subgroups, respectively (Fig 10). The prediction intervals of the annualised changes ranged from -1.10° to 1.64° and from -0.25° to 1.35° in the pre-pubertal and pubertal subgroups, respectively. Finally, for the **mandibular incisor proclination**, the overall annualised change in **pre-pubertal patients was 1.37°** (0.38, 2.36) **and 0.79°** (-0.66, 2.25) in **puberta**l patients. The difference between the subgroups was **not significant** at p = 0.52, and the I2 values were 0% and 47% for the pre-pubertal and pubertal subgroups, respectively (Fig 11). The prediction intervals of the annualised changes was not derivable for the pre-pubertal patients, while for the pubertal patients ranged from -6.49° to 8.07°.

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign: Registrierung bei PROSPERO, RCTs und p/r CCTs, detaillierte Ein-/Ausschlusskriterien, GRADE durchgeführt* *Durchführung: Literatursichtung und Datenextraktion durch zwei unabhängige Auswerter, Messergebnisse der Einzelstudien durch jährliche Angaben vergleichbar , detaillierte Literaturrecherche, Meta-Analyse schließt Einzelstudien von schlechter Qualität aus* *Auswertung: gute RoB-Analyse, ausführliche Heterogenitäts- & Subgruppenanalyse, sowohl narrative als auch quantitative Analyse der Einzelstudien* *Power der Studie/Patientenzahl: 11/ 732* *Funding:* The authors received no specific funding for this work. *Interessenkonflikte:* The authors have declared that no competing interests exist. *Bias (SIGN/AMSTAR/EinzelstudienRoB – alle negativen Punkte aus Fragebogen auflisten):* **3. Did the review authors explain their selection of the study designs for inclusion in the review?** **10. Did the review authors report on the sources of funding for the studies included in the review?** **11. If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results? – No only for NRSI** *Publikationsbias (Reviews):* Generally non-significant p values were seen for all the parameters in both subgroups. Exception were seen for the SNB and ANB angles that yielded a significant publication bias according to the Egger test in the pubertal subgroup (p = 0.020 and p = 0.056, respectively), for the ANB for the pre-pubertal subgroup (p = 0.055), and for the facial divergence for the pre-pubertal subgroup (p = 0.089).
Schluss-folgerung des Begutachters	methodische Qualität: systematisches Review gut, Einzelstudien insgesamt von mittlerer Qualität
	Klinische Aussagekraft: Bei Jugendlichen mit einer Klasse-II-Anomalie scheinen herausnehmbare Funktionskieferorthoädische Geräte die Malokklusion vor allem bei Einsatz während des pubertalen Wachstumsschubes zu verbessern. Dabei wirken die Apparaturen hauptsächlich im Unterkiefer, der in seinem Wachstum positiv beeinflusst wird. Allerdings können keine Aussagen zum Langzeiteffekt getroffen werden.
Evidenz-level (SIGN)	**1+**
Qualität **(RoB, SIGN /AMSTAR II)**	**Moderat ⊕⊕**

Evidenztabelle Petrén und Bondemark 2008

Correction of unilateral posterior crossbite in the mixed dentition: A randomized controlled trial

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Introduction: From an evidence-based point of view, correction of posterior crossbite is not sufficiently evaluated. Thus, the aims of this study were to compare and evaluate the effectiveness of different treatment strategies to correct unilateral posterior crossbite in the mixed dentition by using the randomized clinical trial methodology with an untreated control group. **Methods:** Sixty patients participated in the study. All met the following inclusion criteria: mixed dentition, unilateral posterior crossbite, no sucking habits, and no previous orthodontic treatment. The patients were randomized into 4 groups: quad-helix, expansion plate, composite onlay, and untreated control. The success rates, amounts of maxillary and mandibular expansion, and treatment times were registered. **Results:** The quad-helix appliance was superior to the expansion plate in success rate and treatment time. Treatment with the expansion plate was unsuccessful in one third of the subjects. Crossbite correction with composite onlay in the mixed dentition was ineffective, and spontaneous correction in the mixed dentition did not occur. **Conclusions:** If unilateral posterior crossbite is planned to be corrected in the mixed dentition, this study clearly confirmed that treatment with the quad-helix is an appropriate and successful method. (Am J Orthod Dentofacial Orthop 2008;133:790.e7-790.e13)

Population *Setting* *Komorbiditäten*	**Transversale Anomalie** • Patients from 2 clinics at the Public Dental Health Service, Skane County Council, Sweden, and from the Department of Orthodontics, Faculty of Odontology, Malmö University, Malmö, Sweden. • Patients with posterior crossbite in the mixed dentition
Schweregrad	Unilateral Crossbite
Einschluss-kriterien *Bei Review: PICOS*	1. Mixed dentition (all incisors and first molars erupted) 2. Unilateral posterior crossbite

Ausschluss-kriterien	1. Sucking habits or sucking habit ceased at least 1 year before the trial 2. Previous orthodontic treatment
Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** The patients were randomized into the following groups: quad-helix, expansion plate, composite onlay. **Group A (quad-helix)** N=15 (Anfang) / N=15 (Ende) / Alter = 9,1 ± 1,03 Jahre / ♂:♀ = 6:9 • Gebissphase: frühes/spätes Wechselgebiss • KFO-Behandlung: Frühbehandlung (interzeptiv) **Group B (expansion-plate)** N=15 (Anfang) / N=15 (Ende) / Alter = 8,7 ± 0,82 Jahre / ♂:♀ = 6:9 • Gebissphase: frühes/spätes Wechselgebiss • KFO-Behandlung: Frühbehandlung (interzeptiv) **Group C (Composite Onlay)** N=15 (Anfang) / N=15 (Ende) / Alter = 8,3 ± 0,7 Jahre / ♂:♀ = 7:8 • Gebissphase: frühes/spätes Wechselgebiss • KFO-Behandlung: Frühbehandlung (interzeptiv)
Kontrolle Kontrollgruppe	**Keine Kieferorthopädische Therapie** KONTROLLGRUPPE: **untreated control** N=15 (Anfang) / N=15 (Ende) / Alter = 8,8 ± 0,7 Jahre / ♂:♀ = 7:8 • Gebissphase: frühes/spätes Wechselgebiss • KFO-Behandlung: keine Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: Success rate of crossbite correction (yes/no) SEKUNDÄRZIELGRÖßE: maxillary and mandibular intercanine and intermolar epansion (The shortest intercanine linear distance at the gingival margins and the cusp tips of the teeth/shortest intermolar linear distance at the gingival margins and the mesiobuccal cusp tips of the teeth) TERTIÄRZIELGRÖßE: Treatment time (time in months to correct the crossbite to normal occlusion)
Studientyp	**RCT**

Schluss-folgerungen der Autoren	1. If crossbite is planned to be corrected in the mixed dentition, this study clearly confirms that treatment with the quad-helix is an appropriate and successful method. 2. Treatment with the expansion plate was unsuccessful in one third of the patients, and the reason was insufficient patient cooperation. 3. Crossbite correction with composite onlay in the mixed dentition was not effective.
Zusammen-fassung der Ergebnisse	**GRUPPE A VS. GRUPPE untreated control** **GRUPPE B VS. GRUPPE untreated control** **GRUPPE C VS. GRUPPE untreated control** ***PRIMÄRZIELGRÖßE*** All patients in the quad-helix group were successfully corrected (Table II). In the expansion plate group, two thirds (10 of 15) were successfully corrected; thus, the success rate was significantly lower compared with the quad-helix group (Table II). In the composite onlay group, a few crossbites (2 of 15) were corrected, and, in the untreated control group, no spontaneous correction occurred. Thus, composite onlay had unsatisfactory results for crossbite correction and showed no significant differences compared with the untreated group. The mandibular midlines were corrected in almost all patients in the quad-helix and expansion plate groups. In the untreated control and composite groups, a few subjects showed correction of the mandibular midline, although the crossbite was not corrected. ***SEKUNDÄRZIELGRÖßE*** The intermolar and intercanine distances in the maxilla were significantly increased in the quad-helix($p<0,001$) and expansion plate groups ($p <0,001$)(Table III). The maxillary intermolar expansion was significantly larger in the quad-helix than in the expansion plate group ($p<0,01$; $p<0,05$), whereas maxillary intercanine expansion was significantly larger in the expansion plate group at the gingival margin measurements. The maxillary expansion in the composite onlay group was small, albeit significant ($p < 0,01$; $p < 0,001$) and also in the untreated group small changes were found ($p< 0,01$, NS, $p< 0,05$) (Table III). In the mandible, small but significant amounts of intermolar expansion occurred in the expansion plate and untreated control groups ($p< 0,05$, $p<0,01$) . The mandibular intercanine distance changes were negligible (NS; $p<0,05$) (Table III). ***TERTIÄRZIELGRÖßE*** The average treatment time to correct unilateral posterior crossbite to normal occlusion in the quadhelix group was 4.8 months (SD, 3.52), and the corresponding time for the expansion plate group was 9.6 months (SD, 3.04). Thus, the treatment time was significantly shorter in the quad-helix group ($P=0.0004$).

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Power der Studie/Patientenzahl:* The sample size calculation showed that 12 patients in each group were needed, and, to increase the power even more and compensate for possible dropouts, it was decided to select 15 patients for each group. *Funding: no Information* *Interessenkonflikte: no Information* Bias (SIGN): Reliability and validation of the intervention unclear
Schluss-folgerung des Begutachters	methodische Qualität: insgesamt sehr gut
	Klinische Aussagekraft: • If unilateral posterior crossbite is planned to be corrected in the mixed dentition, this study clearly confirmes that treatment with the quad-helix is an appropriate and successful method. • The quad-helix appliance was superior to the expansion plate. • Crossbite correction with composite onlay in the mixed dentition was ineffective. • correction in the mixed dentition did not occur.
Evidenz-level (SIGN)	**1++**
Qualität **(RoB, SIGN /AMSTAR II)**	**High quality ⊕⊕**

Evidenztabelle Pithon, Santos et al. 2016

Is alternate rapid maxillary expansion and constriction an effective protocol in the treatment of Class III malocclusion? A systematic review

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Introduction: the treatment of Class III malocclusion in early age is one of the greatest challenges for orthodontists, and the establishment of more effective treatment method is a constant concern for these professionals. Thus, the objective of this systematic review is to verify the effectiveness of the therapy protocol for alternate rapid maxillary expansion and constriction (Alt-RAMEC) in the early treatment of Class III malocclusion. **Methods:** searches were performed in the following electronic databases: Cochrane Library, Medline (EBSCO and PubMed), SciELO, LILACS and Scopus. The following inclusion criteria were used: in vivo studies conducted with early intervention (patient in craniofacial development phase) with the use of the Alt-RAMEC protocol. Reviews, case reports, editorials, and studies with syndromic patients or under use of systemic drug were excluded. Duplicates were also excluded. The studies were assessed for methodological quality using the Cochrane tool for assessment of risk of bias, and classified as high or low risk of bias. **Results:** 53 articles were found. Duplicates exclusion was then performed and 35 articles remained. After inclusion analysis, only 5 matched the criteria. Two articles were classified as low risk of bias and three as high risk of bias. It was observed that the Alt-RAMEC enable protraction in less time and with better results, promoting greater effectiveness in the protraction treatment of Class III malocclusion. **Conclusions:** Although there is positive evidence of the effectiveness of early treatment with the Alt-RAMEC protocol in patients with Class III malocclusion, further studies are needed to confirm its effectiveness using long-term methodology.

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie (inkl. LKG)** Individuals in the growing phase and with anteroposterior and transverse maxillary deficiency. Review: controlled clinical studies with patients in the growth phase (during craniofacial development) with Class III malocclusion (P-participants), who were submitted to the Alt-RAMEC protocol for maxillary expansion and protraction as early treatment The articles also had to compare individuals of same gender and age, and also with the traditional method of maxillary expansion establishing from the results whether there was a greater effectiveness of Alt-RAMEC or not. Single Center Studien aus Australien, Italien, Taiwan und der Türkei.
Schweregrad	Keine Angabe
Einschluss-kriterien *Bei Review: PICOS*	Population: Individuals in the growing phase and with anteroposterior and transverse maxillary deficiency. Intervention: Use of the Alt-RAMEC protocol for maxillary expansion and protraction. Comparison: Individuals of same age and sex, and treated with traditional (other) methods of maxillary expansion, longitudinal comparisons and vs. untreated controls. Outcome: PRIMÄRZIELGRÖßE: Behandlungserfolg (Effectivness) Follow-up nicht spezifiziert
Ausschluss-kriterien	case reports, review articles, editorial or personal opinions, patients using systemic medications and/or with systemic disorders, and patients submitted to previous surgical procedures involving maxilla and/or mandible

Intervention Versuchsgruppe	**kieferorthopädische Behandlung** VERSUCHSGRUPPE: **Alt-RAMEC** • N= ?(Anfang) / N= 85 (Ende) / Alter = 10,5 ± 1,6/ ♂:♀ = 41:44 davon 29 in longitudinalen Vergleichen • Gebissphase: frühes Wechselgebiss • KFO Behandlung: frühe Behandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** **und** **kieferorthopädische Therapie zu anderem Zeitpunkt /Zeitraum /Gebissphase/** KONTROLLGRUPPE: **Other MPA OR longitudinal OR untreated** Other MPA: N= ?(Anfang) / N= 62(Ende) / Alter = 10,3 ± 1,7 / ♂:♀ =31:31 Untreated: N=? (Anfang) / N= 21(Ende) / Alter = 8,0 / ♂:♀ =9:12 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: frühe Behandlung, keine kieferorthopädische Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** ▪ primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) ▪ Reduktion der Belastung des Patienten, Behandlungszeit Eine zusammenfassende Analyse oder quantitative Analyse wurde nicht durchgeführt. Alle Ergebnisse: Alt-RAMEC vs. Other MPA OR longitudinal OR untreated Behandlungserfolg: Die Charakteristika der Studien erwähen maxilläre Protraktion Rotation (UK), Schneidezähne (Inklination). Eine konkrete Auflistung fehlt. Unklar ist ebenfalls auf welchen Parameter sich die dort angegebenen p-Werte beziehen. Signifikant verbesserter Behandlungserfolg mit Alt-RAMEC vs. alternative Behandlung. p< 0.05 -0.001 (je nach Studie, Parameter unklar). Als zusätzlicher Behandlungserfolg wird eine verkürzte Therapiedauer für Alt-RAMEC diskutiert. Konkrete Analysen, die eine Reduktion der Patientenbelastung bestätigen könnten, fehlen jedoch.
Studientyp	**Systematisches Review** Systematisches Review N= 5 (Randomisierung unklar, mit hoher Wahrscheinlichkeit kontrollierte Kohortenstudien) *Review:* Gesamt-Teilnehmerzahl in Bezug auf PICO: N = 168

Schluss-folgerungen der Autoren	The use of **Alt-RAMEC protocol is effective to early treatment of Class III malocclusion** patients. The **stability** of the correction of Class III malocclusion **could not be verified**, because of the lack of studies designed to assess this issue. Although the scientific evidence point to a greater effectiveness of the protocol using Alt-RAMEC in the early treatment of Class III malocclusion, **more studies are needed** with longer follow-up period, as well as better definition of the test and control groups
Zusammen-fassung der Ergebnisse	**GRUPPE Alt-RAMEC VS. GRUPPE Other MPA OR longitudinal OR untreated** Regarding the results of the articles included in this systematic review, Isci, Turk and Elekdag-Turk showed **greater effectiveness** in the group that used the alternate repetitive protocol (**Alt-RAMEC) associated to HR**. The **Alt-RAMEC** group exhibited approximately a **two-fold magnitude of maxillary movement**, when compared to the other group. Al-Mozany used Temporary Anchorage Devices (TADs) and Class III intermaxillary elastics, associated with the Alt-RAMEC protocol to correct Class III malocclusions.
Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	Sytematischer Review ohne zusammenfassende Analyse oder gar quantitativer Analyse. Die Einzelstudien werden vorgestellt und interpretiert. Allerdings ist eine RoB Analyse erfolgt und insgesamt war das Vorgehen in Ordnung. Dennoch sollte auf die größtenteils kleinen Gruppengrößen (10- 15 Patienten je Gruppe) und die erwähnte hohe Heterogenität der Outcomes hingewiesen werden. Das Outcome wird als Behandlungserfolg (Effectivness) angegeben, allerdings ist unklar wie dieser definiert wurde. Die Charakteristika der Studien erwähen maxilläre Protraktion Rotation (UK), Schneidezähne (Inklination). Eine konkrete Auflistung fehlt aber. Unklar ist ebenfalls auf welchen Parameter sich die in Tabell 2 angegebenen p-Werte beziehen. Obwohl erkennbar auch longitudinale Vergleiche durchgeführt wurden, bzw. in eiern Studie eien unbehandelte Kontrollgruppe eingschlossen wurde, beziehet sich die Diskussion nur auf den Vergleich mit alternativen Therapien. Die verwendeten Alt-RAMEC Protokolle unterscheiden sich zwischen den Studien z.T. erheblich. Als zusätzlicher Behandlungserfolg wird eine verkürzte Therapiedauer für Alt-RAMEC diskutiert. Konkrete Analysen, die eine Reduktion der Patientenbelastung bestätigen könnten, fehlen jedoch. Obwohl die handwerkliche Qualität des Reviews formal in Ordnung erscheint, schränken die oben erwähnten Schwächen die klinische Relevanz sehr deutlich ein.
Schluss-folgerung des Begutachters	methodische Qualität: Review: gut; Einzelstudien: moderat-gut (laut Review)
	Klinische Aussagekraft: Obwohl die handwerkliche Qualität des Reviews formal in Ordnung erscheint, schränken die oben erwähnten Schwächen die klinische Relevanz sehr deutlich ein.
Evidenz-level (SIGN)	**2+**
Qualität **(RoB, /AMSTAR II)**	**Moderat ⊕⊕**