

# Medical eligibility to participate in high-performance sports in children and adolescents

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Even though regular physical activity is one of the most effective ways to stay healthy [1], high-performance sports, due to the high intensity and frequency of training, may have significant detrimental consequences on a person's health, requiring a sports physician's expertise. The primary role of a sports physician is to ensure an athlete's medical eligibility and physical condition to participate in sports, followed by avoiding exacerbating any preexisting sports injuries and accompanying the athlete in further preventing new injuries and sport-specific accidents. Finally, sports injuries should be properly cared for and a return to sports must be organized in a manner as to conserve the patient's athletic future, be safe, and allow a progressive return to activity. In children and adolescents who aim at elite or high-performance athleticism, schedules including training for multiple hours per week as well as schooling leave little space for rest and physical recuperation. In addition to an initial medical eligibility assessment, sports physicians must accompany these athletes in order to avoid any exercise-related consequences on growth, bone development, metabolism and puberty, and overuse injuries [2-4].

## **I. Definition and organization of high-performance sports in France:**

Common use of the term "high-performance" relates to intense and competitive engagement in a given sport. In fact, this term refers to a very specific and thoroughly codified statute (Articles R221-1 to T221-2 of the Sports Code, Decree no. 2016-1286 from September 29, 2016 relating to high-intensity sports). The status of high-performance athlete is obtained after registering to the high-performance athlete list under the jurisdiction of the ministry responsible for sporting affairs. This registration requires a recommendation by the corresponding sporting federation and approval of the deputy national technical director. Furthermore, high-performance athletes may only apply to the high-performance athlete list if they have previously participated in international competitions in a given sport (of which the high-performance nature is recognized), if they qualify for a high enough performance level in a given sport, and if they were 12 years of age or older during the year in which they had applied to the ministerial list. Four different categories exist on the high-performance list: Elite, Senior, Youth, and Reconversion.

In addition to the high-performance athlete list, two additional categories exist:

- National collective athlete list: Includes athletes who did not meet the above criteria but whose integration in a national collective was deemed necessary. These may include training partners who were previously listed as high-performance athletes themselves who suffer from health-related issues (sports injuries), or even athletes with potential for future high-performance status.
- Hope athlete list: Includes athletes who have shown proficiencies in certain sports that are considered high-performance and who are testified by the deputy national technical director of the concerned sporting federation, but do not yet meet the criteria for registering to the high-performance athlete list.

Children and adolescents are mostly included in the Elite and Youth categories of the ministerial list and the Hope athlete list. An athlete can apply to the “Elite” list if they undertake a significant performance or obtain a significant rank during international benchmark tests (R221-4 Sports Code). Performance, rank and evaluations are identified in the Federal Performance Project of each sporting federation. Registration is valid for two years. Registration in the “Youth” category, the category concerning athletes selected for the French national team for an international competition, is valid for one year (R221-6 Sports Code).

Once registered on the ministerial high-performance or Hope lists, athletes have certain rights (e.g. access to national training facilities) and duties. A convention provided for in Article L. 221-2-1 of the French Sports Code determines the reciprocal rights and obligations of the sporting federations and elite athletes. These include directives regarding the medical follow-up of these high-performance athletes in the form of regulatory longitudinal medical monitoring.

## **II. Certificate of medical non-contraindication to the practice of a sport, reglementary aspects and concept of “playing-up”:**

Medical assessment for the eligibility to participate in sports has the ultimate goal of delivering the certificate of medical non-contraindication (CMNCI) to the practice of a sport. This certificate may be delivered after all clinical anomalies or pathologies susceptible of being exacerbated during physical activity have been ruled out. The delivery of such a certificate commits the professional responsibility of the physician and must therefore be based on a minute physical exam. The Sports Code clauses relative to this medical certificate have been modified by the law no. 2016-41 of January 26, 2016 for the modernization of France’s healthcare system, as well as that of August 24, 2016 that pertains to the medical certificate testifying the absence of contraindications to sports. One of the primary modifications concerns the intervals at which a new CMNCI to the practice of a sport must be issued in order to renew a sports license, which increased from 1 to 3 years: Health questionnaires (QS-Sport) must be administered on a yearly basis; in case of a change in the athlete’s health, the responses to this questionnaire will determine the delivery of a new CMNCI.

Obtaining a CMNCI is mandatory in order to receive an initial license allowing participation in an organized competition by the relevant sporting federation (said CMNCI must be no older

than 1 year). The renewal of a license depends on presenting every 3 years a CMNCI to participate in a sporting competition dating less than a year old, and a confirmation by the athlete that they have would have responded as negative on each section of the QS-Sport questionnaire, every year, even when a certificate was not required (CMNCI every year for high-risk athletes, detailed below). A CMNCI dating less than a year old is also necessary for participation in organized sports competitions by the authorized sporting federation (competitions such as select organized running competitions, including marathons, trails, and ultra-trails).

Some sports are known to induce excessive load on certain body parts and are thus deemed as high-risk sports (Sports Code: law no. 2016-41 of January 26, 2016 – article 219, D. 231-1-5 of the Sports Code):

1. Sports that require a specialized facility
  - a. Mountaineering
  - b. Underwater diving
  - c. Speleology
2. Competition combat sports in which knockouts are authorized
3. Sports including the use of firearms or pneumatic weapons
4. Sports requiring the use of motor vehicles in a competition setting, not including radio-controlled model vehicles
5. Sports requiring the use of aircrafts, not including model aircrafts
6. Rugby XV, rugby XIII and rugby VII.

Delivering an initial license to participate in sports with a high risk on the security or health of the athlete implies an annual medical follow-up specific to the type of sport. As a result, receiving or renewing a license are dependent on obtaining a CMNCI dating less than one year old, thus indicating the absence of contraindications to the participation in the specific sport (notably in competition).

Such certificates are delivered after a specific medical assessment detailed by the ministry responsible for health and sports (decree of July 24, 2017 pertaining to the characteristics of the specific medical assessment required to deliver the CMNCI to practice high-risk sports).

The medical assessment can be done by all medical doctors according to the recommendations of the French Society of Exercise and Sports Medicine (SFMES) and presents the following characteristics (Article A231-1 of the Sports Code):

1. For mountaineering below 2,500 meters in altitude:
  - a. Cardiovascular assessment;
  - b. History of or risk factors related to high-altitude-hypoxia justifying the need for a specialized or mountain medicine consultation;
2. For underwater diving: ENT (eardrum, Eustachian tube equilibration/permeability, vestibular examination, auditory acuity) and dental assessment;
3. For speleology: cardiorespiratory assessment; For cave diving, ENT (eardrum, Eustachian tube equilibration/permeability, vestibular exam, auditory acuity) and dental assessment;

4. For competition combat sports in which a fight might end, especially or exclusively, due to a knockout:
  - a. Neurological exam and mental health;
  - b. Ophthalmic assessment: visual acuity, visual fields, intraocular pressure and fundoscopy;
5. For sports including the use of firearms or pneumatic weapons:
  - a. Neurological exam and mental health;
  - b. Auditory acuity and assessment of the dominant upper limb for the biathlon;
  - c. Spinal exam in minors participating in upright shooting;
6. For competition sports including the use of motor vehicles:
  - a. Neurological exam and mental health;
  - b. Ophthalmic assessment (visual acuity, visual field, color vision);
7. For sports requiring the use of aircrafts:
  - a. Neurological exam and mental health;
  - b. Ophthalmic assessment (visual acuity, color vision);
  - c. ENT (eardrum, Eustachian tube equilibration/permeability, auditory acuity, vestibular exam) and dental assessment;
  - d. Shoulder exam for parachuting and paragliding;
  - e. Spinal exam for class 1 ultralight aviation pilots;
8. For Rugby XV and VII aged 12 to 39 years old, during and out of competition:
  - a. Cardiovascular assessment;
  - b. Spinal exam;
9. For Rugby XIII: orthopedic exam;

The concept of playing-up:

Playing-up corresponds to a special authorization given to a child allowing competition in a higher age category, including the adult category. Playing-up is managed by regulations and special forms specific to each sporting federation. Depending on the federation and each case, physicians may be faced with demands for playing-up at one, two or even three categories. Although a demand for a one-category advancement may sometimes be undertaken by general practitioners, two or three-category advancements require the expertise of a certified sports physician or a physician authorized by the corresponding sporting federation. The requests should then be validated by a federal (regional or general) physician and approved by the technical supervisory staff.

There is a lack in objective criteria for the appraisal of playing-up demands and the decision is generally left to either the examining or federal physician.

Nevertheless, the criteria for a playing-up request to be granted must ensure a physiological response by the athlete that is higher than that of the normative values for their age category. As a result, playing-up should not be granted to athletes with growth delay or if the intense physical training risks inducing a negative effect on growth. Playing-up demands must therefore be granted to athletes whose capacity to adapt to physical stress at least equals or surpasses that of their age category (maximal strength and recuperation during a maximal stress test).

### **III. Goals of the evaluation for the eligibility to participate in sports in children and adolescents**

Medical assessment for eligibility to participate in sports must answer the following principal questions:

- Is there any temporary or permanent contraindication to participate in sports (infectious, cardiac, respiratory, osteoarticular, muscular, psychological or addictive)?
- Are there risk factors for sports-related injuries (clinical or osteoarticular pathologies, working conditions)?
- Is there a history of or present illness that may increase the risk of injury when engaging in a given type of sport?
- Does the sport in question entail intense physical training that may require a specific medical assessment and screening of risk factors (overuse injuries, overtraining, burn-out, effect on growth, malnutrition...)? Such is the case of high-performance athletes.
- Have I properly adapted my physical examination according to age, practiced sport, type of practice, and level of the athlete (hobby, high-performance or playing-up)?

Intensive training is defined as a total training time superior to 10 hours per week in children older than 10 years or 6 hours per week in children younger than 10 years [5]. Only supervised training sessions are included in this definition, thereby allowing spontaneous recreational play for the child during their free time. As such, intensive training is defined by a threshold value that does not consider the intensity of the training sessions, which is generally the cause of overuse injuries [2]. Practically, the training sessions of young high-performance athletes surpasses 15 hours per week and may even reach 20 to 25 hours per week.

In order to reduce the risk of injury, it is recommended that children be allowed resting periods of one or two days per week and at least three months per year in one-month intervals [6].

The primary risks of intensive training include:

- Growth disturbance: delayed growth, deviation in the growth chart, delayed puberty and primary or secondary amenorrhea;
- Overuse injuries: microtraumatic damage to bone, muscle or tendon caused by repetitive biomechanical stress. The American Academy of Pediatrics has described 4 stages for these types of injuries [6]: 1) pain in the affected area after physical activity; 2) pain that occurs during the activity but does not restrict performance; 3) pain that occurs during the activity and restricts performance; and 4) chronic, unremitting pain, even at rest;
- Osteochondral lesions: see specifics in athletic children in paragraph 5;
- Loose body complicating a neglected osteochondral lesion;
- Stress fractures and muscle injury: due to abusive repetitions of certain exercises that may be more traumatic than others;
- Overtraining syndrome;
- Psychological risks: ill-systematized in a global context of athletic, academic and personal stressors. The stress of training, management of competitions, constant traveling, separation from family, stress of group living, and difficulties finding personal time in an academically and athletically full schedule. The expectation of a certain performance or the maintenance of said performance significantly adds to the multiple psychological risk factors and may induce a variety of psychological disorders,

ranging from anxiety to depression or substance abuse with the specific risk of doping. Specific questionnaires for the screening of stress, anxiety, depression, unhealthy eating habits, low self-esteem, and burnout may be used.

#### **IV. Medical assessment for eligibility to participate in sports: history and physical exam**

A thorough medical assessment is essential in order to collect all the required data for the delivery of a CMNCI to participate in sports, in the absence of findings requiring further investigation. In the setting of a presentation for any other complaint (symptoms during activity or at rest), a rigorous approach must be maintained in order to undertake an assessment that is as comprehensive as possible. The French Society of Exercise and Sports Medicine suggests the following [7]:

- Vital record and administrative information
- The child's environment:
  - Collection of data specific to the sport: the practiced sport, role, level of practice (from amateur to international), age at onset of training, age at onset of competition, and the motivations for the choice of the practiced sport (child's own, family or other). It is also essential to assess the volume and intensity of the practice (volume and duration of training sessions), the conditions of practice (terrain, equipment, engagement in a weight-category sport, climatic conditions...)
  - Collection of data specific to the environment: the home environment (divorce, siblings, family's perspective on the child's sporting practice), the number of trainers, group or individual sport
  - Collection of data on the academic environment: academic level, plans of academic future, presence of sports/study supervision
- History: Child athletes are still children and it is essential to include all of the elements of a pediatric physical examination:
  - Assessment of the child's health records
    - Verification of vaccination records depending on the latest recommendations;
    - History of childhood illnesses, allergies and drug contraindications, age of adiposity rebound: red flag if earlier than 6 years old (risk of obesity).
  - Past history
    - Medical and surgical history: Personal cardiovascular risk factors, history of or active or passive smoking (pack-year), alcohol consumption, cannabis use and/or other drugs. The presence of type I diabetes, overweight or obesity (BMI and control of the adiposity rebound age), cardiac pathologies (last resting electrocardiogram and/or echocardiogram), asthma (last pulmonary function testing), epilepsy, near-sightedness (last corrections), traumatic brain injury (with or without loss of consciousness), muscle pathology, neurological pathology, coagulation disorders, loss of function of a paired organ, genetic disorders, and history of trauma (previous injuries, recurring sprains);
    - First-degree family history: congenital diseases, diabetes, muscle pathology, genetic disorders, and coagulation disorders;

- Gynecological history: Age of menarche, regularity of menstrual cycle, use of contraceptives, HPV and Hepatitis B vaccines
- Treatments:
  - Information on the totality of medical treatments and nutritional supplementation of the athlete, absence of illegal substance use as per the World Antidoping Agency (WADA), follow-up on Therapeutic Use Exemption (TUE) in patients requiring a treatment that is included in the list of prohibited substances, reconciliation of the totality of non-medical treatments: physiotherapy, foot orthoses (orthotic insoles), other orthoses (knee or ankle braces), or prostheses in paraspots; evaluation of eyeglasses in patients with vision disorders.
- Lifestyle
  - Complete nutritional assessment: the number of meals and snacks per day, the quality of the food and/or adherence to any particular diet
  - Sleep: time of sleep and waking, quality of sleep, presence of nightmares (may be anxiety-related, but beware oxyurosis), enuresis.
  - Sedentary behavior: screen time (TV and/or video games, computer time, mobile phone).
- Functional symptoms leading to consultation: symptoms at rest and/or on exertion: musculoskeletal symptoms (occurrence, location and type of pain), cardiovascular and pulmonary symptoms, weakness, etc.

#### Physical exam

- Morphology and development: weight, height, body mass index, estimated adipose mass, wingspan, evaluation of growth, psychomotor development, pubertal stage (Tanner stage).
- Physical exam undertaken systematically with a particular attention to the patient's current concerns:
  - Cardiovascular and pulmonary exam: resting heart rate, bilateral blood pressure, peripheral pulses, cardiac auscultation to eliminate any bruits or murmurs, and pulmonary auscultation and cyanosis. The French and European societies of cardiology recommend systematically obtaining a resting ECG in patients aged 12 years or older, repeated every 3 years until 20 years of age and, in case of any anomalous findings, a stress-test may be suggested.
  - Orthopedic exam: spinal alignment disorders (nonstructural or structural scoliosis with an assessment of gibbosity on Adams forward bending test), lower limb deformities (genu valgum or varum), joint range of motion, muscle strength assessment, apophyseal tenderness, foot exam.
  - Digestive system, lymph node palpation, ENT (eardrum, sinuses, auditory acuity...), and dental assessment: dental follow-up, wisdom teeth, tooth alignment, oral parafunctional activities (e.g. bruxism).

#### **V. Specifics of child and adolescent high-performance athletes**

1. Microtraumatic pathologies [8]:
  - Osteochondral lesions: intense physical exercise leads to bony repercussions, especially at the ossification centers, leading to repetitive microtrauma and chronic inflammation: Osteochondritis (osteochondrosis). The diagnosis relies

on the presence of both mechanical pain and radiographic findings. Depending on the location of osteochondral lesion:

- Knee:
    - Osteochondral lesions of the tibial tuberosity (Osgood Schlatter disease): This pathology appears primarily in boys aged 11 to 15 years old and occurs mostly in sports requiring repetitive jumping (football, basketball, handball, etc.).
    - Osteochondral lesions of the tip of the patella (Sinding-Larsen-Johansson syndrome): Less frequently encountered than Osgood-Schlatter disease, Sinding-Larsen-Johansson syndrome affects children aged 11 to 13 years old who participate in sports with trauma to the knees (Figure skating, handball, etc.).
  - Foot and ankle:
    - Osteochondral lesions of the calcaneal apophysis (Sever's disease): This pathology preferentially occurs in boys aged between 10 and 13 years old and is more frequently found in practitioners of sports including sudden changes of direction and significant traction on the heel (football, gymnastics, etc.). The pain is usually localized at the level of the attachment of the Achilles tendon and is manifested by mechanical talalgia.
    - Osteochondral injuries of an accessory navicular bone (Köhler disease)
    - Osteochondral injuries of the growth plate of the base of the fifth metatarsal (Iselin disease).
    - Osteochondral injuries of the heads of the 2<sup>nd</sup> or 3<sup>rd</sup> metatarsals (Freiberg disease)
    - Osteochondral injuries of the sesamoid bones (Renander's disease)
  - Spine:
    - Osteochondral injuries of the spine (Scheuermann's disease): this pathology is equally called osteochondritis deformans juvenilis dorsi and causes sagittal deformities of the spine with loss of disc height. The following radiographic findings characterize Scheuermann's disease:
      - ◆ Vertebral endplate irregularities
      - ◆ Wedging of at least 3 adjacent vertebrae
      - ◆ Schmorl nodes or intravertebral disc herniations
      - ◆ Intervertebral disc narrowing
      - ◆ Limbus vertebrae
- Tibial periostitis: These injuries are induced by microtraumatic events at the level of the anteromedial aspect of the tibia. They are very frequently found in long distance runners and jumpers.  
Other overuse injuries may also be found in children: stress fractures, bone fragility, and tendinopathies.
  - Spondylolysis: defined by an acquired defect of the isthmus of the posterior vertebral arch and may be isolated or associated with spondylolisthesis. Patients with spondylolysis often present with tenderness during physical



activities requiring hyperlordosis and other significant mechanical stresses (diving, gymnastics, judo, Olympic style weightlifting, skiing, football, etc.), although they may also be asymptomatic. Even though spondylolysis essentially affects both isthmuses, unilateral affections are usually found in sports requiring repetitive unilateral torsion (tennis, Javelin throw). Symptomatic patients usually complain of pain (low back pain, sciatica and/or lumbosciatica), intermittent claudication and/or loss of lumbar lordosis.

2. Acute traumatic injuries [8]:

- Apophyseal avulsions: Often secondary to intense physical exercise, apophyseal avulsions occur primarily at the level of the pelvis (ischium, iliac spines, iliac crest, lesser trochanter, ischial tuberosity, and greater trochanter). Sports increasing the risk of these types of avulsions include football (soccer), athletics and gymnastics. This diagnosis must be considered in skeletally immature patients presenting with traumatic injuries that appear to be of muscular origin.
- Classic traumas: Ankle sprain (anterior talofibular and calcaneofibular ligaments), knee sprain and trauma (anterior cruciate ligament rupture), muscle injury after growth plate fusion (muscle tears, tears at the myoaponeurotic junction, etc.) and fractures.

3. Growth defects [9]:

Physical exercise may lead to failure to thrive. As a result, growth chart monitoring is essential: early adipose rebound before 6 years of age suggests obesity, and a deviation from the growth chart suggests hormonal disorders and/or unhealthy nutritional habits. In both cases, a more comprehensive assessment is required. In patients presenting with failure to thrive, gymnastics is often identified as a cause. In fact, intensive training in children is the essential element leading to growth defects by delaying growth spurt. Nevertheless, regular follow-ups are necessary in order to monitor the child's growth.

4. Child abuse:

Although sports are meant to be motivated the child's own ambitions, child athletes are often influenced by external pressures including the sporting federations and families. The former only work towards international recognition, which, in some countries, may lead to the detriment of the child's development. Furthermore, the family's motivations for athletic success may be influenced by secondary financial gains and social recognition (mediatized children, increased incomes). This set of motivations may lead to overtraining, psychological consequences (anxiety and depression, conduct disorders) and eating disorders (malnutrition, specific diets for weight-specific sports).

## **VI. Longitudinal medical follow-up of high-performance athletes:**

Adopted policies consist of placing athletes that are registered on the ministerial high-performance athlete lists, especially potential candidates for registration to these lists and athletes who are integrating the path of athletic excellence, on a specific medical surveillance.

This medical surveillance allows screening, preventing and limiting the risks that are related to high-intensity physical exercise.

The decree of June 13, 2016 concerned with the medical surveillance of high-performance athletes, Hope athletes and national collectives modernized the Sports Code (A231-3) in regard to the medical surveillance of athletes.

In the two months following their first registration to the ministerial list of high-performance athletes and annually afterwards, high-performance athletes must be submitted to:

1. A medical assessment by a sports physician:
  - a. A physical exam and history as per the recommendations of the French Society of Exercise and Sports Medicine (SFMES);
  - b. A dietary assessment and nutritional recommendations;
  - c. A psychological assessment in order to screen for psychopathological complications related to intense physical exercise;
  - d. Indirectly screening for overtraining syndrome through an elaborate questionnaire as per the recommendations of the SFMES;
2. Resting electrocardiogram

At the recommendation of the sports physician and under their responsibility, the psychological and nutritional assessment discussed above may be undertaken by a clinical psychologist and dietitian, respectively.

On this common basis, sporting federations may also include specific complementary exams. For athletes registered on the Hopes athletes list or included in the national collective, the contents and implementation of medical surveillance must consider the age, burden of training, specific physical stressors of the specific sport, morbidity and inherent risks of the type of sport.

The delegate sporting federations ensure the organization of the medical surveillance of their licensed athletes and may require complementary medical evaluations specific to the type of sport.

The French Federation of Rugby (FFR) serves as an interesting example since high-performance Rugby players require specific medical evaluations due to the traumatic nature of the sport. The longitudinal medical follow-up of these athletes is detailed in Annex no. XIV (medical regulation) of the General Regulations that dictate the regulatory environment relative to the management of Rugby in France [10].

As a result, the FFR has established specific evaluations in addition to the regulated medical exam for all athletes registered on the ministerial high-performance or Hope athlete lists.

As a result, rugby players must be subjected to the following medical exams:

1. Evaluation for proteinuria, glycosuria, hematuria, and urinary nitrites on a urine dipstick;
2. Resting transthoracic echocardiogram with a medical report;
3. In the absence of apparent anomalies on resting cardiovascular physical exam and the two preceding exams, a stress test at maximal intensity (coupled, if required, to the measurement of gaseous exchanges and to pulmonary function testing) realized by a physician, according to the most recent scientific data.

This stress test aims at screening possible abnormalities or lack of adjustment during exertion, which impose a specialist's opinion;

4. A dental assessment by a certified specialist;
5. An MRI of the cervical spine for the screening of cervical spinal stenosis in loose-head prop, hooker and tight-head prop positions after the age of 16 years;

The medical surveillance of these athletes includes:

1. Twice a year:  
A medical exam realized by a medical practitioner licensed in sports medicine including:
  - a. Medical interview;
  - b. Physical exam;
  - c. Anthropometric measurements;
  - d. Nutritional assessment and recommendations that may be aided by a specialist;
  - e. Search for proteinuria, glycosuria, hematuria, and urinary nitrites on urine dipstick;
2. Once a year:
  - a. Dental assessment by a certified specialist;
  - b. Standardized resting electrocardiogram with medical report;
  - c. After parental authorization for minors, a biological exam for athletes aged 15 years or more including a
    - i. complete blood count;
    - ii. reticulocytes;
3. A psychological assessment is conducted twice a year during a specific interview either by a physician or by a psychologist with medical supervision. This psychological assessment aims at:
  - a. Detecting psychopathological difficulties and personal and family factors of vulnerability or protection;
  - b. Preventing difficulties related to intense training;
  - c. Orienting toward management;
4. Once every four years:  
A maximal effort stress test
5. Candidates for registration to the high-performance athlete lists or Hope athletes who have already undergone an ECG before the age of 15 years must have another ECG between the ages of 18 and 20 years. For players in sports academies, varsity teams, France national teams or professional Rugby teams, in addition to the ones already planned for, complementary medical surveillance is ensured by the FFR.

Each concerned player must undergo the following exams:

- Cardiological assessment:
  - o Resting ECG every 2 years
  - o Stress test every 2 years
  - o Echocardiography every 4 years or at changing of status.
  - o An MRI of the cervical spine for players of all positions, to be reassessed in the case of new pathology or a change of status depending on the intervals set by the regulations.

- Preseason neurological assessment (concussion follow-up).
- Biological follow-up.

## Conclusion

Participation in sports, even at high-performance, must remain a vector for good health. It is thus imperative to ensure that the risks specific to each type of sport be maximally reduced. This requires a rigorous evaluation of the initial medical eligibility and a meticulous and regular medical follow-up. The primary objectives of this management are to accompany the child's performance, normal development and self-fulfillment.

## References

1. World Health Organization. Global action plan on physical activity 2018–2030: more active people for a healthier world. Geneva: WHO; 2018. <http://apps.who.int/iris/bitstream/handle/10665/272722/9789241514187-eng.pdf>.
2. Brenner, J.S., M. American Academy of Pediatrics Council on Sports, and Fitness, Overuse injuries, overtraining, and burnout in child and adolescent athletes. *Pediatrics*, 2007. 119(6): p. 1242-5.
3. Duclos, M., P. Barat, and Y. Lebouc, [Growth and elite sports practice in children]. *Arch Pediatr*, 2003. 10 Suppl 1: p. 207s-209s.
4. Georgopoulos, N.A., et al., The influence of intensive physical training on growth and pubertal development in athletes. *Ann N Y Acad Sci*, 2010. 1205: p. 39-44.
5. Intensive training and sports specialization in young athletes. American Academy of Pediatrics. Committee on Sports Medicine and Fitness. *Pediatrics*, 2000. 106(1 Pt 1): p. 154-7 Reaffirmed October 2014.
6. Brenner, J.S., M. Council On Sports, and Fitness, Sports Specialization and Intensive Training in Young Athletes. *Pediatrics*, 2016. 138(3).
7. Document téléchargeable aux adresses suivantes : <http://www.sfmes.org/sfmes/textes-utiles> ou [https://www.sfmes.org/images/sfmes/pdf/Visite\\_NCI.pdf](https://www.sfmes.org/images/sfmes/pdf/Visite_NCI.pdf)
8. Brunet-Guedj, E., Pathologies de l'appareil locomoteur chez l'enfant sportif, in *Traité de Médecine AKOS, E. Médico-Chirurgicale*, Editor. 2013. p. 1-8.
9. Grélot, L., Activités physiques et sportives de l'enfant et de l'adolescent : des croyances aux recommandations sanitaires. *Journal de Pédiatrie et de Puériculture*, 2016. 29: p. 57-68.
10. Annexe XIV: Règlement Médical de la Fédération Française de Rugby. <https://api.ligueidf.ffr.fr/wp-content/uploads/2019/07/RG-2019-20-Annexe-XIV.pdf>. 2019.