

Module 1. Qualities and responsibilities of the team sports physician

Unit 1.1 Qualities and responsibilities of the team sports physician

1.1.1 Sports Medicine: The Team Sports Physician

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Introduction

Sports medicine is a burgeoning specialty that mainly seeks:

- 1) the promotion and implementation of physical activity to prevent, treat and cure many current chronic illnesses;
- 2) the prevention, diagnosis, treatment and rehabilitation of injuries suffered during sports practice;
- 3) the prevention, diagnosis and management of different physical conditions, problems and constraints that occur during or after sports practice.

Countries all over the world are regulating this specialty, the knowledge and skills that team sports physicians should have, and the role they play in different organizations, institutions, clubs and sports events. Moreover, incorporating doctors specialised in sports medicine into the hospitals' staff is still a challenge, which is why it's necessary to regulate both athletes and the role of the team sports physician (TSP) who looks after all the aspects related to the athletes' health.

TSPs should have certain general and specific abilities and attitudes in order to be reliable GPs in the context of sports teams, clubs, events and championships. The team sports physician should have profound knowledge and skills in traumatology, physiology, training theory, dietetics, pharmacology, anti-doping rules. They should also be a people person, a quality that should be enhanced by being with the individual athletes that are part of a group pursuing one common goal. The team sports physician should be an integral part of the technical staff and the team in general, which generally requires years of experience. They should be able to naturally take over the hierarchical structure of institutions so as not to relinquish their personality or character. They should earn the



trust of the players, coaches, and staff through their knowledge and practices. Being trustworthy may be one of the most relevant characteristics of a team sports physician, but... How is trust earned? The TSP should come across as a trustworthy, loyal, confident professional who can work with others.

We hope that this unit enhances your knowledge on the basics of sports medicine and the role of the team sports physician in caring for players in an environment that may be complicated, or even "dangerous", the more professional the team is and the more media attention the team gets.

Sports Medicine as a Specialty

As a specialty, the teaching of Sports Medicine (SM) greatly varies from region to region in terms of course programmes and course length. In countries such as the United States, an additional year is required after another medical speciality, while in other countries, such as Australia, this additional period of time can be as long as four years.

Recently, a group of 17 SM specialists from 12 different countries have drafted the ideal SM programme, which can serve as a model and example for existing universities, but especially for other countries interested in offering such speciality. The basic content areas that this draft puts forth and that should be included in any course of study are the following:

1. Physical activity and good health: It is important to know the benefits of physical activity in the prevention and treatment of different illnesses such as hypertension, diabetes, cancer, among others, and to be able to prescribe each patient the adequate "dose" to improve their condition.
2. Medical aspects related to physical exercise: The sports medicine physician should be aware of the cardiovascular, respiratory, gastrointestinal, renal, metabolic, immunological, dermatological and mental aspects related to physical activity.
3. Sports injuries: This is perhaps one of the areas in which the SM specialist must have the most knowledge and skills to make an accurate diagnosis and manage effectively and efficiently. As any part of the human body - from the head to the small phalanges of the foot - is susceptible to injury, they must be familiar with all types of injuries - muscular, tendon, ligament, bone, etc. The SM physician must be familiar with the main treatments, the principles of rehabilitation and, most important, the decision making related to the moment when injured athletes are fit to return to training or playing in matches.
4. Nutrition: Proper nutrition is key to good health and sports performance. A thorough knowledge of hydration and immediate principles, as well as the most common and effective nutritional supplements is paramount. They must know how to integrate and apply this information to each case, whether for a patient an individual athlete, or a team, taking into account the different conditions - from pre-match requirements to conditions related to altitude or for ultra-endurance athletes.



5. Pharmacology: There is a high abuse of medication among the general population as well as athletes. Knowledge of the most commonly used drugs, their interactions and adverse effects, as well as their possible interaction with physical exercise, especially in extreme altitude or weather conditions is crucial.
6. Anti-doping: Knowledge in this area is important, especially for physicians who are responsible for athletes who are subject to testing regimes. SM specialists should be aware and up to date of the World Doping Agency's rules, which are updated every year. Since they usually prescribe medication, they must know the usage of such medication, and whether a substance is permitted or not. In the event that they do not comply with the relevant regulations, SM physicians can be subject to very significant disqualifying sanctions.
7. Team sport and sports event management: Team Sports Physicians are responsible for the health and physical performance of athletes. Therefore, they are also responsible for the conduction of pre-competitive examinations and for monitoring the health and performance of athletes during training, travel, seasons, competitions and national or international events. TSPs practice is also relevant in the design of big sports events and the response to any medical emergency - be it related to the athletes or the fans.
8. Physical activity in extreme conditions related to altitude, cold or heat: This is a very specific area of knowledge, which requires specialised training.
9. Care of specific groups (children, women, the elderly and people with disabilities): the management of injuries in children requires a great deal of specialisation and experience. Women athletes are specially affected by certain disorders due to sports practice, such as secondary amenorrhoea or iron deficiency anaemia, which must be treated appropriately. In the case of elderly people who practise sport, it's important to seek a balance between healthy physical activity in general and dealing with age-related problems such as knee osteoarthritis. Finally, in the case of patients with certain disabilities, special knowledge about this population is required.
10. Intrinsic skills: Although this is not always the case, the TSP is expected to have communication, collaborative and sometimes leadership skills. They are also expected to be professional and to have ethical values.
11. Extrinsic skills: Within this group we should highlight the skills that have to do with the knowledge needed to perform a good physical examination, especially regarding the musculoskeletal, cardio-respiratory and neurological systems. Some of the basic skills that the TSP should have are: being able to interpret an electrocardiogram, and knowing how to use soft tissue ultrasound to diagnose most sports injuries (Humphries, Rod, and Dijkstra, 2017).

Definition and Role of the Team Sports Physician

The team sports physician must first and foremost hold an unrestricted medical licence which allows them to prescribe and coordinate the medical care of the athletes. In this sense, the main responsibility of the team sports physician is to look after the well-being of each individual athlete so that they reach their full potential. The TSP must thoroughly know how to care for musculoskeletal injuries and diagnose any injuries that may occur due to or during the practice of sports. Also, they must actively assimilate into the group formed by other health professionals, such as medical specialists, coaches,



physiotherapists, psychologists and physical trainers. Finally, the team physician must take on the decision-making responsibilities that impact on the athlete's safe participation within the team structure.

What the Team Sports Physician Has to Know

The team sports physician main task is to provide the best medical care for athletes in each and every level of competition. That is why there are certain requirements that the TSP has to meet, which are related to professional training:

- Holding a Medicine and Surgery license: this means being registered and licensed to practise medicine in the place where the professional carries out their practise. Since TSPs travel a lot, they should be aware that they must be certified by the health authorities to carry out their practise and treat their players in another country, for example, if they travel with their team to participate in the Olympic Games.
- Knowing the fundamentals of emergency medical care, in case any grave situation occurs during the various sports events.
- Being trained in basic and advanced cardiopulmonary resuscitation measures.
- Knowing about internal medicine in order to be able to solve common medical problems, from an infection to any allergy.
- Having an extensive knowledge of traumatology and skills that enable them to manage - that is, diagnose, treat and prevent - most sports injuries (Herring, Kibler, and Putukian, 2017).

In addition to specific training in sports medicine, nowadays there are other types of training such as post-graduate courses, doctorates, post-doctorates and more or less specific master's degrees which enable the acquisition of knowledge and skills in areas of great interest to the team sports physician, such as sports cardiology, sports nutrition, rehabilitation or training theory, related to specific population groups. In addition to these medical qualifications, there are other complementary training programmes that help build the team physician's professional profile, such as courses in research and innovation, the use of new technologies, business management, work medicine, professional ethics, and so on.

What Is Expected from the Team Sports Physician

The team sports physician has to be willing to devote the necessary time and effort to care for his players and his team as a whole. In many cases, these time and effort should be extended to the player's relatives. For the player to be in optimal condition, they should feel that her loved ones are also cared for. Usually, the players' home town is not the city or the country where the club is located, so they have to move with their families. The role of the team sports physician often includes contacting the families with specialized doctors, or coping with stressful situations. In addition, the TSP usually treats the staff and their families in a more or less direct way. The team sports physician also has to develop and be up to date with the knowledge related to the sport in which his team competes.



The team sports physician is ultimately responsible for monitoring the athlete's medical management. Therefore, the TSP has to:

- Coordinate pre-competitive screening, examinations and assessments.
- Manage injuries in the field.
- Be in charge of injury and illness management.
- Manage rehabilitation and time of return to participation.
- Provide adequate preparation for a safe return from injury or illness, particularly in professional teams where stressful situations are commonplace and there is often pressure from the coach, the club, the media and even the player him/herself to accelerate the return to play. If there is a conflict of interests, the team sports physician should help to solve it.
- Assist in the continuous process of injury recovery up to the point of return-to-play (RTP). This issue should also be discussed with the staff, but it will ultimately be managed by the TSP together with the player and the coach, who will decide the timing of return to training and playing matches.
- Consolidate their medical expertise with that of the other professionals involved in the athlete's health care, such as medical specialists, athletic trainers (USA. [United States]), physiotherapists or recovery coaches (in Spain, the physical trainer is usually in charge of this) and other professionals trained in the field of physical and mental health, such as sports psychologists.
- Provide adequate nutritional education related to ergogenic aids, substance abuse and other medical problems that may affect the player or athlete.
- Have a thorough up-to-date knowledge of doping issues, and the necessary knowledge to fill out the current World Anti-Doping Agency (WADA/AMA) Whereabouts forms required from athletes.

Administrative and Logistical Duties

Establishing and defining the relationships of all the parties involved.

Educating athletes, parents, administrations and coaches on the necessary aspects of athlete care.

Establishing a hierarchy: it is vitally important that everyone involved in an athlete's care clearly knows who to call if a problem arises.

Developing an emergency plan during competition and training: this emergency plan should cover trips and hotel stays, among other circumstances. There have been cases of food contamination, or food poisoning by the opposing team. In such cases, it is crucial to have a structured emergency plan in order to act as quickly and effectively as possible.

Addressing equipment and supply problems.

Providing an adequate coverage of the event.

Assessing environmental and playing conditions. Playing hockey on a grass pitch in India with a field temperature of 50°C is not the same as playing a football match in adverse weather conditions, such as a light drizzle.

The Main Challenges for a Team Sports Physician



As mentioned above, the knowledge and duties of the team sports physician should be vast and varied. As a result of changes in the needs of athletes and teams, there has been a move from a traditional model to a new model of practice, with many more demands. The current sports medicine specialist model has overtaken the traditional medical model in which the physician - usually a general practitioner with an interest in sports - was the "primary contact". The improved model acknowledges the multidisciplinary nature of the "primary professional contact" of athletes, which may be a physiotherapist, a school doctor, a team sports physician, a general practitioner, an orthopaedic surgeon, a soft tissue therapist, a podiatrist, a chiropractor, an osteopath, a nutritionist, a psychologist or a biomechanist (Dijkstra and Pollock, 2014). This model purports the idea that the medical and coaching teams are lead by qualified and experienced individuals, work collectively towards a common performance goal, and are accountable to a Performance Director and, ultimately, to the Board of Directors. In this way, the importance of establishing appropriate methods to care for the health of athletes on an ongoing basis - and not just during major competitions - is highlighted.

Sports medicine for elite athletes is a challenging specialty with many aspects to consider, and return-to-play decision making is complex. This topic will be covered extensively during this course of study. As an introduction, Creighton, Shrier, Shultz, Meewisse and Matheson (2010) proposed a decision-based return-to-play model, with the aim of clarifying the process that clinicians should follow when making return-to-play decisions. For decision making to be successful, two elements are essential: inter-disciplinary integration and communication, which facilitate optimal training and competition while promoting long-term health care. Moreover, it is widely known that organisational structure can affect performance teams; therefore, optimising the structure of the medical and coaching teams that manage elite athletes should be a strategic priority for all club sport organisations. These and other challenges can be addressed within an integrated health and performance structure in which roles and responsibilities are clear and there is a comprehensive system of clinical governance and external professional assessment.

Unit 1.2 Examinations, Assessments, and Monitoring

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1.2.1 Examinations, Assessments, and Monitoring

Medical Examination for Sports Preparticipation

From Grassroots to Professionals

Continuous and regular physical activity, in particular, sports practice during childhood, increases the risk of injury or functional alteration that may be detrimental to the development and evolution of the child or adolescent. At a professional level, the examination prior to physical activity should be carried out not only to prevent possible injuries, but also to lead to a good exercise practice and to teach the right sports habits.

The main objective of medical examination prior to practising sports or at the start of the season is to make physical activity safe and to spot any illnesses or physical conditions that could make physical activity a health risk.

Medical examination prior to the practice of any physical activity should be approached with the following specific objectives:

- To identify processes that hinder or restrict performance or sports participation.
- To diagnose any pathologies that could be treated or any undetected or asymptomatic diseases.
- To advise on a therapy or plan the rehabilitation of specific processes.
- To prevent injuries - especially those that have not been well rehabilitated - by identifying and treating musculoskeletal disorders.
- To help athletes identify the activities they can or should do in order to improve their performance and keep healthy.
- To comply with legal and insurance requirements.

Any athlete should undergo a medical examination at least once every season and elite athletes should too, whenever circumstances require it. It is completely wrong to think of elite athletes as healthy individuals. Many of the problems that arise in the sports field could be prevented with a regular and thorough medical check-up. (Drobnik, 2007, <https://goo.gl/jqFREH>).

The preparticipation examination should be carried out at least four weeks before the start of such participation so as to enable the individual to start rehabilitation or the therapeutic behaviours required in each case, if necessary. It's necessary to perform an



annual check-up. No further assessments or examinations are required except for specific reasons, in which case the specialist physician will guide each particular case.

Necessary Examinations

1. There are some specific and fundamental aspects to the medical examination of an individual for sports participation. Anamnesis should be considered with an emphasis on the personal and family history regarding cardiorespiratory, circulatory pathologies - sudden death, acute myocardial infarction, diabetes, asthma, etc.- and chronic or hereditary pathologies. In addition to this, a complete physical screening and a resting 12-leads electrocardiogram are essential. This implies asking the right questions, screening and, interpreting verbal or physical responses - signs and symptoms. It's important to remember these aspects, which should be presupposed by the physician in charge of the assessment (Table 1) (Drobnic, and Serra-Grima, 2009).

Table 1: Parts of the Medical Screening intended for Sports Practice

Medical Screening Category	<i>Basic -MSC-</i>	Type I	Type II	Type III	Type III
		Initiation	Proficiency	Competition	Performance
Sport		Up to 13 years old	Between 14 and 17 years old	Up to 17 years old	Professional or Study of physical condition
Physical activity		Up to 17 years old	Between 18 and 34 years old	35 years and older	
Anamnesis (personal and family)	X	X	X	X	X
Physical screening (general and systemic)	X	X	X	X	X
Locomotor-system screening		X	X	X	X
Additional tests					
Electrocardiogram (ECG)	X	X	X	X	X



Echocardiography ¹	X			X	X
Spirometry		X ²	X ²	X	X
Genetic MSC test ²	X				
Static podoscopy		X	X	X	X
Basal parameters		X	X	X	X
Basic anthropometry		X		X	X
Extended anthropometry			X	X	X
Submaximal Ergometry Test ²			X	X	X
Maximal Ergometry Test	X			X	X
Indirect calorimetry with evaluation of exhaled gases, lactate, etcetera ³				X	X
Documentation					
Informed consent ⁴	X	X	X	X	X
Sports medical report	X	X	X	X	X
Sports Medical Certificate (SMC) ⁵	X	X	X	X	X
Monitoring of pathologies		X	X	X	X
Other*		X	X	X	X
Approximate time		20-30 min	30-45 min	45-60 min	60-90 min

Source: Author's own elaboration

Medical History

¹ It is advisable to perform at least once during sporting life. If it has been done before reaching biological maturity, it is advisable to repeat it after the age of 18.

² Based on medical criteria.

³ Indicated only in subjects with a clinical and family history suggesting the need for it.

⁴ By parents or guardians, if the individual is a minor.

⁵ Medical-legal document containing medical information of a public nature and general use.

The Committee on Sports Medicine of the American Academy of Paediatric has defined two standard protocols for the performance of a quick and thorough enough medical history. It is essential to take into account all the systems and apparatuses that could denote a present or latent problem through exercise. Exercise gives away what is not working properly. The following is the health questionnaire for sports participation developed by the American Academy of Paediatric in 1991 (Figure 1).

Figure 1: Health Questionnaire for Sports Participation

Initial History Questionnaire

FORM COMPLETED BY _____ DATE COMPLETED _____

Name _____

ID NUMBER _____

BIRTH DATE _____ AGE _____

M F

Household

Please list all those living in the child's home.

Name	Relationship to child	Birth date	Health problems

Are there siblings not listed? If so, please list their names, ages, and where they live. _____

What is the child's living situation if not with both biological parents?
 Lives with adoptive parents Joint custody Single custody
 Lives with foster family

If one or both parents are not living in the home, how often does the child see the parent(s) not in the home?

Was the delivery Vaginal Cesarean If cesarean, why? _____

Was initial feeding Formula Breast milk How long breastfed? _____

Did your baby go home with mother from the hospital?
 Yes No Explain _____

Birth History ■ Don't know birth history

Birth weight _____ Was the baby born at term? _____ OR _____ weeks

Were there any prenatal or neonatal complications?
 Yes No Explain _____

Was a NICU stay required? Yes No Explain _____

During pregnancy, did mother
 Use tobacco Yes No Drink alcohol Yes No
 Use drugs or medications Yes No Used prenatal vitamins
 What _____ When _____

General DK = don't know

Do you consider your child to be in good health? Yes No DK Explain _____

Does your child have any serious illnesses or medical conditions? Yes No DK Explain _____

Has your child had any surgery? Yes No DK Explain _____

Has your child ever been hospitalized? Yes No DK Explain _____

Is your child allergic to medicine or drugs? Yes No DK Explain _____

Do you feel your family has enough to eat? Yes No DK Explain _____

Biological Family History DK = don't know

Have any family members had the following?

Childhood hearing loss	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Who _____	Comments _____
Nasal allergies	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Who _____	Comments _____
Asthma	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Who _____	Comments _____
Tuberculosis	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Who _____	Comments _____
Heart disease (before 55 years old)	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Who _____	Comments _____
High cholesterol/takes cholesterol medication	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Who _____	Comments _____
Anemia	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Who _____	Comments _____
Bleeding disorder	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Who _____	Comments _____
Dental decay	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Who _____	Comments _____
Cancer (before 55 years old)	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Who _____	Comments _____

(Biological Family History continued on back side.)

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Initial History Questionnaire



Biological Family History (Continued from front side.) DK = don't know

Liver disease	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Who	Comments
Kidney disease	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Who	Comments
Diabetes (before 55 years old)	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Who	Comments
Bed-wetting (after 10 years old)	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Who	Comments
Obesity	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Who	Comments
Epilepsy or convulsions	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Who	Comments
Alcohol abuse	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Who	Comments
Drug abuse	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Who	Comments
Mental illness/depression	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Who	Comments
Developmental disability	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Who	Comments
Immune problems, HIV, or AIDS	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Who	Comments
Tobacco use	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Who	Comments
Additional family history _____					

Past History DK = don't know

Does your child have, or has your child ever had,	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	When	
Chickenpox	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
Frequent ear infections	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
Problems with ears or hearing	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
Nasal allergies	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
Problems with eyes or vision	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
Asthma, bronchitis, bronchiolitis, or pneumonia	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
Any heart problem or heart murmur	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
Anemia or bleeding problem	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
Blood transfusion	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
HIV	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
Organ transplant	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
Malignancy/bone marrow transplant	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
Chemotherapy	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
Frequent abdominal pain	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
Constipation requiring doctor visits	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
Recurrent urinary tract infections and problems	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
Congenital cataracts/retinoblastoma	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
Metabolic/Genetic disorders	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
Cancer	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
Kidney disease or urologic malformations	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
Bed-wetting (after 5 years old)	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
Sleep problems; snoring	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
Chronic or recurrent skin problems (eg, acne, eczema)	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
Frequent headaches	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
Convulsions or other neurologic problems	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
Obesity	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
Diabetes	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
Thyroid or other endocrine problems	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
High blood pressure	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
History of serious injuries/fractures/concussions	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
Use of alcohol or drugs	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
Tobacco use	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
ADHD/anxiety/mood problems/depression	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
Developmental delay	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
Dental decay	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
History of family violence	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
Sexually transmitted infections	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
Pregnancy	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
(For girls) Problems with her periods	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK	Explain	
Has had first period	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Age of first period		
Any other significant problem _____					

This American Academy of Pediatrics Initial History Questionnaire is consistent with *Bright Futures: Guidelines for Health Supervision of Infants, Children, and Adolescents, 3rd Edition*.

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Source: American Academy of Pediatrics, 1991.



Physical Screening

After performing the athlete's medical history, it is time to carry out a check-up by organs and systems. The aim is to detect possible physical signs that may temporarily or permanently prevent the athlete from practising sports. This check-up will also serve as a reference to assess the evolution of the athlete, whether linked to growth or training, or in the event that they suffer any injury during the course of the season.

Frequency: both at grassroots and professional/elite levels, check-ups should be performed on an annual basis.

Assessment of the musculoskeletal system: by carrying out the simple check-up in Table 2 we can make an overall and fairly accurate assessment of an athlete's musculoskeletal system. The physician must not only assess the possible muscular weaknesses related to symmetry but also the signs of discomfort during movements, especially since athletes may try to hide some symptoms out of fear of being disqualified from a particular sports activity.

Table 2: Holistic Assessment of the Musculoskeletal System

Action or instructions	Observations
Standing in front of the examiner.	Acromioclavicular joints. General habitus.
Looking at the ceiling, at the floor, over the shoulders, touching the ears with the shoulders.	Cervical spine mobility.
Raise shoulders against resistance.	Trapezius strength.
Abduction of the arms at 90°. At this point, add resistance from the examiner.	Deltoid strength.
External and total rotation of the arms.	Shoulder mobility.
Elbow flexion and extension.	Elbow mobility.
Arms at both sides and elbows at 90°; pronation and supination of the wrists.	Elbow and wrist mobility.
Extend and flexed fingers; make a strong fist.	Hand and fingers mobility, and assessment of possible deformities.
Tighten quadriceps, relax afterwards.	Symmetry and mobility of patella.
Walk forward in a waddling gait, touching the buttocks with the heels.	Hip, knee and ankle mobility.
Standing with their back to the examiner.	Symmetry of shoulders and back (scoliosis).
Touch their feet with straight knees.	Scoliosis, hip mobility, hamstring strength.
Stand on toes and then lean on heels.	Symmetry and strength of calf muscles.

Source: adapted from De Smith, 1983.



This test takes one and a half minutes. It is designed to spot orthopaedic anomalies in individuals who have not been previously examined or who have suffered physical changes that have not been rehabilitated (or have been poorly rehabilitated) and which could affect their participation in sports.

Assessment of bone maturation: if this is deemed necessary, it is because the definitive height has not been reached, and therefore a growth study should be performed. The bone age and the chronological age may not correspond. This information is of interest to guide workload intensity. For example, to initiate muscular strength work, for the selection of talents or to approximate the prognosis of certain pathologies such as scoliosis in children, spondylolysis, etc., we do this twice a year, aiming at predicting the appropriate size over time. A higher frequency does not provide more information.

Assessment of ligamentous laxity: it is known that ligamentous hyperlaxity may frequently predispose to certain injuries. This aspect is brilliantly presented in Drobnic F., Puigdemívol J. and Bove A. (2009). Although the scale used in the *Hospital del Mar* (Barcelona, ESP) is very complete and provides a lot of information, we consider that Beighton's scale (1973) better indicates whether or not the athlete is hyperlax, with nine simple tests (Table 3). This helps us decide whether to conduct complementary tests to diagnose other possible anomalies that may affect not only performance but also the athlete's health and future - collagen disorders, coagulation disorders, valvulopathies, etc. In addition, it allows us to orchestrate appropriate preventive measures.

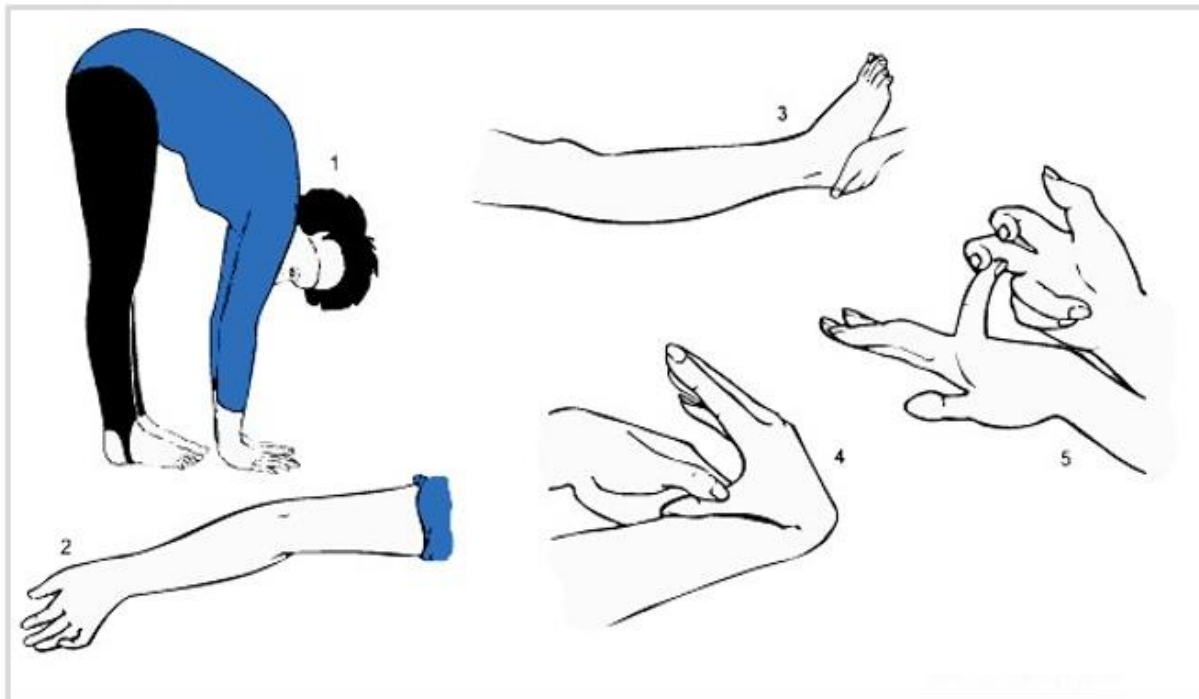
Table 3: Beighton's (1973) Criteria for Ligamentous Hyperlaxity

Beighton's (1973) Criteria for Ligamentous Hyperlaxity	R	L
Passive dorsiflexion of the 5th finger, exceeding 90°.	1	1
Passive positioning of the thumbs on the flexor aspect of the forearm.	1	1
Active hyperextension of the elbows exceeding 10°.	1	1
Hyperextension of the knees exceeding 10°.	1	1
Bend the trunk forward, with the knees extended so that the palms of the hands rest on the floor.	1	
TOTAL		
Positive if → 5 points		

Source: Beighton (1973)



Figure 2: Brighton's Protocol for Ligamentous Hyperlaxity



Source: Retrieved from goo.gl/Xb0PD3.

Differential Diagnosis of Hypergrowth

It should always be performed on new team players, especially if the athlete is still growing. This test will be dealt in detail in a separate chapter, given its relevance to this sport.

Respiratory System

An examination of the structure of the thorax should be performed to identify abnormalities or malformations that could indicate growth diseases or possible difficulties in the function of the respiratory system. A front and back auscultation of the thoracic cavity should be performed symmetrically and comparatively. The mobility of the thorax should also be assessed and the thoracic perimeter (Hirtz Index) should be measured. The complete examination includes a forced basal spirometry. It's also important to perform a quick check-up of the upper respiratory tract. This completes the medical history of the upper respiratory tract - nasal permeability, pharynx, presence of lymphadenopathies, etc. In general, it is not necessary to take a chest X-ray, although it is recommended so as to identify past and, perhaps, present asymptomatic problems, such as bronchiectasis, pleural synechia, primary nodules, hilar adenopathies, scars, etc.

Cardiovascular System

The cardiovascular system well functioning is vital for physical practice. This is why utmost attention is crucial. Peripheral pulses, heart rate, and blood pressure should be checked, as well as auscultation. The study will be completed with an electrocardiogram

(ECG) at rest. It is necessary and mandatory to perform an ECG to complete the examination of all athletes, whatever their age or level, as it provides a great deal of information and is easily performed. Although an echocardiography is necessary for professionals, it is recommended to perform it every two or three years, as long as there are no abnormalities.

Abdomen

Examine the athlete lying on the stretcher with knees and hips flexed and in a standing position, to rule out any visceromegaly or possible hernias. A subjective assessment of the tone of the abdominal muscles, rectus abdominis and obliques can be used to prevent future deficiencies. The presence of hernias or painful orifices should lead to preventive action. While performing the abdominal check-up, also assess the presence of any axillary or inguinal adenopathy.

Genitals

Examination necessary to assess sexual maturation in boys and girls. (Tanner stages). It sheds light on the athlete's development in relation to his or her chronological age. It is also a mandatory complement to the maturational study through radiological tests.

Nervous System

To examine the osteotendinous reflexes. To rule out possible balance disorders of vestibular or cerebellar origin. A quick examination of the cranial nerves is recommended.

Lymphatic System

To assess the state of the lymph node chains, that is, the cervical, submandibular, axillary and inguinal chains.

Complementary Tests

Nutritional Analysis

It is necessary to know the athlete's nutritional habits, the level of mineral or vitamin deficiency and the possible macronutrients intake unbalance. To achieve this knowledge, it is not enough to know the athlete's weight. It is necessary to qualitatively measure their daily intake. The dietary survey consists of the recording and subsequent assessment of a week's food intake. It is necessary to keep a record of the food weight, the cooking method and the ingestion time. This assessment provides information on general habits and nutrients quantification. This allows for the objective identification and correction of existing habits. It also enables the adaptation of dietary guidelines according to specific training objectives in different moments along the season. The athlete has to adapt his or her

diet according to training and competition schedules. (López, 2010, <https://goo.gl/nKwFeH>).

Staff: a dietician trained in sports nutrition.

Material/Equipment: a dietary analysis software programme.

Frequency: it should be annual, both at grassroots and professional levels. There should be a follow-up based on the medical history.

Body Structure

Kineanthropometry is the study of the human being in movement. This discipline helps to describe and quantify the physical characteristics of athletes. Anthropometric data is processed to obtain information on body structure, somatotype and proportionality. This allows for the assessment of morphological characteristics, as well as their monitoring during the season. It is also used to discover talents, study the growth and maturation of young athletes, and monitor athletes who need to follow special diets.

Staff: Professionals authorised to take measurements.

Material/Equipment: plicometer (also called pachymeter or adipometer), measure tape, caliper, anthropometer, accurate scales from 10g to 150k, measuring rod, horizontal measuring rod.

Frequency: initially quarterly. Depending on the medical history and performance objectives, there should be more specific monitoring.

Visual Exam

Due to the importance of having a good visual capacity or acuity for sports practice, it is advisable to carry out a simple examination (optometry) to make an initial assessment. On the basis of this examination, the specialist will be able to extend the study, if necessary. This is an essential check-up for new signings.

Staff: For an optometry, a medical specialist.

Material/Equipment: optometry equipment.

Frequency: it must be annual, both at grassroots and professional levels, and there must be a follow-up based on the medical history.

Dental Exam

This is an essential check-up for new signings and at the start of every season. A poorly treated cavity, an unstable tooth or a septic mouth can lead to an oral and dental infection that may prevent the athlete from training or competing for a certain period of time, thus jeopardizing the team and the club.

Staff: a physician.

Frequency: it should be annual, both at grassroots and professional levels.

Resting Electrocardiogram (ECG)

This is an essential check-up for athletes over 30 years old and for elite athletes. It is an inexpensive and simple procedure that provides a great deal of information. It is important to be aware of the specific characteristics of the elite athlete's ECG, which may be related to rhythm disorders, vagal hypertonia, myocardial hypertrophy or repolarisation alterations. The so-called *athlete's heart* should only be accepted if hypertrophic cardiomyopathy has been ruled out.

Staff: A Graduate Diploma in Nursing, assessed by the specialist physician.

Material/Equipment: electrocardiograph.

Frequency: it should be annual, both at grassroots and professional levels.

Echocardiogram

It is advisable for those who intend to become elite athletes, as it allows to rule out structural cardiac pathologies. Although these are rare, such as hypertrophic cardiomyopathy, the main cause of sudden death in athletes below 25 years old, they can be easily ruled out by performing an echocardiogram. For athletes over 30 years old and school-age athletes, it is recommended when the medical history or physical check-up suggests there may be any cardiovascular disease. It is a basic tool in the screening of hypergrowth disorders.

Staff: Specialist in echocardiography. It is advisable to contact a cardiologist.

Material/Equipment: echocardiograph, gel.

Frequency: at the professional level it should be annual, and at grassroots level it could be performed every two or three years, if there is no clinical need.

Forced Basal Spirometry

This is an essential check-up for any athlete. It provides information on the static values of pulmonary ventilation and, the capacity of the respiratory muscles. It helps to diagnose chronic obstructive, restrictive or mixed respiratory processes, even if previously unknown. It is also useful to monitor therapy and the evolution of the process. It is an inexpensive and simple check-up which provides a lot of information, and it is mandatory before any stress test.

Staff: an expert in the test (nurse or physician).

Material/Equipment: spirometer that produces a flow graph, disposable mouthpieces, thermal paper.

Frequency: if there is no clinical need, it should be annual, both at grassroots and professional levels.

Stress Test

It is used to determine the response of the metabolic, cardiovascular and respiratory systems to exercise. According to the current consensus standards, it is not necessary to perform this test in individuals younger than 45 years old who exercise regularly and do

not exhibit any abnormal symptoms. However, we believe that a medical-sports check-up is not complete if we do not assess the cardiovascular and respiratory response to exercise. It should be a simple test which could be performed by any athlete, whatever their age and category. For professional/elite players, a maximal stress test, with cardiac screening (ECG) and calorimetric monitoring (to assess oxygen consumption and carbon dioxide elimination), is advisable at least at the beginning of the season. In the case of new signings, we recommend to always do it, at any age. It could also be performed whenever there is a hint of cardiorespiratory or metabolic malfunction or pathology related to exercise, at any moment during the season. In the assessment, the ergometer can be a cycloergometer or treadmill, depending on the subject's running capacity or recent or recovering injuries. It should be noted that the cycleergometer often has the disadvantage that the pedals and footrests are small, the saddle is usually short, the distance between the saddle and the handlebars is also short, and a saddle height that provides the correct extension of the limb used for pedalling is not achieved. In addition, the pedal crank is short for a very tall athlete, and the circular motion is small. This is of little relevance if we are only trying to expose the subject to progressive work to assess the correct coupling of the metabolic systems to the different workloads, and are not trying to establish a work pattern based on the workloads performed.

The functional testing laboratory examiner must know this protocol, which must be the same for all the members of the team. A triangular, progressive and maximal test is recommended. The starting speed is 6-8 km/h, and every one minute there is an increase in speed of 1 km/h, up to the maximum sustainable effort. The gradient is kept at 1% and it should not exceed 3% in any case.

Staff: a specialist in stress testing and a nurse.

Material/Equipment: ergometer, treadmill or cycloergometer, indirect calorimetry system with built-in ECG display, emergency trolley with cardioverter system. Although not essential, a lactate analyser can be a very interesting complement in this assessment.

Frequency: for grassroots, when signing, when necessary, for clinical screening, and if field assessments are performed.

Radiological Check-up

Muscle ultrasound: of recent injuries or injuries from the previous season; in new signings at professional levels or in other signings when there are doubts about development.

Simple X-Ray: in new professional signings, of the joints involved in each sport (ankles, hands, knees, hips or lumbar spine) and of those which have suffered injuries. If the clinical check-up or pathological history lead to suspicion of any type of injury, it is advisable to complement the study with a CT (Computed Tomography) or an MRI (Magnetic Resonance Imaging).

MRI Scan: as a standard screening test, it is not justified at any age. However, based on our experience, we believe that for professional signings it is an interesting and necessary diagnostic measure and reference due to the diverse lumbosacral pathologies found in these athletes. We consider that this test should be done if there are available means.

Frequency: For grassroots, depending on medical history. In the case of professional athletes, it should be annual and also depending the medical history.

Table 4: Basic Radiological Check-up

Simple X-Ray		Ultrasound	MRI
Localisation	Projection		
Thorax	AP and side	Patellar tendon	Lumbar spine ⁷
Lumbar spine	AP and lateral Oblique ¹	Achilles tendon	
Knees	AP and lateral Axial ¹	Hamstring muscle 1	
Ankles	Laterals Oblique	Quadriceps muscle 1	
Feet	AP (anteroposterior) Laterals	Shoulder rotator muscles ¹	
Wrist and hand	AP (anteroposterior) Special AP		
Shoulder ¹	Lateral (sella turcica)		
Skull ⁶			

Podiatric Assessment

It is always advisable to carry out a podiatric assessment, both static and in motion. The main objective is to prevent any pathologies and improve the athlete's performance. The static podiatric study enables the assessment of the foot structure, its axes and pressures, as well as its relationship with the rest of the lower limb. The mirror podoscope can be used for this purpose. On the basis of this simple study, we may decide to request a more thorough and dynamic podiatric screening. This study consists of collecting images using complex equipment that allows for data collection and analysis using specific software. It is advisable for elite players, as well as for all those players who show discomfort in sports practice.

Based on our experience, nail care and foot hygiene should not be neglected in any clinical check-up. An abnormal growth, a dystrophic nail or deficient hygiene could cause pathologies that may lead to one, two or even more days off work. Effective prevention in this area, based mainly on education, is very useful for and much appreciated by athletes.

⁶ Shoulder and skull: To be performed according to the medical history

⁷ Whenever possible in professional signings



Frequency: For grassroots, depending on medical history. In the case of professional athletes, it should be annual.

Assessment of Strength Manifestations

The general objectives that guide the assessment of the different expressions of strength include establishing a dynamic profile within the set of qualities required by the specific practice of sports. If an injury occurs, these data are useful to monitor the rehabilitation process. Likewise, it helps assess training development within the season's programme conducted by the physical trainer. Specifically, it helps assess possible imbalances between different muscle groups. The medicine ball throw is a simple test used to assess the upper body, and the stop test or the vertical jump is used to assess the lower body. There are tests that require the use of sophisticated technology unavailable to most clubs - ergo jump or Bosco test, and isometric tests. An abdominal test and a test to assess the lumbar muscles, lumbar pathology of the athlete, strength assessment, etc., should also be performed. It is important to assess the athlete's flexibility (flexibility box test) to plan stretching exercises accordingly.

Frequency: both at the grassroots and professional levels, it should be annual if there is no clinical need for more frequent check-ups.

Blood Test

Blood or urine tests is particularly indicated for new signings and at the beginning of each season. It may be useful to perform a partial blood test, a full blood test and parameters counts of muscle injury or hormonal system overload at regular intervals during the season. Performing full blood tests every two or three months do not provide any practical information. They result in a major expense for the club and cause an aversion to the test on the part of the athlete.

Please keep in mind that it is not clear whether iron deficiency without anaemia has an impact on physical performance. However, empirical knowledge indicates that iron is involved not only in the production of haemoglobin, but also in various enzymatic bodily reactions. Iron deficiency is common in female adolescent and adult athletes, particularly those who practice endurance sports, running, cycling, etc. Female athletes can benefit from monitoring serum iron, transferrin and ferritin, especially the transferrin saturation index.

For work and preventive medicine reasons, the analysis of new professional signings include mandatory serology for infectious diseases, hepatitis, human immunodeficiency virus, Epstein Barr (EB), cytomegalovirus, Chlamydia pneumoniae, and paramyxovirus. EB testing is required because this virus can cause systemic symptoms, such as fatigue, and it can affect the musculoskeletal system. In addition, basal IgG (Immunoglobulin G) assessment allows for the identification of possible contacts and helps to complete or perform a diagnosis that may have been ruled out for other reasons. Regarding intracellular respiratory germs, it is important to monitor response levels in players with a history of asthma or respiratory diseases, especially repeated upper respiratory tract infections. Regarding paramyxoviruses, experience shows that a single assessment of



response levels to mumps virus to vaccinate in those who need it will undoubtedly prevent the surge of the disease - although its absence does not necessarily indicate a lack of immunity, which is otherwise rare in adults in a country with an adequate vaccination schedule. In order to obtain data on certain infectious diseases, authorisation is required from the subject to be tested.

Staff: A nurse.

Material/Equipment: clinical analysis lab.

Frequency: For grassroots, it should be annual and depending on medical history. In the case of professional athletes, a complete quarterly analysis is advisable. In highly active subjects, it may be useful to request a bimonthly haemogram and an iron metabolism test, if real monitoring is to be carried out. Hormone tests may be requested for workload monitoring on a bimonthly or quarterly basis, depending on the workload and whether monitoring is to be done.

See attached form.

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