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SPECIAL ARTICLE

General guidelines in the rehabilitation process for return to training after a sports injury

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Abstract Rehabilitation for return to training is an interdisciplinary, specific and individualised process that is geared towards the sportsman's optimal availability for competition after a sports injury. This process begins after medical discharge and continues up to the return to play, involving the different professionals in the field of healthcare and led by the sports physician. Planning consists of three phases, defined by muscular action (isometric, concentric and eccentric); kinetic chain (closed or open); range of movement (internal, medial, external and total); and exercise orientation (general, directed and specific). Return to play must be agreed upon on the basis of objective information on the recovery stage of the injury, the state of fitness, and the sportsman's own perception.

PALABRAS CLAVE
Readaptación;
Lesión deportiva;
Planificación;
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Interdisciplinar

Pautas generales en el proceso de readaptación al entrenamiento después de una lesión deportiva

Resumen La readaptación a la práctica deportiva es el proceso interdisciplinar, específico e individualizado, que tiene como objetivo la óptima disponibilidad del deportista para la competición después de una lesión deportiva. Este proceso se lleva a cabo a partir del alta médica hasta el alta deportiva, e intervienen los diferentes profesionales del ámbito de la salud,

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liderados por el médico deportivo. Su planificación consta de 3 fases definidas por la acción muscular (isométrica, concéntrica y excéntrica), la cadena cinética (cerrada o abierta), la amplitud de trabajo (interna, media, externa y total) y la orientación de los ejercicios (general, dirigida y específica). La vuelta a la competición *(return to play)* debe ser consensuada a partir de información objetiva sobre la evolución de la lesión, el estado de forma, así como la propia percepción del deportista.

Introduction

In its different disciplines, sport today is defined not only on the basis of performance level or fitness but also on availability and health.[1] In this context, the assessment of training load as well as injury prevention become an element which is an integral part of the training process.[2–6] In spite of this, and considering this is one of the objectives to which sports organisations assign most resources,[7] injuries continue to occur because certain levels of risk are intrinsic to the practice of sport.[7–10]

Once the sportsman is injured and must interrupt his professional routine,[11] regardless of severity, the recovery period begins. The first question asked by the sportsman[12] is, ''What's the matter with me?'', and the question that follows is ''.and how long does that mean not playing?''. The answer to the first question is purely medical, aimed at providing an exact diagnosis.[11,13] The second question introduces a biopsychosocial working model to confront the complex[14] process of recovery of injured sportsmen until their return to play. This process is specific[15,16] to each sportsman, injury and sport, and can be influenced by many different factors[8,9] not only clinical but also involving coaches, clubs and, of course, the sportsman himself.[17] When it comes to professional sportsmen, many other interests come into play, even economic ones. This is therefore a current topic of particular interest.[8,9,18]

Background

Growing interest in the recovery of injuries has led to numerous studies being presented on the subject. One of the most important fields has been research directed towards the prevention of injuries.[1,16,19–23] For more than three decades these studies have been used for rehabilitation[24,25] since the profile of the sportsman is described with data that is used to set goals if the player gets injured. At present, and thanks to technological advance, it is possible to describe the condition of the sportsman better and in more detail.[26,27] Other researchers have looked for elements that provide prognostic value and help clinicians in the decision-making process, whether these are derived from clinical examinations[28–30] or from objective assessments based on findings in diagnostic tests.[31,32] Finally, another line of research attempts to guide clinicians in the preparation or adaptation of programmes for the recovery of injured sportsmen.[33–38] Within this group we can include the present article, which presents an interdisciplinary, cross-sectional and current view of how to face up to the challenge presented whenever a sportsman is injured.

Definitions

Recently the scientific community has attempted to reach a consensus on the return to the play after injury.[18] Rehabilitation for return to play has been defined as the interdisciplinary, specific and individualised process, the objective of which is the sportsman's optimal availability for competition after a sports injury.

There are several concepts that we need to pinpoint in order to standardise the language of health professionals in sport.[18] The concept of *return to participation*, as it is termed internationally, refers to the point at which the sportsman begins to take part in activities specific to his sport, but to a lesser degree than the target set. When the target level is reached, participation in the activity is full and he/she can compete with no restriction. This is classified as *return to sport*. This term is the equivalent of ''*return to play* (RTP),[11,13,39] most commonly used in team sports.

It is necessary to distinguish between medical discharge and the return to full involvement in sport. Both will be decided by the physician.[18,33] Medical discharge marks the healing of the sportsman's injury, as well as full functionality. In contrast, the sportsman will receive the all-clear for sport when he is fully able to compete.[18]

To complete the analysis, we must describe the professional scope of this rehabilitation process. Initially, a medical diagnosis will be fundamental, as well as treatment guidelines that must be determined by a physician specialised in sports medicine. Any injury should be treated by a specialist in rehabilitation of the functionality of the affected area. This specific training and these skills are encompassed within the profile of the physiotherapist. It will then be the specialist in sport and physical activity who will lead this phase of the process, with the objective of improving performance.[40] There is also the figure of the sports therapist who, depending on his training and skills, will be able to undertake the whole process or a significant proportion of it. This structure of different professionals is further extended in professional sport.[14,17]

The profile of the sports therapist should be interdisciplinary, with specific training in sports injuries, kinesiology

and anatomy. To this specific training must be added a profile of friendliness, flexibility and empathy. The psychological management of an injury is not always easy, so the care required by the injured sportsman requires a high degree of dedication.[13]

In addition, over and above any other aspect, none of these professionals can ignore the fact that the true protagonist of the process of rehabilitation is the sportsman himself. During the injury period, the sportsman undergoes an internal process of *disidentification*. For an indefinite period, he ceases to be himself, without being able to do a job that is as vital as it is professional, since his body, seen as a working tool as well as of expression, is not capable of this.[29] His well-being,[13] recovery[28,31] and progress[40] to an optimal state of fitness[14,30,33,35,36] are the only aspects which determine the process.

Description of the working model

The process of rehabilitation is cross-sectional and is based on teamwork by the different specialists in the field of sports medicine. Strictly speaking, rehabilitation to training begins at the moment the patient is discharged. From this point on, up to the point at which he can compete with full potential, rehabilitation is given. This will be an individualised and specific process.[41] Its planning and programming should be oriented specifically to the sport practiced and its competition requirements[14,15,28]; to the sportsman, taking into consideration age, medical history, position of play, role and sports career; and, of course, to the injury: type, cause, location and recurrence.[1,9,13]

The management of the phases[30,32–34] and the information on them will be the responsibility of the doctor. Other professionals taking on this role could be counterproductive for the sportsman, his confidence and stability, as well as for achieving the goals. Taking into account these phases, the therapist and other professionals will design certain content for each of the phases the sportsman is at.

There are variables inherent in the injury that must be monitored and assessed at all times by the professionals who work with the sportsman. On this point, perception of pain is important.[31,33,34] Professional care and its functionality, as well as the qualitative management of the treatment given and its intensity, should be defined as asymptomatic.[33,40] Providing a workload that is restricted merely by pain, or progressing in intensity until reaching thresholds that are not fully tolerable, means taking that injury to limits not prepared for and running the premature and unnecessary risks of both relapse and overload of other areas, due to compensation.

The sportsman must be educated in pain management, as well as in the expression of perceiving it,[32,34] investing all the necessary time until obtaining optimal communication with him. At the same time, personal trust between sportsman and therapist is a fundamental requirement that the professionals involved must know how to achieve in the day-to-day.

This will require that professionals set specific goals in the short term to prevent channelling motivation and concentration from going beyond that set of achievable achievements.[32] Effort must be made to make objectives assessable,[16] and therefore have tests that mark the achievement of these.[16,42–45] It is important that these objectives be defined for each phase and that the sportsman is aware of them, since, by definition, he is competitive and will be more motivated throughout the entire process.

Conditional orientation of the rehabilitation process

Contemporary sources already offer proposals on periodisation of the rehabilitation process, depending on the particular sport practised and its competition programming.[14] This process must adopt the same training patterns as in the case of competition. That is, if team planning involves the project of a competitive programme, rehabilitation and its phases should also be planned as one single programme. This would be the case of individual sports and amateur team sports where only one competition is held. In the case of professional team sports with several different competitions, where planning can take up to seven phases, rehabilitation must understand and approach these in its final (directed and specific) stages.

Depending on the terms and specific conditions of both the injury and the sportsman, it may be considered necessary to undertake a certain degree of conditional work. This may be of a general, preventive or compensatory nature, without any intervention in the affected area prior to medical discharge.[46,47] Subsequent to medical discharge, this could lead to more specific levels of intensity or directions (if deemed appropriate). Physical condition can be worked on in parallel with the injury, with the aim of being integrated within the rehabilitation phase considered.[14,46,47] Its objectives are not only to reduce the duration of the period until return to sport but also prevention, maintenance (and improvement) of conditional modifications, both general and specific.

Planning the rehabilitation process

The proposal must be open; adapted to the specificity of each injury and type of sport; individualised for that particular sportsman; and restricted to the context of professionals who will undertake the process. Planning of the rehabilitation process will be divided into 3 different phases[14,46,47,35,36,48] (Fig. 1) and the duration of each one will be determined by premises previously set out – as well as the achievement of specific clinical and conditional objectives.[16] These phases define a progression for load and intensity[49,50] as regards the exercises actually done. These will be defined by kinetic chain[51,52]; type of muscular action; number of joints involved[53–55]; range of movement; and the technical and tactical approach to the actual practice of sport.[56]

The first phase aims to achieve active early mobilisation, which provides a mechanical and circulatory benefit[57] without ignoring the fact that the whole process should be asymptomatic. Generally, this is characterised by proposing exercises in closed kinetic chain (CKC) and by muscular, isometric or dynamic action in internal or medial ranges. Their orientation will be of a general nature, that is to say, oriented towards the basic conditional and cognitive

	Phase 1	Phase 2	Phase 3
Kinetic chain	CKC	CKC/OKC	OKC
Muscular action	Isométric	Concentric	Eccentric
Extent of work	Internal - medial	External - total	Total
Orientation of content	General	Directed	Specific

Figure 1 General guidelines in the rehabilitation process for return to training after a sports injury.

capacities required in the specific type of sport practised.

The second phase is aimed at increasing functionality, intensity and load. There will be a progression of content in CKC to open kinetic chain (OKC) and extent of work, which enables concentric muscular work patterns, with an orientation directed at the particular movements (gestures) and needs of the specific sport. Specific sport exercises can be designed but without any opposition (defence) whatsoever.

Finally, the third phase will aim to reach competition-level intensity and loading, albeit proposed under training conditions. The content will bear in mind the intensity and maximum loading of the particular type of sport, as well as all its tactical complexity. This progression is achieved with the gradual entry of the sportsman into different phases of training sessions with the team, focussed from a qualitative (intensity) and quantitative (volume) approach.[6] For most sports these exercises will be in OKC and the development of strength will be based on exercises which are eccentric in nature.

Objective assessment for return to play

Determining suitable progression in rehabilitation after sports injuries, up to achieving return to sport requires objective information,[1,2] especially considering the fact that absence of pain is not synonymous with complete healing of the injured tissues.[26] Monitoring is needed which evaluates tissue response to loading from a multifactorial view.[40,58] This requires the design of functional assessment that will enable us to control and monitor both with respect to conditional abilities and state of fitness,[59,60] as well as adaptation to the training process.[61] This process must be handled by means of reliable and applicable,[16] non-invasive,[62] submaximal,[59,60] specific,[44] individualised[63,64] tests.

These should be oriented to the effects of training on the sportsman, both in terms of internal load (based on parameters such as variability in heart rate, perception of fatigue or effort, among others), such as external load (time of exposure, distances, impacts, accelerations, decelerations).[61,65,66] In this design, two types of parameters should not be ignored, such as subjective assessment of the sportsman himself[26,29] (relative to internal load), due to its usefulness in the management of envisaged periods, and the use of isometric tests (external load). This will facilitate monitoring throughout the rehabilitation process.

The validity of the assessment will be determined by data collected prior to the injury. This will enable progress to be compared and assessed.

Future prospects

Sports training and the integration of technology[2,5,6] offer the possibility of obtaining a multitude of different data.[66,67] Accelerometry, tracking and GPS provide a non-invasive way of achieving specific and affordable values from speeds and acceleration rates during competition or training. This data is mainly related to manifestations of specific force in the form of acceleration (concentric) and deceleration (eccentric) rates; jumps; impacts; as well as achieved velocities; displacement; and changes in direction or distances.[66,67] Beyond descriptive studies, research in this field focusses on the development of profiles based on the relationship of workloads with other types of parameters, through simple and ecological questionnaires (Borg, POMS, RPE) or Heart Rate Variability,[68,69] which enables us to relate external and internal loading[65] and therefore, the effect of training on the development of the sportsman, as well as the management of optimal loads.[27]

Conclusions

Once a sportsman has been injured, the recovery period begins, in order to obtain the sportsman's optimum availability for competition. Taking into account the factors that may influence the process, a framework will be designed using a biopsychosocial model, where the roles of each professional are clearly defined and where communication and trust between them and the player are maximum. The management of deadlines; content programming in each phase of work; and the creation of objectives are all essential elements for recovery of the injury, which requires specific, reliable and reproducible tests that will facilitate decision-making in an objective way.

Conflict of interests

Authors declare that they don't have any conflict of interests.

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