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Sportmedizinische Vorsorgeuntersuchung –

Synopse internationaler Leitlinien und Empfehlungen

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Abkürzungen

AAFP	American Academy of Family Physicians
AAP	American Academy of Pediatrics
AAOS	American Academy of Orthopaedic Surgeons
AAPMR	American Academy of Physical Medicine and Rehabilitation
AASP	Association of Applied Sport Psychiatry
ACC	American College of Cardiology
ACC SECLC	American College of Cardiology Sports and Exercise Cardiology Leadership Council
ACEP	American College of Emergency Physicians
ACL	anterior cruciate ligament
ACOG	American College of Obstreticians and Gynecologists
ACS	American Cancer Society
ACLM	American College of Lifestyle Medicine
ACRM	American Congress of Rehabilitation Medicine
ACSM	American College of Sports Medicine
ACSEP	Australasian College of Sports and Exercise Physicians
AEPC	AEPC
AGREE	Appraisal of Guidelines for Research and Evaluation
AH	athlete's heart
AHA	American Heart Association
AIS	Australian Institute of Sport
AMSSM	American Medical Society for Sports Medicine
AOASM	American Osteopathic Academy of Sports Medicine
AOSSM	American Orthopaedic Society for Sports Medicine
APA	American Psychological Association (Division 47: Exercise and Sport Psychology)
APHRS	Asia Pacific Heart Rhythm Society
APTA	American Physical Therapy Association
ASCA	American School Counselor Association
ASD	Academy for Sports Dentistry
ASE	American Society of Echocardiography
ASSMP	Austrian Society of Sports Medicine and Prevention
BASEM	British Association for Sports and Exercise Medicine
BSE CRY	British Society of Echocardiography and Cardiac Risk in the Young
BMI	body mass index
BP	blood pressure
CACHN	Community and Athletic Cardiovascular Health Network
CARF	Commission on Accreditation of Rehabilitation Facilities
CASEM	Canadian Academy of Sport and Exercise Medicine
CATA	Canadian Athletic Therapists Association
CATS	College Athletic Trainers' Society
CCS	Canadian Cardiovascular Society
CDC	Centers for Disease Control
CHRS	Canadian Heart Rhythm Society
CIHR	Canadian Institute of Health Research
CMR	cardiovascular magnetic resonance
COC	Canadian Olympic Committee
COPSI	Canadian Olympic and Paralympic Sport Institute Network
CPC	Canadian Paralympic Committee
CSCCA	Collegiate Strength and Conditioning Coaches Association
CSEP	Canadian Society for Exercise Physiology
CSI	Canadian Sport Institute
CVD	cardiovascular disease
DVGS	Deutscher Verband für Gesundheitssport und Sporttherapie
EA4SD	European Association for Sports Dentistry
EACPR	European Association for Cardiovascular Prevention and Rehabilitation
EACVI	European Association of Cardiovascular Imaging
ECG	electrocardiography
ECSEP	European College of Sports and Exercise Physicians
EFSMA	European Federation of Sports Medicine Associations
EHRA	European Heart Rhythm Association
EIB	Exercise-induced bronchoconstriction
EAPC	European Association of Preventive Cardiology
ESC	European Society of Cardiology
ESSA	Exercise and Sports Science Australia
FABER test	Flexion, Abduction and External Rotation test
FADIR test	Flexion, Adduction and Internal Rotation test
FATC	Female Athlete Triad Coalition
FMATC	Female and Male Athlete Triad Coalition
FIFA	Fédération Internationale de Football Association
HCM	hypertrophic cardiomyopathy
HR	heart rate
HRS	Heart Rhythm Society
HSF	Heart and Stroke Foundation
IAEHC	Italian Association of Extra-hospital Cardiologists
IAIHC	Italian Association of In-hospital Cardiologists
ICISF	International Critical Incident Stress Foundation
IOC	International Olympic Committee
ISC	Italian Society of Cardiology
ISSP	International Society of Sports Psychiatry
LASECS	LASECS
LoE	Level of Evidence
MCS	MacMillan Cancer Support
MET	metabolic equivalent(s)
MTSS	medial tibial stress syndrome
NAIAAA	National Interscholastic Athletic Administrators Association
NASMPA	Norwegian Association of Sports Medicine and Physical Activity
NATA	National Athletic Trainers' Association

NCAA	National Collegiate Athletics Association
NCCN	National Comprehensive Cancer Network
NCI	National Cancer Institute
NCSF	National Council on Strength and Fitness
NFHS	National Federation of State High School Associations
NSCA	National Strength and Conditioning Association
PAR-Q+	Physical Activity Readiness Questionnaire Plus
PPE	pre-participation physical examination
RDSPT	Royal Dutch Society for Physical Therapy
SASMA	South African Sports Medicine Association
SBC-DERC	Brazilian Society of Cardiology – Department of Exercise and Rehabilitation
SBM	Society for Behavioral Medicine
SCE	sudden cardiac death
SCCT	Society of Cardiovascular Computed Tomography
SCG	Sports Cardiology Group
SCMR	Society for Cardiovascular Magnetic Resonance
SCT	sickle cell trait
SDA	Sports Doctors Australia
SGS	Schweizerische Gesellschaft für Sportmedizin
SET	shin edema test
SORT	Strength of Recommendation Taxonomy
SPT	shin palpation test
SSC	Spanish Society of Cardiology
SSESM	Swedish Society of Exercise and Sports Medicine
TTE	trans-thoracic echocardiography

Hintergrund und Fragestellung

Körperliche Aktivität und regelmäßiger Sport sind für jeden wünschenswert. Die Studie „Gesundheit in Deutschland aktuell" (GEDA) aus dem Jahr 2019/20 des Robert Koch Instituts zeigt jedoch, dass sich lediglich 23,3 % der Frauen und 29,4 % der Männer in Deutschland auf dem empfohlenen Niveau sportlich betätigen [1]. Sportmedizinische Vorsorgeuntersuchungen zielen darauf ab, einen sicheren (Wieder-)Einstieg in den Sport zu ermöglichen. Insbesondere sollen sie dazu beitragen, unerwünschte gesundheitliche Ereignisse während körperlicher Aktivität zu verringern und potenzielle Folgeschäden zu vermeiden.

Aktuell wird eine neue S2k-Leitlinie „Sportmedizinische Vorsorgeuntersuchung" durch die Deutsche Gesellschaft für Sportmedizin und Prävention e.V. (DGSP) vorbereitet (AWMF Registernummer 066-002). Die S1-Leitlinie *Vorsorgeuntersuchung im Sport* von 2007 ist seit vielen Jahren abgelaufen und soll durch die neue S2k-Leitlinie ersetzt werden.

Die vorliegende Synopse internationaler Leitlinien, Empfehlungen und Konsensuspapiere soll die Erstellung der S2k-Leitlinie informieren. Es werden darin evidenz- und konsensbasierte Empfehlungen zu sportmedizinischen Vorsorgeuntersuchungen aggregiert und methodisch bewertet. Das Ziel der Leitliniensynopse ist es, einen Überblick über den international bestehenden Wissensstand zur sportmedizinischen Vorsorgeuntersuchung zu liefern. Sie soll als Grundlage für die Generierung klinisch relevanter Fragestellungen für die S2k-Leitlinie dienen. Darüber hinaus können durch die Leitliniensynopse verfügbare Primärstudien als Evidenz identifiziert werden. Somit kann verdeutlicht werden, für welche Fragestellungen Forschungslücken bestehen, die aktuell nur im Expert:innenkonsens bewertet werden können.

Methoden

Die Methodik zur Erstellung der Leitliniensynopse wurde vorab definiert und in einem Protokoll festgehalten. Das Protokoll wurde online auf PROSPERO (https://www.crd.york.ac.uk/prospero/) unter der Kennzeichnung CRD42022355112 veröffentlicht.

Literaturrecherche

Eine systematische Literaturrecherche wurde in den Datenbanken MEDLINE (via PubMed), Trip Medical Database, der Leitliniendatenbank des Internationalen Leitlinien-Netzwerks (Guidelines International Network, GIN), NIH Library sowie ECRI Trust durchgeführt (Appendix 1). Die Recherchen erfolgten am 09.08.2022 (MEDLINE, Trip, GIN) bzw. am 11.08.2022 (ECRI). Die Suchstrategie wurde mithilfe von Automatisierungstools (Word Frequency Analyzer, SearchRefinery) [2] auf Basis bekannter, relevanter Publikationen entwickelt und an die Suchmodalitäten der einzelnen Datenbanken angepasst. Zu den Suchbegriffen zählten unter anderem ‚sport*', ‚physical activ*', ‚preparticipation', ‚diagnostic assessment*', ‚prevention', ‚guideline*', ‚consensus*' oder ‚recommend*'. Die Recherche berücksichtigte Publikationen, die seit dem 01.01.2012 veröffentlicht wurden. Diese Zeitlimitation wurde gewählt, da ca. 50 % aller Leitlinien nach fünf Jahren abgelaufen sind [3, 4]. Daher kann angenommen werden, dass Leitlinien, die älter als zehn Jahre sind, mit hoher Wahrscheinlichkeit veraltet sind. Bei der Recherche erfolgten keine Einschränkungen der Sprache oder des Publikationsstatus. Die vollständigen Suchstrategien können dem Anhang entnommen werden.

Neben der Datenbankrecherche erfolgten zusätzliche, strukturierte Handrecherchen auf den Webseiten von ausgewählten Leitlinienorganisationen (National Institute for Health and Care Excellence (NICE) England, Scottish Intercollegiate Guidelines Network (SIGN), National Health and Medical Research Council (NHMRC) Australien, Canadian Medical Association Infobase of Clinical Practice Guidelines, New Zealand Guidelines Group, U.S. Department of Veterans Affairs and Department of Defense (VA/DoD) Clinical Practice Guidelines, U.S. National Institute of Health (NIH)) sowie von relevanten sportmedizinischen Vereinigungen (American College of Sports Medicine (ACMS), Canadian Academy of Sport and Exercise Medicine (CASEM), Sports Medicine Australia, British Association of Sport and Exercise Medicine (BASEM), European Federation of Sports Medicine Associations (EFSMA). Nähere Informationen zur strukturierten Handrecherche können dem Anhang entnommen werden.

Zusätzlich wurde ein Referenzencheck aller eingeschlossenen Publikationen durchgeführt (backward citation searching).

Ein- und Ausschlusskriterien

Die Leitlinien-Synopse schließt internationale Leitlinien und Konsenspapiere zu anamnestischen und diagnostischen Interventionen in (vermeintlich) gesunden Erwachsenen sowie Athlet:innen jeglichen Alters (mit und ohne Behinderungen) ein. Zu

den primären Outcomes zählen die Vermeidung/Reduktion belastungsinduzierter (fataler) Ereignisse und möglicher Folgeerkrankungen bei der sportlichen Betätigung sowie diagnostische Gütekriterien. Ungültige/abgelaufene Dokumente sowie Empfehlungen für Länder außerhalb des WHO-Mortalitätsstratum A wurden nicht berücksichtigt. Die konkreten Ein- und Ausschlusstabellen sind in Tabelle x dargestellt.

PICOS	Einschlusskriterien	Ausschlusskriterien
Population	I. Gesunde oder genesene Erwachsene, die regelmäßig Sport treiben oder damit (wieder) beginnen wollen; IIa. Athlet:innen (≥ 16 Jahre); IIb. Athlet:innen (< 16 Jahre), jeweils mit oder ohne Behinderung.	Personen mit bekannten Vorerkrankungen (Schwangere sowie gesunde Menschen mit einer bleibenden Einschränkung der körperlichen oder geistigen Leistungsfähigkeit gelten nicht als vorerkrankt)
Interventionen	Anamnese, anthropometrische Diagnostik, kardiometabolische/internistische Untersuchungsverfahren in Ruhe und Belastung, orthopädische Untersuchungsverfahren in Ruhe und Belastung, zusätzliche Tests/diagnostischen Verfahren angrenzender Fachgebiete	Diagnostische Maßnahmen für Sportarten, für die es eine spezifische Tauglichkeitsuntersuchung gibt (z.B. Tauchen, Fliegen, etc.)
Kontrolle	Standardversorgung, andere Untersuchungsverfahren	
Outcomes	Primäre Outcomes I. Vermeidung/Reduktion belastungsinduzierter (fataler) Ereignisse bei der sportlichen Betätigung II. Vermeidung/Reduktion möglicher Folgen/Folgeerkrankungen durch Sport/Belastungen III. diagnostische Gütekriterien Sekundäre Outcomes (Empfehlungen/Interventionen) I. Trainingsempfehlungen II. Ernährungsintervention III. Sonstige Interventionen IV. Weitergehende Abklärung	
Studientyp	Evidenzbasierte oder konsensbasierte klinische Leitlinien/Konsenspapiere	Ungültige/abgelaufene Leitlinien/Konsenspapiere, Leitlinien/Konsenspapiere, die vor 2012 publiziert wurden
Setting	Länder des WHO-Mortalitätsstratum A; Herausgebende: Medizinische Fachgesellschaften, Leitlinienorganisationen, regierungsgeführte Organisationen (z.B. Militär), durch solche Gesellschaften/Organisationen eingesetzten Expert:innengruppen	
Sprache	Deutsch, Englisch	
Weitere		Duplikate; Mehrfachpublikationen ohne Zusatzinformation

Literaturauswahl

Die Treffer der MEDLINE-Recherche wurden in ein Literaturverwaltungsprogramm (Endnote) exportiert. Dubletten wurden entfernt. Die Treffer der Webseiten-Recherche und der anderen Datenbanken wurden in eine Microsoft Excel-Datei überführt. Anschließend erfolgte die Literaturauswahl anhand prädefinierter Ein- und Ausschlusskriterien. Zunächst wurden die Titel und Abstracts der identifizierten Treffer aus der Datenbankrecherche mit Hilfe des Webtools Rayyan [5] gesichtet. Die Treffer der Webseitenrecherche wurden in Microsoft Excel exportiert und auf Titel-Ebene gesichtet. Die Entscheidungen zum Ein- und zum Ausschluss auf Titel/Abstract-Ebene wurden konsentiert und alle als relevant angesehenen Referenzen wurden anschließend im Volltext gesichtet. Die Volltexte wurden hinsichtlich der Erfüllung der Einschlusskriterien geprüft. Alle Schritte der Literaturauswahl erfolgten durch zwei unabhängige Personen. Differenzen wurden konsentiert und ggf. mit einer dritten Person abgestimmt. Bei weiterhin bestehenden Unklarheiten wurden die Koordinatorinnen der vorliegenden Leitlinie konsultiert.

Datenextraktion

Die Datenextraktion erfolgte auf Basis einer neu entwickelten, pilotierten Datenextraktionstabelle in Microsoft Excel (2016). Es wurden zwei Pilotierungsrunden mit jeweils drei eingeschlossenen Publikationen durchgeführt. Zwei Personen nahmen an beiden Pilotierungsrunden teil, zwei weitere durchliefen nur die zweite Pilotierungsrunde. Die Publikationen für die erste Pilotierungsrunde wurden auf Basis heterogener Charakteristika (z.B. Aufbau und Umfang der Leitlinie/Empfehlungen) aus-

gewählt; die Auswahl für die zweite Pilotierungsrunde erfolgte willkürlich. Die Extraktionstabelle wurde während der Pilotierungsphase angepasst und erweitert. Die Extraktion erfolgte durch eine Person und wurde durch eine zweite Person geprüft. Unstimmigkeiten wurden konsentiert, ggf. unter Einbeziehung einer dritten Person.

Vergabe von Evidenzleveln

In Fällen, in denen für relevante Empfehlungen Referenzen angegeben waren, wurde die jeweilige zitierte Literatur extrahiert und deren Volltexte beschafft. Für Primärstudien oder systematische Reviews (SR) wurde auf Basis des Volltextes ein Evidenzlevel nach „Oxford 2011 Level of Evidence“ vergeben [6]. Die ersten 20 Referenzen wurden durch 2 Personen unabhängig voneinander bewertet. Nach einer anschließenden Konsentierung erfolgte die Vergabe durch eine Person. Bei Unklarheiten wurde eine zweite Person konsultiert. Für Referenzen von Übersichtsartikeln, Kommentaren oder Leitlinien ohne SR wurde kein LoE vergeben.

Qualitätsbewertung

Die Qualität der eingeschlossenen Leitlinien/Konsensuspapiere wurde auf Basis der Domäne 3 („Rigour of Development“) und der Domäne 6 („Editorial Independence“) des *Appraisal of Guidelines for Research and Evaluation-II* (AGREE-II) Tools bewertet [7]. Die Bewertung erfolgte durch zwei unabhängige Personen. Die AGREE-II Bewertung wurde anhand der selben sechs Leitlinien/Konsensuspapieren pilotiert, die auch für die Pilotierung der Datenextraktionstabelle verwendet wurden. Die Bewertungen wurden besprochen, um die Kriterien möglichst konsistent anzuwenden und systematische Abweichungen zwischen den Bewertenden zu identifizieren. Alle weiteren Bewertungen wurden am Ende verglichen und Abweichungen von mehr als 2 Punkten pro Item diskutiert, um verbleibende systematische Unterschiede in der Bewertung zu identifizieren und bei Bedarf einzelne Anpassungen vorzunehmen. Anschließend wurde der Mittelwert der beiden Bewertungen gebildet und als Gesamtscore pro Leitlinie/Konsensuspapier und bewertete Domäne angegeben.

Synthese

Die Synthese der Daten erfolgte in einer strukturierten, narrativen Form. Meta-Daten der eingeschlossenen Leitlinien/Konsensuspapiere sowie extrahierte Empfehlungen (inkl. Angaben zur Population, zum Empfehlungstyp, zum Empfehlungsgrad und zum Evidenzlevel eingeschlossener Primärstudien) wurden in tabellarischer Form dargestellt. Die Empfehlungen wurden in medizinische Themengebiete unterteilt und pro Themengebiet dargestellt.

Abweichungen vom Protokoll

Im Rahmen der systematischen Literaturrecherche war für den Referenzencheck sowohl eine vorwärts- als auch eine rückwärtsgerichtete Vorgehensweise (forward and backward citation screening) vorgesehen. In Anbetracht der hohen Einschlussquote und limitierter Ressourcen wurde jedoch beschlossen, sich auf einen rückwärtsgerichteten Referenzencheck zu beschränken.

Im PICO-Schema der Leitliniensynopse wurden sowohl primäre als auch sekundäre Outcomes definiert. Aufgrund einer unerwartet hohen Menge an Empfehlungen und der zumeist nicht möglichen Zuordnung von Outcomes zu einzelnen Empfehlungen wurden im Rahmen der Leitlinien-Synopse nur die primären Outcomes erfasst. Für die sekundären Outcomes ist nun geplant, dass die Mitglieder der jeweiligen Arbeitsgruppen auf Basis der eingeschlossenen Dokumente relevante weiterführende Untersuchungen oder Interventionen bei der Entwicklung von Empfehlungen für die Leitlinie berücksichtigen.

Hinweise zur Nutzung dieses Dokuments

Für jedes Thema werden die Empfehlungen kurz diskutiert, die durch die systematische Leitlinienrecherche identifiziert wurden. Dabei wird hervorgehoben, welche Inhalte sich auf den Breiten- und Freizeitsport beziehen, Besonderheiten bei Subgruppen dokumentiert sowie auf Inkonsistenzen bei den Empfehlungen unterschiedlicher Organisationen verwiesen. Anschließend wird der Originaltext der Empfehlungen wiedergegeben, zusammen mit der Empfehlungsstärke und Literatur, auf die Bezug genommen wird.

Die Stärke der jeweiligen Empfehlung wurde nach dem folgenden Schema gekennzeichnet, das die „Strength of Recommendation Taxonomy” (SORT) erweitert.

SORT	Empfehlungsgrundlage
A	Empfehlung auf Grundlage konsistenter patientenorientierter Evidenz von guter Qualität
B	Empfehlung auf Grundlage inkonsistenter oder limitierter patientenorientierter Evidenz
C	Empfehlung auf Grundlage von Konsens, krankheitsorientierter Evidenz, üblicher Praxis, Expertenmeinung
–	Statement im Text

Teilweise wird von den Autor:innen der Empfehlungen zusätzlich eine Empfehlungsklasse angegeben, die die Konsistenz der Entscheidungsgrundlage wiedergibt:

Klasse	Konsens/Konsistenz der Entscheidungsgrundlage
I	Evidenz und/oder allgemeiner Konsens, dass eine bestimmte Behandlung oder ein bestimmtes Verfahren vorteilhaft, nützlich oder wirksam ist.
II	Widersprüchliche Evidenz und/oder divergierende Meinungen über die Nützlichkeit/Wirksamkeit einer bestimmten Behandlung oder eines bestimmten Verfahrens.
III	Evidenz oder allgemeiner Konsens darüber, dass eine bestimmte Behandlung oder ein bestimmtes Verfahren nicht nützlich/wirksam ist und in einigen Fällen sogar schädlich sein kann.

Definitionen der Population eingeschlossener Empfehlungen

Abkürzung	Definition
BFS	Teilnehmende im Breiten- und Freizeitsport (violett markiert)
OS	Teilnehmende an organisiertem Sport (Vereinssport)
A	Athlet:innen (mit regelmäßiger Wettkampfteilnahme)
EA	Elite-Athlet:innen (nationale Kader, Profisport)

Ergebnisse

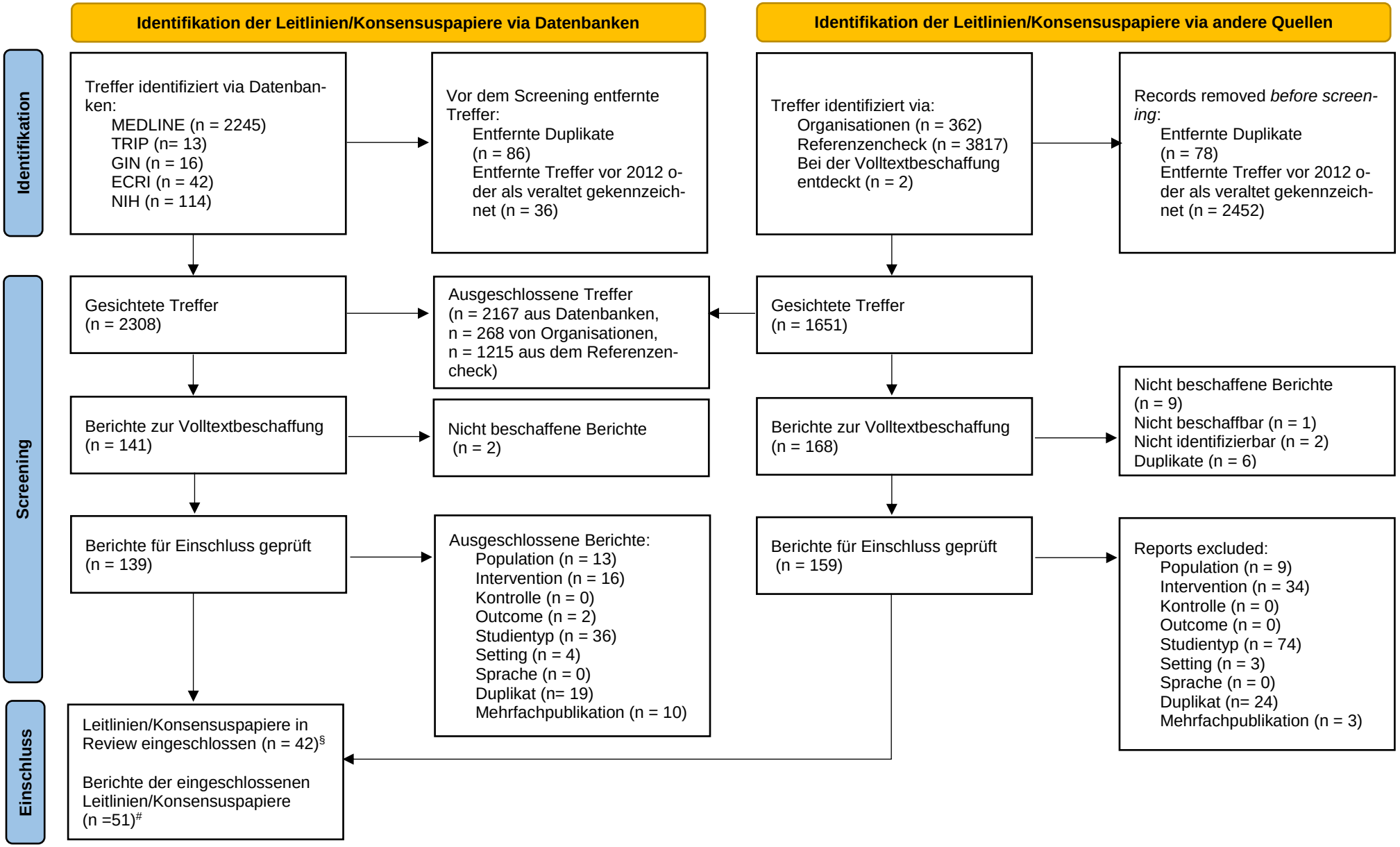
Insgesamt wurden 2.430 Treffer über die Datenbankrecherche und 4.181 über weitere Quellen identifiziert (Abbildung 1). Nach der Entfernung von Dubletten und veralteten Dokumenten (vor 2012) wurden insgesamt 3959 Treffer auf Title/Abstract-Ebene gesichtet. Für insgesamt 297 Treffer wurden die Volltexte beschafft und auf die Erfüllung der Ein- und Ausschlusskriterien überprüft. Insgesamt wurden auf Volltextebene 246 Treffer ausgeschlossen. Zu den häufigsten Ausschlussgründen zählten die Intervention, der Studientyp und Duplikate. Insgesamt wurden 51 Berichte zu 42 Leitlinien/Konsensuspapieren eingeschlossen. Davon beziehen sich 7 Leitlinien/Konsensuspapiere (8 Berichte) auf Sport nach COVID-19. Diese werden im vorliegenden Bericht aufgrund der fehlenden Relevanz für die Leitlinie nicht berücksichtigt, sondern in einem separaten Dokument berichtet.

Eingeschlossene Leitlinien und Konsensuspapiere

Die 42 eingeschlossenen Leitlinien/Konsensuspapiere beruhen mehrheitlich auf Konsens (Tabelle 1). Leider fehlt oft der direkte Bezug zwischen Empfehlungen und entsprechenden Primärstudien.

Domäne 3 des AGREE-II Instruments bewertet die methodische Exaktheit bei der Erstellung von Leitlinien, wobei insbesondere auf Qualitätsmerkmale zugrundeliegender systematischer Reviews geachtet wird., Da die hier eingeschlossenen Dokumente häufig Konsensuspapiere sind und in den seltensten Fällen eine systematische Literaturrecherche berichtet wurde, sind die Bewertungen für diese Domäne durchgehend niedrig. Domäne 6 bewertet die redaktionelle Unabhängigkeit, insbesondere die Abwesenheit von Interessenkonflikten. Hier lagen oft keine ausreichenden Informationen zur Bewertung vor, einige Dokumente erreichten aber hohe Scores.

Abbildung 1. PRISMA 2020 Flussdiagramm für systematische Übersichtsarbeiten mit Suche in Datenbanken und anderen Quellen [8]



§ Davon betreffen n=7 Leitlinien/Konsensuspapiere das Thema „Sport nach COVID-19"; # davon betreffen n=8 Berichte von Leitlinien/Konsensuspapiere zum Thema „Sport nach COVID-19". Diese sind nicht Teil des Berichts, da sie nicht das Thema der Leitlinie adressieren. Die Ergebnisse werden separat veröffentlicht.

Tabelle 1. Meta-Daten der eingeschlossenen Referenzen

ID, Ref.	*Titel* Veröffentlichende Organisation	Beteiligte Organisationen	Land, Jahr	Population	AGREE-II, Domäne: 3	AGREE-II, Domäne: 6
AAFP 2016 [9]	*Selected Issues in Injury and Illness Prevention and the Team Physician: A Consensus Statement* unklar (mehrere)	AAFP, AAOS, ACSM, AMSSM, AOSSM, AOASM	USA, 2016	Athlet:innen	4%	0%
AAFP 2017 [10]	*Female Athlete Issues for the Team Physician: A Consensus Statement - 2017 Update* American Academy for Family Physicians	AAOS, ACSM, AMSSM, AOSSM, AOASM	USA, 2017	Athletinnen (weiblich) und schwangere Athlet:innen	7%	0%
AAP 2019 [11]	*Preparticipation Physical Evaluation, 5th Edition* American Academy of Pediatrics	AAFP, ACSM, AMSSM, AMSSM, AOSSM, AOASM	USA, 2019	Teilnehmende an organisiertem Sport oder intensiven körperlichen Aktivitäten, Athlet:innen	14%	0%
ACOG 2020 [12]	*Physical Activity and Exercise During Pregnancy and the Postpartum Period: ACOG Committee Opinion, Number 804* American College of Obstetricians and Gynecologists	–	USA, 2020	Schwangere (im Allgemeinen)	7%	17%
ACPM 2013 [13]	*Screening for sudden cardiac death before participation in high school and collegiate sports: American College of Preventive Medicine position statement on preventive practice* American College of Preventive Medicine	–	USA, 2013	High School- und College-Athlet:innen	10%	25%
ACSM 2019 [14]	*Exercise Guidelines for Cancer Survivors: Consensus Statement from International Multidisciplinary Roundtable* American College of Sports Medicine	ESSA, ACS, DVGS, AAPMR, MCS, APTA, ACRM, NCCN, ACLM, RDSPT, CSEP, SBM, CDC, CARF, Sunflower Wellness	USA, 2019	Krebsüberlebende	24%	50%
ACSM 2021 [15]	*ACSM's Guidelines for Exercise Testing and Prescription, 11th Edition* American College of Sports Medicine	–	USA, 2021	Allgemeinbevölkerung (inkl. Schwangere und Krebsüberlebende)	11%	0%
AEPC 2017 [16]	*Cardiovascular pre-participation screening in young athletes: Recommendations of the Association of European Paediatric Cardiology* Association of European Paediatric Cardiology	–	Europa, 2017	Junge Athlet:innen	13%	75%
AHA ACC 2015 [17-19]	*Eligibility and Disqualification Recommendations for Competitive Athletes With Cardiovascular Abnormalities: Preamble, Principles, and General Considerations; Task Force 2: Preparticipation Screening for Cardiovascular Disease in Competitive Athletes; Task Force 6: Hypertension: A Scientific Statement From the American Heart Association and American College of Cardiology* American Heart Association, American College of Cardiology	–	USA, 2015	Allgemeinbevölkerung, Teilnehmende an organisiertem Sport, Athlet:innen	41%	33%
AMSSM 2017 [20]	*AMSSM Position Statement on Cardiovascular Preparticipation Screening in Athletes: Current evidence, knowledge gaps, recommendations and future directions* American Medical Society for Sports Medicine	–	USA, 2017	Athlet:innen	20%	25%
AMSSM 2017	*International criteria for electrocardiographic interpretation in athletes: Consensus statement*	AMSSM, ASSMP, SBC-DERC,	Welt, 2017	Athlet:innen	20%	46%

ID, Ref.	*Titel* Veröffentlichende Organisation	Beteiligte Organisationen	Land, Jahr	Population	AGREE-II, Domäne: 3	6
(ECG) [21]	unklar (mehrere)	BASEM, CASEM, ECSEP, ESC, FIFA, DGSP, IOC, NASMPA, SASMA, SSC, SCG, SDA, SSESM				
AMSSM 2020 [22]	*Mental health issues and psychological factors in athletes: detection, management, effect on performance and prevention: American Medical Society for Sports Medicine Position Statement-Executive Summary* American Medical Society for Sports Medicine	–	USA, 2020	Athlet:innen	24%	71%
ASE 2020 [23]	*Recommendations on the Use of Multimodality Cardiovascular Imaging in Young Adult Competitive Athletes: A Report from the American Society of Echocardiography in Collaboration with the Society of Cardiovascular Computed Tomography and the Society for Cardiovascular Magnetic Resonance* American Society of Echocardiography	SCCT, SCMR	USA, 2020	Junge Athlet:innen	19%	21%
BSE CRY 2018 [24]	*A guideline update for the practice of echocardiography in the cardiac screening of sports participants: a joint policy statement from the British Society of Echocardiography and Cardiac Risk in the Young* British Society of Echocardiography and Cardiac Risk in the Young	–	Großbritannien 2018	Junge Athlet:innen	9%	71%
CASEM 2020 [25]	*Physical activity prescription: a critical opportunity to address a modifiable risk factor for the prevention and management of chronic disease: a position statement by the Canadian Academy of Sport and Exercise Medicine* Canadian Academy of Sport and Exercise Medicine	ACSEP, AMSSM, BASEM, ECSEP, NASMPA, SASMA, SGS, SDA, SSESM	Welt, 2020	Gesunde Allgemeinbevölkerung	8%	21%
CCS CHRS 2019 [26]	*Canadian Cardiovascular Society/Canadian Heart Rhythm Society Joint Position Statement on the Cardiovascular Screening of Competitive Athletes* Canadian Cardiovascular Society, Canadian Heart Rhythm Society	–	Kanada, 2019	Athlet:innen	42%	54%
COCIS 2021 [27-29]	*Italian cardiological guidelines for sports eligibility in athletes with heart disease: part 1; part 2; Italian Cardiological Guidelines (COCIS) for Competitive Sport Eligibility in athletes with heart disease: update 2020* Italian Society of Sports Cardiology and the Italian Sports Medicine Federation	IAIHC, ISC, IAEHC	Italien, 2021	Athlet:innen	8%	0%
EA4SD 2020 [30]	*The European Association for Sports Dentistry, Academy for Sports Dentistry, European College of Sports and Exercise Physicians consensus statement on sports dentistry integration in sports medicine* European Association for Sports Dentistry	ASD, ECSEP	Europa/ USA, 2020	Athlet:innen jeglichen Levels	7%	21%
EAPC EACVI	*The multi-modality cardiac imaging approach to the Athlete's heart: an expert consensus of the*	–	Europa, 2018	Athlet:innen und Eliteathlet:innen	10%	21%

ID, Ref.	*Titel* Veröffentlichende Organisation	Beteiligte Organisationen	Land, Jahr	Population	AGREE-II, Domäne: 3	6
2018 [31, 32]	*European Association of Cardiovascular Imaging; European Association of Preventive Cardiology (EAPC) and European Association of Cardiovascular Imaging (EACVI) joint position statement: recommendations for the indication and interpretation of cardiovascular imaging in the evaluation of the athlete's heart* European Association of Cardiovascular Imaging					
EFSMA 2015 [33]	*The Pre-Participation Examination in Sports: EFSMA Statement on ECG for Pre-Participation Examination* European Federation of Sports Medicine Associations	–	Europa, 2015	Freizeitsportler-:innen, Athlet:innen und Eliteathlet:innen	14%	21%
EFSMA 2021 [34]	*Preparticipation medical evaluation for elite athletes: EFSMA recommendations on standardised preparticipation evaluation form in European countries* European Federation of Sports Medicine Associations	–	Europa, 2021	Eliteathlet:innen	8%	33%
EHRA EACPR 2017 [35]	*Pre-participation cardiovascular evaluation for athletic participants to prevent sudden death: Position paper from the EHRA and the EACPR, branches of the ESC. Endorsed by APHRS, HRS, and SOLAECE* European Heart Rhythm Association, European Association for Cardiovascular Prevention and Rehabilitation	APHRS, HRS	Europa, 2017	Athlet:innen	14%	13%
ESC 2021 [36]	*2020 ESC Guidelines on sports cardiology and exercise in patients with cardiovascular disease* European Society of Cardiology	–	Europa, 2021	Allgemeinbevölkerung (inkl. Krebsüberlebende) und Athlet:innen	41%	63%
ESC 2022 [37]	*2022 ESC Guidelines for the management of patients with ventricular arrhythmias and the prevention of sudden cardiac death* European Society of Cardiology	AEPC	Europa, 2022	Mittelalte bis ältere Personen und Athlet:innen	32%	75%
FATC 2014 [38]	*2014 Female Athlete Triad Coalition Consensus Statement on Treatment and Return to Play of the Female Athlete Triad* Female Athlete Triad Coalition	ACSM, AMSSM	USA, 2014	Athletinnen (weiblich)	15%	21%
FMATC 2021 [39, 40]	*The Male Athlete Triad-A Consensus Statement From the Female and Male Athlete Triad Coalition Part 1: Definition and Scientific Basis; Part II: Diagnosis, Treatment, and Return-To-Play* Female and Male Athlete Triad Coalition	–	USA, 2021	Athleten (männlich)	14%	21%
FSC 2019 [41, 42]	*French Society of Cardiology guidelines on exercise tests (part 1): Methods and interpretation; (part 2): Indications for exercise tests in cardiac diseases* French Society of Cardiology	–	Frankreich, 2019	Athlet:innen	17%	71%
IOC 2013 [43]	*How to minimise the health risks to athletes who compete in weight-sensitive sports review and position statement on behalf of the Ad Hoc Research Working Group on Body Composition, Health and Performance, under the auspices of the IOC Medical Commission*	–	Welt, 2013	Athlet:innen in gewichtssensiblen Sportarten	7%	42%

ID, Ref.	*Titel* Veröffentlichende Organisation	Beteiligte Organisationen	Land, Jahr	Population	AGREE-II, Domäne: 3	6
	International Olympic Committee					
IOC 2017 [44]	*Exercise and pregnancy in recreational and elite athletes: 2016/2017 evidence summary from the IOC expert group meeting, Lausanne. Part 5. Recommendations for health professionals and active women* International Olympic Committee	–	Welt, 2017	Freizeitsportler:innen und Eliteathlet:innen während der Schwangerschaft und nach der Entbindung	6%	75%
IOC 2018 [45, 46]	*The IOC consensus statement: beyond the Female Athlete Triad--Relative Energy Deficiency in Sport (RED-S); International Olympic Committee (IOC) Consensus Statement on Relative Energy Deficiency in Sport (RED-S): 2018 Update* International Olympic Committee	–	Welt, 2018	Athlet:innen	7%	42%
NATA 2012 [47]	*National athletic trainers' association position statement: preventing sudden death in sports* National Athletic Trainers' Association	–	USA, 2012	Teilnehmende an organisiertem Sport	15%	0%
NATA 2013 [48]	*The inter-association task force for preventing sudden death in secondary school athletics programs: best-practices recommendations* unklar (mehrere)	NATA, ACSM, AOSSM, AAP, NFHS, AMSSM, AOASM, ACEP, NCSF, NAIAAA, NSCA, CATA, Korey Stringer Institute, Gatorade Sports Science Institute	Nordamerika, 2013	Athlet:innen in der Sekundarstufe	8%	0%
NATA 2014 [49]	*National Athletic Trainers' Association position statement: Preparticipation physical examinations and disqualifying conditions* National Athletic Trainers' Association	–	USA, 2014	Teilnehmende an organisiertem Sport	17%	0%
NATA 2015 [50]	*Interassociation recommendations for developing a plan to recognize and refer student-athletes with psychological concerns at the secondary school level: a consensus statement* unklar (mehrere)	NATA, AAP, AMSSM, APA, AASP, ASCA, ISSP, ICISF	USA, 2015	Studentische Athlet:innen	13%	0%
NCAA 2016 [51]	*Interassociation Consensus Statement on Cardiovascular Care of College Student-Athletes* National Collegiate Athletic Association	AAP, NATA, CATS, AMSSM, ACC SECLC, NFHS, AOSSM, AOASM, AHA, ACSM, NSCA, CSCCA	USA, 2016	College-Athlet:innen	10%	42%

Administration

Für den Breiten- und Freizeitsport wurden keine Empfehlungen zur Administration von sportmedizinischen Vorsorgeuntersuchungen gefunden (Tabelle 2).

Im Athlet:innen-Bereich sind die administrativen Empfehlungen weitgehend konsistent. Empfohlen wird die Berücksichtigung von Privatsphäre und Datenschutz, sowie eine standardisierte Untersuchung anhand von Frage- und Dokumentationsbögen. In Europa empfiehlt die EFSMA die Verwendung digitaler Dokumentation.

Es wird empfohlen, die Vorsorgeuntersuchung der Athlet:innen rechtzeitig (z.B. 4-6 Wochen) vor Trainingsbeginn durchzuführen, um Folgeuntersuchungen zu ermöglichen. Eine vollständige Untersuchung wird alle 2-3 Jahre empfohlen (AEPC, Europa/AAP, USA), sowie bei Änderungen des Belastungsniveaus („level of participation", NATA, USA). Ergänzend wird eine

jährliche Anamnese angestrebt (AAP, USA). Andere Organisation geben keine direkte Empfehlung zum Untersuchungsintervall an, implizieren aber eine jährliche Durchführung (s. Tabelle 8: IOC, weltweit/AMSSM, USA und Tabelle 9: FATC, USA).

Es sind sowohl individuelle als auch Stationen-basierte Untersuchungen möglich. Die AAP empfiehlt individuelle Untersuchungen, während die NATA beides als gleichwertig ansieht (USA). Betont wird, dass vorangehende Untersuchungsergebnisse dem Untersuchenden vorliegen sollten und dass ein Zugang zu weiterführenden Untersuchungen und Spezialisten gewährleistet ist.

Tabelle 2. Empfehlungen zur Administration von sportmedizinischen Vorsorgeuntersuchungen

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT[c]
	Privatsphäre, Datenschutz		
NATA 2014 [49], OS	Privacy must be respected at all times when the findings of the PPE are communicated. Written authorization must be provided by the athlete, or the legal guardian if the athlete is a minor, before any private health information is released.		**C**
AAP 2019 [11], OS-A	Defined sections of the PPE are personal (or protected) health information and require confidential, secure handling and permission of the athlete, or parent, or guardian, to be shared beyond the athlete's health care personnel.		C
	Standardisierung, Dokumentation		
AHA ACC 2015 [17-19], A	It is recommended that standardization of the questionnaire forms used as guides for examiners of high school and college athletes in the United States be pursued.		**I-C**
NATA 2014 [49], OS	A standardized PPE is most desirable, and as research dictates specific recommendations for what is to be evaluated, a more standardized process should emerge. However, considerable variability still exists. The American Academy of Pediatrics has developed a thorough document that should serve as the minimum template for a standardized PPE instrument.		**C**
AAP 2019 [11], OS-A	The standardized PPE History Form is the preferred format for documentation in either paper format or electronic format.		C
EFSMA 2015 [33], A	Recommendations for PPE in Europe: Standardised history and clinical examination with „e-documentation"		C
EFSMA 2021 [34], EA	Standardised history and clinical examination with digital or 'e-documentation' are recommended, storing or paper documentation should be implicit avoided.		–
AMSSM 2017 [20], A	A standardised questionnaire should be considered during the PPE and during well childcare visits that serve as the PPE to guide a comprehensive cardiac symptom and familiy history evaluation.		–
	Zeitpunkt, Intervall		
NATA 2014 [49], OS	The PPE may be conducted 4 to 6 weeks before preseason training begins to allow time for proper follow-up of any findings requiring additional evaluation. However, it is also practical and acceptable to conduct the PPE on the day preseason training begins or the day before because athletes usually report 1 to 2 days earlier. Because of this short timeline, clearance for some athletes who require additional evaluation may be delayed.		**C**
NATA 2014 [49], OS	A complete PPE should be performed at each new level of participation. When warranted during interim years, a review of the medical history and subsequent evaluation should be conducted.		**C**
AAP 2019 [11], OS-A	The pre-participation physical evaluation (PPE) should be performed as part of the periodic health supervision examination every 2 to 3 years, with updated interval histories at intervening health supervision checks yearly.		C
AAP 2019 [11], OS-A	Athletes and their parents or guardians are responsible for timely scheduling of PPEs, as problems that require additional testing may delay the completion of the examination in time for the start of season practices.		C
AEPC 2017 [16], A	The screening should be performed before the start of competitive sports and should be repeated every second year to detect progressive diseases.		–
AMSSM 2017 [20], A	Ideally, pre-participation cardiovascular screening should take place with adequate time prior to the start of a sports season to perform secondary testing of screening abnormalities.		–
	Setting		
NATA 2014 [49], OS	Both individual and multiple-station PPE screening methods can be effective and beneficial provided the appropriate personnel are available and a systematic approach is used to compile and record findings.		**C**
AAP 2019 [11], OS-A	The pre-participation physical evaluation should be integrated into the periodic health evaluations of an athlete along with preventative care strategies by a provider from the medical home health care team who has current and past medical records.		**C**
AAP 2019 [11], OS-A	The PPE is best performed in the setting of the primary medical home, by a provider who knows the athlete well or who has a comprehensive medical and injury history of the athlete.		C
AAP 2019 [11], OS-A	The writing group does not recommend that these examinations be performed in a station-based or group setting or by providers who do not have access to the athlete's comprehensive medical		C

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT[c]
	and injury history. It is clear from the literature that these examinations are not equivalent to the examination performed by the primary medical home.		
AAP 2019 [11], OS-A	If a station-based or group examination is used, it is important that review of the history and physical examination be performed by the provider assessing medical eligibility and participation status.		C
AAP 2019 [11], OS-A	Adolescent athletes should be seen apart from their parents or guardians for at least part of the examination so that the provider can inquire about risk-taking behaviors.		C
	Infrastruktur bei kardiologischen Untersuchungen		
ASE 2020 [23], A	Pre-participation cardiovascular screening programs should ensure timely access to clinical centers with sports cardiology and clinical imaging expertise to facilitate the comprehensive multimodality imaging required to evaluate findings detected during pre-participation cardiovascular screening.		C
AMSSM 2017 [20], A	Any ECG screening programme if implemented, however, should have a strong infrastructure, high quality control, and consider informed consent that outlines the potential benefits and risks with the athlete (and/or parent/guardian).		–
	Abschluss und weiterführende Untersuchungen		
AAP 2019 [11], OS-A	The final responsibility for a PPE lies with the provider who signs the Medical Eligibility Form and assumes the medical liability.		C
AAP 2019 [11], OS-A	Athletes with problems discovered during the PPE that are beyond the scope and expertise of the examining provider should be referred to an appropriate specialist for consultation regarding medical eligibility.		C

[a] BFS=Breiten- und Freizeitsport, OS=Teilnehmende an organisiertem Sport (Vereinssport), A=Athlet:innen (mit regelmäßiger Wettkampfteilnahme), EA=Elite-Athlet:innen (nationale Kader, Profisport); [b] eigene Einschätzung, nur ausgefüllt, falls Literatur eindeutig zuzuordnen; [c] fett falls durch Autor:innen vergeben, ansonsten eigene Einschätzung.

Indikationsstellung

Für den Breiten- und Freizeitsport in der Allgemeinbevölkerung gibt es nur wenige Empfehlungen zur Indikation für eine sportmedizinische Vorsorgeuntersuchung (Tabelle 3). In den USA wird empfohlen, den Bedarf für eine Untersuchung vorab durch qualifiziertes Sport- oder Gesundheitsfachpersonal oder eigenständig mit Hilfe des Physical Activity Readiness Questionnaire Plus (PAR-Q+, s. Appendix 1) zu klären. Ein internationaler Zusammenschluss von Organisationen sieht eine medizinische Untersuchung vor sportlichen Aktivitäten mit leichter bis moderater Intensität nicht als notwendig an (CASEM).

Besonderheiten bei spezifischen Personengruppen

Schwangeren wird eine sportmedizinische Vorsorgeuntersuchung empfohlen (ACOG und ACSM, USA), die durch den Schwangerschafts-spezifischen Fragebogen Physical Activity Readiness Medical Examination (PARmed-X for Pregnancy, s. Appendix 3) geleitet werden kann (ACSM, USA). Allerdings sei hier erwähnt, dass die CSEP, die diesen Fragebogen entwickelt hat, inzwischen selbst eine andere Vorgehensweise empfiehlt. Die CSEP empfiehlt nun, dass Schwangere eigenständig ein Pre-Screening-Tool anwenden, um die Hürde vor sportlicher Betätigung zu reduzieren (Get Active Questionnaire for Pregnancy (GAQ-P), s. Appendix 4) [52].

Bei Sport mit hoher Intensität und bei Eliteathletinnen empfiehlt das IOC eine gründliche klinische Untersuchung zur Identifizierung möglicher Kontraindikationen für Sport während der Schwangerschaft (Box 1).

Tabelle 3. Empfehlungen zur Indikation sportmedizinischer Vorsorgeuntersuchungen

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT[c]
ACSM 2021 [15], BFS	Preparticipation health screening before initiating a moderate-to-vigorous exercise program is a two-stage process: - The need for medical clearance before initiating or progressing exercise programming is determined using the ACSM screening algorithm and the help of a qualified exercise or health care professional. In the absence of professional assistance, interested individuals may use the Physical Activity Readiness Questionnaire Plus (PAR-Q+). - If indicated during screening, medical clearance from a physician or other qualified health care provider should be recommended. The manner of clearance, however, should be determined by the clinical judgment and discretion of said health care provider.		–
CASEM 2020 [25], BFS	Participation in light to moderate exercise confers very little risk and can be 'self-administered', akin to an over-the-counter medication.		–

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT[c]
	Schwangerschaft		
ACOG 2020 **[12]**, BFS	A thorough clinical evaluation should be conducted before recommending an exercise program to ensure that a [pregnant] patient does not have a medical reason to avoid exercise.		C
ACOG 2020 **[12]**, BFS	Obstetrician-gynecologists and other obstetric care providers should evaluate women with medical or obstetric complications carefully before making recommendations on physical activity participation during pregnancy.		C
ACSM 2021 [15], BFS	The Canadian Society for Exercise Physiologists Physical Activity Readiness Medical Examination for Pregnancy (PARmed-X for Pregnancy) or the electronic Physical Activity Readiness Medical Examination (ePARmed-X+) can be used for the health screening of pregnant women before their participation in exercise programs.		–
IOC 2017 [44], BFS-EA	For high level exercisers and elite athletes, a thorough clinical evaluation should be conducted to ascertain that there are no medical or obstetrical reasons to either avoid exercise completely, or to modify exercise routines (box 1, 2).		–
	Nach überstandener Krebserkrankung		
ACSM 2021 [15], BFS	A preexercise medical assessment is suggested (Table 10.1).		–
ACSM 2021 [15], BFS	Specific cancer survivor populations for whom medical evaluation and/or exercise testing should be considered include those with metastatic disease, those with persistent and significant cancer treatment-related side effects, or those with significant comorbidities.	3 [53]	–
ACSM 2021 [15], BFS	Exercise testing is not required for preparticipation assessment for most cancer survivors.	3 [53]	–
ACSM 2021 [15], BFS	The ACSM preparticipation screening algorithm can be used to determine whether exercise testing is needed for cancer survivors prior to participation in moderate-to-vigorous intensity exercise.		–
ACSM 2019 [14], BFS	Pre-exercise medical evaluation (per NCCN guidelines for specific symptoms and side effects) for patients with lung or abdominal surgery, ostomy, cardiopulmonary disease, ataxia, extreme fatigue, severe nutritional deficiencies, worsening/changing physical condition (i.e., lymphedema exacerbation), bone metastases. Consider referral to trained personnel (rehabilitation specialists (i.e., physical therapists, occupational therapists, physiatrists) and certified exercise physiologists).		–
ACSM 2019 [14], BFS	Recommend pre-exercise medical evaluation (per NCCN guidelines for specific symptoms and side effects) for patients with peripheral neuropathy, arthritis/musculoskeletal issues, poor bone health (e.g., osteopenia or osteoporosis), lymphedema. Consider referral to trained personnel (rehabilitation specialists (i.e., physical therapists, occupational therapists, physiatrists) and certified exercise physiologists).		–
ACSM 2019 [14], BFS	No further pre-exercise medical evaluation (per NCCN guidelines for specific symptoms and side effects) for patients without comorbidities.		–

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Box 1. Absolute und relative Kontraindikationen für Sport während der Schwangerschaft (übersetzt aus IOC 2017 [44])

Beschwerden, die ein hohes Risiko für den Fötus darstellen und bei denen aerobes Training absolut kontraindiziert ist

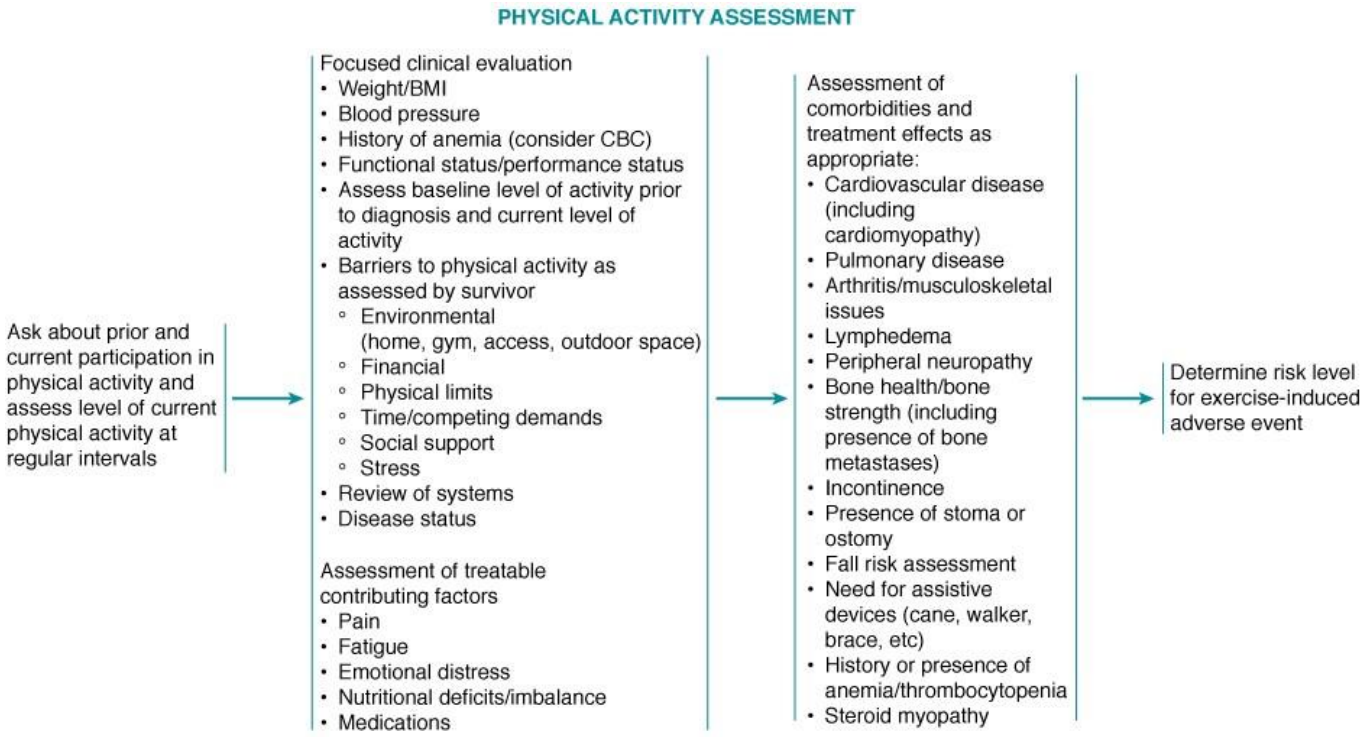
- Hämodynamisch signifikante Herzerkrankung.
- Intrauterine Wachstumsrestriktion in der laufenden Schwangerschaft.
- Schlecht eingestellter Bluthochdruck.
- Restriktive Lungenerkrankung
- Zervixinsuffizienz/Cerclage.
- Mehrlingsschwangerschaft mit Risiko für vorzeitige Wehen.
- Anhaltende Blutungen im zweiten oder dritten Trimester.
- Plazenta previa nach 26 Schwangerschaftswochen.
- Vorzeitige Wehen während der laufenden Schwangerschaft.
- Blasensprung.
- Präeklampsie/schwangerschaftsbedingter Bluthochdruck.
- Schwere Anämie.

Beschwerden, die ein mäßiges Risiko für den Fötus darstellen und bei denen aerobes Training relativ kontraindiziert ist

- Anamnestisch bekannte fetale Wachstumsrestriktion, Fehlgeburt, Frühgeburt oder Wehen.
- Zervixdilatation.
- Nicht abgeklärte mütterliche Herzrhythmusstörungen.
- Chronische Bronchitis oder andere Erkrankungen der Atemwege.
- Schlecht eingestellter Diabetes Typ I.
- Extremes Untergewicht.
- Orthopädische Einschränkungen.
- Unzureichend kontrollierte Anfallsleiden.

Zur Indikationsstellung für eine sportmedizinische Vorsorgeuntersuchung *nach überstandener Krebserkrankung* gibt es lediglich durch die ACSM ausgesprochene Empfehlungen. Darin wird eine klinische Untersuchung nach Abbildung 2 vorgeschlagen sowie weiter nach Krankheitsbild, persistenten Nebenwirkungen und Begleiterkrankungen differenziert.

Abbildung 2. Empfehlungen für die sportmedizinische Vorsorgeuntersuchung bei Patient:innen nach überstandener Krebserkrankung (Abbildung aus ACSM 2021 [15])



Umfang, Testauswahl

Im Breiten- und Freizeitsport empfiehlt die ACSM (USA), die durchzuführende Diagnostik auf Grundlage individueller Risikofaktoren, Krankheitszeichen und Symptome auszuwählen (Tabelle 4).

Alle weiteren Empfehlungen wurden für Athlet:innen ausgesprochen. In Europa schließt dies eine Diagnostik der Haut, der Lymphknoten, des Muskel- und Skelettsystems, des Atmungssystems, des Herz-Kreislauf-Systems inkl. Ruhe-EKG, des Abdomens, der Neurologie, der Ophthalmologie und der HNO ein, ergänzt durch Blut- und biochemische Tests sowie Urinproben. Die US-amerikanischen Empfehlungen sind nicht mit den europäischen konsistent. Es werden deutlich weniger Routinetests empfohlen und die Diagnostik erfolgt auf Grundlage der Anamnese und der körperlichen Untersuchung (AAP, USA).

Besonderheiten bei spezifischen Personengruppen

Bei Athlet:innen mit Behinderung wird dazu geraten, ergänzend auf Probleme zu achten, die oft mit der jeweilige Behinderung zusammenhängen (AAP, USA).

Tabelle 4. Empfehlungen zur Testauswahl

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT[c]
ACSM 2021 [15], BFS	Recommended laboratory tests, depending on individual risk factors, signs, and symptoms, could include fasting serum total cholesterol, fasting plasma glucose, 12-lead ECG, Holter monitoring, cardiac echocardiography, chest radiography, pulmonary function, and oximetry.		C
EFSMA 2021 [34], EA	Establishing the objective health status by physical examination includes the evaluation of dermatological conditions, lymph nodes, musculoskeletal system, respiratory system, cardiovascular system and resting ECG with 12 leads digital recording and software supported. Abdominal, neurological, ophthalmological and ENT examinations, blood and biochemical tests, urine samples should also be assessed.		–
EFSMA 2021 [34], EA	component of PPE is evaluating functional and exercise capacity according to the predominant type of effort of the sports discipline investigated. This includes neuromuscular evaluation (determination of muscle fibre strength and driving speed, EMG, EEG and Sport Concussion Assessment Tool in contact sports), psychological examination (testing aptitude, adaptation to training and personality traits). Mental health status is vital to discover any obstacles to achieving performance.		–
AAP 2019 [11], OS-A	PPE working group concurs that no routine [laboratory, cardiac, and pulmonary] screening tests are required during the PPE for determining medical eligibility of asymptomatic athletes.		–
AAP 2019 [11], OS-A	Findings from the PPE medical history or physical examination may indicate a need to arrange specific case finding [laboratory, cardiac, and pulmonary] diagnostic tests. Additional specific recommendations to test for targeted conditions are not part of the standardized screening examination.		–
EFSMA 2021 [34], EA	The PPE should entail the following diagnostic components: ► Health status. ► Anthropometry. ► Functional and exercise capacity.		–
	Athlet:innen mit Behinderung		
AAP 2019 [11], OS-A	The preparticipation physical evaluation (PPE) for an athlete with a disability should be similar to an athlete with no disabilities along with addressing the unique needs of the specific disability. The health care professional should be aware of common problems associated with different disabilities and be able to identify and help manage conditions that may compromise athlete safety. Just as important, the health care professional should encourage physical activity and provide support as needed.		–

[a] BFS=Breiten- und Freizeitsport, OS=Teilnehmende an organisiertem Sport (Vereinssport), A=Athlet:innen (mit regelmäßiger Wettkampfteilnahme), EA=Elite-Athlet:innen (nationale Kader, Profisport); [b] eigene Einschätzung, nur ausgefüllt, falls Literatur eindeutig zuzuordnen; [c] fett falls durch Autor:innen vergeben, ansonsten eigene Einschätzung.

Anamnese/Familienanamnese

Für den Breiten- und Freizeitsport empfiehlt die ACSM (USA) eine breite Palette an anamnestischen Fragen, die sich auf vorausgegangene Diagnosen, Eingriffe, Ergebnisse von körperlichen und Labor-Untersuchungen, Symptome, Krankheiten, Krankenhausaufenthalte, orthopädische Probleme, Medikamente, Genussmittel, sportliche und berufliche Aktivität beziehen und durch eine Familienanamnese ergänzt werden (Tabelle 5).

Die europäischen Empfehlungen für Athlet:innen sind vergleichbar (EFSMA). Auch für den Breiten- und Freizeitsport hat die EFSMA einen entsprechenden Untersuchungsbogen (Appendix 5) herausgebracht. Die NATA (USA) betont insbesondere den kardiovaskulären Teil (Appendix 6) sowie die Evaluation der Einnahme von Medikamenten und Nahrungsergänzungsmitteln.

Seit 2022 wird auch eine spezifische COVID-19 Anamnese empfohlen, die vorausgegangene Infektionen mit SARS-CoV-2 sowie Symptome, Diagnostik, Folgeerkrankungen, persistente und neue Symptome (AMSSM, USA) dokumentiert.

Die AAP (USA) empfiehlt zusätzlich das Abklären von Missbrauchszeichen bei Athlet:innen.

Besonderheiten bei spezifischen Personengruppen

Bei *Personen mit Behinderung* werden weitere Detailfragen zu folgenden Aspekten empfohlen: Krampfanfälle, Hörprobleme, Sehschwäche, kardiopulmonale Erkrankung, Nierenerkrankung, atlantoaxiale Instabilität, Hitzeschlag, Frakturen/Luxationen, Prothesen und Hilfsmittel, Blasenkatheter, Geschwüre, Wettkampf-Niveau, Selbständigkeit und Mobilität, Medikamente, Diät, und autonome Dysreflexie (AAP, USA).

Bei *Personen nach überstandener Krebserkrankung* sind Komorbiditäten zu berücksichtigen (Appendix 7) sowie ob die Behandlung ein erhöhtes Risiko für Knochenbrüche, kardiovaskuläre Ereignisse, Neuropathien oder Erkrankungen des Bewegungsapparats bedingt (ACSM, USA).

Tabelle 5. Empfehlungen zur Anamnese

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT[c]
NATA 2014 [49], OS	A comprehensive medical and family history should be obtained from each participant. This is the cornerstone of the PPE and should take into account the areas of greatest concern for sport participation: specifically, the American Heart Association recommendations for preparticipation cardiovascular screening of competitive athletes (Table 2).		**B**
NATA 2014 [49], OS	The medical and family history provided by the athlete and the parents or guardians should always be reviewed carefully. Both parties should be questioned and specific answers confirmed because the source that provides the most accurate history is unclear.	3 [54] 4 [55]	**C**
NATA 2014 [49], OS	All medications and supplements currently used by the athlete should be reviewed by the examiner during the PPE.		**C**
AAP 2019 [11], OS-A	For athletes younger than 18 years, both the athlete and the parent or guardian are asked to respond to medical history questions.	4 [55]	–
ACSM 2021 [15], BFS	Appropriate components of the medical history may include the following: • Medical diagnoses and history of medical procedures: cardiovascular disease risk factors including hypertension, obesity, dyslipidemia, and diabetes; cardiovascular disease including heart failure, valvular dysfunction (e.g., aortic stenosis/mitral valve disease), myocardial infarction, and other acute coronary syndromes; percutaneous coronary interventions including angioplasty and coronary stent(s), coronary artery bypass surgery, and other cardiac surgeries such as valvular surgeries; cardiac transplantation; pacemaker and/or implantable cardioverter defibrillator; ablation procedures for dysrhythmias; peripheral vascular disease; pulmonary disease including asthma, emphysema, and bronchitis; cerebrovascular disease including stroke and transient ischemic attacks; anemia and other blood dyscrasias (e.g., lupus erythematosus); phlebitis, deep vein thrombosis, or emboli; cancer; pregnancy; osteoporosis; musculoskeletal disorders; emotional disorders; and eating disorders • Previous physical examination findings: murmurs, clicks, gallop rhythms, other abnormal heart sounds, and other unusual cardiac and vascular findings; abnormal pulmonary findings (e.g., wheezes, rales, crackles), high blood pressure, and edema • Laboratory findings (i.e., plasma glucose, HbA1C, hs-CRP, serum lipids and lipoproteins) • History of symptoms: discomfort (e.g., pressure, tingling sensation, pain, heaviness, burning, tightness, squeezing, numbness) in the chest, jaw, neck, back, or arms; light-headedness, dizziness, or fainting; temporary loss of visual acuity or speech; transient unilateral numbness or weakness; shortness of breath; rapid heartbeat or palpitations, especially if associated with physical activity, eating a large meal, emotional upset, or exposure to cold (or any combination of these activities) • Recent illness, hospitalization, new medical diagnoses, or surgical procedures • Orthopedic problems including arthritis, joint swelling, and any condition that would make ambulation or use of certain test modalities difficult • Medication use (including dietary/nutritional supplements) and drug allergies • Other habits including caffeine, alcohol, tobacco, or recreational (illicit) drug use • Exercise history: information on readiness for change and habitual level of activity: frequency, duration or time, type, and intensity or FITT of exercise • Work history with emphasis on current or expected physical demands, noting upper and lower extremity requirements • Family history of cardiac, pulmonary, or metabolic disease, stroke, or sudden death		–

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT[c]
EFSMA 2021 [34], EA	Health assessment is based on family medical history, personal medical history, training history, training information and medical complaints: symptoms and signs.		–
	Anamnese nach COVID-19		
AMSSM 2022 [56, 57], A	Use the PPE as an opportunity to identify and record the following information: - Prior SARS-CoV-2 infection? If so, when did the infection occur, what symptoms were experienced and for how long. Were diagnostic tests performed (eg, echocardiogram and chest x-ray)? Was there a need for any physician-directed treatment or hospitalization? Presence of postinfection sequelae (eg, myocarditis)? Did the athlete achieve full recovery and return to play? Is the athlete experiencing persistent symptoms? If so, what symptoms? Is the athlete experiencing new symptoms with exercise (especially chest pain or excessive shortness of breath)? - COVID vaccination status? Which vaccine was received? Dates of administration? Reaction(s) to vaccination?		C
	Anamnese zu Missbrauch		
AAP 2019 [11], OS-A	During a PPE, sexual violence and sexual abuse will not be discovered if the question is not asked. If suspected child or adult sexual abuse is documented or suspected during the PPE, immediate notification of the Department of Children's Services or a law enforcement agency of the suspected abuse is mandatory. There is not a legal requirement for the reporting chain to go through any athletic department or school supervisor or administrator.		–
	Athlet:innen mit Behinderung		
AAP 2019 [11], OS-A	The history should include a detailed summary of previous injuries and illnesses, risk factors for injuries and illnesses, and current medications.		–
AAP 2019 [11], OS-A	In addition to the questions asked of an athlete who does not have a cognitive or physical disability (see Chapter 5 and the History Form on pages 217 and 218), additional questions should specifically address the particular impairment. The questions that follow emphasize areas of greatest concern for sports participation. 1. Does the athlete have a history of seizures? Are the seizures controlled? 2. Does the athlete have a history of hearing loss or impairment? 3. Does the athlete have a history of vision loss or impairment? 4. Does the athlete have a history of cardiopulmonary disease? 5. Does the athlete have a history of renal disease or unilateral kidney? 6. Does the athlete have a history of symptomatic atlantoaxial instability (AAI)? 7. Has the athlete had heat stroke or heat exhaustion? 8. Has the athlete had any fractures or dislocations? 9. What prosthetic devices or other assistive equipment does the athlete use during sports participation? 10. Does the athlete use an indwelling urinary catheter or require intermittent catheterization of the bladder? 11. Does the athlete have a history of pressure sores or ulcers? 12. At what levels of competition has the athlete previously participated? 13. What is the athlete's level of independence for mobility and self-care? 14. What medications is the athlete taking? 15. Does the athlete have any dietary restrictions? 16. Does the athlete have a history of autonomic dysreflexia?		–
AAP 2019 [11], OS-A	The PPE physical examination for an athlete who is disabled should include all parts of the examination for an athlete with no disability (see Chapter 5 and the Physical Examination Form on page 221). Particular attention should be given to the ocular, cardiovascular, musculoskeletal, neurological, and dermatologic systems. In addition to examining the athlete, a qualified health care professional or prosthetist should thoroughly inspect all prosthetic devices, orthoses, and assistive or adaptive devices to ensure all fit properly during exercise and are within the rules of competition.		–

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT[c]
	Nach überstandener Krebserkrankung		
ACSM 2019 [14], BFS	Be aware of a survivor's health history, comorbid chronic diseases, and health conditions, and any general exercise contraindications before commencing health-related fitness assessments or designing the exercise prescription.		C
ACSM 2019 [14], BFS	Be familiar with the most common toxicities associated with cancer treatments including increased risk for fractures and cardiovascular events, along with neuropathies or musculoskeletal morbidities related to specific types of treatment.		C

[a] BFS=Breiten- und Freizeitsport, OS=Teilnehmende an organisiertem Sport (Vereinssport), A=Athlet:innen (mit regelmäßiger Wettkampfteilnahme), EA=Elite-Athlet:innen (nationale Kader, Profisport); [b] eigene Einschätzung, nur ausgefüllt, falls Literatur eindeutig zuzuordnen; [c] fett falls durch Autor:innen vergeben, ansonsten eigene Einschätzung.

Körperliche Untersuchung

Für den Breiten- und Freizeitsport wird eine körperliche Untersuchung empfohlen (Tabelle 6), bestehend aus Anthropometrie, Puls- und Blutdruckmessung, Auskultation der Lunge und des Herzens, Tasten der Carotis sowie der Bauch- und Oberschenkelarterien, Abtasten des Abdomens, Prüfung des Vorhandenseins von Sehnen-Xanthomen oder Haut-Xanthelasmen, Folgeuntersuchung auf Basis anamnestisch erhobener Beschwerden sowie neurologische Untersuchungen (ACSM, USA). Bei Athlet:innen wird darüber hinaus eine Untersuchung des Visus, der Haut, der HNO sowie des Bewegungsapparats empfohlen (EFSMA, Europa / NATA, USA / AAP, USA). Für eine zahnmedizinische Untersuchung wird nur in europäischen Empfehlungen plädiert (EA4SD).

Besonderheiten bei spezifischen Personengruppen

Bei *Schwangeren und im Wochenbett* wird ergänzend eine Untersuchung zum Ernährungsstatus und zu Kontraindikationen (siehe Box 1) empfohlen (AAFP, USA).

Bei *Athlet:innen mit Behinderung* gibt es zudem Empfehlungen, die Haut auf die Folgen von Reibung, Scherung oder Druck durch einen Rollstuhl oder sonstige Hilfsmittel zu untersuchen und Blasenkatheter zu überprüfen (AAP, USA). Box 2 zeigt Befunde, auf die bei dieser Personengruppe besonders zu achten ist (AAP, USA).

Tabelle 6. Empfehlungen zur körperlichen Untersuchung

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT[c]
NATA 2014 [49], OS	For the PPE, a limited general physical examination is recommended. The screening physical should include vital signs (eg, height, weight, and blood pressure); visual acuity testing; cardiovascular, neurologic, and general medical (eg, pulmonary, abdominal, skin, genitalia [for males]) examination; and musculoskeletal examination. Further examination should be based on issues uncovered during the history.	3 [58]	**C**
EFSMA 2021 [34], EA	The physical examination of PPE is very important and it should be performed with a particular focus on cardiovascular, pulmonary, musculoskeletal, neurological, ophthalmological and otolaryngology screening.		–
ACSM 2021 [15], BFS	Appropriate components of the physical examination may include the following: • Body weight; in many instances, determination of body mass index, waist girth, and/or body composition (body fat percentage) is desirable. • Apical pulse rate and rhythm • Resting blood pressure: seated, supine, and standing • Auscultation of the lungs with specific attention to uniformity of breath sounds in all areas (absence of rales, wheezes, and other breathing sounds) • Palpation of the cardiac apical impulse and point of maximal impulse • Auscultation of the heart with specific attention to murmurs, gallops, clicks, and rubs • Palpation and auscultation of carotid, abdominal, and femoral arteries • Evaluation of the abdomen for bowel sounds, masses, visceromegaly, and tenderness • Palpation and inspection of lower extremities for edema and presence of arterial pulses • Absence or presence of tendon xanthoma and skin xanthelasma • Follow-up examination related to orthopedic or other medical conditions that would limit exercise testing		–

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT[c]
	• Tests of neurologic function including reflexes and cognition (as indicated)Inspection of the skin, especially of the lower extremities in known patients with diabetes mellitus		
AAP 2019 [11], OS-A	The structured physical examination begins by measuring vital signs and visual acuity.	4 [59]	–
	Augen		
AAP 2019 [11], OS-A	All athletes should have their visual acuity checked at the PPE.		–
	Urogenitaltrakt		
AAP 2019 [11], OS-A	Palpate the abdomen for masses or enlarged organs (enlarged spleen or liver, enlarged kidney, or gravid uterus). The abdominal examination should be performed with the athlete supine.		–
AAP 2019 [11], OS-A	In addition to the general abdominal assessment, if there is a high index of suspicion for an eating disorder, the gastrointestinal tract can be more closely evaluated.		–
AAP 2019 [11], OS-A	A GU examination of female athletes is not part of the PPE.		–
	Haut		
AAFP 2016 [9], A	Illness Reduction and Modification Evaluation (skin infections): Athletes should have an evaluation prior to participation including: o History of previous communicable skin lesions and treatment o Comprehensive assessment for skin breaks and wounds o Identification of type and location of current communicable skin lesions and treatment		–
AAP 2019 [11], OS-A	A thorough skin survey should be performed with particular attention to exposed areas and any areas that might potentially come into contact with another competitor or equipment (eg, wrestling mats, batting helmets). The principle objective in the dermatologic examination is to identify skin infections: bacterial, viral, fungal, and infestations.		–
AAP 2019 [11], OS-A	The examiner should also look for signs of trauma, acne, sun damage, and dermatitis (contact dermatitis, eczema, psoriasis, or urticarial dermatitis), as well as marks of illicit drug use or cutting.	4 [60] 2 [61]	–
AAP 2019 [11], OS-A	Prosthetic devices can cause skin trauma; the prosthesis contact site should be inspected for abrasions, blisters, rashes, or pressure ulcers. The prosthesis should be evaluated for proper fit and reconditioned to decrease the risk of future problems.		–
	Zähne		
EA4SD 2020 [30], A	The integration of dentistry into sports medicine should focus on the most common diseases found in athletes, including dental caries, dental erosion, periodontal disease, malocclusion, temporomandibular disorders (TMD), orofacial injuries, and their prevention. This integration should lead to a multidisciplinary follow up of athletes including oral screening and relevant oral health treatments.		–
	Schwangerschaft		
AAFP 2017 [10], A	An evaluation includes facilitating or performing a medical examination, nutritional assessment, and ongoing assessment of absolute and relative contraindications to exercise throughout pregnancy and the postpartum period.		–
	Athlet:innen mit Behinderung		
AAP 2019 [11], OS-A	The upper extremities should be examined for abrasions and blisters caused by friction, shear, or irritation from repeated contact with the wheelchair push rim. The skin over the sacrum and ischial tuberosities should be inspected for pressure ulcers. The seat cushion should also be evaluated and modified to decrease skin pressures, improve the skin healing, and reduce the risk of further skin trauma.		–
AAP 2019 [11], OS-A	[Urogenital] examination should involve the same evaluation as for athletes who are nondisabled. It is also important to examine any external devices used for bladder drainage.		–

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Box 2. Befunde, auf die bei der körperlichen Untersuchung von Athlet:innen mit Behinderung zu achten ist (übersetzt aus AAP 2019 [11])

Augen

- Geringe Sehschärfe
- Brechungsfehler
- Astigmatismus
- Strabismus

Kardiovaskuläres System

- Angeborene Herzkrankheit

Neurologie

- Einklemmung peripherer Nerven
- Karpaltunnelsyndrom
- Ulnare Neuropathie (z. B. Kubitaltunnelsyndrom)
- Unzureichende motorische Kontrolle
- Unzureichende Koordination und Gleichgewicht
- Beeinträchtigung der Hand-Augen-Koordination
- Ataxie
- Muskelschwäche
- Spastik
- Sensorische Dysfunktion
- Atlantoaxiale Instabilität
- Hyperreflexie
- Klonus
- Anzeichen und Symptome der oberen Motoneuronen und des Hinterstrangs

Dermatologie

- Abschürfungen
- Risswunden
- Blasen
- Druckgeschwüre
- Hautausschläge

Bewegungsapparat

- Eingeschränkter Bewegungsumfang des Halses
- Torticollis
- Atlantoaxiale Instabilität
- Verminderte Flexibilität, oft mit Kontrakturen, verminderter Kraft und Ungleichgewicht der Muskelkraft
- Beckenfehlfunktion, verursacht durch eine Prothese für die unteren Extremitäten, die ungleiche Beinlängen verursacht
- Tendinitis der Rotatorenmanschette und Impingement bei Rollstuhlfahrer:innen
- Handgelenks- und Ellenbogen-Strecksehnenentzündung bei Rollstuhlfahrer:innen

Anthropometrie

Alle identifizierten Empfehlungen zur Anthropometrie beziehen sich auf Athlet:innen (Tabelle 7). In den USA wird insbesondere die Erhebung von Größe, Gewicht und BMI (unter Berücksichtigung der höheren Muskelmasse bei einigen Athlet:innen) empfohlen, um Unter- und Übergewicht zu diagnostizieren (AAP). Bei Kindern finden hier auch Wachstumskurven Anwendung (AAP, USA). In Europa wird dies ergänzt durch die Somatoskopie und die Erhebung weiterer Körpermaße, der Mobilität und der Kraft (EFSMA).

Tabelle 7. Empfehlungen zur Anthropometrie

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT[c]
EFSMA 2021 [34], EA	Part of the PPE is the anthropometric examination that includes the somatoscopy, the classic method of assessing posture and body development by visual observation of the athlete in the anthropometric frame work and biometrics (weight, height, sitting height, body composition, girth measurements, diameters, mobility and strength measurements) to assess body shape, posture, nutrition, body symmetry, harmony in development, compared with the somatic biotype of the sport.		–
AAP 2019 [11], OS-A	Athletes who have conditions such as underweight, overweight, or obesity have long-term health issues that may affect medical eligibility and risk for injury or illness during sport participation. During the PPE, values for height, weight, and body mass index (BMI) should be plotted on age-appropriate growth charts and compared, if possible, with past measurements.		–
AAP 2019 [11], OS-A	Review of growth curve measurements can identify atypical weight loss or gain that may suggest disordered eating or insufficient energy availability, unhealthy weight-cutting behaviors in sports with weight classes, or performance-enhancing supplement use that may not be otherwise identified. Decreased height velocity or delayed puberty may also indicate other medical problems such as endocrine or nutritional problems and deserves further evaluation. Body mass index curves should also be similarly reviewed but may be falsely skewed toward overweight status by muscle development in some athletes.		–

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Ernährung

Empfehlungen sind nur für den organisierten Sport und Athlet:innen Empfehlungen verfügbar (Tabelle 8). Bei Eliteathlet:innen wird eine umfassende Bewertung der Ernährung empfohlen (EFSMA, Europa).

Alle weiteren Empfehlungen beziehen sich auf Energiebilanz, gestörtes Essverhalten und Essstörungen (DE/ED). Es wird konsistent empfohlen, in einer jährlichen Routineuntersuchung DE/ED (AMSSM, USA/IOC, weltweit). Das IOC stellt in diesem Kontext ein Risikobewertungsmodell zur Verfügung (Abbildung 3). Bei Verdacht auf DE/ED wird für die weitere Untersuchung ein „Anthropometric, Biochemical, Clinical, Dietary and Environmental (ABCDE) Assessment" (Abbildung 4) empfohlen (IOC, weltweit). Als weitere Screening-Tools werden SCOFF [62], EDI [63] und LEAF-Q [64] genannt (AAFP, USA).

Tabelle 8. Empfehlungen zur Ernährungsdiagnostik

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT[c]
NATA 2014 [49], OS	Athletic trainers and those who participate in athletic health care should be familiar with the current NATA position statement that outlines the prevention, detection, and management of disordered eating in athletes.		**B**
AMSSM 2020 [22], A	Annual preparticipation screening for eating disorders in athletes should be routine.		**C**
IOC 2018 [45, 46], A	HealthCare professionals can decrease the health implications of RED-S through (…) Implementation of the RED-S Risk Assessment Model in the periodic health examination and the RED-S return to play Model.		C
EFSMA 2021 [34], EA	it would be important for the healthcare professional to perform a comprehensive nutritional assessment and recommend using supplements only when necessary.		–
IOC 2018 [45, 46], A	Screening for RED-S should be undertaken as part of an annual Periodic Health Examination (PHE) and when an athlete presents with DE/ED, weight loss, lack of normal growth and development, menstrual dysfunction, recurrent injuries and illnesses, decreased performance or mood changes.		–
IOC 2013 [43], A	Optimum screening times [for disordered eating/eating disorders] occur at the PPE and annual health check-ups.		–
IOC 2013 [43], A	we suggest that when healthcare providers suspect DE or EDs, an Anthropometric, Biochemical, Clinical, Dietary and Environmental (ABCDE) Assessment be used to evaluate athletes (table 4).		–
AAFP 2017 [10], A	It is desirable the team physician (…) identify and address risk factors [for DE/ED] during the PPE and subsequent clinical encounters, including specific survey tools (e.g., SCOFF, EDI, and LEAF-Q).		–

[a] BFS=Breiten- und Freizeitsport, OS=Teilnehmende an organisiertem Sport (Vereinssport), A=Athlet:innen (mit regelmäßiger Wettkampfteilnahme), EA=Elite-Athlet:innen (nationale Kader, Profisport); [b] eigene Einschätzung, nur ausgefüllt, falls Literatur eindeutig zuzuordnen; [c] fett falls durch Autor:innen vergeben, ansonsten eigene Einschätzung.

Abbildung 3. IOC-Modell zur Risikobewertung relativer Energie-Defizite im Sport (aus IOC 2018 [45, 46])

Table 1 Relative Energy Deficiency in Sport risk assessment model for sport participation (modified from Skårderud *et al*)[140]

High risk: no start red light	Moderate risk: caution yellow light	Low risk: green light
▶ Anorexia nervosa and other serious eating disorders ▶ Other serious medical (psychological and physiological) conditions related to low energy availability ▶ Extreme weight loss techniques leading to dehydration induced haemodynamic instability and other life-threatening conditions	▶ Prolonged abnormally low % body fat measured by DXA or anthropometry using The International Society for the Advancement of Kinanthropometry ISAK[141] or non-ISAK approaches[142] ▶ Substantial weight loss (5–10% body mass in 1 month) ▶ Attenuation of expected growth and development in adolescent athlete	▶ Healthy eating habits with appropriate energy availability
	▶ Abnormal menstrual cycle: FHA amenorrhoea >6 months ▶ Menarche >16 years ▶ Abnormal hormonal profile in men	▶ Normal hormonal and metabolic function
	▶ Reduced BMD (either from last measurement or Z-score < –1 SD). ▶ History of 1 or more stress fractures associated with hormonal/menstrual dysfunction and/or low EA	▶ Healthy BMD as expected for sport, age and ethnicity ▶ Healthy musculoskeletal system
	▶ Athletes with physical/psychological complications related to low EA/ disordered eating - ECG abnormalities- Laboratory abnormalities ▶ Prolonged relative energy deficiency ▶ Disordered eating behaviour negatively affecting other team members ▶ Lack of progress in treatment and/or non-compliance	

BMD, bone mineral density; DXA, dual-energy X-ray absorptiometry; EA, energy availability; FHA, functional hypothalamic amenorrhoea; ISAK, International Society for the Advancement of Kinanthropometry

Abbildung 4. ABCDE Assessment bei Verdacht auf gestörtes Essverhalten/Essstörung (aus IOC 2013, [43])

Table 4 Screening the athlete: ABCDE Assessment

ABCDE Assessment	Measures	Comments
Anthropometric	▶ Stature ▶ Sitting height ▶ Body mass ▶ Body composition ▶ Girth and breadths ▶ BMI ▶ MI	Valid and reliable methods of body composition should be sought (eg, DXA, skinfold assessment using the ISAK standards; 4-component models assessing fat, fat-free and lean tissue mass and total body water; measurement of hydration status using urine specific gravity recommended for all anthropometric assessments) Careful reflection is required to ascertain whether assessment of body mass and composition may trigger more problems BMI and MI are measures (indices) for 'relative body weight' (ponderosity), but not for body composition
Biochemical	▶ Complete blood count ▶ Complete metabolic panel ▶ Lipid panel ▶ Iron profile ▶ Thyroid function (eg, TSH and T_3) ▶ Oestradiol, testosterone, progesterone, prolactin, LH and FSH ▶ Cortisol ▶ 25 (OH) Vitamin D ▶ Urine analysis ▶ Pregnancy test	In females with menstrual dysfunction, prolactin needs to be assessed to rule out pituitary tumour; if ovarian cysts and oligomenorrhoea, androgens should be assessed[57] Oestradiol and testosterone should be included in men and women athletes
Clinical	▶ History ▶ Physical examination ▶ Medications ▶ Dietary supplements	Medical history should include DE and EDs. If this is a preparticipation physical examination, then include a general medical history, including menstrual history/status, bone health, history of stress fracture and other injuries, osteoporosis. Screening for DE and EDs with screening tools and/or clinical interview and identification of physical signs and symptoms (see tables 1 and 2)
Dietary	▶ Quantity ▶ Quality ▶ Timing	Energy intake, energy density; macronutrients (expressed in g/kg/d) and micronutrients, fluid balance and hydration (including sweat rate), food restrictions, allergies, intolerance; scary foods; nutrient and fluid timing; carbohydrate availability during intense training; carbohydrate and fibre related to appetite; recovery nutrition; competition preparation and fuelling, travel nutrition and appetite issues during travel or intense training Dietary assessment methods: consider validity and reliability,[58] as well as additional burden and stress on athletes with DE/ED when using diaries and food logs Energy availability, including the assessment of energy expenditure (see below)
Environmental	▶ Energy expenditure ▶ Annual training plan and peaking ▶ Environmental factors such as cold, heat and altitude ▶ Culture of sport ▶ Travel ▶ Work/school ▶ Family/home ▶ Experience in sports	Total daily energy expenditure, including resting metabolic rate, spontaneous physical activity, exercise energy expenditure; evaluation of training/competition plan in discussion with coach; consideration of environmental factors (eg, training at altitude); leanness/non-leanness sport; countries at risk for inadequate food access and food safety concerns; work/school schedules and time for food preparation, eating, recovery; level of athlete and experience

ABCDE, Anthropometric, Biochemical, Clinical, Dietary and Environmental; BMI, body mass index; DE, disordered eating; DXA, dual energy e-ray absorptiometry; EDs, eating disorders; FSH, follicle stimulating hormone; ISAK, International Society for the Advancement of Kinanthropometry; LH, luteinising hormone; MI, mass index; TSH, thyroid stimulating hormone.

Athlet:innen-Trias

Es wurden keine Empfehlungen zur Athlet:innen-Trias im Bereich Breiten- und Freizeitsport identifiziert (Tabelle 9).

Bei weiblichen Athletinnen wird ein jährliches Screening im Rahmen der sportmedizinischen Vorsorgeuntersuchung empfohlen (FATC, USA/AAFP, USA) und dazu eine Fragenliste bereitgestellt (Box 3). Weitere Details zur Auswahl relevanter Anamnesefragen finden sich in den einzelnen Empfehlungen (Tabelle 9). Bei männlichen Athleten werden ebenfalls gezielte Screening-Fragen (Box 4) empfohlen (FMATC, USA). Das Screening auf Athlet:innen-Trias sollte bereits im Schulalter beginnen und eine Medikamentenanamnese (Hormone) beinhalten (FATC, USA).

Jedes diagnostizierte Element der Trias (Untergewicht, ausbleibende Menstruation und verminderte Knochendichte) sollte weitere Untersuchungen auf das Vorhandensein der anderen Elemente zur Folge haben (FATC, USA/AAP, USA). Weiterführende Untersuchungen werden bei abnormer Menstruation (NATA, USA) oder Untergewicht (AAP, USA) empfohlen.

Bei der körperlichen Untersuchung sollte auf niedrigen BMI, Gewichtsverlust, orthostatische Hypotonie, Lanugo, Hyperkarotämie oder andere Anzeichen für eine ED, wie z.B. Schwellung der Ohrspeicheldrüse und Kallus an den proximalen Interphalangealgelenken geachtet werden (FATC, USA).

Tabelle 9. Empfehlungen zur Diagnostik der Athlet:innen-Trias

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT[c]
NATA 2014 [49], OS	For females who have abnormal menstrual cycles or a personal history of anemia or who are taking iron or other medications, a more detailed laboratory follow-up is warranted.		**C**
FMATC 2021 [39, 40], A	It is recommended that clinicians screen the at-risk male athlete with targeted screening questions and risk assessment tools. Further research is needed to validate a best practice screening questionnaire for the Male Athlete Triad.		**C**
FATC 2014 **[38]**, A	The Consensus Panel recommended that female athletes undergo annual screening with the Triad specific self-report questionnaire displayed in box 1, followed by a more in-depth evaluation if the athlete has or is at risk for any Triad component.		–
FATC 2014 **[38]**, A	Screening for the Triad should be undertaken as part of the Pre-Participation Physical Evaluation (PPE).		–
AAFP 2017 [10], A	All female athletes should be screened for LEA, DE/ED, menstrual dysfunction, and low bone mass/osteoporosis. Female athletes with amenorrhea, prolonged oligomenorrhea, or a history of BSI are at high risk. [...] Coordinate a screening evaluation process, during the PPE and routine visits, to identify at-risk female athletes		–
FATC 2014 **[38]**, A	While such screening is most typically completed at the collegiate level, the Panel recommended screening for younger athletes (high school age) as well.	2 [65] 3 [66]	–
FATC 2014 **[38]**, A	A medication history should be obtained, including medications which may affect menstruation and/or BMD, such as oral contraceptive pills or other contraceptive agents, such as depot medroxyprogesterone acetate.	3 [67]	–
FATC 2014 [38], A	The Panel stated that the risk factors that should be assessed for the Triad include: (1) history of menstrual irregularities and amenorrhoea; (2) history of stress fractures; (3) history of critical comments about eating or weight from parent, coach or teammate; (4) a history of depression; (5) a history of dieting; (6) personality factors (such as perfectionism and obsessiveness); (7) pressure to lose weight and/or frequent weight cycling; (8) early start of sport-specific training; (9) overtraining; (10) recurrent and non-healing injuries and (11) inappropriate coaching behaviour.	2 [68] 2 [69] 3 [70] 3 [71] 3 [72] 3 [73] 4 [74]	–
AAP 2019 [11], OS-A	A history of acute fractures or previous bone stress injuries should lead to further inquiry regarding menstrual history, nutritional status, bone health, eating patterns, and body image concerns, in addition to assessing for training errors, as a cause. Evaluation of nutrition status should include total calorie, calcium, and vitamin D intakes.		–
FATC 2014 **[38]**, A	Existence of any one Triad component should prompt more thorough investigation for the others.		–
AAP 2019 [11], OS-A	Underweight athletes should undergo a thorough medical evaluation, must be asked about emotions related to food and body image, and must be counseled about proper weight and nutrition. Similar concern should be raised for younger athletes who drop one percentage line on their growth chart and even more so for those who drop 2 lines.		–
FATC 2014 **[38]**, A	Physical examination signs such as low body mass index (BMI), weight loss, orthostatic hypotension, lanugo, hypercarotenaemia, or other signs of an ED, such as parotid gland swelling and callus on the proximal interphalangeal joints (also known as Russell's sign), should also prompt further evaluation.		–
AAFP 2017 [10], A	It is desirable the team physician (…) identify multifactorial risk factors [for menstrual dysfunction] during the PPE and subsequent clinical encounter.		–
FATC 2014 [38], A	Obtaining an accurate menstrual history is important, starting from age of menarche to the current and the past menstrual patterns, noting months of consecutive missed menses and the number of menses per year since menarche.		–
AAP 2019 [11], OS-A	Amenorrhea, both primary and secondary, should be evaluated with additional history.		–
FATC 2014 [38], A	A history of physician diagnosed bone stress injuries and other fracture history should be noted, as well as a family history of ED, osteoporosis and/or fractures.		–
AAP 2019 [11], OS-A	Any athlete (female or male) with a history of stress fractures should be queried about dietary restriction behaviors that result in low energy availability, and inadequate calories, macronutrient imbalances, calcium intake, and vitamin D intake.		–
AAFP 2017 [10], A	Multiple risk factors exist for BSI [bone stress injuries] and should be identified and addressed during the PPE.		–

[a] BFS=Breiten- und Freizeitsport, OS=Teilnehmende an organisiertem Sport (Vereinssport), A=Athlet:innen (mit regelmäßiger Wettkampfteilnahme), EA=Elite-Athlet:innen (nationale Kader, Profisport); [b] eigene Einschätzung, nur ausgefüllt, falls Literatur eindeutig zuzuordnen; [c] fett falls durch Autor:innen vergeben, ansonsten eigene Einschätzung.

Box 3. Screening-Fragen der Female Athlete Triad Coalition (übersetzt aus FATC 2014 [38])

- Hatten Sie jemals eine Periode?
- Wie alt waren Sie, als Sie Ihre erste Periode hatten?
- Periode hatten?
- Wann war Ihre letzte Periode?
- Wie viele Perioden hatten Sie in den letzten 12 Monaten?
- Nehmen Sie derzeit weibliche Hormone ein (Östrogen, Progesteron, Antibabypille)?
- Machen Sie sich Gedanken über Ihr Gewicht?
- Versuchen Sie zuzunehmen oder hat Ihnen jemand empfohlen, zuzunehmen oder abzunehmen?
- Machen Sie eine spezielle Diät oder meiden Sie bestimmte Lebensmittel oder Lebensmittelgruppen?
- Hatten Sie jemals eine Essstörung?
- Hatten Sie schon einmal eine Stressfraktur?
- Wurde Ihnen jemals gesagt, dass Sie eine geringe Knochendichte haben (Osteopenie oder Osteoporose)?

Box 4. Screening-Fragen der Male Athlete Triad Coalition (übersetzt aus FMATC 2021 [39, 40])

- Machen Sie sich Gedanken über Ihr Gewicht?
- Versuchen Sie abzunehmen oder hat Ihnen jemand empfohlen, abzunehmen oder zuzunehmen?
- Machen Sie eine spezielle Diät oder meiden Sie bestimmte Lebensmittel oder Lebensmittelgruppen?
- Hatten Sie jemals eine Essstörung?
- Hatten Sie schon einmal eine Stressfraktur?
- Wurde Ihnen jemals gesagt, dass Sie eine geringe Knochendichte oder Osteoporose haben?
- Wurde bei Ihnen jemals ein niedriger Testosteronspiegel diagnostiziert?*
- Haben Sie eine geringe Libido (Sexualtrieb)?*
- Haben Sie morgens eine Erektion?*
- Müssen Sie Ihre Gesichtsbehaarung seltener rasieren?*

* bei postpubertären Sportlern

Hitze und Hydrierung

Im organisierten Sport und bei Athlet:innen wird empfohlen, Fragen zur Hitzeakklimatisierung in die Anamnese zu integrieren. Darunter fallen Risikofaktoren, Flüssigkeitsaufnahme, Trainingsintensität, frühere Hitze-bedingte Erkrankungen sowie das Screening auf Sichelzellanlage (NATA, USA/AAP, USA/AAFP, USA), siehe Tabelle 10.

Tabelle 10. Empfehlungen zur Risikofaktoren für Hitze-bedingte Erkrankungen und Dehydrierung

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT[c]
NATA 2014 [49], OS	Current consensus guidelines for heat acclimatization in secondary school athletes should be reviewed. Questions related to previous problems associated with heat acclimatization should be included in the medical history form.		**B**
NATA 2012 [47], OS	In conjunction with preseason screening, athletes should be questioned about risk factors for heat illness or a history of heat illness.		**C**
AAP 2019 [11], OS-A	The PPE should include specific questions regarding possible risk factors, including prior heat illness, the associated environment, acclimatization status, equipment and uniforms, fluid intake, weight changes during activity, and medication and supplement use.		–
AAFP 2016 [9], A	Injury Reduction and Modification Evaluation (heat illness): Athletes should have a thorough preseason evaluation, including: o History of risk factors o Evaluation of fluid intake o Evaluation of present and anticipated volume/ intensity of training and participation o Evaluation of athlete's state of acclimatization o Screening for sickle cell trait		–

[a] BFS=Breiten- und Freizeitsport, OS=Teilnehmende an organisiertem Sport (Vereinssport), A=Athlet:innen (mit regelmäßiger Wettkampfteilnahme), EA=Elite-Athlet:innen (nationale Kader, Profisport); [b] eigene Einschätzung, nur ausgefüllt, falls Literatur eindeutig zuzuordnen; [c] fett falls durch Autor:innen vergeben, ansonsten eigene Einschätzung.

Kardiovaskuläre Untersuchung

Aufgrund der großen Zahl an Empfehlungen sind diese nach Zielpopulation aufgeteilt. Tabelle 11 enthält Empfehlungen für den Breiten- und Freizeitsport, Tabelle 12 für Athlet:innen. Allgemein empfohlen wird eine kardiologische (Familien-)Anamnese und eine körperliche Untersuchung (EHRA EACPR, Europa/AHA ACC, USA). Die Durchführung eines 12-Kanal-EKG wird in Europa allgemein empfohlen (EHRA EACPR) und in den USA als optional angesehen (AHA ACC). Eine Echokardiographie wird nicht als Routine-Screeninginstrument empfohlen (EHRA EACPR, Europa).

Besonderheiten bei spezifischen Personengruppen

Ab einem Alter von 35 Jahren wird empfohlen, die kardiologische Diagnostik nach kardiovaskulärem Risiko zu stratifizieren. Vor Sport mit hoher Intensität empfiehlt die ESC, das kardiovaskuläre Risiko zu evaluieren, z.B. mittels SCORE2 (Appendix 8) (ESC, Europa). Bei niedrigem oder moderatem Risiko ohne familiäre Risikofaktoren wird eine weiterführende kardiovaskuläre Untersuchung nicht empfohlen (ESC, Europa/ACSM, USA). Bei höherem Risiko (z.B. SCORE >10%) und einer hohen geplanten Trainingsintensität kann eine Risikobewertung mit funktionellem Bildgebungstest, koronarer CCTA oder Ultraschalluntersuchung der Carotis oder der Femoralis in Betracht gezogen werden (ESC, Europa).

Allen über 65 Jahre alten Personen empfiehlt die EFSMA ein EKG. Bei älteren Personen mit Bewegungsmangel, die ein intensives Training aufnehmen möchten, wird eine vollständige klinische Bewertung einschließlich Belastungstest vorgeschlagen in Europa vorgeschlagen (ESC). Den Empfehlungen der ACSM (USA) zufolge benötigen meisten älteren Erwachsenen keinen Belastungstest, bevor sie ein moderates Training beginnen. Sie gibt jedoch Hinweise zur Durchführung von Belastungstests bei älteren Erwachsenen, falls diese dennoch durchgeführt werden sollen (siehe Tabelle 11).

Schwangere sollten keine Untersuchung bei maximaler Belastung erhalten. Wird eine Untersuchung durchgeführt, so sollte diese bei submaximaler Belastung durchgeführt werden und nachdem Kontraindikationen (s. Box 1) abgeklärt wurden (ACSM, USA).

Alle *Personen nach überstandener Krebserkrankung* sollten auf kardiovaskuläre Erkrankungen untersucht werden und bei Verdacht einen kardiopulmonalen Belastungstest erhalten (ACSM, USA). Personen, die kardiotoxische Therapeutika erhalten haben, sollten mittels Echokardiographie untersucht werden, bevor sie mit hoher Intensität trainieren (ESC, Europa).

Kardiovaskuläre Untersuchung bei Athlet:innen

Für (Elite-)Athlet:innen wurden sehr zahlreiche und detaillierte Empfehlungen zusammengetragen (Tabelle 12). Konsistent wird eine Anamnese mithilfe eines standardisierten Fragebogens (Europa: ESC, COCIS, AEPC; Kanada: CCS CHRS; USA: AAFP, AAP, AHA ACC, ASE, NATA, NCAA) sowie eine körperliche Untersuchung (z.B. Auskultation, Blutdruck) empfohlen (Europa: ESC, COCIS, AEPC; Kanada: CCS CHRS; USA: AAFP, ACPM, AHA ACC, ASE, NCAA). Die AAP stellt Folgefragen nach positiver kardiologischer Anamnese (Appendix 9) und Informationen zur Bedeutung abnormer Herzgeräusche bereit (Appendix 10).

Empfehlungen zum EKG als Basisuntersuchung sind inkonsistent. In Europa wird das 12-Kanal-EKG generell empfohlen (AEPC, EFSMA, COCIS, BSE CRY), in Nordamerika wird teilweise eine positive (Familien-)Anamnese und/oder körperliche Untersuchung vorausgesetzt (NATA, USA/ACPM, USA/CCS CHRS, Kanada), teilweise je nach Ressourcen entschieden (ASE, USA) oder ein „shared decision-making" Ansatz gewählt (AMSSM, USA). Abbildung 5 fasst die EKG-Interpretation bei Athlet:innen zusammen.

Ergänzend wird in Europa ein kardiopulmonaler Belastungstest empfohlen, insbesondere bei Top-Athlet:innen oder erhöhtem kardiovaskulärem Risiko (EFSMA, FSC). Weitere Untersuchungen werden nur bei klinischer Indikation empfohlen (Appendix 11), z.B. bildgebende Verfahren, Belastungstests und die Konsultation von Spezialist:innen (Europa: ESC, BSE CRY, FSC, EFSMA, EAPC EACVI; Kanada: CCS CHRS; USA: ASE, NATA). Abbildung 6 zeigt den EFSMA Untersuchungsalgorithmus von 2015.

Belastungstests werden für *ältere Athlet:innen* mit kardiovaskulärem Risiko und ab einem Alter von 45 (Männer) bzw. 55 (Frauen) vor Sport mit hoher Intensität empfohlen (EFSMA, Europa). Abbildung 7 zeigt Parameter für den kardiopulmonalen Belastungstest, Abbildung 8 die Klassifizierung von EKG-Anomalien bei Athlet:innen nach den Seattle-Kriterien.

Tabelle 11. Empfehlungen zur Kardiologie im Breiten- und Freizeitsport

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT[c]
	Testauswahl		
AHA ACC 2015 [17-19], BFS-A	Screening with 12-lead ECGs (or echocardiograms) in association with comprehensive history-taking and physical examination to identify or raise suspicion of genetic/congenital and other cardiovascular abnormalities may be considered in relatively small cohorts of young healthy people 12 to 25 years of age, not necessarily limited to competitive athletes (eg, in high schools, colleges/universities or local communities). Close physician involvement and sufficient quality control is mandatory. If undertaken, such initiatives should recognize the known and anticipated limitations of the 12-lead ECG as a population screening test, including the expected frequency of false-positive and false-negative test results, as well as the cost required to support these initiatives over time.		**II-C**
AHA ACC 2015 [17-19], BFS-A	Mandatory and universal mass screening with 12-lead ECGs in large general populations of young healthy people 12 to 25 years of age (including on a national basis in the United States) to identify genetic/congenital and other cardiovascular abnormalities is not recommended for athletes and non athletes alike.		**III-C**
AHA ACC 2015 [17-19], BFS-A	Consideration for large-scale, general population, and universal cardiovascular screening in the age group 12 to 25 years with history taking and physical examination alone is not recommended (including on a national basis in the United States).		**III-C**
EHRA EACPR 2017 [35], BFS-A	The protocol of PPE including clinical history, physical examination, and 12-lead ECG demonstrates to have superior diagnostic capability than just clinical history and physical examination.		–
	Folgeuntersuchungen		
EHRA EACPR 2017 [35], BFS-A	Available data suggests that routine echocardiography or other imaging modalities do not add substantial diagnostic power to the PPE as a mass screening technique and do not appear to be cost/effective. Therefore, at the moment the ECG-based PPE represents the most effective protocol to evaluate athletes (i.e. best clinical practice), although several limitations should be acknowledged		–
	Personen >35 Jahre		
ESC 2021 [36], BFS	In selected individuals without known CAD who have very high CVD risk (e.g. SCORE>10%, strong family history, or familial hypercholesterolaemia) [age > 35] and want to engage in high- or very high-intensity exercise, risk assessment with a functional imaging test, coronary CCTA, or carotid or femoral artery ultrasound imaging may be considered.		**IIb-B**
ESC 2021 [36], BFS	Among individuals [age > 35] with low to moderate CVD risk, the participation in all recreational sports should be considered without further CV evaluation.		**IIa-C**
ESC 2021 [36], BFS	Clinical evaluation, including maximal exercise testing, should be considered for prognostic purposes in sedentary people and individuals with high or very high CV risk [age > 35] who intend to engage in intensive exercise programmes or competitive sports.		**IIa-C**
	Ältere Personen / Personen >65 Jahre		
ESC 2021 [36], BFS	A full clinical assessment including a maximal exercise test should be considered in sedentary adults aged 65 years or older who wish to participate in high-intensity activity.		**IIa-C**
ESC 2022 [37], BFS-A	The cardiovascular risk of middle-aged and elderly individuals should be evaluated before engaging in strenuous sports through established scores such as the SCORE2 risk chart.	1 [75] 2 [76] 2 [77]	**IIa-C**
EFSMA 2015 [33], BFS	Recommendations for PPE in Europe: In the elderly, ECG is mandatory in all leisure time athletes (female and male).		–
ACSM 2021 [15], BFS	Most older adults do not require an exercise test prior to initiating a moderate intensity PA program (see Chapter 2). However, if exercise testing is recommended, it should be noted that the associated electrocardiogram (ECG) has higher sensitivity (i.e., ~84%) and lower specificity (i.e., ~70%) than in younger age groups (i.e., <50% sensitivity and >80% specificity), producing a higher proportion of false positive outcomes.		–
ACSM 2021 [15], BFS	Special considerations when testing older adults include the following • Initial workload should be light (i.e., <3 METs) and workload increments should be small (i.e., 0.5–1.0 MET) for those with low work capacities. The modified Naughton treadmill protocol is a good example of such a protocol (see Figure 4.1) (97). • A cycle ergometer may be preferable to a treadmill for those with poor balance, poor neuromotor coordination, impaired vision, impaired gait patterns, weight-bearing limitations, and/or orthopedic problems. However, local muscle fatigue may be a factor for premature test termination when using a cycle ergometer (97). • Adding a treadmill handrail support may be required because of reduced balance, decreased muscular strength, poor neuromotor coordination, and fear. However, handrail support for gait	3 [78] 3 [79]	–

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT[c]
	abnormalities will reduce the accuracy of estimating peak MET capacity based on the exercise duration or peak workload achieved (97). • Treadmill workload may need to be adapted according to walking ability by increasing grade rather than speed (97). • Many older adults exceed the age-predicted HRmax during a maximal exercise test. The frequently used (220 − age) HRmax equation tends to underpredict HRmax in older adults (100); therefore, it is best to use other HRmax equations (see Table 5.3). • The influence of prescribed medications on the ECG and hemodynamic responses to exercise may differ from usual expectations (see Appendix A).		
	Schwangerschaft		
ACSM 2021 [15], BFS	Maximal exercise testing should not be performed on women during any stage of pregnancy (142,143). If a submaximal exercise test is warranted, the test should be performed with physician supervision after the woman has been medically evaluated for contraindications to exercise.	4 [80]	–
	Nach überstandener Krebserkrankung		
ESC 2021 [36], BFS	Among individuals treated with cardiotoxic medications, echocardiography before participation in high-intensity exercise is recommended.		**I-A**
ACSM 2019 [14], BFS	CVD has become a competing cause of morbidity and mortality for survivors of cancer with a favorable prognosis. Given the potential for underlying CVD, cancer survivors should be screened for evident or underlying CVD using the ACSM pre-participation guidelines and if implicated have a cardiopulmonary exercise test prior to beginning an exercise program.	3 [81]	C

[a] BFS=Breiten- und Freizeitsport, OS=Teilnehmende an organisiertem Sport (Vereinssport), A=Athlet:innen (mit regelmäßiger Wettkampfteilnahme); [b] eigene Einschätzung, nur ausgefüllt, falls Literatur eindeutig zuzuordnen; [c] fett falls durch Autor:innen vergeben, ansonsten eigene Einschätzung.

Tabelle 12. Empfehlungen zur Kardiologie, spezifisch für Athlet:innen

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT[c]
ESC 2022 [37], A	Pre-participation cardiovascular evaluation of competitive athletes should be considered.	1 [75] 4 [82]	**IIa-C**
NATA 2013 [48], A	Athletes should undergo cardiovascular screening before participation in competitive athletics.		C
ESC 2022 [37], A	It should be considered that cardiovascular evaluation of young (<35 years) competitive athletes includes history, physical examination, and 12-lead ECG.	3 [83] 4 [84] 4 [85] 4 [86]	**IIa-C**
CCS CHRS 2019 [26], A	We recommend an incremental (tiered) approach to CV screening of competitive athletes as part of a broad, organization/athlete-centred CSCAP. Such screening should occur in the context of a consistent, systematic approach to CV screening and care that provides assessment, appropriate investigations, interpretation, management, counselling, follow-up.		I-C
AMSSM 2017 [20], A	Considerations for implementing a cardiovascular screening strategy in a target athlete population should include the risk of SCA/D, the available infrastructure and cardiology resources, and the physician assessment that screening for early detection of cardiac disorders has a favorable risk-benefit ratio that will improve athlete outcomes with limited harm.		–
BSE CRY 2018 [24], A	Type of athletic activity should be known.		–
BSE CRY 2018 [24], A	Amount of athletic activity should be known.		–
	Empfehlungen mit Schwerpunkt Anamnese		
NATA 2014 [49], OS	Specific questions regarding risk factors and symptoms of cardiovascular disease should be asked during the history portion of the PPE (Table 3). A positive response to any question should be confirmed and further evaluation conducted if necessary.		**C**
NATA 2012 [47], OS	The preparticipation physical examination should include the completion of a standardized history form and attention to episodes of exertional syncope or presyncope, chest pain, a personal or family history of sudden cardiac arrest or a family history of sudden death, and exercise intolerance.		**C**
CCS CHRS 2019 [26], A	We recommend that a history/questionnaire should constitute the initial CV screening (tier 1), provided it is: i. Standardized according to at least 1 of the American Heart Association, European Society of Cardiology, fourth-edition Preparticipation Physical Evaluation, or SportsCardiologyBC tools or equivalent; ii. Accurately interpreted by an appropriately qualified professional experienced in the care of		I-C

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT[c]
	athletes; and iii. Is followed with appropriate investigations as “clinically warranted.” “Clinically warranted” findings are those deemed by the interpreter as requiring further assessment, for example using: physical examination; investigations such as ECG testing, imaging, or stress testing; and/or consultation with a specialist.		
AAP 2019 [11], OS-A	A history of previously performed cardiac testing such as ECG, echocardiography, or exercise treadmill testing may indicate a previously suspected cardiac disorder, and a careful review of past medical records may establish the outcomes of the evaluation. This should preclude repeating the studies.		–
AAP 2019 [11], OS-A	• A detailed personal and family history may help identify athletes at risk for SCD. • Sudden cardiac death may be the first manifestation of underlying cardiac disease; warning symptoms that require cardiac workup include syncope and/or chest pain during exercise, palpitations during exercise, unexplained breathlessness during exercise, and unexplained seizures. • A family history of sudden unexpected or unexplained death, sudden death before the age of 50 years (especially younger than age 35) caused by cardiac problems, sudden infant death, unexplained drowning, unexplained near drowning, car crashes caused by unexplained driver loss of consciousness, or unexplained seizures may indicate the presence of a genetic cardiovascular disorder placing the athlete at increased risk for SCD.		–
	Empfehlungen mit Schwerpunkt körperliche Untersuchung		
CCS CHRS 2019 [26], A	We recommend that a physical examination should be considered as an adjunct component of CV screening of competitive athletes (tier 2) provided it is: i. Performed by an appropriately qualified professional involved in the care of athletes; and ii. Followed-up as clinically warranted.		I-C
AHA ACC 2015 [17-19], A	Before people begin training for competitive athletics, it is reasonable that they undergo careful assessment of BP, and those with initially high levels (>140 mm Hg systolic or >90 mm Hg diastolic) should have comprehensive out-of-office measurements to exclude errors in diagnosis. Ambulatory BP monitoring with proper cuff and bladder size would be the most precise means of measurement.		**I-B**
AHA ACC 2015 [17-19], A	It is recommended that the AHA’s 14-point screening guidelines and those of other societies, such as the American Academy of Pediatrics’ Preparticipation Physical Evaluation, be used by examiners as part of a comprehensive history taking and physical examination to detect or raise suspicion of genetic/congenital cardiovascular abnormalities.		**I-C**
ASE 2020 [23], A	Routine pre-participation cardiovascular screening of young competitive athletes should include a focused personal and medical history and physical examination.		C
NATA 2013 [48], A	The task force supports recommendations from the American Academy of Family Physicians et al as the minimum standard for screening using a comprehensive personal history, family history, and physical examination.		C
NATA 2014 [49], OS	Auscultation of the heart should be performed initially with the patient in both the standing and supine positions. Auscultation should also occur during various maneuvers (eg, squat to stand, deep inspiration, Valsalva), because these maneuvers can clarify the type of murmur.		**C**
NCAA 2016 [51], A	Although all models of cardiac screening require more research and education to improve and validate both performance and feasibility, the NCAA supports, in concept, pre-participation cardiovascular screening using a comprehensive personal and family history and physical examination, such as the American Heart Association (AHA) 14-point recommendations and/or the Pre-Participation Physical Evaluation Monograph, Fourth Edition (PPE-4).		C
ACPM 2013 [13], A	The American College of Preventive Medicine (ACPM) supports an evaluation prior to participating in high school and collegiate sports using a standardized history and physical (H&P) (i.e., using standardized items as developed by the American Heart Association [AHA] to ensure uniformity and consistency in risk factor assessment		–
AAFP 2016 [9], A	Illness reduction and modification evaluation of HCM, arrhythmias, coronary artery anomalies, arrhythmogenic right ventricular cardiomyopathy, and ruptured aortic aneurysm (Marfan’s syndrome): - Family history of premature sudden death, especially first degree relatives, and heart disease in surviving relatives - Personal history of heart murmur, hypertension, excessive fatigue, syncope or near syncope with exertion, exertional chest pain, and excessive exertional shortness of breath - Physical examination of pulses, heart murmurs, blood pressure, heart rhythm, and stigmata of Marfan’s syndrome		–
AAP 2019 [11], OS-A	• Physical examination should focus on detecting hypertension, pathological heart murmurs, and any physical findings suggestive of Marfan syndrome. • Athletes with suspected or identified risk for SCD should be evaluated by a cardiologist, preferably a cardiologist who has experience taking care of athletes.		–

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT[c]
	Empfehlungen mit Schwerpunkt EKG		
EFSMA 2015 [33], A	Recommendations for PPE in Europe: ECG at rest with 12 leads, computerized evaluation with athlete's ECG definitions if possible.		C
EFSMA 2015 [33], A	Recommendations for PPE in Europe: ECG at rest once from 12 ys. on, before starting intensive sports or competitive sports.		–
COCIS 2021 [27-29], A	The Italian screening protocol consists of complete personal and family history, physical examination, and 12-lead ECG (Fig. 2).		–
AEPC 2017 [16], A	The cardiovascular pre-participation screening of young athletes should include personal and family history, physical examination, and a 12-lead electrocardiogram.		–
NATA 2013 [48], A	A resting 12-lead electrocardiogram (ECG) may be used in many preparticipation screening programs.		C
CCS CHRS 2019 [26], A	We recommend against the "routine" performance of a 12-lead ECG for the initial CV screening of competitive athletes. "Routine" in this context is defined as "first-line" or blanket mass performance of ECG not occurring in context of an integrated program as described in Recommendation 5.		I-C
CCS CHRS 2019 [26], A	We recommend that a 12-lead ECG should be performed for screening of competitive athletes only when indicated according to history/questionnaire and/or physical examination (targeted screening, tier 3) and provided it is: i. Of "adequate" quality. In this context "adequate" is defined as technically sufficient and of the highest possible quality; ii. Interpreted by those with "appropriate expertise" ("appropriate expertise" is defined as training and skills in ECG interpretation specific to athletes and persons with disorders associated with arrhythmias) and with consideration of sport history, sex, ethnicity, age, family history, relevant clinical findings, "regional" ("regional" refers to geographic areas with a relatively high incidence of certain relevant cardiac conditions) occurrence of disease; and iii. Accompanied by appropriate investigations and expert referral if clinically warranted.		I-C
ASE 2020 [23], A	The addition of a 12-lead ECG may be considered in situations with adequate financial resources and clinical expertise.		C
ACPM 2013 [13], A	ACPM recommends against routine screening for potential sudden cardiac death (SCD) with electrocardiogram (ECG), echocardiography, and genetic testing in individuals without personal risk factors.		–
AMSSM 2017 [20], A	Optimally, the decision to incorporate or exclude an ECG from the preparticipation evaluation is one of shared decision-making between a patient and a provider.		–
AAP 2019 [11], OS-A	If ECG is added to the PPE as a screening test, the most current athlete-specific criteria for ECG interpretation should be used to decrease the number of false-positive test results and minimize the additional testing, cost to the health care system, and undue stress for the individual athlete and family.		–
BSE CRY 2018 [24], A	The 12-lead electrocardiogram should be the first investigation. (…) The ECG should be interpreted in accordance with International Consensus guidelines.		–
NCAA 2016 [51], A	ECG screening can increase the sensitivity to detect potentially lethal cardiac conditions if physician training is improved and cardiology expertise is available. If ECG screening is used ECGs should be interpreted with modern standards that distinguish physiological changes from findings associated with pathological cardiac disorders.		C
EFSMA 2021 [34], EA	While interpreting the ECG, physicians should look out for any rhythm or conduction abnormalities, QRS morphology, abnormal axis deviation, alteration of the repolarisation and atrial enlargement.		–
	Weiterführende, nicht-invasive kardiologische Untersuchungen		
NATA 2014 [49], OS	Noninvasive cardiac testing (eg, electrocardiography [ECG], echocardiography, exercise stress testing) is not a routine aspect of the screening PPE unless warranted by findings from the personal and family history.	4 [87]	**B**
FSC 2019 [41, 42], A	An exercise test is indicated in symptomatic athletes who plan to continue vigorous physical activity (>6 METs or sport competition).		**I-B**
FSC 2019 [41, 42], A	An exercise test may be considered in asymptomatic athletes with a high or very high cardiovascular risk, who plan to continue vigorous physical activity (> 6 METs or competitive sports).		**IIa-C**
FSC 2019 [41, 42], A	An exercise test is not recommended in asymptomatic athletes with a low cardiovascular risk (score <1%).		**III-C**
ESC 2022 [37], A	In athletes with positive medical history, abnormal physical examination, or ECG alterations, further investigations including echocardiography and/or CMR to confirm (or exclude) an underlying disease are recommended.	2 [88] 4 [89]	**I-C**

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT[c]
ASE 2020 [23], A	The use of noninvasive imaging including comprehensive and limited transthoracic echocardiography/echocardiogram, computed tomography angiography, and cardiac magnetic resonance imaging is not recommended as a first-line strategy during pre-participation cardiovascular screening.		C
EFSMA 2021 [34], EA	In competitive athletes, especially top-athletes, PPE without cardio-pulmonary exercise test (CPET) is incomplete.		–
EFSMA 2015 [33], EA	The very top elite athletes may be required to undergo a more detailed examination (IOC, FIFA, FISO) including exercise testing, echocardiography and more as indicated according to cardiology guidelines.		–
BSE CRY 2018 [24], A	Those with 2 or more 'Borderline ECG Findings' or ANY 'Abnormal ECG Findings' require further investigation. A full standard echocardiographic assessment should be performed.		–
EFSMA 2021 [34], EA	Echocardiography is not mandatory for screening. It could be recommended for the first PPE for elite athletes when there is a justified clinical suspicion (eg, suspect ECG findings) with regard to the sports discipline with higher cardiac risk active (high static, high dynamic components).		–
EAPC EACVI 2018 [31, 32], A	Standard echocardiography is the first-line exam for differentiating athlete's heart from pathologic LVH.		–
EAPC EACVI 2018 [31, 32], A	Table 1 shows the most important clinical indications to perform cardiovascular imaging in athletes.		–
EAPC EACVI 2018 [31, 32], A	Further diagnostic work-up, instead, should be reserved to the limited subset of athletes with ECG changes potentially reflecting underlying heart disease.		–
EAPC EACVI 2018 [31, 32], A	Exercise ECG should be the initial step in the diagnostic evaluation of athletes with suspected CAD. Individuals with inconclusive exercise ECG results could be referred for nuclear imaging.		–
EFSMA 2021 [34], EA	Indication for performing a TTE examination are only after information obtained from clinical history, physical examination and ECG at rest and during exercise test.		–
BSE CRY 2018 [24], A	In the case of an ECG-only screening, TTE is recommended as a second-line investigation in those athletes with an abnormal ECG, cardiovascular symptoms, abnormal physical examination findings or a family history of sudden death under the age of 40 years.		–
BSE CRY 2018 [24], A	The extent and nature of physiological cardiac adaptation in the AH is based on several factors and an attempt should be made to obtain information on each of these before the TTE is performed. This should include the list of information presented in Fig. 3 (sex, age, ethnicity, body surface area, ECG changes, symptoms, training volume, type of sport and level, family history of unexplained cardiac death <40 years).		–
BSE CRY 2018 [24], A	The following protocols should be strictly adhered to so as to exclude pathology: • BSE Minimum Dataset. • BSE protocol for the assessment of LV diastolic function. • BSE protocol on the assessment of the right heart with a focus on ARVC. • BSE protocol for HCM. • BSE protocol for DCM. In addition, the following image acquisition should be made (Table 3).		–
	Folgeuntersuchungen bei Spezialist:innen		
EAPC EACVI 2018 [31, 32], A	Exercise stress echocardiography can be considered a very reliable and non-invasive methodology to provide information on cardiac function, contractile reserve, exercise capabilities, and arrhythmias which can be combined with clinical and ECG data and contribute to detect cardiac abnormalities.		–
EAPC EACVI 2018 [31, 32], A	Cardiac CT should be reserved for individuals with suspected CAD (symptoms of angina, positive exercise test, arrhythmias, or syncope during exercise), aortic diseases, or pericardial pathology.		–
EAPC EACVI 2018 [31, 32], A	In case of suboptimal echocardiographic images and contraindications to CMR, CT scan may represent the alternative imaging modality.		–
EAPC EACVI 2018 [31, 32], A	Both photon emission computed tomography (SPECT) or positron emission tomography (PET) can be used in athletes for the assessment of myocardial ischaemia when coronary artery anomalies or disease are suspected, however ischaemia can also be related to dysbalanced myocardial perfusion (e.g. in severe LV hypertrophy) or microvascular disease		–
	Ältere Personen (>35 Jahre)		
ESC 2021 [36], A	Cardiac screening with family history, symptoms, physical examination, and 12-lead resting ECG should be considered for competitive athletes [age > 35].		**IIa-C**

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT[c]
EFSMA 2015 [33], A	Beyond the age of 35 ys., physicians should follow the European recommendations, for pragmatic self assessment and further screening of risk patients, with stress testing. In case of abnormal findings, such as symptoms and signs and abnormal ECG, further examinations are recommended.		–
EFSMA 2015 [33], A	Exercise testing (incl. ECG) is recommended in asymptomatic subjects before vigorous sports (males > 45 ys., females > 55 ys.). At the same time, physical capacity should be measured by exercise testing for risk estimation and evaluation of future risk.		–

[a] OS=Teilnehmende an organisiertem Sport (Vereinssport), A=Athlet:innen (mit regelmäßiger Wettkampfteilnahme), EA=Elite-Athlet:innen (nationale Kader, Profisport); [b] eigene Einschätzung, nur ausgefüllt, falls Literatur eindeutig zuzuordnen; [c] fett falls durch Autor:innen vergeben, ansonsten eigene Einschätzung.

Abbildung 5. EKG-Interpretation bei Athlet:innen (aus BSE CRY 2018 [24])

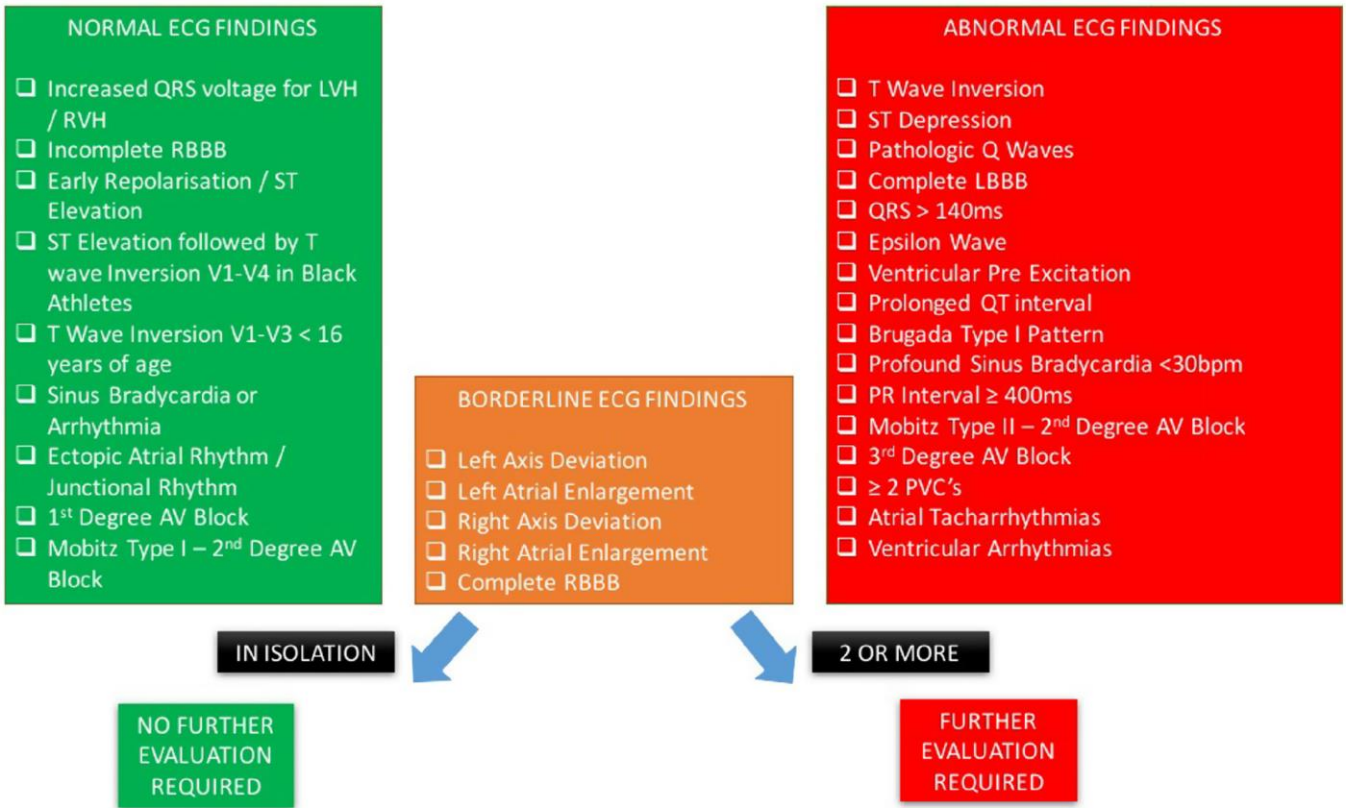


Abbildung 6. Algorithmus zur kardiovaskulären Untersuchung bei Athlet:innen (aus EFSMA 2015 [33])

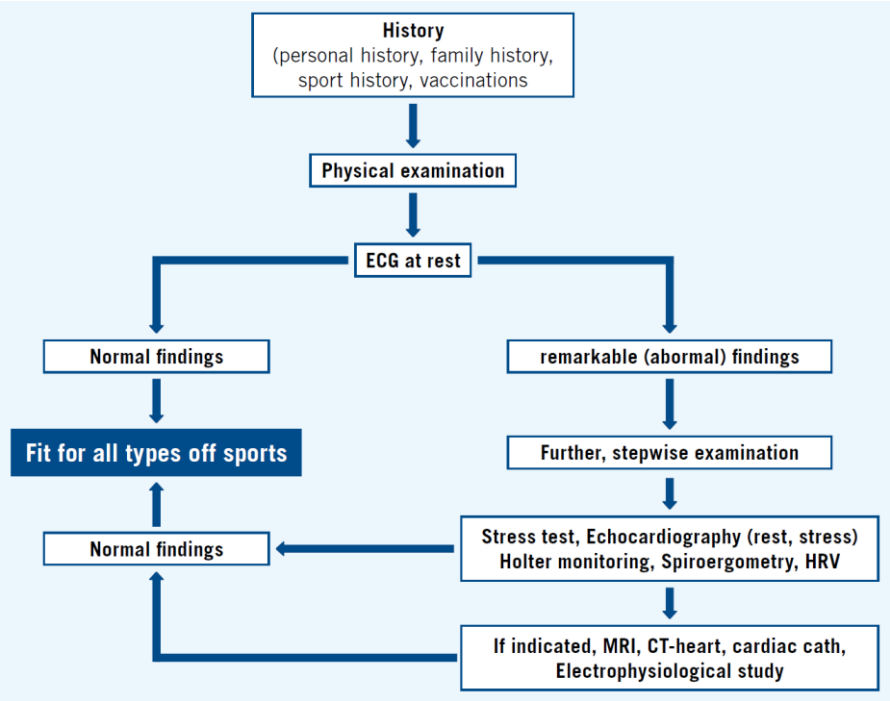


Abbildung 7. Parameter für den kardiopulmonalen Belastungstest (aus [34])

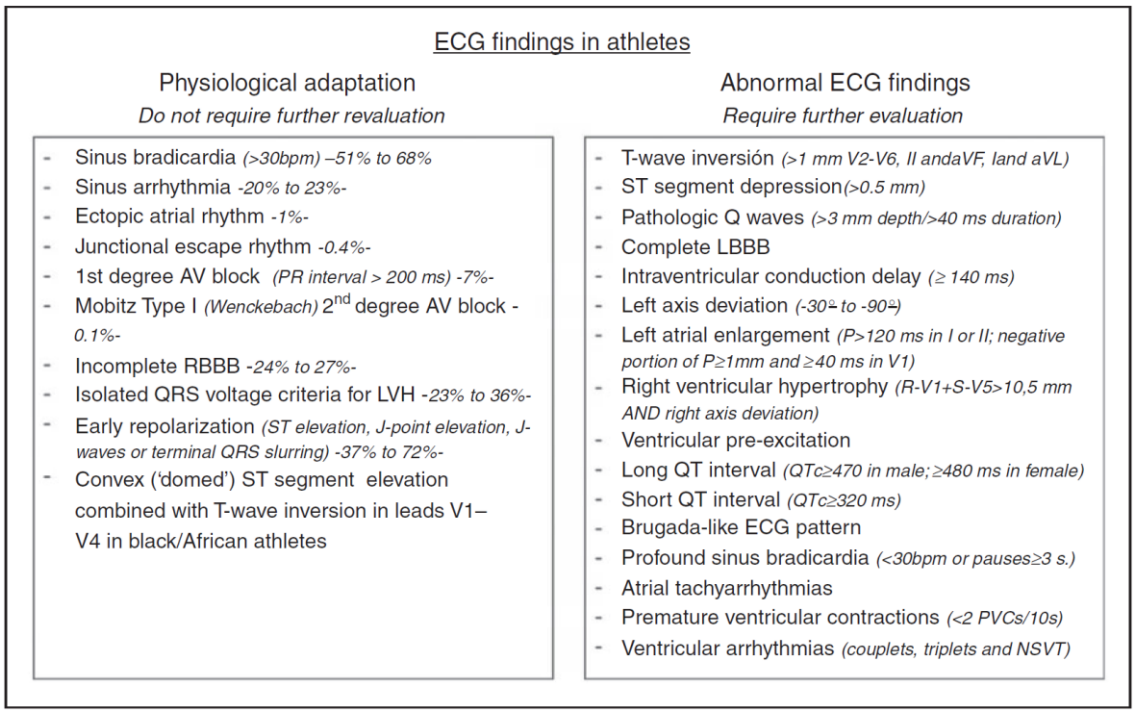
Table 1 Parameters to be measured during cardio-pulmonary exercise test

VO_2 max, VO_2 max/kg	Ventilator equivalents for O_2 and carbon CO_2, end-tidal CO_2
HR max, heart rate reserve, BP max	Ventilators thresholds—VT1, VT2, VT3
O_2 pulse, oxygen saturation	Ventilatory efficiency
Breathing equivalent	Respiratory exchange ratio
Dead space ventilation, breathing reserve	Respiratory coefficient

BP, blood pressure; HR, heart rate.

Ergänzung: EKG/Echokardiographie Interpretationskriterien

Abbildung 8. Klassifizierung von EKG-Anomalien bei Athlet:innen nach den Seattle-Kriterien (aus [35])



ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT [c]
AMSSM 2017 [20], A	Physicians incorporating ECG in the cardiovascular screening process should optimize strategies to assure accurate ECG interpretation and adequate cardiology resources to conduct the secondary evaluation of ECG abnormalities.		–
	EKG Interpretationskriterien		
COCIS 2021 [27-29], A	Common ECG changes (Group 1) should not cause alarm and should allow eligibility to competitive sports without additional evaluation. Hence, further diagnostic investigation is needed only for the subset of athletes with uncommon (Group 2) ECG changes.		–
AEPC 2017 [16], A	Trained physicians using the Electrocardiogram Criteria should perform the screening programme.		–
AMSSM 2017 (ECG) [21], A	The isolated presence of high QRS voltages that fulfil voltage criteria for LVH in the absence of other ECG or clinical markers suggestive of pathology are considered part of the normal and training-related ECG changes in athletes related to physiological increases in cardiac chamber size and/or wall thickness and does not in itself require further evaluation. However, the additional presence of TWI, ST segment depression or pathological Q waves should raise the possibility of pathological LVH and should prompt further evaluation.		–
AMSSM 2017 (ECG) [21], A	Isolated QRS voltage for RVH is part of the normal spectrum of ECG findings in athletes and in the absence of other ECG or clinical markers of pathology does not require further evaluation.		–
AMSSM 2017 (ECG) [21], A	Incomplete RBBB represents a phenotype of cardiac adaptation to exercise and in the absence of other features suggestive of disease does not require further evaluation.		–
AMSSM 2017 (ECG) [21], A	All patterns of early repolarisation, when present in isolation and without clinical markers of pathology, should be considered benign variants in athletes.	3 [90]	–
AMSSM 2017 (ECG) [21], A	TWI in leads V1-V4 when preceded by J-point elevation and convex ST segment elevation should be considered part of the 'black athlete's heart' and should not result in further investigation, in the absence of other clinical or ECG features of cardiomyopathy.		–
AMSSM 2017 (ECG) [21], A	TWI in the anterior leads (V1-V3) in adolescent athletes <16 years of age (or prepubertal athletes) should not prompt further evaluation in the absence of symptoms, signs or a family history of cardiac disease.		–
AMSSM 2017 (ECG) [21], A	In the absence of symptoms such as fatigue, dizziness, or syncope, heart rates ≥30 bpm are considered normal in highly trained athletes.		–
AMSSM 2017 (ECG) [21], A	Sinus arrhythmia, the physiological fluctuation in heart rate with breathing, is considered a normal finding and should not be confused with sinus node dysfunction or sick sinus syndrome. Differentiating features that suggest sinus node dysfunction include: ► lack of rhythmic changes in the heart rate, ► abrupt sustained rate increases and decreases, ► prolonged pauses or periods of sinus arrest, ► inappropriate rate response to exercise (including slowed acceleration and an inappropriately rapid deceleration), ► any association with clinical symptoms such as exercise intolerance, pre-syncope and syncope.		–
AMSSM 2017 (ECG) [21], A	Left axis deviation, left atrial enlargement, right axis deviation, right atrial enlargement and complete RBBB are considered borderline variants in athletes. The presence of any one of these findings in isolation or with other recognised physiological electrical patterns of athletic training does not warrant further assessment in asymptomatic athletes without a family history of premature cardiac disease or SCD. Conversely, the presence of more than one of these borderline findings in combination places the athlete in the abnormal category warranting additional investigation		–
AMSSM 2017 (ECG) [21], A	Abnormal TWI in asymptomatic athletes warrants a comprehensive clinical assessment to exclude underlying cardiomyopathy.		–
AMSSM 2017 (ECG) [21], A	TWI affecting the lateral leads (V5-V6, I and aVL) is considered abnormal and should prompt comprehensive investigation irrespective of ethnicity, including cardiac MRI, when echocardiography is non-diagnostic.		–
AMSSM 2017 (ECG) [21], A	Cardiac MRI should be a standard component of the assessment for markedly abnormal ECGs suggestive of apical HCM, specifically ECGs with deep (>−0.2 mV) TWI and ST segment depression in the lateral or inferolateral leads.		–
AMSSM 2017 (ECG) [21], A	Anterior TWI is a normal variant in asymptomatic adolescent athletes age <16 years and in black athletes when preceded by J-point elevation and convex ST segment elevation.		–

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT [c]
AMSSM 2017 (ECG) [21], A	In most non-black athletes age ≥16 years, anterior TWI beyond lead V2 should prompt further evaluation given the potential overlap with ARVC.	4 [91]	–
AMSSM 2017 (ECG) [21], A	In athletes age ≥16 years with TWI beyond V2, concurrent findings of J-point elevation, ST segment elevation or biphasic T waves more likely represent athlete's heart, while the absence of J-point elevation or a coexistent depressed ST segment is more concerning for ARVC.84Other ECG findings suggestive of ARVC in the presence of anterior TWI include low limb lead voltages, prolonged S wave upstroke, ventricular ectopy with LBBB morphology and epsilon waves.	4 [92]	–
AMSSM 2017 (ECG) [21], A	ST segment depression (relative to the isoelectric PR segment) in excess of 0.05 mV (0.5 mm) in two or more leads should be considered an abnormal finding requiring definitive evaluation for underlying structural heart disease		–
AMSSM 2017 (ECG) [21], A	The consensus of this panel based on existing scientific data is to modify the definition for pathological Q waves in athletes as a Q/R ratio ≥0.25 or ≥40 ms in duration in two or more contiguous leads (except III and aVR).		–
AMSSM 2017 (ECG) [21], A	Athletes with complete LBBB require a thorough investigation for myocardial disease including echocardiography and a cardiac MRI with perfusion study.		–
AMSSM 2017 (ECG) [21], A	In asymptomatic athletes with profound non-specific intraventricular conduction delay, an echocardiogram is recommended to evaluate for myocardial disease.		–
AMSSM 2017 (ECG) [21], A	Evaluation of epsilon waves, especially in combination with right precordial TWI or delayed S wave upstroke, requires the exclusion of possible ARVC through a combination of tests including echocardiography, cardiac MRI, Holter monitoring, exercise ECG test and signal averaged ECG.		–
AMSSM 2017 (ECG) [21], A	Asymptomatic athletes with WPW pattern should be investigated for the presence of a low-risk or high-risk accessory pathway. Non-invasive risk stratification begins with an exercise stress test in which abrupt, complete loss of pre-excitation at higher heart rates suggests a low-risk accessory pathway. If non-invasive testing cannot confirm a low-risk pathway or is inconclusive, electrophysiology testing should be considered	3 [93] 4 [94]	–
AMSSM 2017 (ECG) [21], A	This consensus group also recommends QTc values of >470 ms in males and >480 ms in females to define the threshold of QT prolongation that warrants further assessment in asymptomatic athletes. It is critical that an athlete with a single QTc reading above these threshold values not be obligated a diagnosis of LQTS, but rather that these cut-off values have triggered the need for additional evaluation.		–
AMSSM 2017 (ECG) [21], A	Genetic testing for LQTS is recommended for any athlete where a cardiologist has an index of suspicion for LQTS (intermediate or high probability score), or for an asymptomatic patient with no family history but an incidental ECG finding with a QTc >480 ms pre-puberty and >500 ms post-puberty that is confirmed on repeat ECG testing.		–
AMSSM 2017 (ECG) [21], A	The coved ST segment elevation in type 1 Brugada pattern results in a broad r' and should be distinguishable from the upsloping ST segment elevation of early repolarisation in an athlete.		–
AMSSM 2017 (ECG) [21], A	Patients with a [Brugada] type 1 ECG pattern should be referred to a cardiac electrophysiologist for further evaluation, regardless of symptoms.		–
AMSSM 2017 (ECG) [21], A	A resting heart rate ≤30 bpm or a sinus pause ≥3 s may be normal in a well-trained athlete but nevertheless should prompt further evaluation.		–
AMSSM 2017 (ECG) [21], A	Mobitz type II second-degree AV block and third-degree (complete) AV block are pathological disruptions in AV conduction and abnormal findings in athletes.		–
AMSSM 2017 (ECG) [21], A	In athletes with ≥2000 PVCs per 24 hours or with episodes of non-sustained ventricular tachycardia, or with an increasing burden of ectopy during an incremental exercise test, additional evaluation may include contrast-enhanced cardiac MRI and more invasive EP study.	4 [95]	–
AMSSM 2017 (ECG) [21], A	SVT, atrial fibrillation and atrial flutter are rarely seen on a resting ECG in athletes and require investigation.		–
AMSSM 2017 (ECG) [21], A	Ventricular couplets, triplets and non-sustained ventricular tachycardia always require investigation.		–
AMSSM 2017 (ECG) [21], A	[in athletes ≥30 years of age] Additional evaluation for underlying coronary artery disease should be considered in asymptomatic older athletes with TWI, pathological Q waves, ST segment depression, left or right bundle branch block, abnormal R wave progression, left anterior hemiblock and atrial fibrillation.		–

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT [c]
AMSSM 2017 (ECG) [21], A	Several common heritable cardiomyopathies including HCM, ARVC and familial DCM may present with ECG abnormalities prior to the onset of overt heart muscle pathology. Therefore, athletes with abnormal ECGs suggestive of cardiomyopathy and initially normal clinical evaluations should be followed with serial evaluation during and after their competitive athletic careers.		–
EAPC EACVI 2018 [31, 32], A	The ECG should be evaluated in relation with the athlete's gender, age and race, family history of cardiovascular disease and/or SCD, clinical symptoms, physical examination, and intensity/duration of physical exercise.		–
EAPC EACVI 2018 [31, 32], A	These [athlete's heart] ECG abnormalities should be clearly separated from training unrelated ECG patterns (present in <5%), such as ST-segment depression and T-wave inversion, pathologic Q waves, major intraventricular conduction defects, ventricular pre-excitation, long or short QT interval, and ventricular arrhythmias, which may be an expression of cardiovascular disorders, notably cardiomyopathies and cardiac ion channel diseases, with potential risk of SCD during sports.		–
EAPC EACVI 2018 [31, 32], A	Some borderline ECG variants (left and right atrial enlargement, left and right axis deviation, and right ventricular hypertrophy) are considered of uncertain significance in athletes and, in the setting of cardiac evaluation, should not require additional investigation if not associated with positive family history and present in isolation.	2 [96]	–
EAPC EACVI 2018 [31, 32], A	In asymptomatic athletes with a negative family history, ECG changes due to cardiac adaptation to physical exertion should not cause alarm and do not represent indication for additional evaluation.		–
EHRA EACPR 2017 [35], OS-A	The updated recommendations for interpretation of the athlete's ECG (Seattle criteria) represent a useful document to the scope.		–
	Echokardiographie Interpretationskriterien		
EAPC EACVI 2018 [31, 32], EA	In elite athletes the LV end-diastolic diameter is not frequently increased >60 mm. A LV end-diastolic diameter >60 mm— when combined with reduced EF and abnormal diastolic function—should raise suspicion of IDCM.		–
EAPC EACVI 2018 [31, 32], EA	In elite athletes LVH involves typically all myocardial segments and the maximal septal thickness is usually ≤12 mm. Septal wall thickness is lower in female athletes and more pronounced in African than in Caucasian athletes.		–
EAPC EACVI 2018 [31, 32], A	In HCM increased wall thickness (>15 mm) involves mainly the basal septum and in 20% of HCM cases is associated with additional features, such as SAM or aortic valve mid-systolic closure.		–
EAPC EACVI 2018 [31, 32], A	After physical deconditioning of three months, a reduction of LV wall thickness can be observed in athletes but not in HCM.		–
EAPC EACVI 2018 [31, 32], A	In athletes LVH is combined with normal EF, normal, or even increased SV and s' velocity >9 cm/s, whereas s' is <9 cm/s in HCM. EF is normal or high in early stages and possibly reduced in advanced stages of HCM.		–
EAPC EACVI 2018 [31, 32], A	LV diastolic function is often supranormal in athletes (E/A ratio >2, increased e' velocity, low E/e' ratio). In the HCM E/A ratio is <1, E velocity deceleration time is prolonged, e' velocity and e'/a' ratio are low. However, normal LV diastolic filling pattern does not exclude pathological LVH.		–
BSE CRY 2018 [24], A	Regardless of whether TTE is a first- or second-line investigation, it should be performed according to the BSE Minimum Dataset for a Standard Transthoracic Echocardiogram in an Adult and should also consider recommendations made in the Supplementary Protocols for (i) Comprehensive Assessment of the Right Heart and (ii) the Assessment of Diastolic Function.		–
BSE CRY 2018 [24], A	LV geometry should be determined using a combination of LV mass indexed to BSA (LVMI) and relative wall thickness (RWT). LVMI is calculated as per BSE guidelines and RWT is calculated by summating septal and posterior wall thickness in diastole and dividing into the LV diastolic cavity dimension. LV geometry can be reported as 'normal' (normal RWT and normal LVMI), 'concentric remodeling' (increased RWT with normal LVMI), 'concentric hypertrophy' (increased RWT and increased LVMI) or 'eccentric hypertrophy' (normal RWT with increased LVMI) according to published criteria (Fig. 4)	4 [97]	–

[a] BFS=Breiten- und Freizeitsport, OS=Teilnehmende an organisiertem Sport (Vereinssport), A=Athlet:innen (mit regelmäßiger Wettkampfteilnahme), EA=Elite-Athlet:innen (nationale Kader, Profisport); [b] eigene Einschätzung, nur ausgefüllt, falls Literatur eindeutig zuzuordnen; [c] fett falls durch Autor:innen vergeben, ansonsten eigene Einschätzung.

Lunge und Atemweg

Für den Breiten- und Freizeitsport liegen keine spezifischen Empfehlungen vor (Tabelle 13). Für den organisierten Sport wird bei Verdacht auf Asthma eine gründliche Anamnese und körperliche Untersuchung empfohlen (NATA, USA).

Vorliegende diagnostische Empfehlungen zu Lunge und Atemweg erscheinen lückenhaft und auf wenige Aspekte beschränkt. Bei Athlet:innen wird empfohlen, eine Untersuchung der Lunge im Sitzen bei tiefer Atmung durchzuführen (AAP, USA). Die Diagnose einer belastungsinduzierten Bronchokonstriktion sollte durch Spirometrie in Ruhe und nach einem Provokationstest gestellt werden (AAP, USA).

Tabelle 13. Empfehlungen zur Untersuchungen von Lunge und Atemweg

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT[c]
NATA 2012 [47], OS	Athletes who may have or are suspected of having asthma should undergo a thorough medical history and physical examination.		**B**
AAP 2019 [11], OS-A	Spirometry at rest followed by a challenge test to elicit bronchoconstriction is the preferred method to diagnose EIB with or without asthma.	2 [98] 4 [99]	**A**
AAP 2019 [11], OS-A	Pulmonary evaluation of the anterior and posterior chest should be done in a quiet room with the patient in the seated position using breaths that are deeper than those of normal breathing.		–

[a] BFS=Breiten- und Freizeitsport, OS=Teilnehmende an organisiertem Sport (Vereinssport), A=Athlet:innen (mit regelmäßiger Wettkampfteilnahme), EA=Elite-Athlet:innen (nationale Kader, Profisport); [b] eigene Einschätzung, nur ausgefüllt, falls Literatur eindeutig zuzuordnen; [c] fett falls durch Autor:innen vergeben, ansonsten eigene Einschätzung.

Weitere Themen der inneren Medizin

Für den Breiten- und Freizeitsport liegen keine spezifischen Empfehlungen vor (Tabelle 14). In den USA wird im organisierten Sport kein Routinescreening von Urinproben oder Blutbild empfohlen (NATA, USA). Hämoglobin und Ferritin sollten bei einer Anämie in der Anamnese gemessen werden, Lipide bei hohem Cholesterin oder Lipidlevel in der Vorgeschichte (NATA, USA).

Bei Eliteathlet:innen wird eine Blut- und Urinuntersuchung in Europa empfohlen. Darunter zählen zelluläre Bestandteile, metabolische Werte (Glucose, Leber-/Nierenwerte, Lipidprofil, Elektrolyte, Vitamin D) und weitere Biomarker, in Abhängigkeit von der Anamnese und den Ergebnissen der körperlichen Untersuchung (EFSMA).

Ein breites Screening auf HIV und Hepatitis wird für Athlet:innen nicht generell empfohlen, sollte aber Risikogruppen angeboten werden (AAP, USA). Für ein Screening auf Sichelzellanlage im organisierten Sport wird die Anamnese von Voruntersuchungen, inklusive der Ergebnisse eines Neugeborenenscreenings, empfohlen (NATA, USA). Es wird empfohlen, eine positive (Familien-)Anamnese durch Diagnostik zu bestätigen und die Betroffenen in Bezug auf die Risiken von Hitze und Dehydrierung zu beraten (NATA, USA). Bei Athlet:innen ohne positive Anamnese sind die Empfehlungen zur Notwendigkeit eines Screenings auf Sichelzellanlage inkonsistent (NATA vs. AAP, beides USA).

Tabelle 14. Empfehlungen zur inneren Medizin

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT[c]
NATA 2014 [49], OS	The use of routine laboratory or other screening tests such as urinalysis, complete blood count, chemistry profile, lipid profile, ferritin level, or spirometry during the PPE is not supported by current studies.	4 [100] 4 [101]	**B**
NATA 2014 [49], OS	If the athlete has a history of anemia, then hemoglobin and ferritin levels should be measured.	4 [102] 4 [103]	**C**
NATA 2014 [49], OS	Lipid profiles should be reserved for those who have a personal history of elevated cholesterol or dyslipidemia and those athletes in whom other cardiovascular risk factors have been identified (by history or examination) that require further investigation as part of a thorough medical evaluation rather than as part of the PPE.	2 [104]	**C**
NATA 2014 [49], OS	For athletes with a history of elevated cholesterol or lipid levels, longitudinal care by the team physician includes review of previous laboratory results and appropriate management.		**C**
EFSMA 2021 [34], EA	additional blood (haematological and biochemical tests depending on the athlete's age and level of training) and urine samples are collected.		–
EFSMA 2021 [34], EA	The athlete blood test panel should include the complete blood cell count and a comprehensive metabolic panel (glucose blood level, liver panel, kidney profile, lipid profile, electrolytes, vitamin D). When the three diagnostic components of the PPE are completed, the SEM doctor can ask for		–

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT[c]
	more biomarkers to be tested to make the right diagnosis (if there is a suspicion of nutritional deficiencies, overtraining, relative energy deficiency in sport (RED-S), hormonal imbalances, inefficient recovery after injury, etc).		
	Chronische Infektionen		
AAP 2019 [11], OS-A	While mandatory testing of athletes for HIV or hepatitis is not recommended, voluntary testing should be encouraged for athletes at high risk, that is, who have exposure to blood products, symptoms suggestive of disease, or significant risk factors detected during the PPE.		–
	Sichelzellanlage		
NATA 2012 [47], OS	Screening for sickle cell trait (SCT), by self-report, is a standard component of the preparticipation physical evaluation (PPE) monograph. Testing for SCT, when included in the PPE or conducted previously, confirms SCT status.		**A**
NATA 2014 [49], OS	Confirmatory testing is recommended for those athletes who report a history of sickle cell trait and those whose family heritage suggests higher risk. Athletes found to have sickle cell trait should be educated by the medical staff and be monitored carefully for heat- and dehydration- related concerns during training and competition.		**C**
NATA 2013 [48], A	Efforts to obtain newborn screening results of sickle cell trait (SCT) status during the preparticipation physical evaluation are recommended.		C
NATA 2013 [48], A	In the absence of newborn screening results, SCT screening during the preparticipation physical evaluation should be considered for all athletes, especially if they are performing intense physical activity.		C
AAP 2019 [11], OS-A	Universal [sickle cell trait] screening is not widely recommended for athletes, except for NCAA athletes who are required as students to show proof of screening or decline screening.		–

[a] BFS=Breiten- und Freizeitsport, OS=Teilnehmende an organisiertem Sport (Vereinssport), A=Athlet:innen (mit regelmäßiger Wettkampfteilnahme), EA=Elite-Athlet:innen (nationale Kader, Profisport); [b] eigene Einschätzung, nur ausgefüllt, falls Literatur eindeutig zuzuordnen; [c] fett falls durch Autor:innen vergeben, ansonsten eigene Einschätzung.

Orthopädie

Allgemeine Untersuchungsempfehlungen für den Breiten- und Freizeitsport liegen nicht vor (Tabelle 15). Für den organisierten Sport und Athlet:innen jeden Niveaus wird empfohlen, mit einer Anamnese von Verletzungen und Operationen sowie einer körperlichen Untersuchung zu beginnen (NATA, USA/AAP, USA/EFSMA, Europa), wie beispielweise in Tabelle 16 beschrieben. Die Ergebnisse dieser Untersuchungen entscheiden dann über die weiterführende Diagnostik (NATA, USA/AAP, USA/EFSMA, Europa). Details zu den Untersuchungsempfehlungen von einzelnen Gelenken sind Tabelle 15 zu entnehmen; entsprechende Abbildungen gibt es in AAP 2019, Kapitel G (Musculoskeletal Concerns) [11].

Besonderheiten bei spezifischen Personengruppen

Bei *weiblichen Athletinnen* wird empfohlen, besonders auf das Risiko für Kreuzbandverletzungen, patellofemorale Schmerzen und muskuloskeletale Defizite zu achten und eine umfassende Bewertung der kinetischen Kette des Bewegungsapparats im Hinblick auf Schulterverletzungen vorzunehmen (AAFP, USA).

Bei *Athlet:innen mit Behinderung* wird empfohlen, die Stabilität, Flexibilität und Kraft häufig verletzter und besonders belasteter Gelenke zu untersuchen (AAP, USA).

Tabelle 15. Empfehlungen zur Orthopädie

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT[c]
NATA 2014 [49], OS	The musculoskeletal history screening and examination can be combined for asymptomatic athletes with no previous injuries (Table 4). With an accurate history, the clinician can detect more than 90% of significant musculoskeletal injuries; the screening physical examination is 51% sensitive and 97% specific. If the player has either a previous injury or other signs or symptoms (eg, pain or tenderness; asymmetric muscle bulk, strength, or range of motion; or any obvious deformity) detected during the general screening examination or history, the relevant elements of a site-specific examination should be performed.	2 [105]	**A**
AAP 2019 [11], OS-A	Key findings during the musculoskeletal history will direct the focus of the musculoskeletal physical examination, as there are currently limited screening examinations that have been validated to reduce injury risk.		**B**

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT[c]
EFSMA 2021 [34], EA	The musculoskeletal manual screening combines both history and physical examination, to be informed about previous injuries in asymptomatic athletes. [...] This can be detected during the examination or history, the relevant elements of a site-specific examination should be performed.		–
EFSMA 2021 [34], EA	Physicians can also focus on movement quality. This involves identification and rating functional compensations, asymmetries, impairments or efficiency of movement control through transitional or dynamic movement.		–
AAP 2019 [11], OS-A	A general [musculoskeletal] screening examination is reasonable for athletes with no symptoms and no previous injury.		–
AAP 2019 [11], OS-A	Examiners need to determine which method best suits a given situation, depending on history of injury, musculoskeletal signs or symptoms, resources and time available, and type of sport or activity in which the athlete will participate.		–
	Anamnese		
NATA 2014 [49], OS	Musculoskeletal injury is a common cause for restriction or disqualification of an athlete, so the medical history should attempt to detect any underlying condition that might predispose an athlete to injury. Special attention in the examination should be given to any areas that have been injured or undergone surgery.	4 [106]	**B**
	Wirbelsäule		
AAP 2019 [11], OS-A	The cervical spine should be inspected for posture and alignment. The ear canal should line up with the middle of the shoulder. Forward flexion of the neck should allow the chin to touch the manubrium, extension should allow a nearly vertical gaze, rotation should let the chin almost touch the clavicle in both directions, and the ears should approach the shoulders with lateral flexion. Any asymmetrical or deficient motion should be noted. Examination of the thoracolumbar spine and back focuses on posture, range of motion, and potential deformities. The scapulae should be level, symmetrical, and flat against the thoracic cage. The presence of scoliosis, kyphosis at the thoracic level, or lordosis at the lumbar level should be documented. Scoliosis causes a rotatory deformity as the athlete bends forward at the waist (Figure 6G-2). Pain or restriction of forward flexion may indicate lumbar disk disease. Pain from compression fractures is most often midline, is most often worse with flexion of the spine, and may be related to neurological findings. Back extension may increase pain from a facet injury, spondylolysis, spondylolisthesis, or a sprain or strain. As part of the thoracolumbar examination, the athlete bends forward at the waist. The rotary deformities of scoliosis, such as asymmetrical, prominent ribs; curvature of the spine; or an asymmetrical waist, are accentuated in this position.		–
	Schulter		
AAFP 2016 [9], A	Injury Reduction and Modification Evaluation (The ‘‘Disabled Throwing Shoulder’’ (DTS)): - History of any previous injury in the shoulder and relevant parts of the kinetic chain. - Volume and intensity of training - Examination of shoulder, including the scapula and kinetic chain - When possible, coordinate the evaluation of the throwing, hitting, or serving mechanics, including the kinetic chain.		–
AAP 2019 [11], OS-A	The shoulder examination begins with inspection for symmetry with the athlete standing. It is important to visualize the posterior and anterior aspects of the shoulder boney and muscular anatomies (for bruising, scapular symmetry, winging, atrophy, acromioclavicular joint prominence, and sternoclavicular joint prominence). Palpate the bilateral sternoclavicular joint, acromioclavicular joint, and proximal biceps tendon and bicipital groove. Range of motion in abduction (Figure 6G-3A), flexion (Figure 6G-3B), and internal rotation (Figure 6G-3C) and external rotation (Figure 6G-3D) are then assessed.		–
AAP 2019 [11], OS-A	Shoulder impingement signs should be tested with Neer impingement test and Hawkins test.		–
AAP 2019 [11], OS-A	A screening for multidirectional instability includes subluxation tests in the anterior and posterior planes of a supine athlete (Figures 6G-6A–6G-6C) and in the inferior plane of a seated athlete.		–
	Ellbogen, Handgelenk		
AAFP 2016 [9], A	Injury Reduction and Modification Evaluation (Elbow): - Review of playing and throwing history to determine risk factors - History of elbow, shoulder, and kinetic chain injury and rehabilitation status - Examination of the elbow, including the shoulder and kinetic chain - When possible, coordinate the evaluation of the throwing, hitting or serving mechanics, including the kinetic chain.		–
AAP 2019 [11], OS-A	The elbow is observed for swelling, discoloration, and carrying angle (cubital valgus). The elbow should extend fully and then flex to allow the athlete to touch the ipsilateral shoulder with the hand.		–

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT[c]
AAP 2019 [11], OS-A	Forearm motion is assessed by having the athlete pronate and supinate the forearms with the elbows bent 90 degrees at his or her sides. The athlete should be able to turn the hand completely palm up and completely palm down.		–
AAP 2019 [11], OS-A	In a throwing athlete, medial stability can be assessed by applying a valgus force to the elbow (Figure 6G-7B). The modified milking maneuver (Figure 6G-7C) also assesses medial instability. The test result is considered positive if pain is noted over the ulnar collateral ligament or if the joint opens medially. Direct comparison with the opposite arm is critical.		–
AAP 2019 [11], OS-A	The hand and wrist should be evaluated for symmetry. Wrists should palmar flex equally to about 80 degrees and dorsiflex to 70 degrees or more. There should be more ulnar deviation than radial deviation. The fingers should be able to close into a full fist, and each fingernail should point at the scaphoid bone with the fingers flexed across the palm.		–
	Hüfte		
AAP 2019 [11], OS-A	The hip examination begins with observation of the standing posture. The iliac crest and posterior superior iliac spine heights should be level with the floor when the torso is aligned symmetrically, and the athlete should be able to stand on each foot without any translation or tilting of the pelvis. The hip joint should be palpated for tenderness in the greater tuberosities, hip flexor, adductor, and external rotator tendons (behind the greater trochanter). Hip range of motion can be assessed with the athlete lying supine. Landmarks should be reviewed at this point. With the hip and the knee fully extended, the hip joint is rotated internally and externally (a “log roll” movement), and any asymmetry is noted. Symmetry of abduction and adduction should also be observed. Hip flexion should be beyond 90 degrees, and the knees should come straight toward the chest; any external rotation indicates an intrinsic hip deformity. With the hip and knee flexed to 90 degrees, the hip joint should have 40 degrees of internal rotation and 45 degrees of external rotation. Keeping the athlete’s hip flexed 90 degrees and extending the knee checks hamstring flexibility. The popliteal angle should be 0 degrees to 10 degrees in young children and can vary depending on patient age and sex.		–
AAP 2019 [11], OS-A	Passive assessment of the hip in flexion, adduction and internal rotation (FADIR) is conducted as part of the supine assessment of the hip.		–
AAP 2019 [11], OS-A	The FABER test involves combining the motion of hip flexion, abduction, and external rotation. Evaluation documents pain provocationand range of motion. Posterior hip pain may be indicative of sacroiliac joint involvement, while anterior hip pain or groin pain indicates intra-articular hip pathology. With the athlete standing, inspection should reveal a normal leg-thigh valgus angulation of 12 degrees or less in males and 18 degrees or less in females. The patella should be observed for abnormal lateral subluxation or tilt or an excessively high position (patella alta) with the athlete seated. A patella apprehension test evaluates for patella instability and a positive test result is apprehension with lateral translation of the patella and the knee in extension.		–
	Knie		
AAFP 2016 [9], A	Injury Reduction and Modification Evaluation (Knee Injuries: ACL): Athletes in running, landing, and cutting sports should have an evaluation (10), including: o History of previous personal or family ACL injury o Lower extremity alignment (e.g., knee valgus) o Motor control (including core and lower extremity strength, balance and flexibility) Other evaluation techniques may include: o Review of training surface and shoe type o Screening biomechanical analysis of jumping and landing		–
AAFP 2016 [9], A	Injury Reduction and Modification Evaluation (Other knee injuries): Athletes should have an evaluation (10), including: o History of previous lower extremity injury and rehabilitation o Present and anticipated volume of training and participation o Patellar and peri-patellar examination o Lower extremity alignment (e.g., femoral anteversion, knee valgus, foot pronation) o Hip abduction, quadriceps, and hamstring strength o Quadriceps, hamstring, and iliotibial band flexibility Other evaluation techniques may include the following: o Review of training surface and shoe type o Screening biomechanical analysis of jumping and landing		–
AAP 2019 [11], OS-A	The remainder of the knee examination should be done with the athlete supine. Each patella should be evaluated for hypermobility by translating the patella medially and laterally with the knee in approximately 20 degrees of flexion; comparison with the opposite side should be made. Joint-line tenderness may indicate a meniscal tear. Any amount of knee effusion should be noted.		–

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT[c]
	Knee range of motion should be from full extension or hyperextension to approximately 140 degrees of flexion. Knee ligament stability tests include the Lachman test for ACL deficiency (Figure 6G-12A), posterior drawer test for posterior cruciate ligament insufficiency (Figures 6G-12B and 6G-12C), and varus and valgus stress tests for collateral ligament laxities (Figures 6G-12D and 6G-12E). It is important to remember that a negative anterior drawer test result does not rule out an ACL tear and the Lachman test is the better test for ACL integrity. Palpation of the tibial tubercle is important to assess for Osgood-Schlatter disease (tibial tubercle apophysitis).		
	Unterschenkel, Knöchel, Fuß		
AAFP 2016 [9], A	Injury Risk Reduction and Modification Evaluation (Inversion Ankle Sprains): Athletes in running, landing, and cutting sports should have an evaluation, including the following: o History of previous ankle injury o Ankle ligament evaluation o Heel alignment o Ankle muscle strength and flexibility testing o Balance and core muscle control o Body mass index (BMI)		–
AAP 2019 [11], OS-A	The lower leg and tibia examination should include the shin edema test (SET) and shin palpation test (SPT) to test for medial tibial stress syndrome (MTSS). SET is sustained palpitation of the distal two-thirds of the medial surface of the tibiae bilaterally for at least 5 seconds to evaluate for signs of pitting edema. SPT is palpation of the distal two-thirds of the posteromedial border of the tibiae for focal bony tenderness that may indicate bone stress injuries.	3 [107]	–
AAP 2019 [11], OS-A	The ankles are evaluated with the athlete standing and sitting for normal appearance. In the seated position, active dorsiflexion to 20 degrees and plantar flexion to 40 degrees should be present. With the knee extended, tightness in the Achilles tendon can be assessed by passively dorsiflexing the seated athlete's ankle while observing the lateral aspect of the leg and ankle. The ankle should dorsiflex 15 degrees to 20 degrees past neutral. Stress testing for ligament laxity includes the anterior drawer test for anterior subluxation and the talar tilt test for lateral ligament stability.		–
AAP 2019 [11], OS-A	At inspection of the foot, pes cavus or rigid flatfoot deformities should be noted. A supple flatfoot does not affect an athlete's performance, but it may be a risk factor for upstream problems in the kinetic chain, such as MTSS or patellofemoral joint pain.		–
AAP 2019 [11], OS-A	A simple screening for potential lower extremity injury risk is the single-leg squat (SLS) test. Barefoot athletes are asked to place their hands onto their hips and stand on one limb and flex the opposing limb to 90 degrees, followed by an SLS to 30 degrees of knee flexion with return to a fully extended knee position. Abnormal responses, which include arms flailing, Trendelenburg sign, or collapse of the supporting knee into valgus, should be noted (Figure 6G-14).	3 [108]	–
AAP 2019 [11], OS-A	The data supporting functional movement testing and improved outcomes are not strong. Testing should be considered in players of lateral, pivoting, cutting sports. Athletes in sports requiring lateral, pivoting, and cutting motions might be evaluated in greater detail with the box drop test and core strength evaluation to determine deficits in neuromuscular control that increase risk of ACL rupture.	2 [109] 3 [110]	–
	Athletinnen		
AAP 2019 [11], OS-A	Screening for biomechanical risk factors associated with higher rates of ACL injury can be performed as part of the PPE, especially for female athletes participating in pivoting and cutting sports such as soccer, basketball, and team handball.		–
AAFP 2017 [10], A	It is desirable the team physician identify risk factors [for ACL injuries] during the PPE.		–
AAFP 2017 [10], A	It is desirable the team physician utilize the PPE to identify and address known risk factors for the development of patellofemoral pain.		–
AAFP 2017 [10], A	It is desirable the team physician (…) identify musculoskeletal deficits as the basis for a conditioning program		–
AAFP 2017 [10], A	It is desirable the team physician (…) perform a comprehensive musculoskeletal kinetic chain evaluation of the athlete [with regard to shoulder injuries]		–
	Athlet:innen mit Behinderung		
AAP 2019 [11], OS-A	The musculoskeletal examination of an athlete who uses a wheelchair should include evaluation of the stability, flexibility, and strength of commonly injured sites (eg, shoulder, hand, and wrist) and the trunk.		–
AAP 2019 [11], OS-A	Athletes with lower-limb amputation and prostheses require a full assessment of the lower back, pelvis, and lower extremities, and those with upper-limb amputation and prosthetic devices require a full assessment of the upper back, shoulder girdle, and upper extremities.		–

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT[c]
AAP 2019 [11], OS-A	Athletes with cerebral palsy have decreased strength, decreased musculotendinous flexibility (often with contractures), and muscle strength imbalances, especially of the lower extremities. These conditions vary in severity from mild and nearly imperceptible to very severe and requiring wheelchair use. Overuse injuries, strains, and sprains are common, especially at the hips, knees, ankles, and feet. The PPE should include a thorough examination of these regions.		–

[a] BFS=Breiten- und Freizeitsport, OS=Teilnehmende an organisiertem Sport (Vereinssport), A=Athlet:innen (mit regelmäßiger Wettkampfteilnahme), EA=Elite-Athlet:innen (nationale Kader, Profisport); [b] eigene Einschätzung, nur ausgefüllt, falls Literatur eindeutig zuzuordnen; [c] fett falls durch Autor:innen vergeben, ansonsten eigene Einschätzung.

Tabelle 16. Untersuchung des Bewegungsapparates auf Verletzungszeichen (aus NATA 2014 [49])

Table 4. The 90-Second Musculoskeletal Screening Examination[a]

Instruction	Observation
Stand facing examiner	Acromioclavicular joints: general habitus
Look at ceiling, floor, over both shoulders, touch ears to shoulder	Cervical spine motion
Shrug shoulders (resistance)	Trapezius strength
Abduct shoulders to 90° (resistance at 90°)	Deltoid strength
Full external rotation of arms	Shoulder motion
Flex and extend elbows	Elbow motion
Arms at sides, elbows at 90° flexed; pronate and supinate wrists	Elbow and wrist motion
Spread fingers; make fist	Hand and finger motion, strength, and deformities
Tighten (contract) quadriceps; relax quadriceps	Symmetry and knee effusions, ankle effusion
"Duck walk" away and toward examiner	Hip, knee, and ankle motions
Back to examiner	Shoulder symmetry; scoliosis
Knees straight, touch toes	Scoliosis, hip motion, hamstrings tightness
Raise upon toes, heels	Calf symmetry, leg strength

[a] Reprinted with permission from Carek PJ, Mainous AG, A thorough yet efficient exam identifies most problems in school athletes. *The J Fam Pract.* 2003;52(2):127–134, Quadrant HealthCom Inc.[18]

Neurologie

Allgemeine Untersuchungsempfehlungen für den Breiten- und Freizeitsport liegen nicht vor (Tabelle 17). Im organisierten Sport und bei Eliteathlet:innen wird eine gründliche neurologische Untersuchung nach Gehirnerschütterung, Krampfanfällen, Stenose der Halswirbelsäule oder einer Rückenmarksverletzung empfohlen (EFSMA, Europa/NATA, USA). Dagegen empfiehlt die AAFP, bei *allen* Athlet:innen eine neurologische Untersuchung und eine Untersuchung der Halswirbelsäule, um Verletzungen an der Halswirbelsäule zu vermeiden (AAFP, USA).

Besonderheiten bei spezifischen Personengruppen

Athlet:innen mit körperlichen Einschränkungen wird eine vollständige neurologische Untersuchung empfohlen (AAP, USA).

Nach überstandener Krebserkrankung sollten ältere Personen und solche, die mit einer neurotoxischen Chemotherapie behandelt wurden, eine Standarduntersuchung des Gleichgewichts und der Mobilität zur Beurteilung des Sturzrisikos erhalten (ACSM, USA).

Tabelle 17. Empfehlungen zur Neurologie

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT[c]
NATA 2014 [49], OS	If the athlete has a history of concussion, seizure disorder, cervical spine stenosis, or spinal cord injury, a thorough neurologic assessment is necessary.		**C**
AAFP 2016 [9], A	Injury Reduction and Modification Evaluation (Cervical spine injury): Athletes should have an evaluation including: o History of c-spine injury or abnormality o C-spine and neurological examination o Consideration of additional testing and/or consultation		–
EFSMA 2021 [34], EA	A thorough neurological assessment is necessary if the athlete has a history of concussion, seizure disorder, cervical spine stenosis or spinal cord injury. This is of special significance for soccer players and rugby or American football to evaluate the risk of cerebral harms.		–

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT[c]
	Athlet:innen mit Behinderung		
AAP 2019 [11], OS-A	Since many athletes with physical impairments may also have some form of neurological deficit, a complete neurological evaluation should be performed.		–
	Nach überstandener Krebsbehandlung		
ACSM 2019 [14], BFS	Older survivors and/or survivors treated with neurotoxic chemotherapy (typical for breast, colon, lung, ovarian cancers) may especially benefit from a standard assessment of balance and mobility to assess fall risk.	1 [111]	C

[a] BFS=Breiten- und Freizeitsport, OS=Teilnehmende an organisiertem Sport (Vereinssport), A=Athlet:innen (mit regelmäßiger Wettkampfteilnahme), EA=Elite-Athlet:innen (nationale Kader, Profisport); [b] eigene Einschätzung, nur ausgefüllt, falls Literatur eindeutig zuzuordnen; [c] fett falls durch Autor:innen vergeben, ansonsten eigene Einschätzung.

Psychiatrie

Allgemeine Untersuchungsempfehlungen für den Breiten- und Freizeitsport liegen nicht vor (Tabelle 18). Für Teilnehmende an organisiertem Sport und Athlet:innen wird empfohlen, den Anamnese-Teil der sportmedizinischen Vorsorgeuntersuchung durch Fragen zur psychischen Gesundheit zu ergänzen (NATA, USA/AAP, USA). In Abwesenheit validierter Screening-Instrumente für Sportler:innen wird die Fragenliste in Box 5 vorgeschlagen (NATA, USA).

Tabelle 18. Empfehlungen zur psychischen Gesundheit von Sportler:innen

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT[c]
NATA 2015 [50], A	The Plan [for Recognition and Referral of Student-Athletes With Psychological Concerns][d] offers questions regarding a student-athlete's history of a mental health concern or present psychological status at the preparticipation physical examination, with follow-up questionnaires if the student-athlete's answers indicate the need for further evaluation.		**B, C**
NATA 2015 [50], A	The Plan [for Recognition and Referral of Student-Athletes With Psychological Concerns][d] provides questions to consider asking when approaching a student-athlete with a potential psychological concern.		**B, C**
NATA 2014 [49], OS	As part of the health history portion of the PPE, including questions to determine the mental health status of the athlete should be considered, along with a plan for referral and follow-up where appropriate.	4 [112]	**C**
AAP 2019 [11], OS-A	As part of the health history portion of the PPE, questions addressing the mental health status of the athlete should be considered, along with a plan for referral and follow-up.		–
AAP 2019 [11], OS-A	While screening tools are not validated as stand-alone assessments for mental disorders, they may be incorporated into the PPE as indicated.		–

[a] BFS=Breiten- und Freizeitsport, OS=Teilnehmende an organisiertem Sport (Vereinssport), A=Athlet:innen (mit regelmäßiger Wettkampfteilnahme), EA=Elite-Athlet:innen (nationale Kader, Profisport); [b] eigene Einschätzung, nur ausgefüllt, falls Literatur eindeutig zuzuordnen; [c] fett falls durch Autor:innen vergeben, ansonsten eigene Einschätzung; [d] Hier wurden Empfehlungen abgegeben, wie Schulen ihren eigenen Plan zum Umgang mit psychologischen Problemen von Schüler-Athlet:innen entwickeln können.

Box 5. Fragen zur psychischen Gesundheit von Athlet:innen (mit ja/nein-Antworten; übersetzt aus NATA 2015 [50], Original in [112])

- Ich habe oft Schlafprobleme
- An den meisten Tagen der Woche wünschte ich, ich hätte mehr Energie
- Ich denke immer wieder über Dinge nach
- Ich fühle mich die meiste Zeit ängstlich und nervös
- Ich fühle mich oft traurig oder deprimiert
- Ich habe Schwierigkeiten, zuversichtlich zu sein
- Ich habe keine Hoffnung für die Zukunft
- Ich habe Schwierigkeiten, meine Gefühle zu kontrollieren (Frustration, Wut, Ungeduld)
- Ich fühle, dass ich mich selbst oder andere verletzen könnte

Beratung

Im Rahmen einer Vorsorgeuntersuchung empfehlen einige Organisationen, die untersuchte Person auf gesundheitliche Risiken und Präventionsmaßnahmen aufmerksam zu machen (Tabelle 19). Im Breitensport gibt es nur eine Empfehlung, dass Schwangere Warnzeichen kennen sollten, bei denen sie mit dem Sport aufhören sollten (Box 6).

Tabelle 19. Empfehlungen zur Beratung von Sportler:innen

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT[c]
	Kardiovaskuläres Risiko		
AMSSM 2017 [20], A	Part of the PPE process should include athlete and family education on cardiovascular signs and symptoms that may develop after the examination and warrant re-evaluation.		–
	Akuter Infekt		
AEPC 2017 [16], A	The screening programme should include instructing athletes to suspend exercise during infections and recognise red flag signs.		–
	Hitze und Hydrierung		
AAP 2019 [11], OS-A	Educating athletes, parents or guardians, and coaches about risk factors and preventive strategies is key to decreasing the incidence of heat illness.		–
AAP 2019 [11], OS-A	Athletes should be informed of the increased heat intolerance caused by some medications and supplements. The use of diuretics, caffeine, antihistamines, or stimulants increases the risk of heat illness. Banned substances such as ephedra or methamphetamines also increase the risk of heat injury.		–
	Schwangerschaft		
ACSM 2021 [15], BFS	All pregnant women should be educated on the warning signs for when to stop exercise.		–

[a] BFS=Breiten- und Freizeitsport, OS=Teilnehmende an organisiertem Sport (Vereinssport), A=Athlet:innen (mit regelmäßiger Wettkampfteilnahme), EA=Elite-Athlet:innen (nationale Kader, Profisport); [b] eigene Einschätzung, nur ausgefüllt, falls Literatur eindeutig zuzuordnen; [c] fett falls durch Autor:innen vergeben, ansonsten eigene Einschätzung.

Box 6. Warnzeichen für eine Unterbrechung der sportlichen Betätigung während der Schwangerschaft (Übersetzt aus ACSM 2021 [15])

- Fruchtwasseraustritt oder sonstiger vaginaler Flüssigkeitsverlust, einschließlich Blasensprung
- Wadenschmerzen oder -schwellungen
- Brustschmerzen
- Schwindel, Ohnmacht oder Schwäche, die sich in Ruhe nicht bessert
- Kopfschmerzen
- Muskelschwäche oder Muskelschwäche, die sich auf das Gleichgewicht auswirkt
- Regelmäßige schmerzhafte Gebärmutterkontraktionen
- Kurzatmigkeit vor Anstrengung oder anhaltende und übermäßige Atemnot, die sich in Ruhe nicht bessert
- Vaginalblutungen

Für Athlet:innen wird empfohlen, auf kardiovaskuläre Symptome zu achten (AMSSM, USA), bei akuten Infekten zu pausieren (AEPC, Europa) sowie Risikofaktoren und Präventionsstrategien zu Hitzeerkrankungen zu kennen (AAP, USA).

Sporttauglichkeit

Auch bei der Beurteilung der Sporttauglichkeit werden in der eingeschlossenen Literatur nur Empfehlungen für Athlet:innen ausgesprochen und nicht für den Breiten- und Freizeitsport (Tabelle 20). Die AAP (USA) stellt eine Liste an Leitfragen bereit, an denen sich die Untersuchenden orientieren können (Box 7).

Kardiovaskuläre Auffälligkeiten sollten erst weiter abgeklärt werden, bevor Sport mit hoher Intensität empfohlen werden kann (AAP, USA). Bei kardiovaskulären Erkrankungen gelten eigene Leitlinien, die über den Rahmen dieser Leitliniensynopse hinausgehen.

Im Falle einer Athlet:innen-Trias oder RED-S wird die Anwendung von Tools zur Risikobeurteilung empfohlen und die Entscheidung zur Sporttauglichkeit nach einem Stufenschema empfohlen, siehe Abbildung 9 und Abbildung 10 (FMATC, USA und IOC, weltweit).

Besonderheiten bei spezifischen Personengruppen

Bei Personen mit Behinderung sollte der Inklusionsaspekt neben der Sicherheit im Vordergrund stehen (AAP, USA).

Tabelle 20. Empfehlungen zur Festlegung der Sporttauglichkeit

ID, Ref., Population[a]	Empfehlungstext	LoE[b], Ref.	SORT[c]
OS-A	When considering any abnormality or condition found during the PPE that may influence participation, the practitioner should consider the following questions: — Does participation put the athlete at risk for illness or injury above the inherent hazards of the activity? — Does participation increase the risk of injury or illness for other participants? — Will treatment of the underlying condition allow safe participation (medication, rehabilitation, bracing, and padding)? — Can limited participation be allowed while treatment or evaluation is completed? — If medical eligibility is denied for certain sports because of medical or safety concerns, can the athlete safely participate in other activities or sports?		–
	Sporttauglichkeit bei RED-S		
IOC 2018 [45, 46], A	It is recommended that athletes in the 'High Risk—Red Light' risk category should not be cleared to participate in sport.		–
IOC 2018 [45, 46], A	Athletes in the 'Moderate Risk— Yellow Light' risk category should be cleared for sport participation only with supervised participation and a medical treatment plan.		–
	Sporttauglichkeit Athlet:innen-Trias		
FMATC 2021 [39, 40], A	Risk assessment tools can be helpful in guiding clearance and return-to-play decisions in the male athlete with one or more components of the Male Athlete Triad.		**B**
	Kardiometabolische Sporttauglichkeit		
CCS CHRS 2019 [26], A	We recommend that sport restriction be considered and discussed in the following conditions: ARVC, exercise-induced significant ventricular arrhythmias (if arrhythmogenic risk cannot be mitigated), catecholaminergic polymorphic ventricular tachycardia, exercise-induced heart block, hypertrophic cardiomyopathy with sustained ventricular tachycardia or multiple risk factors, dilated cardiomyopathy unrelated to an athlete's heart, left ventricular non-compaction with left ventricular dysfunction and or ventricular arrhythmia, Marfan syndrome with aortic dilatation, significant aortic dilatation, coronary artery aneurysm with ischemia, oral anticoagulation treatment in an athlete competing in sports with a high risk of injury causing bleeding, pulmonary hypertension, and cyanotic congenital heart disease.		I-C
AAP 2019 [11], OS-A	Athletes identified with cardiovascular symptoms or signs such as exertional syncope or near syncope, chest pain, palpitations, or excessive exertional dyspnea require a thorough cardiovascular evaluation to exclude underlying heart disease before they are allowed to participate in vigorous physical activity.		–
	Athlet:innen mit Behinderung		
AAP 2019 [11], OS-A	Medical eligibility for sports participation should follow the same principles used for athletes with no disability (see Chapter 5). The emphasis in this population of athletes is on inclusion and safe participation.		–

[a] BFS=Breiten- und Freizeitsport, OS=Teilnehmende an organisiertem Sport (Vereinssport), A=Athlet:innen (mit regelmäßiger Wettkampfteilnahme), EA=Elite-Athlet:innen (nationale Kader, Profisport); [b] eigene Einschätzung, nur ausgefüllt, falls Literatur eindeutig zuzuordnen; [c] fett falls durch Autor:innen vergeben, ansonsten eigene Einschätzung.

Box 7. Leitfragen zur Abwägung der Sporttauglichkeit (AAP 2019 [11])

- Setzt die Teilnahme die/den Athletin/Athleten einem Krankheits- oder Verletzungsrisiko aus, das über die mit der Aktivität verbundenen Gefahren hinausgeht?
- Erhöht die Teilnahme das Verletzungs- oder Krankheitsrisiko für andere Teilnehmende?
- Erlaubt die Behandlung der Grunderkrankung eine sichere Teilnahme (Medikamente, Rehabilitation, Schiene und Polsterung)?
- Ist während der laufenden Behandlung oder Untersuchung eine eingeschränkte Teilnahme möglich?
- Wenn die medizinische Eignung für bestimmte Sportarten aufgrund von medizinischen Bedenken oder Sicherheitsbedenken verweigert wird, kann die/der Sportler/in dann gefahrlos an anderen Aktivitäten oder Sportarten teilnehmen?

Abbildung 9. Das Male Athlete Triad Cumulative Risk Assessment tool (FMATC 2021) [39, 40]; in der Version für Frauen ergänzend Fragen zur Menstruationsgeschichte [38].

Risk Factor	Low Risk = 0 points each	Moderate Risk = 1 point each	High Risk = 2 points each
Low EA with or without ED/DE	☐ No dietary restriction	☐ Some dietary restriction*; current or past DE	☐ Meets DSM-5 criteria for ED
Low BMI	☐ BMI ≥ 18.5 in adults, OR % Median BMI** ≥ 90% in adolescents/children, OR weight stable	☐ BMI 17.5 < 18.5 in adults, OR % Median BMI 86-89% in adolescents, OR 5<10% weight loss/12mo†	☐ BMI ≤ 17.5 in adults, OR % Median BMI ≤ 85% in adolescents, OR ≥ 10% weight loss/past 12mo
Low BMD	☐ Z-score ≥ -1.0	☐ Z-score -1.0*** < -2.0	☐ Z-score ≤ -2.0
Stress Reaction/Fracture	☐ None	☐ 1	☐ ≥ 2; OR ≥ 1 high risk‡ or trabecular bone site
Cumulative Risk (total each column, then add together for total score)	____ points +	_____ points +	_____ points = _____ total

Abbildung 10. Die Male/Female Athlete Triad: Freigabe und Return-to-play Leitlinien auf Basis einer kumulativen Risikobewertung: FMATC 2021 [39, 40] (oben) und IOC 2018 [45, 46] (unten).

Total Cumulative Risk Score	Recommendation for Low Risk	Recommendation for Moderate Risk	Recommendation for High Risk
0-1	Full Clearance		
2-3		Provisional or Limited Clearance	
≥ 4			Restriction from Training and/or Competition

Table 3 The Relative Energy Deficiency in Sport Return-to-Play Model (modified from Skårderud *et al*, 2012)[140]

High risk red light	Moderate risk yellow light	Low risk: green light
▶ No competition ▶ Supervised training allowed when medically cleared for adapted training ▶ Use of written contract (see supplementary appendix 1)	▶ May compete once medically cleared under supervision ▶ May train as long as is following the treatment plan	▶ Full sport participation

Appendix 1

Systematische Literaturrecherche

Datenbanken

Medline via Pubmed (09.08.2022)

Search no.	Query	Search Details	Results
6	#4 AND #5	("athlet*"[Title/Abstract] OR "sport*"[Title/Abstract] OR "physical activ*"[Title/Abstract] OR "non athlet*"[Title/Abstract] OR "Sports"[MeSH Terms] OR "Athletes"[MeSH Terms] OR "Exercise"[MeSH Terms]) AND ("pre-participation"[Title/Abstract] OR "pre-participation"[Title/Abstract] OR "preparticipation"[Title/Abstract] OR "exercise test*"[Title/Abstract] OR "physical examination*"[Title/Abstract] OR "clinical examination*"[Title/Abstract] OR "physical evaluation*"[Title/Abstract] OR "clinical evaluation*"[Title/Abstract] OR "diagnostic examination*"[Title/Abstract] OR "diagnostic evaluation*"[Title/Abstract] OR "clinical assessment*"[Title/Abstract] OR "physical assessment*"[Title/Abstract] OR "diagnostic assessment*"[Title/Abstract] OR "prevention"[Title/Abstract] OR "Diagnosis"[MeSH Terms] OR "death, sudden, cardiac/prevention and control"[MeSH Terms] OR "athletic injuries/prevention and control"[MeSH Terms] OR "relative energy deficiency in sport/diagnosis"[MeSH Terms] OR "relative energy deficiency in sport/prevention and control"[MeSH Terms]) AND ("guideline"[Publication Type] OR "Guidelines as Topic"[MeSH Terms] OR "practice guideline"[Publication Type] OR "Consensus"[MeSH Terms] OR "consensus development conference, nih"[Publication Type] OR "Consensus Development Conference"[Publication Type] OR "consensus*"[Title] OR "position statement*"[Title] OR "guideline*"[Title] OR "recommend*"[Title] OR "guidance"[Title]) AND 2012/01/01:3000/12/31[Date - Publication]	2,245
5	("2012/01/01"[Date - Publication] : "3000"[Date - Publication])	2012/01/01:3000/12/31[Date - Publication]	12,806,307
4	#1 AND #2 AND #3	("athlet*"[Title/Abstract] OR "sport*"[Title/Abstract] OR "physical activ*"[Title/Abstract] OR "non athlet*"[Title/Abstract] OR "Sports"[MeSH Terms] OR "Athletes"[MeSH Terms] OR "Exercise"[MeSH Terms]) AND ("pre-participation"[Title/Abstract] OR "pre-participation"[Title/Abstract] OR "preparticipation"[Title/Abstract] OR "exercise test*"[Title/Abstract] OR "physical examination*"[Title/Abstract] OR "clinical examination*"[Title/Abstract] OR "physical evaluation*"[Title/Abstract] OR "clinical evaluation*"[Title/Abstract] OR "diagnostic examination*"[Title/Abstract] OR "diagnostic evaluation*"[Title/Abstract] OR "clinical assessment*"[Title/Abstract] OR "physical assessment*"[Title/Abstract] OR "diagnostic assessment*"[Title/Abstract] OR "prevention"[Title/Abstract] OR "Diagnosis"[MeSH Terms] OR "death, sudden, cardiac/prevention and control"[MeSH Terms] OR "athletic injuries/prevention and control"[MeSH Terms] OR "relative energy deficiency in sport/diagnosis"[MeSH Terms] OR "relative energy deficiency in sport/prevention and control"[MeSH Terms]) AND ("guideline"[Publication Type] OR "Guidelines as Topic"[MeSH Terms] OR "practice guideline"[Publication Type] OR "Consensus"[MeSH Terms] OR "consensus development conference, nih"[Publication Type] OR "Consensus Development Conference"[Publication Type] OR "consensus*"[Title] OR "position statement*"[Title] OR "guideline*"[Title] OR "recommend*"[Title] OR "guidance"[Title])	3,820
3	("guideline"[Publication Type] OR "Guidelines as Topic"[MeSH Terms] OR "practice guideline"[Publication Type] OR "Consensus"[MeSH Terms] OR "consensus development conference, nih"[Publication Type] OR "Consensus Development Conference"[Publication Type] OR "consensus*"[Title]	"guideline"[Publication Type] OR "Guidelines as Topic"[MeSH Terms] OR "practice guideline"[Publication Type] OR "Consensus"[MeSH Terms] OR "consensus development conference, nih"[Publication Type] OR "Consensus Development Conference"[Publication Type] OR "consensus*"[Title] OR "position statement*"[Title] OR "guideline*"[Title] OR "recommend*"[Title] OR "guidance"[Title]	330,293

Search no.	Query	Search Details	Results
	OR "position statement*"[Title] OR "guideline*"[Title] OR "recommend*"[Title] OR "guidance"[Title])		
2	("pre participation"[Title/Abstract] OR "pre-participation"[Title/Abstract] OR "preparticipation"[Title/Abstract] OR "exercise test*"[Title/Abstract] OR "physical examination*"[Title/Abstract] OR "clinical examination*"[Title/Abstract] OR "physical evaluation*"[Title/Abstract] OR "clinical evaluation*"[Title/Abstract] OR "diagnostic examination*"[Title/Abstract] OR "diagnostic evaluation*"[Title/Abstract] OR "clinical assessment*"[Title/Abstract] OR "physical assessment*"[Title/Abstract] OR "diagnostic assessment*"[Title/Abstract] OR "prevention"[Title/Abstract] OR "Diagnosis"[MeSH Terms] OR "death, sudden, cardiac/prevention and control"[MeSH Terms] OR "athletic injuries/prevention and control"[MeSH Terms] OR "Relative Energy Deficiency in Sport/diagnosis"[Mesh] OR "Relative Energy Deficiency in Sport/prevention and control"[Mesh])	"pre-participation"[Title/Abstract] OR "pre-participation"[Title/Abstract] OR "preparticipation"[Title/Abstract] OR "exercise test*"[Title/Abstract] OR "physical examination*"[Title/Abstract] OR "clinical examination*"[Title/Abstract] OR "physical evaluation*"[Title/Abstract] OR "clinical evaluation*"[Title/Abstract] OR "diagnostic examination*"[Title/Abstract] OR "diagnostic evaluation*"[Title/Abstract] OR "clinical assessment*"[Title/Abstract] OR "physical assessment*"[Title/Abstract] OR "diagnostic assessment*"[Title/Abstract] OR "prevention"[Title/Abstract] OR "Diagnosis"[MeSH Terms] OR "death, sudden, cardiac/prevention and control"[MeSH Terms] OR "athletic injuries/prevention and control"[MeSH Terms] OR "relative energy deficiency in sport/diagnosis"[MeSH Terms] OR "relative energy deficiency in sport/prevention and control"[MeSH Terms]	9,795,115
1	("athlet*"[Title/Abstract] OR "sport*"[Title/Abstract] OR "physical activ*"[Title/Abstract] OR "non-athlet*"[Title/Abstract] OR "Sports"[MeSH Terms] OR "Athletes"[MeSH Terms] OR "Exercise"[MesH Terms])	"athlet*"[Title/Abstract] OR "sport*"[Title/Abstract] OR "physical activ*"[Title/Abstract] OR "non athlet*"[Title/Abstract] OR "Sports"[MeSH Terms] OR "Athletes"[MeSH Terms] OR "Exercise"[MeSH Terms]	483,632

Webseiten

ECRI (https://www.ecri.org/): Recherche 11.08.2022, Insgesamt 42 Treffer

- athlete/athletes + Filter: Guidance: 2 Treffer
- sport + Filter Guidance: 2 Treffer
- sports + Filter Guidance: 7 Treffer
- physically active + Filter Guidance: 26 Treffer
- preparticipation: 0 Treffer
- pre-participation + Filter Guidance: 5 Treffer

GIN (https://guidelines.ebmportal.com/): Recherche 09.08.2022, Insgesamt 16 Treffer, davon 4 vor 2012 (nicht in Liste enthalten)

- athlet*: 1 Treffer
- sport*: 3 Treffer
- physically activ*/physical activity: 12 Treffer davon 4 vor 2012 (nicht in Liste enthalten)
- pre participation/pre-participation/preparticipation: 0 Treffer

NIH Library (https://www.nihlibrary.nih.gov/): Recherche 10.08.2022, Treffer: 114, davon 23 Dubletten und 28 vor 2012 → Dublettenabgleich mit Pubmed-Recherche: Alle Referenzen auch via Pubmed identifiziert

- Titel contains: ("athlet*" OR "sport*"OR "physical activ*"OR "non-athlet*") AND ("pre participation" OR "pre-participation"OR "preparticipation" OR "exercise test*" OR "physical examination*" OR "clinical examination*"OR "physical evaluation*" OR "clinical evaluation*" OR "diagnostic examination*"OR "diagnostic evaluation*"OR "clinical assessment*" OR "physical assessment*" OR "diagnostic assessment*" OR "prevention") AND ("consensus*" OR "position statement*" OR "guideline*" OR "recommend*" OR "guidance")

TRIP Database (https://www.tripdatabase.com/): Recherche 09.08.2022, Treffer: 13 davon 4 vor 2012 (nicht in Liste enthalten)

- Population: athlete OR athletes OR athletic OR sport OR sports OR "physically active" OR "physical activity"Intervention: "pre participation" OR preparticipation OR diagnostic OR diagnosis OR "exercise test" OR "clinical examination" OR "physical evaluation" OR "clinical evaluation" OR "physical examination" OR "clinical assessment" OR "physical assessment" OR prevention

  Filter: Guidelines

Webseitenrecherche relevanter Organisationen/Fachgesellschaften

American College of Sports Medicine (https://www.acsm.org/): Recherche 09.08.2022, Insgesamt 28 "Treffer"

- ACSM's Resource Library, Filter "Publication" Date range 01/01/2012-09/08/2022: 13 "Treffer"
- ACMS's Books: 15 "Treffer"

British Association of Sport & Exercise Medicine (https://basem.co.uk/): Recherche (AW) 23.08.2022, insgesamt 15 Treffer (Davon 2 Dubletten, schon in Liste gewesen)

- SEM Resources, Covid-19 (guideline, consensus statement): 2 Treffer
- SEM Resources, Para-sport Classification Lexi (guideline, consensus statement): 0 Treffer
- SEM Resources, Mental health resources (guideline, consensus statement): 4 Treffer
- SEM Resources, MSK Resources for junior clinicians (guideline, consensus statement): 0 Treffer
- SEM Resources, Harassment in sport (guideline, consensus statement): 3 Treffer
- SEM Resources, Return to play (guideline, consensus statement): 2 Treffer
- SEM Resources, BJSM (guideline, consensus statement): 0 Treffer
- SEM Resources, BASEM today (guideline, consensus statement): 0 Treffer
- SEM Resources, RED-S (guideline, consensus statement): 1 Treffer
- SEM Resources, anti-doping (guideline, consensus statement): 1 Treffer
- SEM Resources, female athlete health (guideline, consensus statement): 2 Treffer (Dubletten, schon in Liste gewesen)
- SEM Resources, orthoevidence (guideline, consensus statement): 0 Treffer

Canadian Academy of Sport and Excercise Medicine (https://casem-acmse.org/): Recherche 10.08.2022, Insgesamt 81 Treffer (Davon 10 nicht in der Liste und eine Dublette die unter CASEM/BASEM läuft)

- Position statements: 20 „Treffer“, Davon 1 vor 2012 und 9 „past CASEM statements“ (nicht in der Liste)
- Concussion resources: 27 „Treffer“, davon 9 explizit als Website, Podcast oder Bewertungstool gekennzeichnet oder vor 2012 (nicht in der Liste)
- Mediciene through movement resources, CASEM Position statements: 2 “Treffer”
- Resident/Fellow SEM Resources, text books: 6 “Treffer”
- Resident/Fellow SEM Resources, Cardiology/Preparticipation physical exam (PPE): 8 “Treffer”
- Resident/Fellow SEM Resources, Dermatology: 2 “Treffer”
- Resident/Fellow SEM Resources, Orthopedics: 3 “Treffer”
- Resident/Fellow SEM Resources, Para and adaptive sport: 2 “Treffer”
- Resident/Fellow SEM Resources, RED-S: 1 “Treffer”
- Covid-19 resources, Sport Medicine Advisory Committee, tools to assist in the decision making: 6 “Treffer”
- Covid-19 resources, other resources: 4 “Treffer”

Sports Medicine Australia (https://sma.org.au/): Recherche 10.08.2022, insgesamt 14 Treffer (Davon 2 nicht in der Liste)

- Resources & Advice, Policies and Guidelines: 10 “Treffer”
- Resources & Advice, SMA Position Statements: 4 Treffer, Davon 2 Dubletten (nicht in der Liste)

Eurpoean Federation of Sports Medicine Associations (https://www.efsma.org/): Recherche 25.10.2022, insgesamt 61 Treffer

- News & Events: Publications (61 Treffer)

Canadian Medical Association Infobase of Clinical Practice Guidelines (https://joulecma.ca/cpg/homepage): Recherche 10.08.2022, Treffer: 21

- Suchstring: athlet* OR sport* OR "physically active" OR "physical activity" OR "pre participation" OR preparticipation

Australian National Health and Medical Research Council (https://www.nhmrc.gov.au/), Recherche 10.08.2022, Treffer: 45 davon 17 vor 2012 (nicht in der Liste)

- Suchstring: athlet* OR sport* OR "physically active" OR "physical activity" OR "pre participation" OR preparticipation + Filter: Guideline

National Institute for Health and Care Excellence (https://www.nice.org.uk/): Recherche: 10.08.2022, Treffer: 8

- Suchstring: athlete OR athletes OR sport OR sports OR "physically active" OR "physical activity" OR "pre participation" OR preparticipation, Filter: Guidance, Last updated date between01/1/2012-10/8/2022

New Zealand Guidelines Group via Ministry of Health New Zealand (https://www.health.govt.nz/) : Recherche 10.08.2022, Insgesamt 25 Treffer (4 davon nicht in der Liste)

- Athlete/athletes: 0 Treffer
- Sport/sports, Filter: Guides and standards: 2 Treffer
- Physically active/physical activity, Filter: Guides and standards, 21 Treffer, Davon 1 Dublette und 2 vor 2012 (nicht in der Liste)
- Preparticipation: 0 Treffer
- Pre participation: 2 Treffer, Davon 1 vor 2012 (nicht in Liste)

Scottish Intercollegiate Guidelines Network (https://www.sign.ac.uk/): Recherche 23.08.2022, Treffer: 42 davon 1 vor 2012 (nicht in der Liste)

- Our Guidelines, current guidelines

VA/DoD Clinical Practice Guidelines (https://www.healthquality.va.gov/): Recherche 23.08.2022, Treffer: 22

- VA/DoD Clinical Practice Guidelines

Rückwärtsgerichteter Referenzencheck

Scopus Advanced Search: Recherche 13.12.2022

- DOI (10.1016/j.acvd.2018.05.005) OR DOI (10.1016/j.acvd.2018.07.001) OR DOI (10.1016/j.cjca.2018.10.016) OR DOI (10.1016/j.cjca.2020.11.007) OR DOI (10.1016/j.echo.2020.02.009) OR DOI (10.1016/j.jsams.2020.05.004) OR DOI (10.1017/s1047951117001305) OR DOI (10.1017/s1047951117001986) OR DOI (10.1017/s1047951117002700) OR DOI (10.1093/ehjci/jeu323) OR DOI (10.1093/eurheartj/ehac262) OR DOI (10.1093/eurheartj/ehv316) OR DOI (10.1093/eurheartj/ehw631) OR DOI (10.1093/eurheartj/ehx532) OR DOI (10.1093/eurheartj/ehy408) OR DOI (10.1093/eurheartj/ehy730) OR DOI (10.1097/jsm.0000000000000664) OR DOI (10.1097/jsm.0000000000000892) OR DOI (10.1097/jsm.0000000000000946) OR DOI (10.1097/jsm.0000000000000948) OR DOI (10.1097/jsm.0000000000000981) OR DOI (10.1111/edt.12593) OR DOI (10.1123/ijsnem.2018-0136) OR DOI (10.1136/bjsports-2013-092966) OR DOI (10.1136/bjsports-2013-093218) OR DOI (10.1136/bjsports-2014-093502) OR DOI (10.1136/bjsports-2016-096781) OR DOI (10.1136/bjsports-2016-097331) OR DOI (10.1136/bjsports-2018-099193) OR DOI (10.1136/bjsports-2018-099351) OR DOI (10.1136/bjsports-2019-101583) OR DOI (10.1136/bjsports-2019-101813) OR DOI (10.1136/bmjsem-2021-001178) OR DOI (10.1161/cir.0000000000000236) OR DOI (10.1161/cir.0000000000000238) OR DOI (10.1161/cir.0000000000000242) OR DOI (10.1177/2047487316676042) OR DOI (10.1177/19417381221077138) OR DOI (10.1249/jsr.0000000000000231) OR DOI (10.1249/mss.0b013e318279a10a) OR DOI (10.1249/mss.0000000000000664) OR DOI (10.1249/mss.0000000000002116) OR DOI (10.1530/erp-17-0075) OR DOI (10.2459/jcm.0b013e32835f6a21) OR DOI (10.2459/jcm.0b013e32835fcb8a) OR DOI (10.4085/1062-6050-47.1.96) OR DOI (10.4085/1062-6050-48.4.12) OR DOI (10.4085/1062-6050-48.6.05) OR DOI (10.4085/1062-6050-50.3.03) OR DOI (10.4085/j.jacc.2016.03.527)
- 54 document results

→ View references (all 54 selected)

- 3817 references cited by 54 selected documents
- Filter: 2012-2022

→ 1396 references cited by 54 selected documents

- Abgleich Referenzen im TiAb Screening (73 schon gescreent)

→ 1323 references

Appendix 2

Physical Activity Readiness Questionnaire Plus (PAR-Q+) Version 2023

2023 PAR-Q+

The Physical Activity Readiness Questionnaire for Everyone

The health benefits of regular physical activity are clear; more people should engage in physical activity every day of the week. Participating in physical activity is very safe for MOST people. This questionnaire will tell you whether it is necessary for you to seek further advice from your doctor OR a qualified exercise professional before becoming more physically active.

GENERAL HEALTH QUESTIONS

Please read the 7 questions below carefully and answer each one honestly: check YES or NO.	**YES**	**NO**
1) Has your doctor ever said that you have a heart condition ☐ **OR** high blood pressure ☐?	☐	☐
2) Do you feel pain in your chest at rest, during your daily activities of living, **OR** when you do physical activity?	☐	☐
3) Do you lose balance because of dizziness **OR** have you lost consciousness in the last 12 months? Please answer **NO** if your dizziness was associated with over-breathing (including during vigorous exercise).	☐	☐
4) Have you ever been diagnosed with another chronic medical condition (other than heart disease or high blood pressure)? **PLEASE LIST CONDITION(S) HERE:** _____	☐	☐
5) Are you currently taking prescribed medications for a chronic medical condition? **PLEASE LIST CONDITION(S) AND MEDICATIONS HERE:** _____	☐	☐
6) Do you currently have (or have had within the past 12 months) a bone, joint, or soft tissue (muscle, ligament, or tendon) problem that could be made worse by becoming more physically active? Please answer **NO** if you had a problem in the past, but it **does not limit your current ability** to be physically active. **PLEASE LIST CONDITION(S) HERE:** _____	☐	☐
7) Has your doctor ever said that you should only do medically supervised physical activity?	☐	☐

If you answered NO to all of the questions above, you are cleared for physical activity.
Please sign the PARTICIPANT DECLARATION. You do not need to complete Pages 2 and 3.

- Start becoming much more physically active – start slowly and build up gradually.
- Follow Global Physical Activity Guidelines for your age (https://www.who.int/publications/i/item/9789240015128).
- You may take part in a health and fitness appraisal.
- If you are over the age of 45 yr and NOT accustomed to regular vigorous to maximal effort exercise, consult a qualified exercise professional before engaging in this intensity of exercise.
- If you have any further questions, contact a qualified exercise professional.

PARTICIPANT DECLARATION

If you are less than the legal age required for consent or require the assent of a care provider, your parent, guardian or care provider must also sign this form.

I, the undersigned, have read, understood to my full satisfaction and completed this questionnaire. I acknowledge that this physical activity clearance is valid for a maximum of 12 months from the date it is completed and becomes invalid if my condition changes. I also acknowledge that the community/fitness center may retain a copy of this form for its records. In these instances, it will maintain the confidentiality of the same, complying with applicable law.

NAME _____ DATE _____

SIGNATURE _____ WITNESS _____

SIGNATURE OF PARENT/GUARDIAN/CARE PROVIDER _____

If you answered YES to one or more of the questions above, COMPLETE PAGES 2 AND 3.

Delay becoming more active if:

- You have a temporary illness such as a cold or fever; it is best to wait until you feel better.
- You are pregnant - talk to your health care practitioner, your physician, a qualified exercise professional, and/or complete the ePARmed-X+ at www.eparmedx.com before becoming more physically active.
- Your health changes - answer the questions on Pages 2 and 3 of this document and/or talk to your doctor or a qualified exercise professional before continuing with any physical activity program.

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FOLLOW-UP QUESTIONS ABOUT YOUR MEDICAL CONDITION(S)

1. Do you have Arthritis, Osteoporosis, or Back Problems?

If the above condition(s) is/are present, answer questions 1a-1c — If **NO** ☐ go to question 2

1a.	Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? (Answer **NO** if you are not currently taking medications or other treatments)	YES ☐ NO ☐
1b.	Do you have joint problems causing pain, a recent fracture or fracture caused by osteoporosis or cancer, displaced vertebra (e.g., spondylolisthesis), and/or spondylolysis/pars defect (a crack in the bony ring on the back of the spinal column)?	YES ☐ NO ☐
1c.	Have you had steroid injections or taken steroid tablets regularly for more than 3 months?	YES ☐ NO ☐

2. Do you currently have Cancer of any kind?

If the above condition(s) is/are present, answer questions 2a-2b — If **NO** ☐ go to question 3

2a.	Does your cancer diagnosis include any of the following types: lung/bronchogenic, multiple myeloma (cancer of plasma cells), head, and/or neck?	YES ☐ NO ☐
2b.	Are you currently receiving cancer therapy (such as chemotheraphy or radiotherapy)?	YES ☐ NO ☐

3. Do you have a Heart or Cardiovascular Condition? This includes Coronary Artery Disease, Heart Failure, Diagnosed Abnormality of Heart Rhythm

If the above condition(s) is/are present, answer questions 3a-3d — If **NO** ☐ go to question 4

3a.	Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? (Answer **NO** if you are not currently taking medications or other treatments)	YES ☐ NO ☐
3b.	Do you have an irregular heart beat that requires medical management? (e.g., atrial fibrillation, premature ventricular contraction)	YES ☐ NO ☐
3c.	Do you have chronic heart failure?	YES ☐ NO ☐
3d.	Do you have diagnosed coronary artery (cardiovascular) disease and have not participated in regular physical activity in the last 2 months?	YES ☐ NO ☐

4. Do you currently have High Blood Pressure?

If the above condition(s) is/are present, answer questions 4a-4b — If **NO** ☐ go to question 5

4a.	Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? (Answer **NO** if you are not currently taking medications or other treatments)	YES ☐ NO ☐
4b.	Do you have a resting blood pressure equal to or greater than 160/90 mmHg with or without medication? (Answer **YES** if you do not know your resting blood pressure)	YES ☐ NO ☐

5. Do you have any Metabolic Conditions? This includes Type 1 Diabetes, Type 2 Diabetes, Pre-Diabetes

If the above condition(s) is/are present, answer questions 5a-5e — If **NO** ☐ go to question 6

5a.	Do you often have difficulty controlling your blood sugar levels with foods, medications, or other physician-prescribed therapies?	YES ☐ NO ☐
5b.	Do you often suffer from signs and symptoms of low blood sugar (hypoglycemia) following exercise and/or during activities of daily living? Signs of hypoglycemia may include shakiness, nervousness, unusual irritability, abnormal sweating, dizziness or light-headedness, mental confusion, difficulty speaking, weakness, or sleepiness.	YES ☐ NO ☐
5c.	Do you have any signs or symptoms of diabetes complications such as heart or vascular disease and/or complications affecting your eyes, kidneys, **OR** the sensation in your toes and feet?	YES ☐ NO ☐
5d.	Do you have other metabolic conditions (such as current pregnancy-related diabetes, chronic kidney disease, or liver problems)?	YES ☐ NO ☐
5e.	Are you planning to engage in what for you is unusually high (or vigorous) intensity exercise in the near future?	YES ☐ NO ☐

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6. Do you have any Mental Health Problems or Learning Difficulties? This includes Alzheimer's, Dementia, Depression, Anxiety Disorder, Eating Disorder, Psychotic Disorder, Intellectual Disability, Down Syndrome

If the above condition(s) is/are present, answer questions 6a-6b — If **NO** ☐ go to question 7

6a.	Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? (Answer **NO** if you are not currently taking medications or other treatments)	YES ☐ NO ☐
6b.	Do you have Down Syndrome **AND** back problems affecting nerves or muscles?	YES ☐ NO ☐

7. Do you have a Respiratory Disease? *This includes Chronic Obstructive Pulmonary Disease, Asthma, Pulmonary High Blood Pressure*

If the above condition(s) is/are present, answer questions 7a-7d — If **NO** ☐ go to question 8

7a.	Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? (Answer **NO** if you are not currently taking medications or other treatments)	YES ☐ NO ☐
7b.	Has your doctor ever said your blood oxygen level is low at rest or during exercise and/or that you require supplemental oxygen therapy?	YES ☐ NO ☐
7c.	If asthmatic, do you currently have symptoms of chest tightness, wheezing, laboured breathing, consistent cough (more than 2 days/week), or have you used your rescue medication more than twice in the last week?	YES ☐ NO ☐
7d.	Has your doctor ever said you have high blood pressure in the blood vessels of your lungs?	YES ☐ NO ☐

8. Do you have a Spinal Cord Injury? *This includes Tetraplegia and Paraplegia*

If the above condition(s) is/are present, answer questions 8a-8c — If **NO** ☐ go to question 9

8a.	Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? (Answer **NO** if you are not currently taking medications or other treatments)	YES ☐ NO ☐
8b.	Do you commonly exhibit low resting blood pressure significant enough to cause dizziness, light-headedness, and/or fainting?	YES ☐ NO ☐
8c.	Has your physician indicated that you exhibit sudden bouts of high blood pressure (known as Autonomic Dysreflexia)?	YES ☐ NO ☐

9. Have you had a Stroke? *This includes Transient Ischemic Attack (TIA) or Cerebrovascular Event*

If the above condition(s) is/are present, answer questions 9a-9c — If **NO** ☐ go to question 10

9a.	Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? (Answer **NO** if you are not currently taking medications or other treatments)	YES ☐ NO ☐
9b.	Do you have any impairment in walking or mobility?	YES ☐ NO ☐
9c.	Have you experienced a stroke or impairment in nerves or muscles in the past 6 months?	YES ☐ NO ☐

10. Do you have any other medical condition not listed above or do you have two or more medical conditions?

If you have other medical conditions, answer questions 10a-10c — If **NO** ☐ read the Page 4 recommendations

10a.	Have you experienced a blackout, fainted, or lost consciousness as a result of a head injury within the last 12 months **OR** have you had a diagnosed concussion within the last 12 months?	YES ☐ NO ☐
10b.	Do you have a medical condition that is not listed (such as epilepsy, neurological conditions, kidney problems)?	YES ☐ NO ☐
10c.	Do you currently live with two or more medical conditions?	YES ☐ NO ☐

PLEASE LIST YOUR MEDICAL CONDITION(S) AND ANY RELATED MEDICATIONS HERE: _____

GO to Page 4 for recommendations about your current medical condition(s) and sign the PARTICIPANT DECLARATION.

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01-11-2022

2023 PAR-Q+

If you answered NO to all of the FOLLOW-UP questions (pgs. 2-3) about your medical condition, you are ready to become more physically active - sign the PARTICIPANT DECLARATION below:

- It is advised that you consult a qualified exercise professional to help you develop a safe and effective physical activity plan to meet your health needs.
- You are encouraged to start slowly and build up gradually - 20 to 60 minutes of low to moderate intensity exercise, 3-5 days per week including aerobic and muscle strengthening exercises.
- As you progress, you should aim to accumulate 150 minutes or more of moderate intensity physical activity per week.
- If you are over the age of 45 yr and **NOT** accustomed to regular vigorous to maximal effort exercise, consult a qualified exercise professional before engaging in this intensity of exercise.

If you answered **YES** to **one or more of the follow-up questions** about your medical condition:

You should seek further information before becoming more physically active or engaging in a fitness appraisal. You should complete the specially designed online screening and exercise recommendations program - the **ePARmed-X+ at www.eparmedx.com** and/or visit a qualified exercise professional to work through the ePARmed-X+ and for further information.

Delay becoming more active if:

- You have a temporary illness such as a cold or fever; it is best to wait until you feel better.
- You are pregnant - talk to your health care practitioner, your physician, a qualified exercise professional, and/or complete the ePARmed-X+ **at www.eparmedx.com** before becoming more physically active.
- Your health changes - talk to your doctor or qualified exercise professional before continuing with any physical activity program.

- You are encouraged to photocopy the PAR-Q+. You must use the entire questionnaire and NO changes are permitted.
- The authors, the PAR-Q+ Collaboration, partner organizations, and their agents assume no liability for persons who undertake physical activity and/or make use of the PAR-Q+ or ePARmed-X+. If in doubt after completing the questionnaire, consult your doctor prior to physical activity.

PARTICIPANT DECLARATION

- All persons who have completed the PAR-Q+ please read and sign the declaration below.
- If you are less than the legal age required for consent or require the assent of a care provider, your parent, guardian or care provider must also sign this form.

I, the undersigned, have read, understood to my full satisfaction and completed this questionnaire. I acknowledge that this physical activity clearance is valid for a maximum of 12 months from the date it is completed and becomes invalid if my condition changes. I also acknowledge that the community/fitness center may retain a copy of this form for records. In these instances, it will maintain the confidentiality of the same, complying with applicable law.

NAME _____ DATE _____

SIGNATURE _____ WITNESS _____

SIGNATURE OF PARENT/GUARDIAN/CARE PROVIDER _____

For more information, please contact

www.eparmedx.com
Email: eparmedx@gmail.com

Citation for PAR-Q+
Warburton DER, Jamnik VK, Bredin SSD, and Gledhill N on behalf of the PAR-Q+ Collaboration. The Physical Activity Readiness Questionnaire for Everyone (PAR-Q+) and Electronic Physical Activity Readiness Medical Examination (ePARmed-X+). Health & Fitness Journal of Canada 4(2):3-23, 2011.

The PAR-Q+ was created using the evidence-based AGREE process (1) by the PAR-Q+ Collaboration chaired by Dr. Darren E. R. Warburton with Dr. Norman Gledhill, Dr. Veronica Jamnik, and Dr. Donald C. McKenzie (2). Production of this document has been made possible through financial contributions from the Public Health Agency of Canada and the BC Ministry of Health Services. The views expressed herein do not necessarily represent the views of the Public Health Agency of Canada or the BC Ministry of Health Services.

Key References

1. Jamnik VK, Warburton DER, Makarski J, McKenzie DC, Shephard RJ, Stone J, and Gledhill N. Enhancing the effectiveness of clearance for physical activity participation: background and overall process. APNM 36(S1):S3-S13, 2011.
2. Warburton DER, Gledhill N, Jamnik VK, Bredin SSD, McKenzie DC, Stone J, Charlesworth S, and Shephard RJ. Evidence-based risk assessment and recommendations for physical activity clearance: Consensus Document. APNM 36(S1):S266-s298, 2011.
3. Chisholm DM, Collis ML, Kulak LL, Davenport W, and Gruber N. Physical activity readiness. British Columbia Medical Journal. 1975;17:375-378.
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01-11-2022

Appendix 3

Physical Activity Readiness Medical Examination (PARmed-X) for Pregnancy, CSEP 2015

CSEP | SCPE
THE GOLD STANDARD IN EXERCISE SCIENCE AND PERSONAL TRAINING

PARmed-X FOR PREGNANCY

Physical Activity Readiness Medical Examination

PARmed-X for PREGNANCY is a guideline for health screening prior to participation in a prenatal fitness class or other exercise.

Healthy women with uncomplicated pregnancies can integrate physical activity into their daily living and can participate without significant risks either to themselves or to their unborn child. Postulated benefits of such programs include improved aerobic and muscular fitness, promotion of appropriate weight gain, and facilitation of labour. Regular exercise may also help to prevent gestational glucose intolerance and pregnancy-induced hypertension.

The safety of prenatal exercise programs depends on an adequate level of maternal-fetal physiological reserve. PARmed-X for PREGNANCY is a convenient checklist and prescription for use by health care providers to evaluate pregnant patients who want to enter a prenatal fitness program and for ongoing medical surveillance of exercising pregnant patients.

Instructions for use of the 4-page PARmed-X for PREGNANCY are the following:

1. The patient should fill out the section on PATIENT INFORMATION and the PRE-EXERCISE HEALTH CHECKLIST (PART 1, 2, 3, and 4 on p. 1) and give the form to the health care provider monitoring her pregnancy.
2. The health care provider should check the information provided by the patient for accuracy and fill out SECTION C on CONTRAINDICATIONS (p. 2) based on current medical information.
3. If no exercise contraindications exist, the HEALTH EVALUATION FORM (p. 3) should be completed, signed by the health care provider, and given by the patient to her prenatal fitness professional.

In addition to prudent medical care, participation in appropriate types, intensities and amounts of exercise is recommended to increase the likelihood of a beneficial pregnancy outcome. PARmed-X for PREGNANCY provides recommendations for individualized exercise prescription (p. 3) and program safety (p. 4).

*Note: **Sections A and B** should be completed by the patient before the appointment with the health care provider.*

A PATIENT INFORMATION

NAME _____ ADDRESS _____

PHONE _____ BIRTHDATE MM / DD / YEAR HEALTH INSURANCE No. _____

NAME OF PRENATAL FITNESS PROFESSIONAL _____ PHONE NUMBER OF PRENATAL FITNESS PROFESSIONAL _____

B PRE-EXERCISE HEALTH CHECKLIST

PART 1: GENERAL HEALTH STATUS

In the past, have you experienced:	Y	N
1 Miscarriage in an earlier pregnancy?	☐	☐
2 Other pregnancy complications?	☐	☐
3 I have completed a PAR-Q within the last 30 days.	☐	☐

If you answered YES to question 1 or 2, please explain:

_____

Number of previous pregnancies: _____

PART 2: STATUS OF CURRENT PREGNANCY

Due Date: MM / DD / YEAR

During this prenancy, have you experienced:	Y	N
1 Marked fatigue?	☐	☐
2 Bleeding from the vagina ("spotting")?	☐	☐
3 Unexplained faintness or dizziness?	☐	☐
4 Unexplained abdominal pain?	☐	☐
5 Sudden swelling of ankles, hands or face?	☐	☐
6 Persistent headaches or problems with headaches?	☐	☐
7 Swelling, pain or redness in the calf of one leg?	☐	☐
8 Absence of fetal movement after 6th month?	☐	☐
9 Failure to gain weight after 5th month?	☐	☐

If you answered YES to any of the above questions, please explain:

_____

PART 3: ACTIVITY HABITS DURING THE PAST MONTH

1 List only regular fitness/recreational activities:

_____

INTENSITY	FREQUENCY (times/week)			TIME (minutes/day)		
	1-2	2-4	4+	<20	20-40	40+
Heavy						
Medium						
Light						

2 Does your regular occupation (job/home) activity involve:	Y	N
Heavy lifting?	☐	☐
Frequent walking/stair climbing?	☐	☐
Occasional walking (> once/hr)?	☐	☐
Prolonged standing?	☐	☐
Mainly sitting?	☐	☐
Normal daily activity?	☐	☐
3 Do you currently smoke tobacco?*	☐	☐
4 Do you consume alcohol?*	☐	☐

PART 4: PHYSICAL ACTIVITY INTENTIONS

What physical activity do you intend to do?

_____

Is this a change from what you currently do? ☐ YES ☐ NO

**Note: Pregnant women are strongly advised not to smoke or consume alcohol during pregnancy and during lactation.*

CONTRAINDICATIONS TO EXERCISE *To be completed by your health care provider*

ABSOLUTE CONTRAINDICATIONS

Does the patient have:	Y	N
1 Ruptured membranes, premature labour?	☐	☐
2 Persistent second or third trimester bleeding/ placenta previa?	☐	☐
3 Pregnancy-induced hypertension or pre-eclampsia?	☐	☐
4 Incompetent cervix?	☐	☐
5 Evidence of intrauterine growth restriction?	☐	☐
6 High-order pregnancy (e.g., triplets)?	☐	☐
7 Uncontrolled Type I diabetes, hypertension or thyroid disease, other serious cardiovascular, respiratory or systemic disorder?	☐	☐

RELATIVE CONTRAINDICATIONS

Does the patient have:	Y	N
1 History of spontaneous abortion or premature labour in previous pregnancies	☐	☐
2 Mild/moderate cardiovascular or respiratory disease (e.g., chronic hypertension, asthma)?	☐	☐
3 Anemia or iron deficiency? (Hb < 100 g/L)?	☐	☐
4 Malnutrition or eating disorder (anorexia, bulimia)?	☐	☐
5 Twin pregnancy after 28th week?	☐	☐
6 Other significant medical condition? Please specify: _____	☐	☐

Note: Risk may exceed benefits of regular physical activity. The decision to be physically active or not should be made with qualified medical advice.

PHYSICAL ACTIVITY RECOMMENDATION ☐ Recommended/Approved ☐ Contraindicated

Appendix 4

Get Active Questionnaire for Pregnancy (GAQ-P), CSEP 2019

GET ACTIVE QUESTIONNAIRE FOR PREGNANCY

CSEP | SCPE

NAME (+ NAME OF PARENT/GUARDIAN IF APPLICABLE) (PLEASE PRINT):			
TODAY'S DATE (DD/MM/YYYY):	YOUR DUE DATE (DD/MM/YYYY):	NO. OF WEEKS PREGNANT:	AGE:

Physical activity during pregnancy has many health benefits and is generally not risky for you and your baby. But for some conditions, physical activity is not recommended. This questionnaire is to help decide whether you should speak to your Obstetric Health Care Provider (e.g., your physician or midwife) before you begin or continue to be physically active.

Please answer YES or NO to each question to the best of your ability. **If your health changes as your pregnancy progresses you should fill in this questionnaire again.**

1.	In this pregnancy, do you have:		
	a. Mild, moderate or severe respiratory or cardiovascular diseases (e.g., chronic bronchitis)?	Y	N
	b. Epilepsy that is not stable?	Y	N
	c. Type 1 diabetes that is not stable or your blood sugar is outside of target ranges?	Y	N
	d. Thyroid disease that is not stable or your thyroid function is outside of target ranges?	Y	N
	e. An eating disorder(s) or malnutrition?	Y	N
	f. Twins (28 weeks pregnant or later)? Or are you expecting triplets or higher multiple births?	Y	N
	g. Low red blood cell number (anemia) with high levels of fatigue and/or light-headedness?	Y	N
	h. High blood pressure (preeclampsia, gestational hypertension, or chronic hypertension that is not stable)?	Y	N
	i. A baby that is growing slowly (intrauterine growth restriction)?	Y	N
	j. Unexplained bleeding, ruptured membranes or labour before 37 weeks?	Y	N
	k. A placenta that is partially or completely covering the cervix (placenta previa)?	Y	N
	l. Weak cervical tissue (incompetent cervix)?	Y	N
	m. A stitch or tape to reinforce your cervix (cerclage)?	Y	N
2.	In previous pregnancies, have you had:		
	a. Recurrent miscarriages (loss of your baby before 20 weeks gestation two or more times)?	Y	N
	b. Early delivery (before 37 weeks gestation)?	Y	N
3.	Do you have any other medical condition that may affect your ability to be physically active during pregnancy? What is the condition? Specify:	Y	N
4.	Is there any other reason you are concerned about physical activity during pregnancy?		

Go to Page 2 *Describe Your Physical Activity Level*

Describe Your Physical Activity Level

CSEP | SCPE

During a typical week, what types of physical activities do you take part in (e.g., swimming, walking, resistance training, yoga)?

_____

_____

_____

During the same week, please describe ON AVERAGE how often and for how long you engage in physical activity of a light, moderate or vigorous intensity. See definitions for intensity below the box.

ON AVERAGE	FREQUENCY (times per week)	INTENSITY (see below for definitions)	DURATION (minutes per session)
How physically active were you in the **six months before pregnancy**?	☐ 0 ☐ 1-2 ☐ 3-4 ☐ 5-7	☐ light ☐ moderate ☐ vigorous	☐ <20 ☐ 20-30 ☐ 31-60 ☐ >60
How physically active have you been **during this pregnancy**?	☐ 0 ☐ 1-2 ☐ 3-4 ☐ 5-7	☐ light ☐ moderate ☐ vigorous	☐ <20 ☐ 20-30 ☐ 31-60 ☐ >60
What are your physical activity goals for the **rest of your pregnancy**?	☐ 0 ☐ 1-2 ☐ 3-4 ☐ 5-7	☐ light ☐ moderate ☐ vigorous	☐ <20 ☐ 20-30 ☐ 31-60 ☐ >60

Light intensity physical activity: You are moving, but you do not sweat or breathe hard, such as walking to get the mail or light gardening.

Moderate intensity physical activity: Your heart rate goes up and you may sweat or breathe hard. You can talk, but could not sing. Examples include brisk walking.

Vigorous intensity physical activity: Your heart rate goes up substantially, you feel hot and sweaty, and you cannot say more than a few words without pausing to breathe. Examples include fast stationary cycling and running.

General Advice for Being Physically Active During Pregnancy

Follow the advice in the 2019 Canadian Guidelines for Physical Activity throughout Pregnancy: **csepguidelines.ca/pregnancy**

It recommends that pregnant women get at least 150 minutes of moderate-intensity physical activity (resistance training, brisk walking, swimming, gardening), spread over three or more days of the week. **If you are planning to take part in vigorous-intensity physical activity, or be physically active at elevations above 2500 m (8200 feet), then consult with your health care provider.** If you have any questions about physical activity during pregnancy, consult a Qualified Exercise Professional or your health care provider beforehand. This can help ensure that your physical activity is safe and suitable for you.

Declaration

To the best of my knowledge, all of the information I have supplied on this questionnaire is correct. **If my health changes, I will complete this questionnaire again.**

☐ **I answered NO to all questions on Page 1.**
Sign and date the declaration below.
Physical activity is recommended.

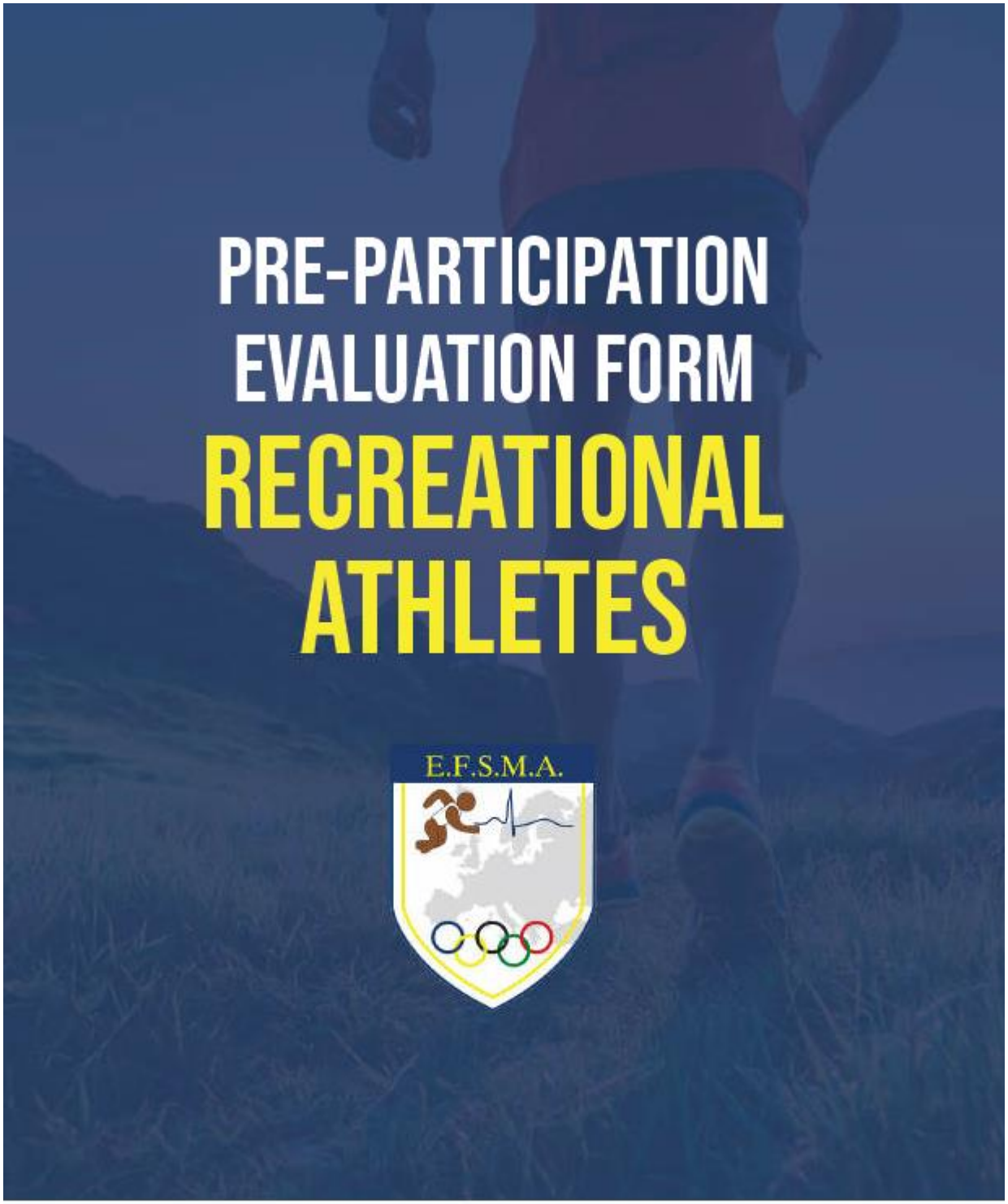
I answered YES to one or more questions on Page 1 and I will speak with my health care provider before beginning or continuing physical activity.
*The Health Care Provider Consultation Form for Prenatal Physical Activity can be used to start the conversation (**www.csep.ca/getactivequestionnaire-pregnancy**).*

☐ **I have spoken with my health care provider who has recommended that I take part in physical activity during my pregnancy.**
Sign and date the declaration below.

NAME (+ NAME OF PARENT/GUARDIAN IF APPLICABLE) (PLEASE PRINT):		SIGNATURE (OR SIGNATURE OF PARENT/GUARDIAN IF APPLICABLE):
TODAY'S DATE (DD/MM/YYYY):	TELEPHONE (OPTIONAL):	EMAIL (OPTIONAL):

Appendix 5

EFSMA Pre-Participation Evaluation Form for Recreational Athletes



Sports Medicine Centre

Country

Date

Pre-Participation Evaluation Form
RECREATIONAL ATHLETES 1

PRE-PARTICIPATION EVALUATION FORM

Questionnaire to be completed by the athlete before physician's evaluation

Surame		**First Name**	
Date of Birth		**Gender**	
Physical Activity			
Phone Number		**E-mail**	

SECTION 1 - HEALTH STATUS

Please answer ALL the following questions below.

No.	Family Medical History	Yes	No
1.	**Has any family member or relative died of heart problems or had an unexpected or unexplained sudden death?**		
2.	Has any family member or relative had a genetic heart problem such as hypertrophic cardiomyopathy (HCM), Marfan syndrome, arrhythmogenic right ventricular cardiomyopathy (ARVC), channelopathy: long QT syndrome (LQTS), short QT syndrome (SQTS), Brugada syndrome or cathecholaminergic polymorphic ventricular tachycardia (CPVT)		
3.	Has any family member or relative had a pacemaker or implanted defibrillator?		
4.	Has any family member or relative had hypertension?		
5.	Has any family member or relative had unexplained seizures?		
6.	Has any family member or relative had diabetes?		

Please explain "YES" answers below:

PRE-PARTICIPATION EVALUATION FORM

SECTION 1 - HEALTH STATUS ... cont

No.	Personal Medical History	Yes	No
1	Do you have any ongoing medical issues or recent illness?		
2	Are you on any cardiac treatment?		
3	Do you have a history of the following?		
	Fainting/dizziness/ pass out during or after exercise?		
	Respiratory Problems (pneumonia, bronchitis, sinus problems)?		
	Chest discomfort or dyspnoea during exercise?		
	Asthma or Wheezing? If yes, are you on any medication or inhaler? Please specify		
	Heart disease?		
	Chronic Skin Disease (e.g. eczema, psoriasis)?		
	Hepatitis/Yellow Jaundice/Kidney/Bladder Disease? Abdominal Issues, Digestive Tract Disease (ulcer, colitis, etc.) or Hernia?		
	Frequent or Severe Headache (migraine)?		
	High Blood Pressure (> 140/90 mmHg for adults) High level of Cholesterol/abnormal lipid profile?		
	Depression or Anxiety?		
	Speech, Hearing Problems Vision Problems?		
	Sexually Transmitted Disease or HIV/ AIDS?		
	Cancer (if Yes please provide details)		
	Thrombophlebitis or Blood Clots?		
	Diabetes, Thyroid, or any other Endocrine Disorder?		
	Other illnesses?		
4	Have you ever been knocked unconscious?		
5	Have you ever had a head injury of any kind?		
6	Have you ever had a seizure, convulsions or epilepsy?		
7	Do you have an allergy to any of the following? Drug or medicine (over the counter/ prescribed), foods, insect or animals, plants, grasses, pollen, dust, other. Please specify.		

PRE-PARTICIPATION EVALUATION FORM

SECTION 1 - HEALTH STATUS ... cont

No.	Personal Medical History ... cont		Yes	No
8	Are you on any medication or regular treatment? (Including birth control pills, insulin, allergy shots or pills, asthma inhalers, epilepsy medication, anti-inflammatory medication, supplements of any kind. etc.)			
	Medication	**Dose / Frequency of use**	**How long have you been taking this drug?**	
	1.			
	2.			
	3.			
	4.			
	5.			
9	Do you consume nutritional supplements?			
10	Are you on special diet? Do you avoid certain type of foods? If yes, why? Please specify			
11	Have you ever had an eating disorder or disordered eating?			
12	Post exercise recovery?			
13	How many hours do you sleep per night?			
14	Have you ever passed out or nearly passed out during exercise?			
15	Have you ever had discomfort, pain, tightness or pressure in your chest during exercise?			
16	Do you ever feel that your heart ever was working irregularly during exercise?			
17	Do you get light-headed or feel shorter of breath than your friends during exercise?			
18	Has a physician ever denied or restricted your participation in sports for any health problems?			
19	Have you been hospitalised in the past two years?			
20	Have you ever required surgery for any medical illness or injury?			
21	Do you smoke? If so, how often and how much and how long?			
22	Do you drink alcohol? If so, how often (per week), how much and what kind of alcohol do you drink? Have you ever used marijuana or any similar drugs?			
23	**FEMALE ONLY**			
	How old were you when you had your first menstrual period?			
	When was your last menstrual period?			
	How many menstrual periods have you had in the last 12 months?			
	Are you taking birth control pills?			
24	What vaccinations did you have in the last 2 years: against the flu, COVID-19, pneumonia etc?			

PRE-PARTICIPATION EVALUATION FORM

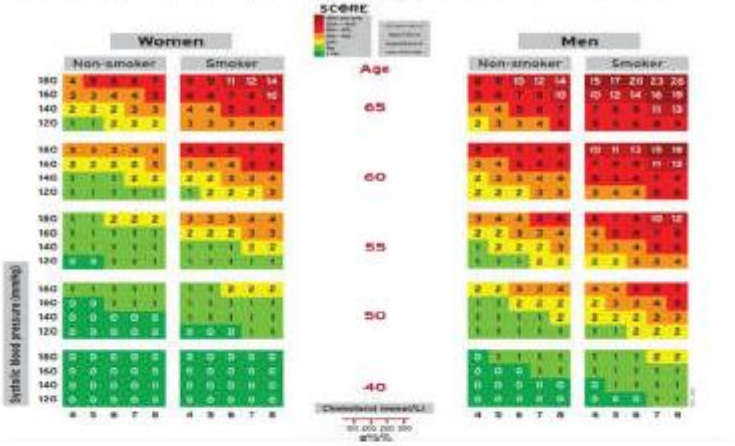
SECTION 1 - HEALTH STATUS ... cont

Please explain "YES" answers below:

Do you have any other conditions, illnesses, etc. that should be reported?

SCORE - European Low Risk Chart

10-year risk of fatal CVD in low risk regions of Europe by gender, age, systolic blood pressure, total cholesterol and smoking status



The European score can also be applied by the ASCVD Score.

By signing this form, I acknowledge that I have answered all the questions truthfully and have given details to the best of my knowledge

NAME	
SIGNATURE	

PRE-PARTICIPATION EVALUATION FORM

SECTION 2 - TRAINING HISTORY

Sports training history			
Years (months) in sports		**Last training**	
Training Information according to the acronym FITT: frequency per week, intensity, type and time			
Personal motivation for training	**Low**	**Medium**	**High**

Training Intensity
The Borg 20 Point Scale – Rate of Perceived Exertion (RPE)

RPE	Description		RPE	Description	
6	None		14	Somewhat hard	
7	Very, very light		15	Hard	
8	Very, very light		16	Hard	
9	Very light		17	Very hard	
10	Very light		18	Very hard	
11	Fairly light		19	Very, very hard	
12	Fairly light		20	Very, very hard	
13	Somewhat hard				

PRE-PARTICIPATION EVALUATION FORM

SECTION 3 HEALTH CONDITION

COMPLAINTS: Symptoms and signs, aches or pains

Physical Evaluation			
Examination			
BP: / (/) mmHg	**HR:** beats/min.		
Femoral pulse			
Medical		**Normal**	**Abnormal**
Appearance: Any murmur or irregularity by auscultation Marfan stigmata (kyphoscoliosis, high arched palate, pectus excavatum, arachnodactyly, hyperlaxity, myopia, mitral valve prolapse, aortic insufficiency), other			
Eyes, ears, nose, throat	Vision: R 20/ L 20/ Corrected **Yes** **No**		
Lymph nodes			
Heart	Murmurs (auscultation standing, auscultation supine) Valsalva maneuver Delay in femoral pulses		
12-lead resting ECG (digital recording, software supported)			
Abdomen (Inspection, Palpation, Percussion, Auscultation	Gastrointestinal symptoms during exercise **Yes** **No**		
Skin e.g. Herpex simplex virus, lesions suggestive of methicillin-resistant Staphylococcus aureus (MRSA) or tinea corporis			
Musculoskeletal		**Normal**	**Abnormal**
Neck			
Back			
Shoulder and arm			

PRE-PARTICIPATION EVALUATION FORM

SECTION 3 HEATLH CONDITION ... cont

Physical Evaluation ... cont		
Musculoskeletal	**Normal**	**Abnormal**
Neck		
Back		
Shoulder and arm		
Elbow and forearm		
Wrist, hand, fingers		
Hip and thigh		
Knee		
Leg and ankle		
Foot and toes		
Functional Double leg squat test, single leg squat test, box drop or step drop test		
Laboratory Tests (optional)		
Blood and Urine samples		

Biometrics							
Height (cm)		Weight (kg)		BMI		Abdominal perimeter (cm)	
Waist circumference (cm); **Hip circumference** (cm), **WHR** indicator **Body composition** (Bioelectrical Impedance Analysis) optional							
Diagnosis Anthropometry and Nutritional Status							

PRE-PARTICIPATION EVALUATION FORM

SECTION 3 HEALTH CONDITION ... cont

Exercise Capacity
Optional one of (see separate sheet): **CARDIO-PULMONARY EXERCISE TESTING (CPET)** **Ergometry** to exhaustion (standardised); Measurements: **Achieved peak workload** (calculate V02 max, V02 max/kg and MET's by means of algorithm e.g. Myers et al.); **Heart rate,** incl. HR immediately after 1 and 3 min after end of exercise; **Blood pressure** (rest and during exercise, at peak of exercise); **ECG: rest and exercise** (recording continuously COOPER Test or other Exercise test
SPORTS RECOMMENDATIONS according to EFSMA tables (www.efsma.org) by means of exercise prescription for health (FITT)
F **I** **T** **T**
Nutrition (optional)

SECTION 4 - CONCLUSIONS & MEDICAL ELIGIBILITY FORM

Medical Eligibility form	Yes	No
Medically eligible for leisure time activities without restriction		
Eligible for training with special medical monitoring or medical rehabilitation		
Not medically eligible pending further examination		

Examining Physician and Medical Centre Stamp	
Name of Examining Physician	
Address:	
Phone no:	
Email:	
Signature:	

Appendix 6

AHA recommendations for preparticipation cardiovascular screening of competitive athletes

Quelle: [51]

Table 2. The 14-Element AHA Recommendations for Pre-Participation Cardiovascular Screening of Competitive Athletes Versus the PPE-4

AHA Recommendations (10)*	PPE-4 (21)
Medical History†	
Personal History	Heart Health Questions About You
1. Chest pain/discomfort/tightness/pressure related to exertion	6. Have you ever had discomfort, pain, tightness, or pressure in your chest during exercise?
2. Unexplained syncope/near syncope‡	5. Have you ever passed out or nearly passed out *during* or *after* exercise?
3. Excessive and unexplained dyspnea/fatigue or palpitations, associated with exercise	12. Do you get more tired or short of breath more quickly than your friends during exercise? 10. Do you get lightheaded or feel more short of breath than expected during exercise? 7. Does your heart ever race or skip beats (irregular beats) during exercise?
4. Prior recognition of a heart murmur	
5. Elevated systemic blood pressure	
6. Prior restriction from sports	8. Has a doctor ever told you that you have any heart problems? If so, check all that apply: ☐ High blood pressure ☐ A heart murmur ☐ High cholesterol ☐ A heart infection ☐ Kawasaki disease ☐ Other:_____ 1. Has a doctor ever denied or restricted your participation in sports for any reason?
7. Prior testing for heart disease, ordered by a physician	9. Has a doctor ever ordered a test for your heart? (For example, ECG/EKG, echocardiogram) 11. Have you ever had an unexplained seizure?
Family History Heart	**Heart Health Questions About Your Family**
8. Premature death (sudden and unexpected or otherwise) before 50 years of age attributable to heart disease in ≥1 relative	13. Has any family member or relative died of heart problems or had an unexpected death before age 50 yrs (including drowning, unexplained car accident, or sudden infant death syndrome)?
9. Disability from heart disease in a close relative <50 yrs of age	
10. Hypertrophic or dilated cardiomyopathy, long QT syndrome or other ion channelopathies, Marfan syndrome, or clinically significant arrhythmias; specific knowledge of genetic cardiac condition in family member	14. Does anyone in your family have hypertrophic cardiomyopathy, Marfan syndrome, arrhythmogenic right ventricular cardiomyopathy, long QT syndrome, short QT syndrome, Brugada syndrome, or catecholaminergic polymorphic ventricular tachycardia? 15. **Does anyone in your family have a heart problem, pacemaker, or implanted defibrillator?** 16. **Has anyone in your family had unexplained fainting, unexplained seizures, or near drowning?**
Physical Examination	**Physical Examination**
11. Heart murmur§	a. Heart Murmurs (auscultation standing, supine, ± Valsalva) Location of point of maximal impulse
12. Femoral pulses to exclude coarctation	b. Pulses • Simultaneous femoral and radial pulses
13. Physical stigmata of Marfan syndrome	c. Appearance • Marfan stigmata (kyphoscoliosis, high-arched palate, pectus excavatum, arachnodactyly, arm span > height, hyperlaxity, myopia, MVP, aortic insufficiency)
14. Brachial artery blood pressure (sitting positional)‖	d. Blood pressure

Differences between AHA and PPE-4 recommendations are indicated in bold. *Reprinted with permission from Maron et al. (10). †Parental verification is recommended for high school and middle school athletes. ‡Judged not to be neurocardiogenic (vasovagal) in origin; of particular concern when occurring during or after physical exertion. §Refers to heart murmurs judged likely to be organic and unlikedly to be innocent; auscultation should be performed with the patient in both the supine and standing positions (or with Valsalva maneuver), specifically to identify murmurs of dynamic left ventricular outflow tract obstruction. ‖Preferably taken in both arms.
AHA = American Heart Association; ECG/EKG = electrocardiogram; MVP = mitral valve prosthesis; PPE = pre-performance physical evaluation.

Appendix 7

Mögliche Auswirkungen von Krebstherapien auf die Belastungstoleranz und Sicherheit

		Surgery	Chemotherapy	Radiation	Anti-hormonal therapy (surgical or pharmaceutical)	Targeted Therapy or Immunotherapy [a]
Cardiovascular changes	Cardiac damage or increased CVD risk		√	√	√	√
Endocrine changes						
	Worsening bone health		√	√	√	
	Changes in body composition (weight gain)		√		√	
	Changes in body composition (weight loss/muscle mass loss)	√	√	√	√	√
Gastrointestinal changes						
	Nausea		√			√
	Diarrhea		√	√		√
	Altered GI function	√	√	√		√
Immune changes	Impaired immune function and/or anemia		√	√	√	√
Metabolic changes						
	Development/worsening of metabolic syndrome		√		√	√ [b]
Neurological changes	Peripheral Neuropathy		√			
	Cognitive changes	√ **(brain surgery)**	√	√	√	
Pulmonary changes	Altered lung function or pneumonitis	√ **(lung surgery)**	√	√		
Skin changes						
	Redness, irritation			√		
	Rashes			√		√
	Reduced ROM	√ **(by healing at surgical site)**		√		
Fatigue		√	√	√	√	√
Lymphedema [c]		√		√		
Pain	General	√	√	√	√	√
	Myalgia/Arthralgia		√		√	√

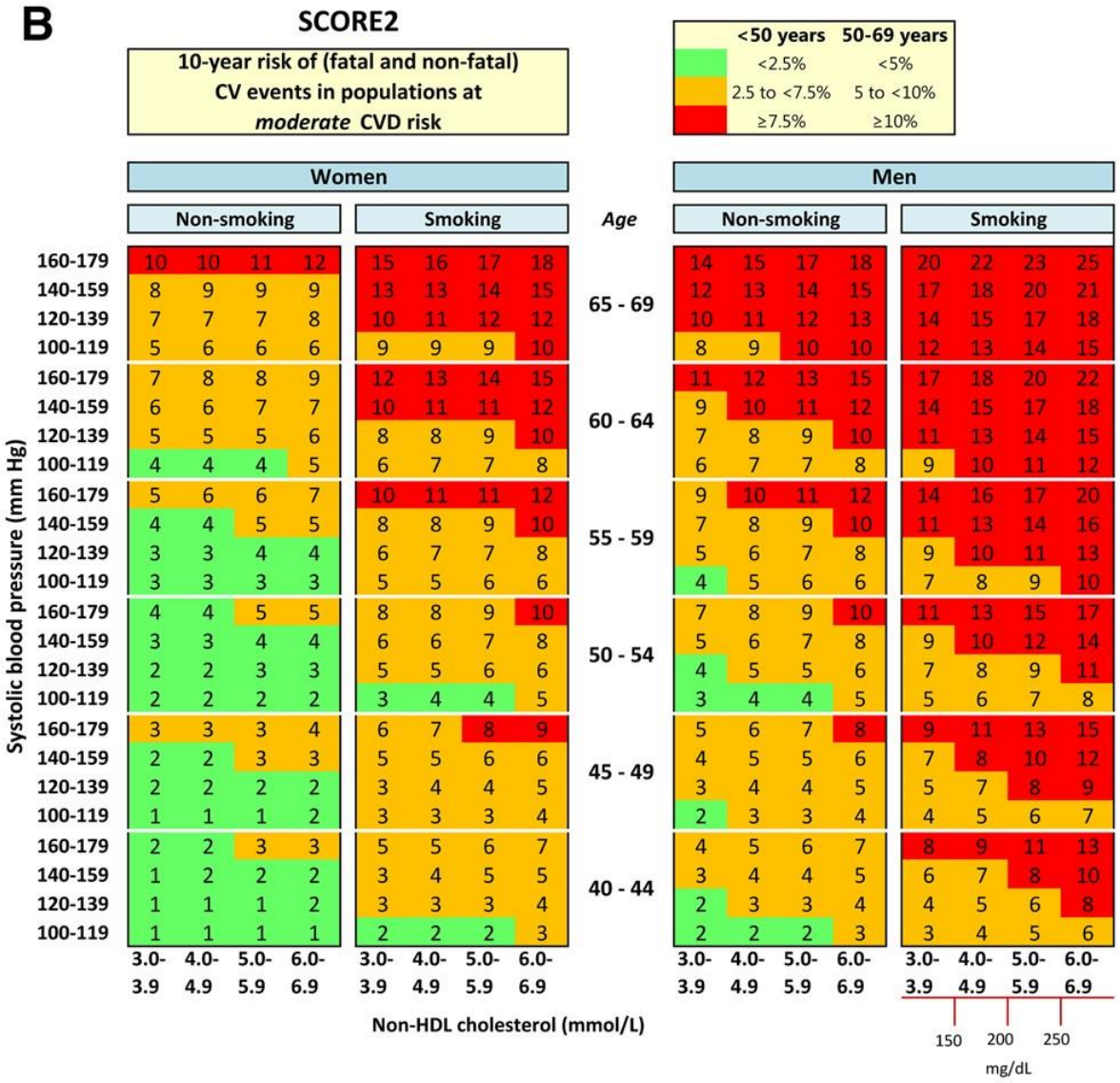
[a] Depends on type or target of agent; [b] especially common with PI3kinase inhibitors; [c] can occur in any type of cancer when and where lymph nodes are surgically resected and/or radiation over lymph nodes. Abbreviations: CVD, cardiovascular disease; GI, Gastrointestinal.

Appendix 8

SCORE2 – Algorithmen zur Risikovorhersage

Neue Modelle zur Schätzung des 10-Jahres-Risikos für Herz-Kreislauf-Erkrankungen in Europa; Quelle: [113]

Das "**moderate CVD risk**" Modell gilt für folgende Länder: Island, Portugal, Schweden, Italien, San Marino, Irland, Zypern, Finnland, Österreich, Malta, Griechenland, Deutschland, Slowenien



Appendix 9

Folgefragen nach positiver kardiologischer Anamnese (AAP 2019 [11])

Follow-up Question	Additional Follow-up Questions
Have you ever experienced chest pain or discomfort with exercise?	• How would you describe your pain? What does it feel like? Where is it located? • Are there things other than exercise or how hard you exercise that cause your chest discomfort? • When does your chest discomfort occur during exercise? Beginning, middle, end, or after? • How long does your chest discomfort last after you stop exercising? • Have you ever passed out or felt like you were about to pass out while you had your chest discomfort? • Is there anything else associated with your exertional chest discomfort? • Does the discomfort in your chest make you slow down or stop your exercise? • Has anyone in your family (parents, sisters, brothers, grandparents, uncles, aunts, or cousins) died of heart attack or heart problems? • Has anyone in your family had an unexplained death? • Was anyone in your family born with a heart condition? • Has anyone in your family been told they cannot play sports? • Does anyone in your family have an implantable cardiac defibrillator? • Do you take any medications or supplements? • Do you use any street or recreational drugs? • Do you use any nutritional supplements or drugs to improve your performance? • What do you use to improve your performance?

Follow-up Question	Additional Follow-up Questions
Have you ever nearly lost or actually lost consciousness?	• Did the collapse occur during or immediately after exercise? • If the collapse occurred immediately after exercise, were you already stopped or still moving? • Did you feel anything that warned you or made you feel like something was wrong, such as chest pain, palpitations (irregular heartbeat), visual changes, wheezing/shortness of breath, nausea, or itching? • What happened after the collapse? Did you wake up quickly, or were you out for a long time? How long? Did you have a seizure? Did you wet your pants, pass stool, or bite your tongue? Did anyone check your breathing, heart rate, or temperature at the time of your collapse? • What medications and supplements were you using before the event? • Were you ill in the few days before your collapse? • Have you ever collapsed like this before? • Is there a family history of collapse during exercise or of sudden cardiac arrest or death?
Have you ever had excessive shortness of breath or fatigue with exercise beyond what is expected for your level of fitness?	• Is the shortness of breath recent or new for you or has it been there for a long time (weeks or months)? • Does this occur every time you exercise or only when you exercise hard? • Do you get chest discomfort along with the shortness of breath? • Do you get light-headed or dizzy? • Have you passed out during exercise? • Does anyone in your family have a serious heart condition or has anyone died suddenly? • Do you have a history of exercise asthma or allergies? • Have you recently moved to a different home or recently moved to the area? • Are you not playing as well as you should or could because of excessive fatigue? Are you getting tired during regular or usual daily activities?
Have you ever been told that you have a heart murmur?	• What can you tell me about your heart murmur? • Were you born with the murmur? Is it still present? • Have you been told it is an innocent murmur and not to worry about it? Have you been told it should be fixed or watched closely? • Do you get chest pain, shortness of breath at rest or with exercise, or racing, pounding, or skipped heartbeats that you can feel in your chest? • Does anyone else in your in your family have a heart murmur?
Do you experience the skipped, irregular, or racing heartbeats (palpitations) with exercise?	• Are the palpitations associated with passing out (syncope) or near passing out (pre-syncope)? • Do the palpitations have an abrupt onset and end (termination)? • Is there anything that stops or starts the palpitations consistently?

Follow-up Question	Additional Follow-up Questions
Has anyone in your family <35 years of age died suddenly or unexpectedly of heart disease?	• What is your relationship with the family member who died? • What age did the death occur, especially if <35? • Do you know what caused the death? Was it a heart attack? • Do you know anything about the death (signs, symptoms, and circumstances)?
Has anyone in your family <35 years of age been disabled from heart disease or had cardiac treatments including surgery?	• Can you name the heart disease that caused your family member's disability? • What treatments or surgical procedures has your family member had? • Can you describe the disability?
Are there any cardiac conditions in your extended family members such as hypertrophic or dilated cardiomyopathy, long QT syndrome or other ion channelopathies, Marfan syndrome, or arrhythmias?	• What is the diagnosis, who has it, and at what age did the diagnosis occur? • How was the diagnosis made? • Has anyone in your family had genetic testing for these heart conditions? • Have any of your family members had pacemakers or defibrillators implanted? • Has anyone in your family died unexpectedly or had surgery for these conditions?

Appendix 10

Bedeutung abnormer Herzgeräusche (AAP 2019 [11])

Auscultatory Finding	Significance
• Harsh, loud (usually ≥ grade 3), systolic ejection murmur • Loudest right upper sternal border • Increases with maneuvers that decrease venous return (ie, Valsalva, or moving from squatting to standing)	HCM-associated LV outflow tract obstruction
• Systolic ejection murmur heard best at right upper sternal border • Radiation to neck • Diminishes with maneuvers that decrease venous return • (ie, Valsalva) and increases with maneuvers that increase venous return (ie, squatting)	Aortic stenosis
• Holosystolic murmur heard best at the apex • Radiation to axilla	Mitral valve regurgitation and possible dilated cardiomyopathy or HCM
• Diastolic murmur heard at right upper sternal border • Murmur accentuated with hand grip (increased systemic vascular resistance)	Aortic valve insufficiency and possible Marfan syndrome or bicuspid aortic valve
• High-frequency diastolic murmur heard best at left upper sternal border	Pulmonary valve insufficiency from primary pulmonary hypertension (Graham Steele murmur)
• Soft early systolic murmur heard best at the upper sternal border while supine (increased venous return) • Murmur often absent or diminished when standing or sitting and with Valsalva maneuver	Physiological (hyperdynamic) flow murmur in a well-trained athlete

Abbreviations: HCM, hypertrophic cardiomyopathy; LV, left ventricular.

Appendix 11

Klinische Indikationen für kardiovaskuläre Bildgebung (EAPC EACVI 2018 [32])

Table 1 Clinical indications to perform cardiovascular imaging studies in athletes

Clinical history:	Imaging tests of choice	Heart disease	Additional testing
SCD in the family	Echocardiography	Cardiomyopathies	Clinical and genetic family screening in selected cases
Known cardiomyopathy in the family	CMR	Mitral valve prolapse	
Palpitations	Echocardiography	Cardiomyopathies	Consider 24-h and/or long-term ambulatory ECG monitoring and/or electrophysiological study in selected cases
Syncope	CMR	Coronary artery disease/ anomalies	CT according to clinical suspicion Consider stress echo to rule out LV outflow obstruction
Chest pain	Echocardiography	Coronary artery disease/ anomalies	Consider the risk profile, age and radiation exposure
	CMR CT Nuclear imaging		Consider exercise stress imaging
Physical examination	**Imaging tests of choice**	**Heart disease**	**Additional testing**
Cardiac murmurs Abnormal cardiac sound	Echocardiography	Valvular heart disease Congenital heart defects	Additional tests on the basis of echocardiographic findings and clinical suspicion (e.g. CMR)
Marfanoid habitus	Echocardiography CT CMR	Marfan disease	Clinical and genetic family screening Accurate evaluation of thoracic aorta
12-leads electrocardiogram	**Imaging tests of choice**	**Heart disease**	**Additional testing**
T-wave inversion	Echocardiogram CMR	Cardiomyopathies Myocarditis	Clinical and genetic family screening Annual follow-up with imaging tests in athletes with normal findings at initial evaluation
ST-segment depression	Echocardiogram CMR	Cardiomyopathies Myocarditis Coronary artery disease Valve disease	Consider exercise stress imaging Coronary CT or nuclear imaging in athletes with clinical suspicion of coronary artery disease
Pathologic Q-waves	Echocardiogram CMR	Cardiomyopathies Myocarditis Coronary artery disease	Consider exercise stress imaging Coronary CT or nuclear imaging in athletes with clinical suspicion of coronary artery disease
Complete LBBB	Echocardiogram CMR CT Nuclear imaging	Cardiomyopathies Myocarditis Cardiac sarcoidosis Valve disease Coronary artery disease/ anomalies	Comprehensive cardiac evaluation for exclusion of heart disease Consider exercise stress imaging
Bifascicular block (RBBB and left anterior hemiblock)	Echocardiogram	Cardiomyopathies Myocarditis Cardiac sarcoidosis Coronary artery disease	Additional tests on the basis of echocardiographic findings and clinical suspicion
Non-specific intraventricular conduction delay	Echocardiogram	Cardiomyopathies Coronary artery disease/ anomalies	Additional tests on the basis of echocardiographic findings and clinical suspicion
Minor non-voltage criteria for LV or RV hypertrophy (atrial enlargement and QRS axis deviation)	Echocardiogram	Cardiomyopathies Valve disease Congenital heart disease Pulmonary hypertension	Additional tests on the basis of echocardiographic findings and clinical suspicion
Abnormal exercise testing (repolarization abnormalities/ symptoms/arrhythmias)	Echocardiography	Coronary artery disease/ anomalies	Consider the cardiovascular risk profile and age
	CMR		Consider also exercise stress imaging
	CT Nuclear imaging	Cardiomyopathies Myocarditis	Low-radiation examinations advised in young individuals

CMR, cardiac magnetic resonance; CT, computed tomography; LBBB, left bundle branch block; LV, left ventricle; RBBB, right bundle branch block; RV, right ventricle; SCD, sudden cardiac death.

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