

# Contraindications to sports participation. Spanish Society of Sports Medicine (SEMED) Consensus Document. Version 2023

Pedro Manonelles Marqueta, Emilio Luengo Fernández, Luis Franco Bonafonte (coordinators), Helena Álvarez-Garrido, Miguel Archanco Olcese, Carmen Arnaudas Roy, Rafael Arriaza Loureda, Montserrat Bellver Vives, Raquel Blasco Redondo, Araceli Boraita Pérez, Daniel Brotons Cuixart, Josep Brugada Terradellas, Juan Calatayud Pérez, Aridane Cárdenes León, Gonzalo María Correa González, Miguel Chiacchio Sieira, Miguel Del Valle Soto, Vicente Elías Ruiz, Vicente Ferrer López, Bernardo J. Galmés Sureda, Pedro García Zapico, Teresa Gaztañaga Aurrekoetxea, Luis González Lago, Gonzalo Grazioli, Fernando Gutiérrez Ortega, Fernando Jiménez Díaz, Ricardo Jiménez Mangas, Kepa Lizarraga Sainz, Jeroni Llorca Garnero, Begoña Manuz González, Ignacio Martínez González-Moro, Silvia Monserrat, Zigor Montalvo Zenarruzabeitia, Juan Miguel Morillas Martínez, Elena Muñoz Farjas, Fernando Novella María-Fernández, Concepción Ocejo Viñals, José Luis Orizaola Paz, Nieves Palacios Gil de Antuñano, Javier Pérez Ansón, Francisco Javier Rubio Pérez, Fernando Salom Portella, José Sánchez Martínez, Ángel Sánchez Ramos, Luis Segura Casado, Nicolás Terrados Cepeda, José Luis Terreros Blanco

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### Summary

Main purpose of sports medicine is reaching the health care of the athlete, not only from the point of view of treatment, but also from the point of view of prevention. The performance of preparticipation medical sports evaluation, one of the main attributions of this specialty, is aimed at the discovery of pathologies, diseases or alterations that may affect health. They might range from situations that can trigger deadly incidents, to those without putting life at risk, can affect the health or performance of the athlete. Adequate implementation of preparticipation medical sports evaluation implies the diagnosis of medical problems that must be analyzed, from other points of view such as the perspective of fitness for sport practice. In addition, the doctor in charge must have a guide for clearance for sports practice. In case of non-authorization, time for non-sports activities must be recommended in order to decrease injury risks. Cardiovascular pathologies are the best-known contraindications in sport practice, treated extensively in the literature. However, there are also contraindications secondary to problems or issues of the rest of apparatus organs and systems of the organism, knowing that the athlete represents an entity in which physical exercise affects all their sets. This document highlights those contraindications already discussed above and analyzes the legal aspects of sports practice contraindications. Medical professionals are responsible for managing the pre-participation medical sports evaluation as well as the documentary aspects that support it.

### Key words:

Contraindication. Preparticipation medical sports evaluation. Ineligibility. Sports fitness. Consensus. Sports Medicine.

### Resumen

La función principal de la medicina del deporte es el cuidado de la salud del deportista, no solo desde el punto de vista del tratamiento, sino también desde el de la prevención. Los reconocimientos médicos para la aptitud deportiva, una de las atribuciones principales de esta especialidad, están destinados a descubrir patologías, enfermedades o alteraciones que pueden afectar a la salud, y abarcan desde las situaciones que pueden desencadenar incidentes mortales hasta las que, sin poner en riesgo la vida, pueden afectar la salud o el rendimiento del deportista. La realización adecuada de reconocimientos para el deporte implica el diagnóstico de problemas médicos que deben analizarse, entre otros puntos de vista, desde la óptica de la aptitud para la práctica deportiva, y el médico encargado debe disponer de una guía que le oriente sobre la decisión de autorizar o no la práctica de deporte, y en caso de no autorización, la temporalidad de esta y el riesgo asumible de participación en algunos deportes. Las contraindicaciones para la práctica deportiva mejor conocidas son las de origen cardiovascular, tratadas extensamente en la literatura, pero también existen contraindicaciones del resto de aparatos y sistemas del organismo, entendiendo que el deportista es un ser completo y que el ejercicio físico afecta a todo su conjunto. Este documento, además de recoger dichas contraindicaciones, analiza los aspectos legales que afectan a los profesionales en los que recae la responsabilidad de realizar los reconocimientos y los aspectos documentales que les son propios.

### Palabras clave:

Contraindicación. Reconocimiento médico deportivo. Exclusión. Aptitud deportiva. Consenso. Medicina del deporte.

**Correspondence:** Pedro Manonelles  
E-mail: pmanonelles@femede.es

## Introduction

Doing sport in today's society is not only an increasingly widespread fact of great social importance which involves more than half of the Spanish population, but it is also strongly recommended by the health authorities and scientific societies as a tool to combat sedentary lifestyles and chronic disease<sup>1-3</sup>. However, it is necessary to do sport in safe conditions to avoid the associated risks and make it as satisfactory as possible. There are risks inherent in sport that are difficult to avoid, such as those arising from accidents or overloading. However, it is possible to prevent many cases of sudden death (SD) or problems which are a consequence of medical conditions, alterations or diseases the athlete suffers. Pre-participation physical evaluations (PPE) serve to prevent these risks<sup>4</sup>.

Proper medical evaluations detect conditions which, in some cases, may constitute some kind of risk for the athlete. Hence the concept of suitability for sports activity, that is, the criterion which, after carrying out a medical examination which, in this case, is called a pre-participation physical evaluation, determines the suitability of the athlete or his or her unsuitability for medical reasons.

Determining unsuitability for sports activity means that it is necessary to set objective, established criteria to create a catalogue of contraindications so that decisions do not have to be based solely on the doctor's own criteria. Although, ultimately, it is the doctor who assumes the responsibility of authorising sports activity, there needs to be a document on which the doctor confirming the athlete's eligibility can base him or herself to establish this criterion.

The Spanish Society of Sports Medicine (SEMED) took on the task of drafting a consensus document on contraindications to sports participation in 2018<sup>5</sup>. This document was ground-breaking, because it included contraindications concerning systems which went beyond the cardiological systems which have commonly been used.

The development of knowledge and experience has made it necessary to write up a new consensus document of contraindications to sports participation which contains two significant modifications with respect to the previous one. Firstly, the contraindications by systems other than the cardiovascular system have been thoroughly revised and, secondly, the cardiovascular contraindications have been significantly readdressed in such a way that contraindications for conditions according to the cardiovascular demands that sport places on each athlete evaluated are included.

The aim of this document is to serve as a useful guide for the doctor who has to make the decision about the sports participation of people with some type of condition discovered in their pre-participation physical evaluation or previously known.

Although the fundamental purpose of pre-participation physical evaluations is to prevent SD, hence the significant content in the document on cardiovascular contraindications<sup>6</sup>, given that the athlete constitutes a unit of organs and systems, and sports activity affects the

entire body, it also covers diseases relevant to other systems which can be significantly affected by physical exercise in order to avoid aggravation or decompensation.

Despite the fact that this document is intended to address recommended contraindications to competitive sport (federated athletes of any level, including school and university), it should not be forgotten that many amateur athletes, outside regulated competition, do similar and sometimes even more intense training and engage in their sport with a highly competitive spirit. In this sense, and always at the discretion of the most responsible doctor, these recommendations also apply to this type of athlete and other physically active people. Therefore, it is possible to selectively apply the principles contained in this document to certain sports activities that do not meet the exact definition of 'competitive', although always bearing in mind that excessive and unnecessary restrictions can lead to physical and psychological problems (especially in childhood)<sup>7</sup>.

Although the document focuses mainly on contraindication standards for competitive athletes, especially federated ones, these guidelines may also be useful for physically active people in other circumstances, for example, police officers, firefighters and pilots<sup>8</sup>, as well as those who take part in certain recreational sports activities and other physically active people.

Some of the criteria used are based on the opinion and experience of the authors of the document, and some are based on solid scientific evidence, but many others are presented in the knowledge that there is a lack of experience in the subject and that further studies are needed which should be taken into account in future editions of the document. In all events, it is a guide that should be used in the context of each medical condition and each specific patient, and it is up to the doctor to make the most appropriate decision in each case.

The indications and contraindications included in this guide provide decision support for sports doctors, who must reach their conclusions on the basis of the clinical data provided by the athlete or the clinical tests carried out. In no way should they replace correct clinical criteria based on the experience of the doctor and an appropriate, personalised medical act for the athlete or patient and the special circumstances at play in each situation.

## Definitions

There now follows a list of exact definitions of some of the terms used in this consensus.

**Competitive athlete.** An athlete who participates in an organised team or individual sport which requires regular competition against others as a core component, attaches great importance to excellence and achievement, and requires some form of systematic and generally intense training<sup>9</sup>.

**Pre-participation physical evaluation<sup>4</sup>.** An evaluation or examination carried out by a doctor on an athlete in order to determine if the

latter is eligible for sports activity or if such activity is contraindicated for them.

Contraindications to sports participation<sup>4</sup>. Indicating that sports activity can, in certain cases, be harmful. Such contraindications establish the existence of a state or condition, especially pathological ones, which render sports inappropriate or dangerous. The diagnosis of any contraindication leads to recommending the limitation or impossibility of doing sport, and denying, where appropriate, the issuance of the relevant sports licence.

*Medical certificate*<sup>10</sup>. Written statement from a doctor attesting to a person's state of health at any given time.

*Most responsible doctor*<sup>10</sup>. Professional in charge of coordinating the information and health care of the patient or user, acting as their main contact in everything related to attention and information during the healthcare process, without prejudice to the obligations of other professionals who participate in the actions.

*Patient*<sup>10</sup>. A person who requires health care and is subject to professional care for the maintenance or recovery of their health.

*User*<sup>10</sup>. Person who uses health education and promotion, disease prevention and medical information services.

## Medical-legal considerations

From the recognition of the right to health protection and the responsibility of the public authorities to organise and protect public health through preventive measures, among other things, as indicated in the Spanish Constitution<sup>11</sup>, stem various rules to develop application.

The General Health Act<sup>12</sup> regulates all those actions aimed to fulfil the right to health protection for all Spaniards and foreign citizens who have established their residence in the country. The General Public Health Act<sup>13</sup> addresses the preventive aspect and health protection and promotion, regulating ways to encourage, protect and promote people's health, including physical exercise.

The Health Protection Act<sup>14</sup> establishes a framework for health prevention in the field of sports of general application, understanding as 'health protection in the field of sport the set of actions that the Public Authorities demand, drive or carry out, according to their respective fields of competence, to ensure that sports are performed in the best conditions for the health of athletes and to prevent any harmful consequences which may arise as a result of sports activity, especially in top-level sport'.

The law includes, as a specific minimum measure to protect the health of athletes, the performance of medical evaluations prior to the issuance of federation licenses in those sports where it is considered necessary to better prevent risks to the health of the athletes involved.

The priority objective of pre-participation physical evaluations is not only to reduce the incidence of SD in athletes but also to prevent health problems and, clearly, to determine the absolute or relative, permanent or temporary medical contraindications to sports participation, barring those individuals who are at risk<sup>4</sup>.

It is, therefore, essential to know which conditions can affect, to a greater or lesser extent, the health of an athlete and establish the applicable contraindications.

Because cardiovascular disease is the most important cause of SD in athletes<sup>15,16</sup>, there is a large body of work establishing cardiovascular contraindications to sports participation<sup>17-30</sup>.

There is much less literature available regarding the other diseases and conditions which should be taken into consideration from the health protection perspective<sup>18,31-37</sup>.

From a medical point of view, it is important to have a suitable guide covering contraindications of all kinds and that such a guide is, as a matter of course, revised according to the knowledge gained of the repercussions that sport and physical exercise can have on the health of athletes. Furthermore, and by no means less importantly, this guide should serve to support medical decisions regarding the specification of contraindications from a legal and judicial point of view, as indicated in the system of physical evaluations proposed by the Higher Sports Council<sup>18,31</sup>.

Athletes, as individuals with health-related rights, have a series of rights safeguarded by law aimed at protecting their health both as patients, when they suffer a pathological process which requires health care, and as users, when they need health services aimed at prevention. These include the right to information about their health endorsed by the most responsible doctor<sup>10</sup>.

Therefore, the doctor, within his/her obligations to play an active role to benefit the health and well-being of people in health and disease situations, especially in the field of prevention<sup>38</sup> and information, must warn them of the relevant or significant consequences and risks of, and contraindications to sports participation.

## The professionals who decide contraindications

The contraindication to sports participation must be made by a doctor who has the appropriate knowledge, experience and responsibility. It is clear that the professionals with these characteristics are doctors who specialise in Physical Education and Sports Medicine. However, other doctors may point out contraindications if they meet the indicated requirements.

To issue the decision of participation or contraindication of any kind, the doctor should use as a guide the classic sports classification<sup>39</sup> (Appendix 1), based on the varying intensities of dynamic and static demands (low, medium, high), the one based on the possibility of contact or risk of body collision (Appendix 2) and the risk to life in the event of syncope (Appendix 3). However, it should be remembered that the demands of training and competition can vary between sports and also within the same sport, that the intensity of training can be greater than that of competition and that different levels of physical activity can affect underlying (and unsuspected) cardiovascular diseases and other

diseases unpredictably and in different ways. Furthermore, it is difficult to accurately evaluate or take into account exercise intensity in several sports due to a variety of factors, particularly motivational attitudes.

Sports participation recommendations or decisions should be based on probable or confirmed diagnostic tests and not involve ambiguous, possible or dubitable diagnoses.

In many cases it is necessary to consult a specialist in a specific area, with whose help the most responsible doctor makes the contraindication or who establishes it him/herself.

The importance of establishing a contraindication, especially an absolute contraindication, calls for the exercise of great responsibility by the doctor who makes it, who must spare no effort to make the decision in the most objective and appropriate way, based on the criteria described in this document.

## Justification for the consensus

The Spanish Society of Sports Medicine adopted various initiatives as a means of preventing SD and protecting the health of athletes, including the recently published consensus document on pre-participation physical evaluations<sup>4</sup>.

One possible consequence of health research, even when focusing on athletes, is the discovery of alterations, conditions or diseases which imply a declaration of unfitness for sports participation. This implies the existence of some type of contraindication to sports participation. When the consensus document on evaluations was drafted, the need to create a list of contraindications was recognised and it was decided that they should be independent documents so that they would not be so difficult to handle and could be updated separately when required.

The justification for this consensus document, an update of the previously published document<sup>5</sup>, is the establishment of a guide to help the most responsible doctor make the appropriate decisions on participation in or contraindication to sports and to serve as legal protection, insofar as possible, for decision-making in their professional practice. This new consensus includes an update on all the conditions reviewed in the previous one with the modifications discussed above.

## Documentation

The performance of a pre-participation physical evaluation should lead to two types of documents<sup>4</sup>: a medical report and a PPE report.

### Medical report

Confidential report for the athlete only (or his/her father, mother, guardian or legal representative if he/she is a minor), it should be handed over personally. It should include:

- Personal details of the athlete.

- Sports details.
- Description of tests carried out and protocols applied.
- Results obtained in these tests.
- Evaluation of the results.
- Copy of the PPE report.
- Documentation on the contraindications in the PPE report (cause, future requirements to lift a contraindication, any necessary complementary studies or reports which need to be provided).
- Other contraindications other than those of the sport and speciality requested.
- Medical-sports advice for the participation in his/her sport in the best conditions of health and safety.
- Any other information that the doctor wishes to give the athlete.

### PPE report

Document to be submitted by the interested party to the relevant sports federation or requesting entity. This report will only express:

- Degree of fitness for sport, indicating very briefly:
  - Eligibility for the specific sport and speciality in question.
  - Existing contraindications to the specific sport and the speciality in question (stating whether these are definitive or temporary, and in the latter case the expected period of contraindication).
- Time for the next sports medical (SM), which by default is 2 years, but may be shortened by the doctor performing the medical.

This document should avoid including all types of medical information: diagnosis, complementary studies, advice, treatments, etc.

## Contraindications to sports participation

The following types of contraindications exist:

- Absolute and definitive: definitive contraindication to participation in any sport or sport modality.
- Absolute and temporary: temporary contraindication to participation in any sport or sport modality. In this case, the period of contraindication or requirements for the contraindication to be lifted in the future should be specified in the final SM report. The period of contraindication should also be reflected in the PPE report.
- Relative and definitive: definitive contraindication to participation in a specific sport or modality. In this case, the contraindicated sports or modalities should be specified in the final sports medical (SM) report and on the fitness for sports certificate (FSC).
- Relative and temporary: temporary contraindication to participation in a specific sport or modality. In this case, both the contraindicated sports or modalities should be specified, together with the period of contraindication, (all in the final SM report and on the FSC), or the requirements for the contraindication to be lifted in the future (only in the final SM report).

Below are the contraindications to sports participation. Cardiovascular contraindications are discussed in various sections because there

is a lot of experience in the subject and documentation on them, and they require more extensive treatment.

There are significant descriptions of other contraindications by systems after that.

### Cardiovascular contraindications

General note on the use of the cardiovascular contraindications table.

The tables of contraindications presented below provide an adequate and reasonable guide for decision-making regarding the declaration of fitness to do a sport, complementing and guiding the good judgment and reasoned clinical judgment of the examining doctor.

A colour system has been used to more easily identify eligibility under each condition (Table 1).

### Valvular heart disease

The incidence of valvular disease is still relevant due to non-rheumatic degenerative aetiologies and congenital valvular diseases<sup>40</sup>. In these diseases, exertion acts as a trigger and limiting factor for many of the symptoms, so it is important to define the criteria for sports activity and

its contraindication<sup>19,20</sup>. Symptomatology is very helpful in deciding the management of these patients and four stages of valvular disease have been defined which can be useful in establishing recommendations and limitations on sports participation<sup>39</sup>.

- Stage A: asymptomatic patients at risk of developing valvular stenosis or major valvular insufficiency. These patients have symptoms typical of their condition, such as murmurs, but do not have a malfunctioning valve.
- Stage B: asymptomatic patients with mild or moderate valvular disease and normal left systolic ventricular function.
- Stage C: asymptomatic patients with severe valvular disease, with evidence of preserved systolic ventricular function (stage C1) or left ventricular dysfunction (C2).
- Stage D: symptomatic patients with severe valvular disease, with or without left ventricular dysfunction.

This classification is of interest from the point of view of contraindications because patients in stages A, B and C, while asymptomatic, can participate in physical and sports activity, while those in stage D, symptomatic, cannot do so and must receive surgical treatment.

Table 2 describes the contraindications for valvular diseases and their degrees of application.

**Table 1. Eligibility indication classes: for the sport or sports speciality evaluated for competitive activity in a federation context.**

Class	Colour	Description	Details
RED	R	INELIGIBLE	Cardiovascular demand is evaluated taking into account the dynamic and static component of the sport/speciality evaluated, together with the exercise associated with training and physical preparation in terms of intensity, duration and type. Likewise, the load that the competitive component implies for the subject in the sport and, possibly, in the evaluation test.
ORANGE	O	ELIGIBLE for sports with low cardiovascular demand	
YELLOW	Y	ELIGIBLE for sports with up to moderate cardiovascular demand	
GREEN	G	ELIGIBLE	

**Table 2. Cardiovascular contraindications. Valvular heart diseases<sup>17-20, 42,43</sup>.**

Condition	Level of severity	Details	Class	Follow-up needed
Aortic valve stenosis	Severe	With or without symptoms Group selected with EF >50%	R	SI or 6 months
	Moderate	WITH marker of severity: - EF<50% LV ejection fraction - Stress test with symptoms, poor FC or lowering BP - ARR complex ventricular arrhythmia	O	Referral for evaluation by HT
		NO marker of severity	G	1 year
	Mild	NO symptoms	G	1 year
	Bicuspid	NO severe stenosis and NO aortic dilatation	G	1 year

(continued)

**Table 2. Cardiovascular contraindications. Valvular heart diseases17-20, 42,43 (continuation).**

Condition	Level of severity	Details	Class	Follow-up needed
Aortic insufficiency	Severe	With symptoms	R	SI
		NO symptoms + WITH marker of severity - EF ≤50% LV ejection fraction - LVESV >25 mm/m <sup>2</sup> or LVESD >50 mm - ARR complex ventricular arrhythmia - Abnormal stress test	R	SI
		NO symptoms + NO marker of severity	G	6 months
	Moderate	WITH marker of severity:	Y	6 months
		NO marker of severity	G	1 year
Mild.		G		
Mitral stenosis	Severe		R	
	Moderate	WITH pulmonary hypertension PAPs >40 mm Hg (rest/exercise)	R	
		WITHOUT pulmonary hypertension PAPs <40 mm Hg and without symptoms (rest/exercise)	O	1 year
	Mild.	WITHOUT pulmonary hypertension PAPs <40 mm Hg (rest/exercise)	G	
Mitral insufficiency	Severe	WITH symptoms	R	
		NO symptoms + WITH marker of severity - EF <60% LV ejection fraction - LVEDD ≥60 mm, LVEDV ≥35.3 mm/m <sup>2</sup> H, ≥40 mm/m <sup>2</sup> M. - Abnormal stress test - PAPs at rest ≥50 mmHg	R	
		NO symptoms + NO marker of severity	O	6 months
	Moderate	WITH symptoms	R	
		NO symptoms + WITH marker of severity - EF <60% LV ejection fraction - LVEDD ≥60 mm, LVEDV ≥35.3 mm/m <sup>2</sup> H, ≥40 mm/m <sup>2</sup> M. - Abnormal stress test - PAPs at rest ≥50 mmHg	R	
		NO symptoms + NO marker of severity	G	6 months
	Mild.		G	1 year
Mitral valve prolapse		Reference will be made to the MI presented by the person evaluated		
Tricuspid stenosis	Moderate-severe	WITH symptoms, IVC dilatation without respiratory variation, severe dilatation of the right atrium	R	6 months
		NO symptoms	O	6 months
	Mild (mean gradient <5 mm Hg)	NO symptoms	G	1 year
Tricuspid insufficiency	Severe	WITH pulmonary hypertension and RA Pressure >20 mmHg	R	
		WITH pulmonary hypertension and (rest/exercise) >50 mmHg	O	6 months
		NO pulmonary hypertension	Y	6 months
	Mild-Moderate	NO pulmonary hypertension and normal RV	G	1 year
Multivalve		At least the most severe of the valve heart diseases or at least the one that involves the highest degree limitation for fitness in this case will be evaluated. Evaluate exercise echocardiogram		
Anticoagulated		For sports with RISK OF FALLING, CONTACT, COLLISION	R	
Heart transplants			O	1 year



### Congenital heart diseases

All the great advances in knowledge and treatment of congenital heart diseases have led to an improvement in the physical condition of children with heart disease, allowing them to perform a greater number of physical activities, including participation in sport<sup>44</sup>.

Recommendations on the participation of patients with heart disease in physical or sports activities are difficult due to the difficulties in quantifying myocardial exertion during exercise, which depends on the type of activity and the congenital heart disease involved<sup>19,20</sup>.

In congenital heart disease, it is important to take into account its severity and possible symptoms, and evaluate the functional situation through a stress test (ST). In general, in most cases some type of exercise is allowed, although contraindications and recommendations must be established on an individual basis.

Table 3 describes the contraindications for congenital heart diseases and their degrees of application.

**Table 3. Cardiovascular contraindications. Congenital heart diseases<sup>18,21,45-48</sup>.**

Condition	Level of severity	Details	Class	Follow-up needed
ASD VSD APVD PDA following closure of any defect		Symptoms (syncope, chest pain, palpitations, dyspnoea) or any of the following 1. RV dysfunction (for ASD and APVD) or with LV dysfunction (for VSD or PDA) EF <45% 2. Tricuspid insufficiency >3.5 m/s suspected (right catheterisation PAP m >20 mm Hg or PVR >3 wu) 3. Dilation of aorta 4. Arrhythmias: Uncontrolled AF or AFL, ventricular ARR, NSVT, PVC with exercise, or AVB2 or AVB3 5. Baseline or exercise desaturation (<95%)	R	Evaluate treatment and 3-6 months after closure
Avoid underwater diving pre-closure, avoid high altitudes with pulmonary hypertension or cyanosis	Only mild RV or LV dysfunction EF 45-50%		O	6 months
	Only tricuspid insufficiency 2.8-3.5 m/s and no RV dysfunction (for ASD and AVDP) or LV (for VSD or PDA) with right catheterization PAP >20 mmHg or PVR (pulmonary vascular resistance) >3 WU (Wood Units)		Y	6 months
	Only controlled atrial arrhythmias (AF or AFL), or only PVC >500 h/24 h, doublets that disappear with exercise		Y	6 months
	All normal (No symptoms or arrhythmias, TrI < 2.8m/s and no RV (for ASD and AVDP) or VI dysfunction (for VSD or PDA))		G	1 year
AV canal repaired		Same as ASD, AVDP, VSD or PDA, and depending on residual valve injury (MI or MS, TI or TS), see valvular heart diseases	G	
Right ventricular outflow tract obstruction	Severe	Severe: Transpulmonary gradient >60 mm Hg, or maximum velocity >4 m/s (severe)	R	6 months (if moderate TI progression, RV dysfunction, R-L shunt or SI symptoms)
	Moderate	Moderate: Transpulmonary gradient 40-60 mmHg or maximum velocity 3-4 m/s	O	6 months
	Mild.	Transpulmonary gradient <40 mm Hg or maximum velocity <3 m/s	G	1 year
Tetralogy of Fallot Rule out fibrosis with NMR, and if risk criteria for sudden death, perform EPS		Symptoms: Syncope or palpitations or any of the following 1. RV or LV dysfunction with EF <45% or severe RV dilatation (>160 ml/m <sup>2</sup> ) with severe PI 2. Right ventricular hypertension (>50% of systemic pressure) 3. Severe ascending aortopathy >50 mm 4. Uncontrolled atrial or ventricular arrhythmia, QRS ≥180 msec, fractionated QRS, QT scatter, extensive fibrosis in NMR, NSVT on Holter or VT induction in EPS. 5. Baseline or exercise desaturation <90% Other risk criteria: long-lasting palliative shunts, repair at older age, LV end-diastolic pressure >12 mm Hg, coronary anomalies	R	Evaluate treatment
		Only one of the following: - Severe pulmonary insufficiency with slightly dilated RV and RV EF >55% - Moderate RVOT obstruction - Aorta 45-50 mm - Baseline or exercise desaturation 90-95%	O	6 months
		Only one of the following: - RV or LV EF 45-50% - Moderate pulmonary insufficiency. - Aorta 40-45 mm - Controlled atrial or ventricular arrhythmia	Y	1 year

(continued)

**Table 3. Cardiovascular contraindications. Congenital heart diseases<sup>18,21,45-48</sup> (continuation).**

Condition	Level of severity	Details	Class	Follow-up needed
Tetralogy of Fallot Rule out fibrosis with NMR, and if risk criteria for sudden death, perform EPS	Asymptomatic and without risk criteria:	1. LV and RV EF >50% and RV size normal or slightly increased or mild PI 2. No or mild RVOT obstruction 3. No aortopathy. Aorta <40 mm 4. No arrhythmia on Holter, normal stress test and no significant fibrosis in NMR. 5. Baseline or exercise desaturation Sat O <sub>2</sub> >95%	G	1 year
Cyanotic heart disease without surgery	Symptomatic for cardiac insufficiency		R	
	Asymptomatic. Sat O <sub>2</sub> 90-95% without risk criteria		O	
Transposition of the great arteries, atrial switch procedure (Mustard and Senning: DO not do sports with high static component (III)) or congenitally corrected	Risk criteria:	1. Systemic RV EF <40-45% 2. Right ventricular hypertension (>50% of systemic pressure) 3. Severe ascending aortopathy >50 mm 4. Recurrent or uncontrolled atrial or ventricular arrhythmia, VT on Holter or stress test or significant fibrosis in NMR. 5. Sat O <sub>2</sub> <90% Other risk criteria: Previous VSD, QRS >180 msec, fractionated QRS, CI, ischaemia, coronary abnormalities.	R	
	Atrial switch: No risk criteria and normal stress test		O	
	CCTGA : No risk criteria and normal stress test		O	
Operated transposition of great arteries (anatomical correction – Jatene arterial switch) Coronary CT angiography: Rule out coronary stenosis or angulation	Only one of the following:	- Myocardial ischaemia in stress - Ventricular dysfunction EF <45% - Severe neo-aortic insufficiency with dilated LV and LV EF <55% - Severe pulmonary stenosis	R	
	Only one of the following:	- Severe neo-aortic insufficiency with dilated LV and LV EF >55% - Moderate pulmonary stenosis	O	
	Only one of the following:	- Moderate-severe neo-aortic insufficiency. - Mild ventricular dysfunction EF 45-50% with normal stress test	Y	
	Asymptomatic. Mild neo-aortic insufficiency, mild pulmonary stenosis	1. LV and RV EF >50% 2. No or mild RVOT obstruction 3. No aortopathy. 4. No arrhythmia on Holter, normal stress test 5. No residual short circuit	G	
Total cavo-pulmonary shunt – Fontan rocedure	Symptoms of CI or risk criteria		R	6 months
	Asymptomatic for cardiac insufficiency and without risk criteria:	1. LV and RV EF >50% 2. No or mild RVOT obstruction 3. No aortopathy. 4. No arrhythmia on Holter, normal stress test 5. No residual short circuit Sat O <sub>2</sub> >95% Normal stress test (no ischaemia or arrhythmias or arterial hypotension)	O	6 months
Ebstein's anomaly	Severe TI with symptoms or any of the following:	1. Moderate-severe RV and/or LV dysfunction EF <45% or RV moderately-severely dilated 2. Right ventricular hypertension (>50% of systemic pressure) 3. Dilation of aorta >50 mm 4. Uncontrolled atrial arrhythmias or malignant ventricular arrhythmias 5. Baseline or exercise desaturation <90%	R	Evaluate treatment
	Severe TI with only mild RV and/or LV dysfunction EF 45-55% and non-significant or non-malignant arrhythmias (infrequent isolated PVCs) Severe tricuspid insufficiency with mildly dilated RV and RV EF >55%		O	Evaluate treatment (stress test with gas and proBNP)

(continued)



**Tabla 3. Contraindicaciones cardiovasculares. Cardiopatías congénitas<sup>18,21,45-48</sup> (continuation)**

Condition	Level of severity	Details	Class	Follow-up needed
		Mild, moderate, severe TI without symptoms 1. No RV and/or LV dysfunction, with RV not dilated 2. No arterial hypertension 3. No dilation of aorta 4. No arrhythmias 5. No baseline or exercise desaturation	G	
Untreated coarctation of the aorta (avoid isometric exercise)		1. Aortic dilatation score ≤3.0 2. Systolic blood pressure gradient between right upper and lower limbs < 20 mm Hg 3. Systolic blood pressure peak <95 <sup>th</sup> percentile predictable by age (stress test with BP <220 in men and <200 mm Hg, in women)	G	1 year
		Exceed any of the 3 items above	R	6 months
Coarctation of the aorta treated with stenting or surgical repair (avoid isometric exercise)		After 3 months when all these points are presented: 1. Aortic dilatation z score ≤3.0 2. Systolic blood pressure gradient between right upper and lower limbs <20 mm Hg 3. Peak systolic blood pressure <95 <sup>th</sup> percentile predictable by age 4. No aneurysm associated with the coarctation 5. No aortic valvular disease that contraindicates it N.B. Evaluate association with bicuspid valve which could be [Y]	G	1 year
		Aortic dilatation z score >3 With aneurysm associated with the coarctation N.B. Evaluate association with bicuspid valve which could be [O]	Y	6 months
Turner syndrome		ASI >25 mm/m <sup>2</sup>	R	Evaluate SI (bicuspid, elongated transverse aortic arch, CoA, and/or arterial hypertension)
		ASI (aortic size index) 20-25 mm/m <sup>2</sup>	O	6 months
		Non-dilated aorta	G	1 year
Anomalous origin of coronary arteries		Course between aorta-pulmonary and origin with acute angle (particularly common trunk from right coronary sinus), including incidental detection and other coronary anomalies with symptoms (angina, or syncope or sudden death) or exercise echocardiogram positive for ischaemia or arrhythmias	R	Evaluate SI
		Coronary artery from the pulmonary artery (except when previous infarction or pending surgery) with rest normal RC from left coronary sinus with rest normal, individualise	O	1 year
		No previous criteria 3 months after successful SI without ischaemia or arrhythmias	G	1 year

**Myocardial and pericardial diseases**

Myocardial diseases have a high probability of causing SD, especially hypertrophic cardiomyopathy, the most frequent cause of SD in young athletes in the United States<sup>15</sup> and the second most frequent in Spain<sup>16</sup>.

Table 4 describes the contraindications for myocardial diseases and their degrees of application.

**Arrhythmias and conduction disorders**

A wide range of heart rates and rhythms, specific arrhythmias and atrioventricular and intraventricular conduction disorders can be observed in athletes.

Arrhythmias and cardiac conduction disorders should be considered in a global context when they are discovered in an athlete due to the important relationships between physical exercise and the cardiovascular system.

In general, arrhythmias can be classified as benign, paraphysiological or malignant<sup>19,20</sup>.

They are considered benign when they do not present an arrhythmogenic substrate, do not have haemodynamic consequences when they appear during sports activity and do not constitute a vital risk for the athlete. The hypoactive arrhythmias typical of athletes are called paraphysiological arrhythmias (sinus bradycardia, wandering pacemaker, type I second degree atrioventricular block, junctional rhythms, etc.), which appear mainly during situations of vagal predominance and usually disappear with exertion, physical activity and emotions. Finally, arrhythmias with serious haemodynamic consequences during physical activity are considered malignant, can put the athlete's life at risk and are indicative of arrhythmogenic heart disease.

Table 5 describes the contraindications for arrhythmias and cardiac conduction disorders, and their degrees of application

**Table 4. Cardiovascular contraindications. Myocardial and pericardial diseases<sup>18-22</sup>.**

Condition	Level of severity	Details	Class	Follow-up needed
Pericarditis	Acute	Until full resolution of signs and symptoms	R	Temporary until control
	Recurrent	Until full resolution of signs and symptoms	R	Temporary until control
		NO marker of severity	G	1 year
	Chronic constrictive		O	1 year
	Chronic pericardial effusion		MODERATE or SEVERE or WITH haemodynamic impact	R
MILD or MODERATE or SEVERE and WITHOUT haemodynamic impact			G	
Myocarditis (Myopericarditis)	Acute	Until end of acute symptoms	R	
	3 months after acute symptoms	NO symptoms or marker of severity - LV dysfunction of any kind - Persistent pericardial effusion - ARR complex (ventricular) arrhythmia - ECG not normalised	R	3 months
		NO symptoms + NO marker of severity	G	
Hypertrophic cardiomyopathy	Reasons for suspicion	- Certain family history of hypertrophic cardiomyopathy - Syncope (with no identified cause) - Unexplained chest pain - Palpitations - ECG with indicative or suspicious alterations		Referral to specialised HT evaluation
	1 or more criteria...	- Syncope studied and with no identified cause - ARR complex ventricular arrhythmia - LVH severe ventricular hypertrophy, with tissue confirmation of risk - Intolerance or poor haemodynamic response to exercise - Presence of any mutation involving risk	R	
		If the subject only meets one of the above criteria, and NOT severely, and only in sports that do not pose a personal risk to the athlete or to third parties	G	6 months (failure to pass is cause for non-fitness)
Dilated cardiomyopathy	1 or more criteria...	- EF <50% LV ejection fraction - LV end-systolic diameter >35mm/m <sup>2</sup> - ARR complex ventricular arrhythmia	R	
		If the subject only meets one of the above criteria, and NOT severely, and only in sports that do not pose a personal risk to the athlete or to third parties	G	6 months (failure to pass is cause for non-fitness)
Arrhythmogenic dysplasia	With correct clinical diagnosis		R	

**Table 5. Cardiovascular contraindications. Arrhythmias and conduction disorders<sup>18-22</sup>.**

Condition	Level of severity	Details	Class	Follow-up needed
Bradycardia	- Sinus - 1AVB - 2-1 AVB Wenckebach - 2-2 AVB Mobitz	- Asymptomatic at rest and during exercise - No underlying structural disease - With adequate exercise-induced tachycardisation	G	
		- Any bradycardia: symptomatic, with structural disease, with poor tachycardisation - High grade 2AVB - 3AVB - High grade sinoatrial block	R	Until appropriate treatment
Bundle branch block or fascicular block	Incomplete RBBB to QRS <120ms - RBBB QRS >120 ms, LBBB, AFB, PFB - Any combination of branch blocks		G	
			R	Until heart disease is ruled out

(continued)

**Table 5. Cardiovascular contraindications. Arrhythmias and conduction disorders<sup>18-22</sup> (continuation).**

Condition	Level of severity	Details		Class	Follow-up needed
Ventricular extrasystole	-- No heart disease - No channelopathy - Non-exercise induced			G	Once heart disease is ruled out
	- Severe/complex - Exercise induced			R	Until heart disease is ruled out
	N.B. The degree of fitness will depend on the underlying heart disease, if discovered				
Atrial fibrillation	WITH structural disease		Refer to underlying structural heart disease		
	NO disease	Adrenergic	Exercise-induced AF in young athlete	R	Until diagnosis
		Others	With poor HR control with exercise	Y	
			With good HR control with exercise	G	
N.B. The limitation induced by possible anticoagulation must be evaluated ( <i>vide retro</i> )					
Atrial flutter			R	Diagnosis and treatment	
Supraventricular tachycardia	Due to nodal re-entry	Detected or symptomatic	Until electrophysiological study (EPS) and successful ablation (ABL) after that: <b>G</b> , other heart disease ruled out	R	
		Asymptomatic	Chance finding Commitment to electrophysiological study/ ablation within 6 months, which if it not done will lead to loss of eligibility for the specific sport	G	Before 6m: EPS/ABL or... INELIGIBILITY
Channelopathies	Properly defined with genotype and phenotype	Brugada Syndrome	WITH increased repolarisation alterations typical with/after exercise, or extreme endurance sports or high ambient temperature risk	R	
			NO previous data	G	
		Catecholamine-induced VT		R	
		Prolonged QT		R	
		Other channelopathies: there are no data at present to be able to provide adequate information in athletes			
Ventricular tachycardia	NO underlying heart disease	Until effective treatment		R	
		AFTER treatment		G	
	WITH structural heart disease			R	
Pre-excitation	Pre-excitation NO demonstrable or inducible SVTs and no risk criteria (fast AV conduction pathway) in electrophysiological study			G	
	WITH demonstrable or inducible SVTs and with risk criteria (fast AV conduction pathway) in electrophysiological study			R	Until solution of pre-excitation by ablation
Implanted devices	AID or PPM	NO underlying heart disease	EXCEPT: <b>R</b> , for contact sports, with risk of collision, integrity hazard for the device, cables, or athlete	G	
		WITH structural heart disease	Evaluation of underlying structural heart disease		
Syncope	Related to physical exercise (with, during or after)			R	Until diagnosis and treatment
	Unrelated to physical exercise	EXCEPT: <b>R</b> , for sports with integrity hazards for the athlete or third parties		G	
				G	

**Arterial Hypertension**

High blood pressure (HBP) is the most prevalent cardiovascular disease in the general population, and the most common cardiovascular risk factor. Although it fundamentally affects the middle-aged and elderly population, it is estimated that in Spain 35% of adults have blood pressure (BP) figures  $\geq 140/90$  mmHg<sup>49</sup> and in the United States of America 11.6% of subjects aged 20-39 years have high BP figures and 11.0% of children and adolescents aged 8 to 17 years old have HBP (systolic BP [SBP] or diastolic BP [DBP] in the 95th percentile or higher) or borderline HBP (SBP or DBP in the 90-95th percentile, or BP of 120/80 mmHg or higher, but below the 95th percentile<sup>50</sup>). This means that a significant number of people, even very young people, have high blood pressure.

Although HBP has been associated with an increased risk of complex ventricular arrhythmias and SD, this cardiovascular risk factor per se has not been indicated as a cause of SD in young athletes<sup>51</sup>. Furthermore, certain types of physical activity cause BP to decrease, also occurring in hypertensive patients<sup>52</sup>, so sports can be beneficial when suffering from this condition.

Table 6 describes the contraindications for arterial hypertension and their degrees of application.

**Aortic diseases – Marfan syndrome**

Several aortic conditions, such as aortic dissection or rupture in Marfan syndrome, are important causes of SD in athletes<sup>15</sup>. The increase in BP and strain on the aorta during exertion cause an enormous risk of rupture, dissection or acceleration of an aneurysm formation in the first sections of the artery<sup>25</sup>.

Given the small number of patients with these conditions, there is not a lot of experience in their participation in physical and sports activity, and although active lifestyles should be favoured to improve health and avoid the stigmatisation of these patients at young ages, we must bear in mind the great risk they present of suffering catastrophic incidents.

Table 7 describes the contraindications for aortic diseases and Marfan syndrome, and their degrees of application.

**Table 6. Cardiovascular contraindications. Arterial hypertension<sup>18,24,27</sup>.**

Condition	Level of severity	Details	Class	Follow-up needed
Systemic arterial hypertension.	Untreated	With baseline values of $>180$ and/or $>110$ mmHg	R	
	Controlled	With extreme response to physical exercise: $\geq 230$ mmHg SBP and $\geq 110$ mmHg DBP	O	Temporary until control
		With adequate response to physical exercise:	G	
N.B. In sports with high isometric upper body demands, the BP evaluation must be performed on an individual basis				

**Table 7. Cardiovascular contraindications. Aortic diseases and Marfan syndrome<sup>25,53</sup>.**

Condition	Level of severity	Details	Class	Follow-up needed
Bicuspid valve	See AORTIC VALVE STENOSIS or AORTIC INSUFFICIENCY			
	Dilation Evaluate with echocardiogram and CT angiography or NMR angiography	≥55 mm	R	SI
		≥50 mm or if there are risk factors: - SI - Family history of aortic dissection - Pregnancy desired - HBP - Growth of >3 mm/year	R	
		≥45-50 mm or Z-score ≥4	O	6 months
		≥40-45 mm or Z-score 3-4	Y	6 months
		≥35-40 or Z-score 2-3	G	1 year
		≤35	G	1 year
		After successful aortic surgery	Y	1 year
N.B. In SPORTS with HIGH ISOMETRIC UPPER BODY DEMANDS (power sports, car racing), the evaluation must be performed individually if the aorta is ≥40-45 mm or Z-score 3-4. Non-contact sports if ≥45-50 mm or Z-score ≥4				
Marfan Syndrome	Dilation of aorta	45-50 mm o Z-score ≥4	R	If risk factors or >50: SI
		40-45 mm o Z-score 3-4	R	
	Mitral or aortic valve heart disease	Severe to moderate grade	R	
	Well-defined MARFAN WITHOUT EITHER of the above two components		Y	6 months
	After successful aortic surgery		O	6 months
	N.B. Evaluate the risk of valve or isthmic rupture, or dissection in contact sports, avoid competition, contact and isometric exercise			

**Ischaemic heart disease**

Ischaemic heart disease (atherosclerotic coronary artery disease) is the leading cause of SD<sup>16,51</sup> and myocardial infarction in adult athletes<sup>54</sup>. Although physical exercise performed for health purposes (low-moderate intensity) is highly beneficial and facilitates the prevention of coronary episodes<sup>55</sup>, it is unquestionable that intense

exercise, performed in an acute and transient manner, increases the risk of triggering SD or a myocardial infarction even in apparently healthy people<sup>55</sup>.

Table 8 describes the contraindications for ischaemic heart disease and their degrees of application.

**Table 8. Cardiovascular contraindications. Ischaemic heart disease<sup>18,26,27</sup>.**

Condition	Level of severity	Details	Class	Follow-up needed
Ischaemic heart disease	Severe or unstable	- Acute Coronary Syndrome, before at least 1 month has passed - ECHO Ejection fraction <50% - At least 1 coronary lesion with at least 70% ischaemic obstruction Ischaemia with exercise - ARR complex/severe arrhythmia in stress	R	
		Chronic	Revascularisation (by any procedure) without severe ischaemia or ARR with exercise	G
		Coronary heart disease without severe lesions, or without severe ischaemia or ARR with exercise	G	
	Other situations	Muscle bridging or milking with good response to medical treatment, without associated ARR	Y	
		Coronary spasm	Y	
		Coronary microvascular disease	Y	

**Supplementary note common to the tables of contraindications and limitations on sports eligibility**

In the event of conditions or clinical situations not covered in the foregoing tables, the athlete should be referred to a centre or professional specialised in cardiology, from which/whom a reasoned report

should be obtained on the suitability of the athlete for participation in the specific sport or speciality for which the evaluation is required. The eligibility of the athlete will be determined in consideration this report.

The abbreviations, initials and acronyms used in the cardiovascular contraindications are described in Table 9.

**Table 9. Initials / abbreviations / acronyms.**

Initials	Explanation
ABL	Ablation in electrophysiological study of the mechanisms responsible for arrhythmia
ARR	Arrhythmia (usually severe, complex, progressive with exercise) (usually ventricular)
ASI	Aortic size index
1-2-3AVB	1st-, 2nd-, 3rd-degree atrioventricular block
BNP (proBNP)	(N-terminal fragment) of brain (pro-) natriuretic peptide
RBBB, LBBB	Right bundle branch block, Left bundle branch block
AFB, PFB	Left anterior or posterior fascicular block
FC	Functional capacity, ability to perform physical activity without symptoms or signs interpretable as representing a medical condition
ASD	Atrial septal defect
APVD	Anomalous pulmonary venous drainage
VSD	Ventricular septal defect
PDA	Patent ductus arteriosus
LVEDD- LVESD	Left ventricular end-diastolic or end-systolic diameters
LVEDV - LVESV	Left ventricular end-diastolic or end-systolic volumes
AS	Aortic valve stenosis
ECG	Resting electrocardiogram (classic 12 leads)
EPS	Electrophysiological study
MS	Mitral stenosis
PS	Pulmonary valve stenosis
TS	Tricuspid stenosis
PVC	Premature ventricular contraction
AF	Atrial fibrillation
EF	Ejection fraction (two-dimensional echocardiography, or equivalent and comparable validated method)
AFL	Atrial flutter
HT	Heart team, evaluation by, referral for (re)evaluation
AI	Aortic valve insufficiency/regurgitation
MI	Mitral insufficiency/regurgitation
PI	Pulmonary valve insufficiency/regurgitation
TI	Tricuspid valve insufficiency/regurgitation
SI	Surgical intervention, indication thereof
PAP	Pulmonary artery (systolic) pressure
QT, QTc	ECG QT interval, corrected QT interval (by Bazett formula)
NMR	Cardiac (nuclear) magnetic resonance
PVR	Pulmonary vascular resistance
SBP	(Systemic) Systolic arterial blood pressure
NSVT	Non-sustained ventricular tachycardia
LV	Left ventricle/ ventricular

## Contraindications for respiratory system diseases

Table 10 describes the contraindications for respiratory system diseases and their degrees of application.

**Table 10. Contraindications for respiratory system diseases<sup>18-31</sup>.**

Condition	Level of severity	Contraindication
Asthma	Difficult-to-control asthma	Only participation in low-intensity sports (class IA) is allowed Absolute contraindication to contact sports or with risk of body collision, mountaineering in conditions of environmental hypoxia or at low temperatures. Absolute contraindication to life-threatening sports in the event of syncope
Chronic bronchial conditions	Symptomatic and poorly controlled with treatment	Only participation in low-intensity sports (class IA) is allowed
Respiratory insufficiency	With poor arterial O2 saturation: a) Baseline saturation <90% with normal haemoglobin b) Progressive desaturation with exercise	Only participation in low-intensity sports (class IA) is allowed Absolute contraindication to contact sports or with risk of body collision, underwater diving and mountaineering in conditions of environmental hypoxia or at low temperatures.
Spontaneous pneumothorax	Treated conservatively if there is no reversal	Only participation in low-intensity sports (class IA) is allowed. Absolute contraindication to contact sports or with risk of body collision, underwater diving and mountaineering in conditions of environmental hypoxia or at low temperatures.
	Surgically treated	Temporary absolute contraindication 1 month
	Treated surgically and with recurrence	Absolute contraindication to contact sports or sports with risk of body collision and underwater diving.
Pulmonary thromboembolism	Up to 3 months after resolution of signs and symptoms N.B. See anticoagulant and antiplatelet medication	Temporary absolute contraindication
Interstitial lung disease	Symptomatic and poorly controlled with treatment	Absolute contraindication
Thoracic surgery	Until declared fit	Absolute contraindication to underwater diving



## Contraindications for endocrine-metabolic and nutritional diseases

Table 11 describes the contraindications for endocrine-metabolic and nutritional diseases, and their degrees of application.

**Table 11. Contraindications for endocrine-metabolic and nutritional diseases<sup>18,56</sup>.**

Condition	Level of severity	Contraindication
Hyperthyroidism	Not controlled with treatment	Absolute contraindication
Familial hypercholesterolemia	Homozygous variety. Adequately treated, with reasonable cholesterol levels and no evidence of cardiovascular disease	Static, low dynamic intensity sports (class IA) are allowed
	If the above criteria are not met	Absolute contraindication
Obesity	IBMI>40 kg/m <sup>2</sup> , until beneath this index	Absolute contraindication
	BMI>35-39,9 kg/m <sup>2</sup> , until beneath this index	Only participation in low-intensity sports (class IA) is allowed.
Diabetes mellitus	Poorly controlled with treatment, with blood glucose >250 mg/dl, with frequent hypoglycaemia, difficult to control during exertion, or inability of the patient to control and monitor their blood glucose	Only participation in low-intensity sports (class IA) is allowed. Absolute contraindication to sports that involve driving a vehicle, underwater diving, sailing and mountaineering in cold and hypoxia conditions
Alterations in amino acid and fatty acid metabolism		Relative contraindication. Each case should be individualised, but in general only static intensity and low dynamic sports (classes IA and IB) should be allowed
Alterations of purine and pyrimidine metabolism		Relative contraindication. Each case should be individualised, but in general only static intensity and low dynamic sports (classes IA and IB) should be allowed
Glycogen storage disease and other alterations of carbohydrate metabolism		Relative contraindication. Each case should be individualised, but in general only static intensity and low dynamic sports (classes IA and IB) should be allowed

BMI: body mass index.

## Contraindications for infectious diseases

Table 12 describes the contraindications for infectious diseases and their degrees of application.

**Table 12. Contraindications for infectious diseases<sup>18,31,57</sup>.**

Condition	Level of severity	Contraindication
Tuberculosis	Active	Absolute contraindication
Infectious mononucleosis	Until the normalisation of the test markers and the return to normal spleen size is observed	Only participation in low-intensity sports (class IA) is allowed
	With normal blood test results and observation of the return to normal spleen size	Temporary absolute contraindication 1 week more for contact sports or sports with risk of body collision
Acute febrile illness	Until the end of fever and accompanying symptoms	Temporary absolute contraindication
Human immunodeficiency virus infection	In symptomatic phase with marked immunodeficiency	Temporary absolute contraindication
Any infection	Until resolution	Temporary absolute contraindication
Long COVID	Until resolution of major disease	Temporary relative contraindication

### Contraindications for nephro-urological diseases

Table 13 describes the contraindications for nephro-urological diseases and their degrees of application.

**Tabla 13. Contraindicaciones por enfermedades nefrourológicas<sup>18,31</sup>.**

Condition	Level of severity	Contraindication
Renal insufficiency	Active	Absolute contraindication
Glomerulonephritis	Up to 3 months after episode	Temporary absolute contraindication
Single kidney		Absolute contraindication to contact sports or sports with risk of body collision
	Adults and adolescents over 14 years of age	Absolute contraindication to contact sports or sports with risk of body collision
	Children, up to 14 years old, with normal single kidney, with recent images confirming the normal position and anatomy of the single kidney and no evidence of renal insufficiency, hypertension or proteinuria. Inform that when they pass that age they will not be able to participate in the chosen sport	No contraindication.
	Children, up to 14 years old, with a single kidney who do not meet all the above criteria	Sports participation decision by the appropriate specialist doctor (nephrologist, urologist, oncologist)
Myoglobinuria and organic haematuria		Absolute contraindication
Permanent lesional proteinuria		Absolute contraindication
Varicocele	Until resolution	Temporary absolute contraindication
Hydrocele	Until resolution	Temporary absolute contraindication
Cryptorchidism	Until resolution	Temporary absolute contraindication
Testicular torsion	Until resolution	Temporary absolute contraindication
Orchitis	Until resolution	Temporary absolute contraindication
Epididymitis	Until resolution	Temporary absolute contraindication
Testicular neoplasm	Until resolution	Temporary absolute contraindication
Prostate disease	Chronic	Absolute contraindication to sports that involve driving a vehicle, including cycling
	If corrected by treatment (prostate cancer, etc.)	Temporary absolute contraindication
Kidney, liver, heart and marrow transplantation		Absolute contraindication to contact sports or sports with risk of body collision and sports that involve driving a vehicle

## Contraindications for ophthalmological diseases

Table 14 describes the contraindications for ophthalmological diseases and their degrees of application.

**Table 14. Contraindications for ophthalmological diseases<sup>18,58</sup>.**

Condition	Level of severity	Contraindication
Retinal detachment	Including surgically operated	Only participation in low-intensity sports (class IA) is allowed unless authorised by an ophthalmologist
Retinal, choroidal or pupillary condition		Absolute contraindication to underwater diving and boxing
Myopia	Advanced (decimal visual acuity <0.5)	CAbsolute contraindication to underwater diving, skydiving and mountain sports above 1200 m (risk of retinal detachment)
	>3 dioptres	Absolute contraindication to underwater diving, boxing and martial arts in which all types of contact are allowed and there is no facial protection
Other visual acuity alterations (1)	Visual acuity <9/10 in each eye, unless corrected (10/10 in one eye and 8/10 in the other is acceptable). Abnormal binocular vision Decreased visual field. Abnormal stereopsis Macular degeneration	Temporary absolute contraindication until correction to sports that involve driving a vehicle and skydiving
Glaucoma	Angle-closure glaucoma	Absolute contraindication to underwater diving
	Initial, moderate or advanced stage, due to the decrease in peripheral vision	Only sports with low static and dynamic components (class IA) are allowed.
Conjunctiva disease	Until resolution of signs and symptoms	Absolute contraindication to snow sports, swimming and contact sports
Radial keratotomy		Absolute contraindication to boxing and contact sports
Single eye or monocular vision		Absolute contraindication to underwater diving. Evaluate absolute contraindication to contact sports or sports with risk of body collision. Absolute contraindication to sports that involve driving a vehicle
Eye prosthesis or hollow implant		Absolute contraindication to underwater diving. Evaluate absolute contraindication to contact sports or sports with risk of body collision
Hyphaema	Until full resolution	Temporary absolute contraindication
Colour blindness		Absolute contraindication to air sports and skydiving. Consider the legal restrictions and regulations specific to sports that involve driving vehicles and boats
Cataracts		Temporary contraindication until resolution of the condition
Trauma of the eye	With moderate or high myopia, due to the risk of detachment. Increased risk when underwater diving and doing mountain sports above 1200 m	Temporary contraindication until declared fit by an ophthalmologist
Previous eye surgery (2)		Contraindication to combat and collision sports

1. If glasses are worn, they must be shatterproof.

2. Eye protection is required.

## Contraindications for digestive system diseases

Table 15 describes the contraindications for digestive system diseases and their degrees of application.

**Table 15. Contraindications for digestive system diseases<sup>18,31</sup>.**

Condition	Level of severity	Contraindication
Splenomegaly	Palpable	Only participation in low-intensity sports (class IA) is allowed. Absolute contraindication to contact sports or sports with risk of body collision
Abdominal hernia	Large and with symptoms	Only participation in low-intensity sports (class IA) is allowed
	Abdominal wall hernia without surgery	Absolute contraindication to skydiving and sports requiring isometric strength (such as weightlifting). Relative contraindication to combat and collision sports
Hepatomegaly		Absolute contraindication to contact sports or sports with risk of body collision
Inflammatory bowel disease	Flare-up	Temporary absolute contraindication
Hepatitis	Viral. Until normalisation of symptoms and analysis	Temporary absolute contraindication
	Chronic B and C with cirrhosis	Absolute contraindication
	Chronic B and C, no cirrhosis, with good response to treatment	Temporary absolute contraindication
Haemorrhoids	Significantly affected, until evaluation of surgical correction	Temporary absolute contraindication to weightlifting and maximal strength sports
Diarrhoea	Significantly clinically affected or risk of dehydration, until the signs and symptoms are normalised	Temporary absolute contraindication

## Contraindications for musculoskeletal system diseases

Table 16 describes the contraindications for musculoskeletal system diseases and their degrees of application.

**Table 16. Contraindications for musculoskeletal system diseases**<sup>18,31-36,59-65</sup>.

Condition	Level of severity	Contraindication
Spondylolysis	Symptomatic or unstable, until the cessation of symptoms in all sports that involve an increase in lumbar lordosis or repetitive trunk twists, maintaining trunk hyperextension, such as golf, canoeing and kayaking, artistic, rhythmic and acrobatic gymnastics, swimming in breaststroke and butterfly style, synchronised swimming, high jump, diving, wrestling, judo, horseback riding, skydiving, motocross, rowing. Congenital lyses. Until confirmation of no instability	Temporary absolute contraindication until resolution when traumatic. Relative contraindication in congenital lyses
	After surgery, up to 6-12 months	Absolute contraindication
Spondylolisthesis	Symptomatic (contracture, pain) and/or with vertebral slippage <25%, until the symptoms cease and stability is verified	Temporary absolute contraindication. Absolute contraindication to activities involving extension or hyperextension of the rachis
	With vertebral slippage ≥25%, or with any degree of listhesis with neurological compromise	Absolute contraindication to contact sports or sports with risk of body collision, rhythmic and artistic gymnastics, diving, skydiving, equestrian sports, motocross, high jump in Fosbury style, swimming in breaststroke or butterfly styles, synchronised swimming, judo, wrestling/Greco-Roman wrestling, sailing in trapeze positions, weightlifting
Cervical instability	Post-traumatic or post-surgical. Until resolution and between 6-12 months asymptomatic	Absolute contraindication to contact sports or sports with risk of body collision. Absolute contraindication to life-threatening sports in the event of syncope
Cervical canal stenosis	Asymptomatic	No contraindication.
	Symptomatic. Until resolution, and liberation and stability have been checked for 6/12 months	Absolute contraindication to contact sports or sports with risk of body collision. Absolute contraindication to life-threatening sports in the event of syncope
Odontoid alterations	Agenesis, odontoid hypoplasia and os odontoideum	Absolute contraindication to contact sports or sports with risk of body collision
Spina bifida	Occulta	No contraindication.
Atlanto-occipital assimilation		Absolute contraindication to contact sports or sports with risk of body collision
Klippel-Feil syndrome	Type I: Massive fusion of the upper cervical and thoracic vertebrae	Absolute contraindication to contact sports or sports with risk of body collision
	Type II: fusion of only one or two intervening spaces in C3 and below with full range of cervical movement and no occipitocervical abnormalities, instability, disc disease or degenerative changes	No contraindication.
Disc hernia	Symptomatic, with compression of the medullary or nerve root canal	Absolute contraindication to contact sports or sports with a risk of body collision, skydiving, windsurfing, horse riding, weightlifting and sports with significant axial loads and sudden bending of the trunk
Vertebral hyperkyphosis	Severe (>40°)	Absolute contraindication to butterfly-style swimming, cycling and equestrian sports
Lumbar vertebral hyperlordosis	Severe or symptomatic	Absolute contraindication to rhythmic gymnastics and judo. Similar to description for spondylolisthesis in terms of sports until symptom resolution

(continued)

**Table 16. Contraindications for musculoskeletal system diseases<sup>18,31-36,59-65</sup> (continuation).**

Condition	Level of severity	Contraindication
Vertebral scoliosis	With Cobb angle ≤20°, asymptomatic	No contraindication.
	When treated with fixation or immobilisation systems that pose a risk to others in contact sports	Absolute contraindication to contact sports or sports with risk of body collision
	With Cobb angle 20-30°, asymptomatic	Relative contraindication to weightlifting and butterfly-style swimming. Relative contraindication to unilateral sports such as racket sports, throwing sports, golf, etc
	With Cobb angle of 30-50°, or with progression of 5° in 6 months, asymptomatic	Absolute contraindication to butterfly-style swimming and weightlifting, and for unilateral sports such as racket sports, throwing sports, golf, etc.
	With Cobb angle >50°, asymptomatic	Absolute contraindication, except swimming, cycling and long-distance running
	Post-surgical vertebral scoliosis, 1 year after surgery with complete consolidation	No contraindication, except to sports with axial and rotational loads (ball sports, tennis, downhill skiing, diving, ski jumping, throwing and jumping in athletics, gymnastics, contact sports and motorcycling)
Spinal arthrodesis	Post-surgery 6-12 months	Temporary absolute contraindication
		Absolute contraindication to contact sports or sports with risk of body collision
Spondylarthrosis	With poor tolerance or neurological deficit	Absolute contraindication to equestrian sports
Osgood–Schlatter disease	Severe, until control of signs and symptoms	Temporary absolute contraindication to jumping sports
Perthes' disease	Until resolution of symptoms	Temporary absolute contraindication Relative for long-distance running
Other diseases that present with bone necrosis and epiphysitis: Sinding-Larsen Johansson, Panner, Freiberg, etc.	With severe symptoms, until control of signs and symptoms	Temporary absolute contraindication
Flat feet	Severe and symptomatic, until surgical correction	Absolute contraindication, except to sports in which the feet do not support body weight and standing sports with low axial loads which do not trigger symptoms
Pes cavus	Severe and symptomatic, until surgical correction	Absolute contraindication, except to sports in which the feet do not support body weight and standing sports with low axial loads which do not trigger symptoms
Recurrent shoulder instability	Due to surgical contraindication, delay or failure of surgery	Absolute contraindication to combat sports, solo sailing, surfing, climbing and diving
Fractures	Uncomplicated, until resolution and disappearance of symptoms	Temporary absolute contraindication if the sport involves the affected area
	Joint or unstable, not properly stabilised which may entail a delay in consolidation, malunion or may lead to sequelae or functional limitations	Absolute contraindication
	Significant sequelae in lower limbs with deformities or alteration of axes	Absolute contraindication to skydiving, jumping and running sports
Stress fractures	Until resolution	Temporary absolute contraindication
Dislocations	Until resolution	Temporary absolute contraindication
Tendon tears.	Until recovery after treatment	Temporary absolute contraindication
Muscle tears	Until recovery after treatment	Temporary absolute contraindication
Ligament tears	Until recovery after treatment	Temporary absolute contraindication
Rheumatic diseases	Significant symptoms	Temporary absolute contraindication
	Chronic or subacute, in joints of lower limbs	Absolute contraindication to skydiving and jumping activities with intense axial loads
	With atlantoaxial instability	Absolute contraindication to contact and collision sports

(continued)

**Table 16. Contraindications for musculoskeletal system diseases<sup>18,31-36,59-65</sup> (continuation).**

Condition	Level of severity	Contraindication
Functional limitation of joint mobility	Hand joints >50%	Absolute contraindication to sports that involve driving a vehicle
	Large joints >50%	Absolute contraindication to sports that involve driving a vehicle
	Abnormal mobility of the first finger and at least two of the other fingers on the hand	Absolute contraindication to motorcycling
	Knee, ankle, hip or shoulder joint ankylosis	Absolute contraindication to skydiving, running, jumping and sports that involve pivoting action
Amputations	Except for fingers if grip is retained	Absolute contraindication to sports that involve driving a vehicle
	Of a limb below the knee, even with prostheses	Absolute contraindication to motorcycling
	Of the two lower limbs	Absolute contraindication to motorcycling
	Segment of a limb	Absolute contraindication to skydiving
Joint prostheses or replacements	Evaluate individually	There may be absolute contraindication to sports that involve driving a vehicle and relative contraindication to sports in which the joint affected is used a lot
	Upper limb prostheses	Absolute contraindication to motorcycling
Spinal instability		Absolute contraindication to sports involving the possibility of head/neck trauma (motorcycling, combat sports, rugby, climbing, jumps in gymnastics, diving, weightlifting and golf) Similar to listhesis
Severe limitation of spinal mobility	Cervical or thoracolumbar	Absolute contraindication to sports involving the possibility of head/neck trauma (motorcycling, combat sports, rugby, climbing, jumps in gymnastics, diving, weightlifting and golf)
Repeat Lumbosciatica	Hyperalgiac phase	Absolute contraindication to motorcycling, weightlifting, equestrian sports, sports that involve twisting the trunk (gymnastics, golf, etc.) and marked flexion of the spine (long jump...) until diagnosis and effective treatment
Rhabdomyolysis	Until the normalisation of liver enzymes and creatine kinase, disappearance of symptoms and images of severity	Temporary absolute contraindication



### Contraindications for neurological, neurosurgical and psychiatric diseases

Table 17 describes the contraindications for neurological, neurosurgical and psychiatric diseases, and their degrees of application.

**Table 17. Contraindications for neurological, neurosurgical and psychiatric diseases<sup>18,31,66,67</sup>.**

Condition	Level of severity	Contraindication
Epilepsy and seizures of different aetiology	Poorly controlled with treatment	Absolute contraindication to contact sports or sports with risk of body collision. Absolute contraindication to life-threatening sports in the event of syncope. Absolute contraindication to sports that involve driving a vehicle and doing sports alone
	Even controlled with treatment	Absolute contraindication to boxing and other combat sports in which KOs may exist
	Seizures with loss of consciousness during the last year	Absolute contraindication to sports that involve driving a vehicle, air sports, underwater diving and mountaineering. After 1 year with no crisis: no contraindication
	Seizures or with loss of consciousness during sleep. It should be confirmed that 1 year has passed with only crises of this kind and only during sleep	Absolute contraindication to sports that involve driving a vehicle, air sports, underwater diving and mountaineering. After 1 year with no crisis: no contraindication
	Repeated epileptic or convulsive seizures with no influence on consciousness or the ability to act. It should be confirmed that 1 year has passed with only crises of this kind	Absolute contraindication to sports that involve driving a vehicle, air sports, underwater diving and mountaineering. After 1 year with no crisis: no contraindication
	With epileptic or convulsive seizures caused by an identifiable causative factor, a favourable neurological report must be provided confirming a seizure-free period of 6 months	Absolute contraindication to sports that involve driving a vehicle, air sports, underwater diving and mountaineering. After 6 months with no crisis: no contraindication
	In the event of a first or single unprovoked crisis, a crisis-free period of 6 months must be confirmed by a neurological report	Absolute contraindication to sports that involve driving a vehicle, air sports, underwater diving and mountaineering. After 6 months with no crisis: no contraindication
	If a seizure or loss of consciousness occurs during a change or withdrawal of medication, 1 seizure-free year must be confirmed once anti-epileptic treatment has been restored. On the basis of neurological criteria, driving may be forbidden from the start of the withdrawal of treatment and for 6 months after cessation	Absolute contraindication to sports that involve driving a vehicle, air sports, underwater diving and mountaineering. After 1 year with no crisis: no contraindication
Traumatic brain injury	Until the total disappearance of psychological, cognitive, affective and sensory-motor symptoms	Temporary absolute contraindication
Multiple sclerosis	In symptomatic outbreaks	Temporary absolute contraindication
Myopathies	In symptomatic phase	Temporary absolute contraindication
Peripheral neuropathy	In symptomatic phase	Temporary absolute contraindication
Psychiatric condition	Suicide risk	Solo sports are not allowed
	History and established condition	Absolute contraindication to boxing and other contact sports, and underwater diving
Headaches	Intense, with exertion or with little response to treatment	Temporary absolute contraindication

(continued)

**Table 17. Contraindications for neurological, neurosurgical and psychiatric diseases<sup>18,31,66,67</sup> (continuation).**

Condition	Level of severity	Contraindication
Chiari malformation, type 1 (1)	Symptomatic by compression of the brainstem, herniation of the tonsils or cerebrospinal fluid circulation disorders (pulsatile headache, severe cervical pain, caused by coughing, sneezing, strain, change of posture or physical exertion, which can cause an increase in intracranial pressure)	Absolute contraindication to contact sports or sports with risk of body collision and sports that involve intense Valsalva manoeuvre (e.g. weightlifting)
	Asymptomatic patients in whom the abnormality was discovered after a diagnostic evaluation for concussion	Absolute contraindication to contact sports or sports with risk of body collision
	Asymptomatic patients, after the chance finding of the abnormality and with authorisation from a neurosurgeon	No contraindication.
Permanent treatment with psychotropics	While treatment lasts	Absolute contraindication to sports that involve driving a vehicle, air sports, Olympic shooting, archery and combat sports

## Contraindications for dermatological diseases

Table 18 describes the contraindications for dermatological diseases and their degrees of application.

**Table 18. Contraindications for dermatological diseases<sup>18,68,-75</sup>.**

Condition	Level of severity	Contraindication
Human papilloma virus (HPV) infections (warts)	Until resolution of signs and symptoms	Temporary absolute contraindication to sports that use mats.
Impetigo	Until 72 hours after antibiotic treatment, 48 hours without new lesions and no exudation	Temporary absolute contraindication
Mycosis	If the affected area cannot be isolated completely to avoid contact with other people and while the lesions are active	Temporary absolute contraindication until cured to contact sports or sports with a risk of body collision, and to sports that use mats.
Folliculitis, boils, anthrax, abscesses, cellulitis, erysipelas	Until 72 hours after antibiotic treatment, 48 hours without new lesions and no exudation. In the event of Pseudomonas infection, recommendations should be individualised due to the possibility of skin-to-skin contact (contact sports or sports with a risk of body collision, and for sports that use mats)	Temporary absolute contraindication
Wounds	Symptomatic and risk of poor cicatrisation while active or bleeding	Temporary absolute contraindication
Cuts and abrasions	If they cannot be covered or until resolution	Temporary absolute contraindication to contact sports
Molluscum contagiosum	Depending on location, as long as the lesions are active	Temporary absolute contraindication to contact sports and sports that use mats.
Pediculosis	In the event of active infestation and until resolution	Temporary absolute contraindication
Urticaria and angioedema (cholinergic, cold, pressure, aquagenic, sunlight, exercise-induced anaphylaxis)	Depending on the degree of control	Relative contraindication
Hereditary angioedema	Depending on the degree of control	Relative contraindication
Atopic dermatitis	Depending on the degree of control	Relative contraindication for water sports
Oral retinoid treatment	Depending on the symptoms (fatigue, arthralgia, photosensitivity, staphylococcus colonisation, CPK elevation)	Relative contraindication

### Contraindications for haematological diseases

Table 19 describes the contraindications for haematological diseases and their degrees of application.

**Table 19. Contraindications for haematological diseases<sup>18,31,33,36,76</sup>.**

Condition	Level of severity	Contraindication
Coagulation disorders (haemophilia, von Willebrand disease and other severe coagulopathies) (1)	No prophylactic treatment	Absolute contraindication to contact sports or sports with risk of body collision
	With prophylactic treatment, evaluation of participation in sports theoretically contraindicated by haematologist (1)	Possible participation in non-contact sports without risk of collision or falling, when permitted by the haematologist
Platelet diseases (thrombocytopenia or thrombopathies)	Risk of bleeding, especially with platelet counts <50,000	Absolute contraindication to sports with risk of injury and contact sports, with risk of body collision or falling
Anticoagulant and antiplatelet medication		Absolute contraindication to sports with risk of injury and contact sports, with risk of body collision or falling
Haemoglobinopathies	Heterozygous alterations or thalassaemic features (thalassaemia minor) without anaemia	No contraindication.
	Heterozygous alterations or thalassaemic features (thalassaemia minor) with anaemia (Hb <10 gr/dl) and thalassaemia	Absolute contraindication to high dynamic intensity sports (classes CI, CII and CIII)
	Sickle cell anaemia or sickle cell disease	Absolute contraindication to high-intensity sports, underwater diving and sport in extreme temperature conditions. Children should be encouraged to participate in sports activities to the best of their ability and physical tolerance, with more frequent periods of rest and greater hydration
	Sickle cell trait (carrier) The diagnosis is not in itself a justification for ineligibility for competitive sport, but the following preventive strategies must be taken: a) Adequate rest and hydration to minimise the likelihood of an event occurring on the sports field b) Familiarity with the medical strategies for acute emergencies if a medical incident occurs c) Special care with athletes competing or training in high temperature or ambient humidity conditions or at extreme altitude	Possible absolute contraindication to high dynamic intensity sports (classes IC, IIC and IIIC)
Deficiency anaemias (iron deficiency, vitamin B12 deficiency, folic acid deficiency, etc.)	Symptomatic, of any nature, until recovery to normality	Temporary absolute contraindication (while Hb <10 gr/dl)
Oncohaematology (acute leukaemias, lymphomas and myelomas)		Absolute contraindication to high and medium intensity exercise

1. Before organising any sports programme, risk situations and protocols for action in case of emergency must be assessed.

## Contraindications for other syndromes, diseases and cases

Table 20 describes the contraindications for other syndromes and diseases, and their degrees of application.

**Table 20. Contraindications for other syndromes, diseases and cases<sup>18,31,33</sup>.**

Condition	Level of severity	Contraindication
Alteration of ion concentrations in the blood	Hypernatraemia, hyponatraemia, hyperkalaemia, hypokalaemia, hypercalcaemia, hypocalcaemia, hyperphosphoraemia, hypophosphoraemia, hypermagnesaemia, hypomagnesaemia, until normalisation of figures	Temporary absolute contraindication
Any surgery	Not specifically described elsewhere	Temporary absolute contraindication, until full recovery
Neurosensory hypoacusis		Absolute contraindication to shooting and underwater diving sports
Otosclerosis and otospongiosis		Absolute contraindication to underwater diving
Loss or absence of organ of hearing, deafness	Loss or absence of an organ of hearing	Absolute contraindication to shooting
	Total unilateral deafness	Absolute contraindication to underwater diving
Alterations of the middle ear		Absolute contraindication to skydiving and air sports
Blocked eustachian tube	Permanent	Absolute contraindication to skydiving, underwater diving and air sports
Mastoiditis	Operated	Absolute contraindication to underwater diving
Tracheotomy	Permanent	Absolute contraindication to underwater diving
Congenital laryngocele		Absolute contraindication to underwater diving
Balance alteration	If permanent	Absolute contraindication to motorcycling, skydiving, gliding, figure skating, underwater diving, cycling, climbing and mountaineering
Malformed or affected oral cavity	Severe	Absolute contraindication to skydiving
Malformed or affected upper airways	Severe	Absolute contraindication to skydiving
Cold urticaria		Absolute contraindication to windsurfing and winter sports
Acrocyanosis, Raynaud's phenomenon	Severe	Absolute contraindication to windsurfing and for sports in which it is not possible to maintain sufficient hand temperature
Dupuytren's contracture		Absolute contraindication to windsurfing and hand pelota
Drug addiction		Absolute contraindication
Alcoholism		Absolute contraindication
Taking medication that causes drowsiness	While treatment lasts	Absolute contraindication to life-threatening sports in the event of syncope
Acute symptoms	Diarrhoea, vomiting, dizziness, fatigue, dyspnoea, etc., depending on the degree affected and with the need to study until diagnosis	Temporary absolute contraindication
Heat stroke	With risk of recurrence and after evaluation of risks and trigger factors	Relative absolute contraindication in hot and humid conditions
Hypoglycaemia	Repeated, with syncope or impairment of degree of consciousness	Absolute contraindication to sports that involve driving a vehicle, air sports, underwater diving and mountaineering
Polymyositis/dermatomyositis		Only participation in low-intensity sports (class IA) is allowed

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## Authors:

**Álvarez-Garrido, Helena.** Dermatologist, Hospital Universitario de Fuenlabrada, Fuenlabrada (Madrid).

**Archanco Olcese, Miguel.** Physical Medicine and Rehabilitation Doctor, Hospital Clínico San Carlos. Associate Professor, Faculty of Medicine, Universidad Complutense. Madrid.

**Arnaudas Roy, Carmen.** Physical Education and Sports Doctor, Sub-Directorate General of Sports Sciences, Higher Sports Council. Madrid.

**Arriaza Loureda, Rafael.** Orthopaedic Surgeon and Traumatologist, Instituto Médico Arriaza y Asociados. HM Chair of Sports Traumatology at Universidad de A Coruña. La Coruña.

**Bellver Vives, Montserrat.** Physical Education and Sports Doctor. Head of the Department of Healthcare Medicine at CAR de Sant Cugat-Consorcio Hospitalario de Terrassa, Terrasa (Barcelona). Member of the Board of Directors of the Catalan Society of Sports Medicine.

**Blasco Redondo, Raquel.** Internist. Head of the Internal Medicine Unit of the Regional Sports Medicine Centre of the Autonomous Government of Castile and Leon (CEREMEDE). Professor of the Faculty of Medicine at Universidad de Valladolid. Valladolid.

**Boraita Pérez, Araceli.** Cardiologist. Madrid.

**Brotos Cuixart, Daniel.** Doctor of Medicine. Sports Medicine Doctor. Director of the "Sport and Health Unit" of the Catalan Sports Council, Department of the Presidency, Autonomous Government of Catalonia. Barcelona.

**Brugada Terradellas, Josep.** Full Professor of Cardiology, Universidad de Barcelona. Senior Cardiology Consultant, Hospital Clínic and Hospital Pediátrico Sant Joan de Déu. Barcelona.

**Calatayud Pérez, Juan.** Head of the Neurosurgery Service at Hospital Clínico Universitario de Zaragoza. Zaragoza.

**Cárdenes León, Aridane.** Cardiologist, Hospital Universitario de Gran Canaria Dr. Negrín. Las Palmas de Gran Canaria.

**Correa González, Gonzalo María.** Physical Education and Sports Medicine Doctor. Vice-president of the Spanish Society of Sports Medicine. Attending doctor in Mutualidad de Futbolistas Extremeños. Attending doctor in Fremap. Badajoz.

**Chiacchio Sieira, Miguel.** Head of the Sports Medicine Service, Clínica Juaneda. Palma de Mallorca.

**Del Valle Soto, Miguel.** Physical Education and Sports Doctor. Editor of Archivos de Medicina del Deporte. Full professor of the Faculty of Medicine, School of Sports Medicine, Universidad de Oviedo. Oviedo.

**Elías Ruiz, Vicente.** Physical Education and Sports Doctor, Mutualidad de Futbolistas Españoles (Logroño, La Rioja). Chief Medical Officer of the Riojan Football Federation. Logroño.

**Ferrer López, Vicente.** Physical Education and Sports Doctor. Director of the medical services of the Castile-La Mancha Football Federation. Associate professor of the Faculty of Medicine, Universidad de Murcia. Albacete.

**Franco Bonafonte, Luis.** Doctor of Medicine. Sports Medicine Doctor. Head of Sports Medicine. General secretary of the Spanish Society of Sports Medicine. Zaragoza.

**Galmés Sureda, Bernardo J.** Haematology Service (Thrombosis and Haemostasis). Hospital Universitario Son Espases. Palma de Mallorca.

**García Zapico, Pedro.** Physical Education and Sports Medicine Doctor, Sports Medicine Service, Clínica Ovimed. Oviedo.

**Gaztañaga Aurrekoetxea, Teresa.** Physical Education and Sports Medicine Doctor, Sports Medicine Unit Kirolbidea - Hospital de Día Quironsalud Donostia. San Sebastián (Guipúzcoa). President of the Basque Society of Sports Medicine (EKIME). San Sebastian.

**González Lago, Luis.** Physical Education and Sports Doctor. Doctor Responsable Sasaki Baskonia, Grupo Baskonia-Alavés. Vitoria.

**Grazioli, Gonzalo.** Cardiologist. Barcelona. Aptima Centre Clinic. Terrasa. Barcelona.

**Gutiérrez Ortega, Fernando.** Physical Education and Sports Medicine Doctor. Head of the Sports Medicine Centre, Higher Sports Council. Madrid.

**Jiménez Díaz, Fernando.** Physical Education and Sports Medicine Doctor. Professor of Universidad de Castilla-La Mancha. Director of the International Chair of Musculoskeletal Ultrasound (UCAM). Toledo.

**Jiménez Mangas, Ricardo.** Physical Education and Sports Medicine Doctor. Head of the Sports Medicine Unit at Hospital Quironsalud de San Sebastián (Kirolbidea SLP). San Sebastián (Guipúzcoa).

**Lizarraga Sainz, Kepa.** Physical Education and Sports Doctor, Regional Council of Biscay. Bilbao.

**Llorca Garnero, Jeroni.** Physical Education and Sports Doctor, Arena Salud. Alicante.

**Luengo Fernández, Emilio.** Cardiologist. Director of the School of Sports Cardiology at SEMED. Zaragoza.

**Manonelles Marqueta, Pedro.** Extraordinary Full Professor and Director of the International Chair of Sports Medicine, Universidad Católica San Antonio de Murcia (UCAM). Zaragoza. Governing Board of SEMED.

**Manuz González, Begoña.** Physical Education and Sports Doctor, Centro Médico Deportivo B. Manuz. Torrelavega (Cantabria).

**Martínez González-Moro, Ignacio.** Physical Education and Sports Medicine Doctor, Physical Exercise and Human Performance Research Group. Tenured Professor at Universidad de Murcia. Murcia.

**Montserrat, Silvia.** Cardiologist, Hospital Clínic Barcelona, Consorci Hospitalari de Vic.

**Montalvo Zenarruzabeitia, Zigor.** Head of the Performance Control Unit at the Sports Medicine Centre, AEPSAD. Head of the medical services of the Spanish Triathlon Federation. Madrid.

**Morillas Martínez, Juan Miguel.** Physical Education and Sports Medicine Doctor, Clínica de Medicina del Deporte de Lorca. Lorca (Murcia). President of AMD.

**Muñoz Farjas, Elena.** Neurologist, Hospital Clínico de Zaragoza. Zaragoza.

**Novella María-Fernández, Fernando.** Head of the medical service of the Municipal Sports Board of Fuenlabrada. Professor of the Faculty of Phy-



sical Activity and Sport Sciences (INEF) at UPM. Madrid. Member of ImFine® ResearchGroup - UPM.

**Ocejo Viñals, Concepción María.** Physical Education and Sports Medicine Doctor. Castro-Urdiales (Cantabria).

**Orizaola Paz, José Luis.** Physical Education and Sports Medicine Doctor. Specialist in Occupational Medicine. Doctor of Real Racing Club de Santander. Santander.

**Palacios Gil de Antuñano, Nieves.** Physical Education and Sports Doctor, Endocrinologist and Nutritionist. Head of the Medicine, Endocrinology and Nutrition Unit, Sports Medicine Centre, Sub-Directorate General of Sports Sciences, Higher Sports Council. Madrid.

**Pérez Ansón, Javier.** Medical Care for Zaragoza City Council Fire, Rescue and Civil Protection Service. Zaragoza.

**Rubio Pérez, Francisco Javier.** Head of the Sport Medicine Unit, Hospital Universitari Sant Joan de Reus. Head of the Sports Medicine Unit at Hospital Comarcal Amposta. Centre de Tecnificació Esportiva Terres de l'Ebre, Higher Sports Council, Autonomous Government of Catalonia. Associate Professor of the Faculty of Health Sciences, URV Reus.

**Salom Portella, Fernando.** Head of the Sports Medicine Office, Sports Department, Menorca Island Council. Menorca.

**Sánchez Martínez, José.** Physical Education and Sports Medicine Doctor. Director of the Sports Medicine Centre, San Javier Council. San Javier (Murcia).

**Sánchez Ramos, Ángel.** Physical Medicine and Rehabilitation Doctor. Medical coordinator of Centro de Rehabilitación y Medicina del Deporte Eurosport. Collaborating Professor at Universitat Internacional de Catalunya– Universitat de Barcelona. Barcelona. Member of the Board of Directors of the Catalan Society of Sports Medicine.

**Segura Casado, Luis.** Physical Education and Sports Medicine Doctor, Sports Medicine Service, Tudela City Council. Tudela (Navarre).

**Terrados Cepeda, Nicolás.** Physical Education and Sports Medicine Doctor. Director of the Regional Sports Medicine Unit of the Principality of Asturias - Municipal Sports Foundation of Avilés. Oviedo.

**Terreros Blanco, José Luis.** Director of the Spanish Commission for the Fight Against Doping in Sports, CELAD. Madrid.

## APPENDIX 1. Classification of sports according to their static and dynamic demands, and as contact sports or sports with risk of body collision, or life-threatening sports in the event of syncope<sup>39</sup>.

	A. Low dynamic component	B. Moderate dynamic component	C. High dynamic component
<b>I. Low static component</b>	Billiards Bowling Cricket Curling Golf Boules Olympic Shooting <sup>b</sup>	Baseball Softball Basque pelota Doubles tennis Table tennis Volleyball Fencing	Long-distance running Race walking Badminton Cross-country skiing (classic technique) <sup>a,b</sup> Football <sup>a</sup> Field hockey <sup>a</sup> Orienteering <sup>b</sup> Padel Squash <sup>a</sup> Tennis
<b>II. Moderate static component</b>	Auto racing <sup>a,b</sup> Underwater diving <sup>b</sup> Equestrian sports <sup>a,b</sup> Motorcycling <sup>a,b</sup> Archery <sup>b</sup> Aeronautical sports <sup>a,b</sup>	Field events (jumping) Running (sprint) American football <sup>a</sup> Rhythmic gymnastics Synchronised swimming <sup>b</sup> Figure skating <sup>a</sup> Rugby <sup>a</sup> Surfing <sup>a,b</sup>	Running (middle-distance) Basketball <sup>a</sup> Handball Cross-country skiing (skating technique) Ice hockey <sup>a</sup> Lacrosse <sup>a</sup> Swimming
<b>III: High static component</b>	Field events (throwing) <sup>b</sup> Martial arts <sup>a</sup> Bobsledding <sup>a,b</sup> Rock climbing <sup>a,b</sup> Waterskiing <sup>a,b</sup> Weightlifting <sup>b</sup> Artistic gymnastics <sup>a,b</sup> Luge <sup>a,b</sup> Ski jumping <sup>a,b</sup> Sailing Windsurfing <sup>a,b</sup>	Bodybuilding Downhill skiing <sup>a,b</sup> Wrestling <sup>a</sup> Skateboarding <sup>a,b</sup> Snowboarding <sup>a,b</sup>	Combined track and field events <sup>b</sup> Boxing <sup>a,b</sup> Cycling <sup>a,b</sup> Ski mountaineering <sup>a,b</sup> Speed skating <sup>a,b</sup> Kayaking <sup>b</sup> Sailing <sup>b</sup> Triathlon <sup>a,b</sup> Waterpolo <sup>a,b</sup>

<sup>a</sup> Contact sports or sports with risk of body collision.

<sup>b</sup> Life-threatening sports in the event of syncope.

## APPENDIX 2. Contact sports or sports with risk of body collision<sup>18</sup>.

<ul style="list-style-type: none"> <li>• Martial arts</li> <li>• Auto racing</li> <li>• Boxing</li> <li>• Cycling</li> <li>• Rock climbing</li> <li>• Downhill skiing</li> <li>• Waterskiing</li> <li>• Cross-country skiing</li> <li>• Ski mountaineering</li> </ul>	<ul style="list-style-type: none"> <li>• Football</li> <li>• American football</li> <li>• Artistic gymnastics</li> <li>• Wrestling</li> <li>• Equestrian</li> <li>• Field hockey</li> <li>• Ice hockey</li> <li>• Motorcycling</li> <li>• Figure skating</li> </ul>	<ul style="list-style-type: none"> <li>• Speed skating</li> <li>• Rugby</li> <li>• Ski jumping</li> <li>• Snowboarding</li> <li>• Squash</li> <li>• Surfing</li> <li>• Waterpolo</li> <li>• Windsurfing</li> </ul>
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### APPENDIX 3. Life-threatening sports in the event of syncope<sup>18</sup>.

<ul style="list-style-type: none"> <li>• Field events (throwing)</li> <li>• Combined track and field events</li> <li>• Auto racing</li> <li>• Boxing</li> <li>• Underwater diving</li> <li>• Cycling</li> <li>• Rock climbing</li> <li>• Waterskiing</li> <li>• Downhill skiing</li> <li>• Cross-country skiing</li> </ul>	<ul style="list-style-type: none"> <li>• Ski mountaineering</li> <li>• Artistic gymnastics</li> <li>• Weightlifting</li> <li>• Equestrian sports</li> <li>• Motorcycling</li> <li>• Swimming</li> <li>• Synchronised swimming</li> <li>• Orienteering</li> <li>• Speed skating</li> <li>• Kayaking</li> </ul>	<ul style="list-style-type: none"> <li>• Sailing</li> <li>• Ski jumping</li> <li>• Snowboarding</li> <li>• Surfing</li> <li>• Archery</li> <li>• Olympic Shooting</li> <li>• Sailing</li> <li>• Waterpolo</li> <li>• Windsurfing</li> </ul>
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