RETURN TO TRAINING AND PROFESSIONAL FOOTBALL COMPETITION AFTER THE SANITARY ALERT OF COVID-19 WITH EMPHASIS IN THE ANALYSIS, MANAGEMENT AND CONTROL OF TRAINING LOADS. SYSTEMATIC REVIEW AND PRACTICAL PROPOSAL.

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ABSTRACT

In the year 2020, the world is facing a global emergency called COVID-19, causing sports competitions to be postponed and/or suspended, resulting in the modification of sports schedules. This has caused coaches to have to prepare individual training plans or group training at a distance in decontextualized environments and with low specificity regarding the nature of the sport.

In order to analyse the main factors to be taken into account in planning the training after competition in professional football players, a systematic review of scientific literature addressing the selected problem was carried out. In the first search, 155 articles were obtained, identifying a total of 37 duplicate articles, therefore, according to the established criteria, a total of 118 articles were analysed. Of these, 30 were chosen for the investigation.

As conclusions of the study, we highlight the importance of performing the correct management and distribution of training loads after training with the aim of reducing the injury rate of athletes. It would be useful to follow the different practical proposals / recommendations that we present in the research for the period after training.

KEY WORDS: Risk of injury; Training load; COVID 19; Football; Competition; Back to training.

INTRODUCTION

In the year 2020, the world is facing a global emergency called COVID-19, which has caused football professionals to be unable to carry out their professional work in the usual way, causing the postponement or suspension of sports competitions. Confinement has meant that the footballers have had to exercise for several weeks in unusual contexts and training conditions, which could mean there is a higher risk of injury after competition (Myer et al., 2011). This is the *raison d'être* of the present investigation. As for all sports planning, football coaches design training plans to maintain the physical state of the players as far as possible (Urdiales et al., 2010). Given the nature of football as a collective sport, with interaction between players, collaboration-opposition, these plans in non-competitive periods could present a low level of specificity and are largely decontextualized regarding the real demands of competition (Martín, A., and Martínez, I, 2019), highlighting that the plans proposed during this unique situation in the history of COVID aim to maintain the conditional level of the footballer but are far removed from the real demands of the competition. For this reason, it will be necessary to carry out optimal and efficient planning and management of the load on the way back to training to avoid periods of overtraining that could increase the athlete's injury index (Colby et al., 2014; Hulin et al., 2016; Rogalski et al., 2013).

This, added to the fact that the nature of football presents a high risk of injury (Askling et al., 2013; Chena et al., 2019), highlights the importance of delving into factors related to the training load that could increase the risk of a sportsman becoming injured upon return to competition (Blanch and Gabbett, 2016; Gabbett, 2019).

It is worth highlighting research carried out by (Ekstrand et al., 2011) which indicates that each player will have an average of 2 injuries per season, so that in a 25-player squad, an average of around 50 injuries per season can be expected. This takes into account the fact that the nature of the injuries in football players is complex, dynamic, multifactorial and context-dependent (Bolling et al., 2018; Chena et al., 2019) and that many sportsmen appear prone to overuse (Woods et al., 2002). Therefore, the monitoring and analysis of external load, internal load, acute load, chronic load and acute: chronic load ratio, as well as the use of different questionnaires such as the subjective perception of effort scale (RPE) or the Wellness Questionnaire are especially important to avoid high injury rates and meet the different objectives presented by the competition (Gabbett et al., 2014).

For all these reasons, this study aims to analyse the main factors in planning training on the way back to training and competition in professional football players, with special emphasis on injury prevention. For this, a systematic review of the scientific literature related to the subject in question was made.

METHOD

Research design

A bibliographic review was carried out in different electronic databases to identify primary studies carried out between 1999 and 2020; therefore, it was delimited as a systematic documentary research design.

Systematic Selection of the Database

To meet the objective of the study, the following databases were consulted, based on reliability criteria: EBSCO (via the internet), PUBMED (via the internet) and RESEARCHGATE (via the internet). Magazines and eligible publications were restricted to those located in databases not cited above; Abstracts or conference proceedings,

book chapters and thesis were excluded.

Search Terms Selection

The terms used initially for the searches were: "return to training", "internal load", "external load", "football injuries", "return to play", "acute load", "acute: chronic workload". In this order of ideas, in a first search 155 articles were obtained, identifying a total of 37 duplicate articles, so according to the established criteria a total of 118 articles were analysed, of which 30 were chosen for research.

Search Strategy and Selection of Inclusion Criteria

This bibliographic review was carried out in accordance with the guidelines proposed by QUOROM (Quality of Reporting of Meta-Analysis) (Moher et al., 1999). As inclusion criteria of the article, it was taken into account that it was the result of primary, published research and that some of the words used in the search were included in the title or in the abstract. This research study is a systematic review of information collected from primary studies, with the aim of synthesizing, summarizing the existing information regarding the main factors to take into account in planning after training and competition in professional football players.

RESULTS

Of the 155 articles located in the first search, 37 articles were duplicates and 118 were considered for review. Of these, 84 articles were not used to write the article; what remained at the end was a total of 30 articles analysed and used for the writing of this research:

Figure 1

Flowchart of the citation process of the selected st

Database	Authors	Year of Publication	Article Title	Journal of Original Publication	Findings/ Practical applications
ResearchGate	Blanch, P., & Gabbett, T. J.	2016	Has the athlete trained enough to return to play safely? The acute: chronic workload ratio permits clinicians to quantify a player's risk of subsequent injury.	<i>British journal of sports medicine.</i>	There is a relationship between acute:chronic workload and the probability of injury.
ResearchGate	Carey, D. L., Crow, J., Ong, K.-L., Blanch, P., Morris, M. E., Dascombe, B. J., & Crossley, K. M.	2018	Optimizing Preseason Training Loads in Australian Football.	<i>International Journal of Sports Physiology and Performance</i>	This study underscores the importance of making an adequate progression after the return to training during the preseason.
ResearchGate	Colby, M. J., Dawson, B., Heasman, J., Rogalski, B., & Gabbett, T. J.	2014	Accelerometer and GPS-Derived Running Loads and Injury Risk in Elite Australian Footballers.	<i>Journal of Strength & Conditioning Research</i>	It is necessary to analyse the training load accumulated during different weeks in order to prevent sports injuries.

ResearchGate	Ekstrand, J., 2011 Hägglund, M., & Waldén, M.	Injury incidence and injury patterns in professional football: The UEFA injury study.	<i>British Journal of Sports Medicine</i>	Traumatic injuries and hamstring strains were more frequent during the competitive season, while overuse injuries were common during the preseason. The injury incidence in training and games was stable in preseason and season. There is an increased risk of injury during the second parts of football games.
ResearchGate	Gabbett, T. J. 2019	How Much? How Fast? How Soon? Three Simple Concepts for Progressing Training Loads to Minimize Injury Risk and Enhance Performance.	<i>The Journal of orthopaedic and sports physical therapy.</i>	Progressive, gradual, and systematic increases in training load allow athletes to progress safely until the return to competition, reducing the risk of injury, improving availability, and improving performance.
ResearchGate	Gabbett, T. J., 2014 Whyte, D. G., Hartwig, T. B., Wescombe, H., & Naughton, G. A.	The relationship between workloads, physical performance, injury and illness in adolescent male football players.	<i>Sports Medicine.</i>	There is a relationship between the burden and risk of injury.
ResearchGate	Hulin, B. T., 2014 Gabbett, T. J., Blanch, P., Chapman, P., Bailey, D., & Orchard, J. W.	Spikes in acute workload are associated with increased injury risk in elite cricket fast bowlers.	<i>British Journal of Sports Medicine.</i>	Large increases in acute workload are associated with an increased risk of injury in elite cricket players.

ResearchGate	Hulin, B. T., 2016 Gabbett, T. J., Lawson, D. W., Caputi, P., & Sampson, J. A.	The acute: chronic workload ratio predicts injury: High chronic workload may decrease injury risk in elite rugby league players.	<i>British journal of sports medicine</i>	Higher workloads can have positive or negative influences on the risk of injury in elite rugby league players. Acute Load Ratios: Chronic less than 0.85 or greater than 1.35 increases the risk of injury to athletes.
ResearchGate	Malone, S., Owen, 2017 A., Newton, M., Mendes, B., Collins, K. D., & Gabbett, T. J.	The acute:chronic workload ratio in relation to injury risk in professional football.	<i>Journal of Science & Medicine in Sport.</i>	An acute:chronic workload between values of 1.00 and 1.25 has a protective effect for professional football players. Increased intermittent aerobic capacity offers greater protection against sports injuries if elite players are exposed to very rapid changes in training loads. Moderate workloads, along with moderate-low to moderate-high acute workload ratios, appear to be protective for professional football players.

ResearchGate	McLaren, S. J., 2018 Macpherson, T. W., Coutts, A. J., Hurst, C., Spears, I. R., & Weston, M.	The Relationships Between Internal and External Measures of Training Load and Intensity in Team Sports: A Meta-Analysis.	<i>Sports Medicine</i>	Measurements of internal load derived from perceived exertion and heart rate show consistently positive associations with external loads and intensity derived from running and the accelerometer during training and sports competition.
ResearchGate	Myer, G. D., 2011 Faigenbaum, A. D., Cherny, C. E., Heidt, R. S., & Hewett, T. E.	Did the NFL Lockout Expose the Achilles Heel of Competitive Sports?	<i>Journal of Orthopaedic & Sports Physical Therapy.</i>	After a long period of decontextualized and non-specific training, there is a high risk of injury upon returning to competition.
ResearchGate	Sekiguchi, Y., 2018 Huggins, R. A., Curtis, R. M., Benjamin, C. L., Adams, W. M., Looney, D. P., West, C. A., & Casa, D. J.	Relationship Between Heart Rate Variability and Acute: Chronic Load Ratio Throughout a Season in NCAA D1 Men's Football Players.	<i>Journal of strength and conditioning research.</i>	There is a relationship between heart rate in terms of the variability of the acute: chronic load ratio.
ResearchGate	Tysoe, A., Moore, I. 2020 S., Ranson, C., McCaig, S., & Williams, S.	Bowling loads and injury risk in male first-class county cricket: Is «differential load» an alternative to the acute-to-chronic workload ratio?	<i>Journal of science and medicine in sport.</i>	The application of different acute and chronic load peaks can increase the risk of injury.

ResearchGate	Urdiales, D. M., 2010 Arrese, A. L., Izquierdo, D. M., & Rodríguez, R. E. M.	Características de la planificación del entrenamiento en los deportes de equipo españoles de élite.	<i>Apunts: Educación física y deportes.</i>	In sports planning there is a relationship between the training of physical trainers and knowledge deficiencies.
EBSCO	Arney, B. E., Glover, 2019 R., Fusco, A., Cortis, C., de Koning, J. J., Van Erp, T., Jaime, S., Mikat, R. P., Porcari, J. P., & Foster, C.	Comparison of RPE (Rating of Perceived Exertion) Scales for Session RPE.	<i>International Journal of Sports Physiology & Performance</i>	The RPE provides essentially interchangeable estimates of perceived intensity in training.
EBSCO	Buckthorpe, M., 2019 Della Villa, F., Villa, S. D., & Roi, G. S.	On-field Rehabilitation Part 1: 4 Pillars of High-Quality On-field Rehabilitation Are Restoring Movement Quality, Physical Conditioning, Restoring Sport-Specific Skills, and Progressively Developing Chronic Training Load.	<i>Journal of Orthopaedic & Sports Physical Therapy.</i>	It is very important to follow good planning in the footballer's "Return to play".
EBSCO	Chena, M., 2019 Rodríguez, M. L., Bores, A. J., & Ramos-Campo, D. J.	Effects of a multifactorial injuries prevention program in young Spanish football players.	<i>Journal of Sports Medicine & Physical Fitness.</i>	The injury rate in football is reduced when multifactorial strategies are applied, increasing the availability for sports practice.

EBSCO	Cross, M. J., 2016 Williams, S., Trewartha, G., Kemp, S. P. T., & Stokes, K. A.	The Influence of In-Season Training Loads on Injury Risk in Professional Rugby Union.	<i>International Journal of Sports Physiology & Performance.</i>	Abrupt weekly changes in training load increase the risk of injury.
EBSCO	Loose, O., 2018 Achenbach, L., Fellner, B., Lehmann, J., Jansen, P., Nerlich, M., Angele, P., & Krutsch, W.	Injury prevention and return to play strategies in elite football: No consent between players and team coaches.	<i>Archives of orthopaedic and trauma surgery.</i>	To improve the process of prevention, rehabilitation and return to competition after an injury, there needs to be good communication between players, coaches, doctors and physical therapists.
EBSCO	Martín-Barrero, A., 2019 & Ignacio Martínez-Cabrera, F.	El modelo de juego en el fútbol. De la concepción teórica al diseño práctico. / Game models in football. From theoretical conception to practical design.	<i>Retos: Nuevas Perspectivas de Educación Física, Deporte y Recreación.</i>	For the development of a game model, it is necessary to: 1. Carry out a conceptual analysis of the game model, 2. Identify the elements that it must contain and 3. Practical development of each of the elements that serves as a worksheet. route for those professionals who want to delve into this way of conceiving football training.

EBSCO	Moher D, Cook DJ, 1999 Eastwood S, Olkin I, Rennie D, Stroup DF, Moher, D., Cook, D. J., Eastwood, S., Olkin, I., Rennie, D., & Stroup, D. F.	Improving the quality of reports of meta-analyses of randomized controlled trials: The QUOROM statement. Quality of Reporting of Meta-analyses.	<i>Lancet.</i>	Generate ideas for improving the writing of scientific articles.
EBSCO	Murray, N. B., 2017 Gabbett, T. J., & Townshend, A. D.	Relationship Between Preseason Training Load and In-Season Availability in Elite Australian Football Players.	<i>International Journal of Sports Physiology & Performance</i>	Completing a greater number of preseason sessions has a protective effect on the season.
EBSCO	Woods, C., Hawkins, 2002 R., Hulse, M., & Hodson, A..	The Football Association Medical Research Programme: An audit of injuries in professional football--analysis of preseason injuries.	<i>British Journal of Sports Medicine</i>	Players are at increased risk for major and minor injuries, overuse injuries, lower leg injuries (especially the Achilles tendon), and strains on the femoral rectum during the preseason period.
PUBMED	Askling, C. M., 2013 Tengvar, M., & Thorstensson, A.	Acute hamstring injuries in Swedish elite football: A prospective randomized controlled clinical trial comparing two rehabilitation protocols.	<i>British journal of sports medicine.</i>	A hamstring injury rehabilitation protocol using lengthening exercises is more effective than a protocol containing conventional exercises to reduce the time to return to competition in Swedish elite football.

PUBMED	Bolling, C., van Mechelen, W., Pasman, H. R., & Verhagen, E. 2018	Context Matters: Revisiting the First Step of the ‘Sequence of Prevention’ of Sports Injuries.	<i>Sports Medicine.</i>	It proposes an alternative approach to explore and understand the context of injury through qualitative research methods.
PUBMED	Impellizzeri, F. M., Rampinini, E., Coutts, A. J., Sassi, A., & Marcora, S. M. 2004	Use of RPE-based training load in football.	<i>Medicine and Science in Sports and Exercise.</i>	RPE can be considered a good indicator of the overall internal load of football training.
PUBMED	Rago, V., Brito, J., Figueiredo, P., Costa, J., Krstrup, P., & Rebelo, A. 2020	Internal training load monitoring in professional football: A systematic review of methods using rating of perceived exertion.	<i>Journal of Sports Medicine & Physical Fitness.</i>	There is a lack of consensus for the use of RPE in professional football. This review could help professionals improve the procedures to adopt in the collection and interpretation of RPE data.
PUBMED	Rogalski, B., Dawson, B., Heasman, J., & Gabbett, T. J. 2013	Training and game loads and injury risk in elite Australian footballers.	<i>Journal of Science & Medicine in Sport</i>	To reduce the risk of injury, training load values must be controlled individually.
PUBMED	Sclafani, M. P., & Davis, C. C. 2016	Return to play progression for rugby following injury to the lower extremity: A clinical commentary and review of the literature.	<i>International Journal of Sports Physical Therapy</i>	Stresses the importance of making a correct progression in the tasks chosen for the return to training during the rehabilitation phase.

PUBMED	Troester, J. C., & 2019 Duffield, R.	Postural Control Responses to Different Acute and Chronic Training Load Profiles in Professional Rugby Union.	<i>Journal of strength and conditioning research.</i>	Postural control is directly related to acute and chronic load in training.
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Table 1

Description and characteristics of the different studies.

DISCUSSION

This research study attempts to address a the most important factors to be analysed when considering appropriate physical activity for professionals on the way back to training and competition, since football players have been working during the period of confinement in decontextualized and low-specific environments. The main objective of training is to improve the performance of athletes in training and competition, highlighting the importance of managing and analysing the internal and external load of professional athletes (McLaren et al., 2018). These authors highlight that the internal load refers to how the organism responds to the activity carried out; it can be monitored through heart rate (HR), lactate meter, muscle temperature analysis, subjective effort perception scale (RPE), amongst others. In this sense, it is important to find methods that provide reliable information on the training process taking into account the economic level of the club. RPE is highlighted as a valid method, with high reliability indices and with a low economic cost (Impellizzeri et al., 2004; Rago et al., 2020; Arney et al., 2019). On the other hand, external load is one that refers to the nature of the task performed and is monitored through GPS devices or video tracking systems. It is very important to relate both internal and external load in time windows through the following concepts: acute load, chronic load and the acute:chronic load ratio. First of all, the acute load is usually considered the weekly workload or load of a microcycle. For its calculation, time windows of between 3 and 7 days are usually analysed and are related to the “fatigue” of the athlete (Troester and Duffield, 2019). On the other hand, a chronic load is usually considered a load carried out over a longer period, usually using temporary windows between 3 and 6 weeks, although in general the value of 4 weeks (28 days) is usually used for its calculation. It is closely associated with the athlete's physical state or fitness level (Buckthorpe et al., 2019). Finally, the acute:chronic load ratio is defined as the absolute load performed in a close period in time that represents the acute load in relation to the average of the temporary load chosen as chronic load, which is usually 4 weeks and is calculated by dividing the acute workload by the chronic workload (Hulin et al., 2014). We can measure the ratio of acute:chronic load in internal load variables (Example: RPE, TRIMP, among others), as well as in external load variables (total distance, distances travelled to sprint, distances travelled at high intensity, number of accelerations / decelerations, etc.), recommending its analysis in those variables that have a high relationship with the injury index (accelerations and decelerations of high intensity, high speeds, sprint speed, RPE, heart rate > 90%, among others) (Gabbett et al. , 2014; Sekiguchi et al., 2018; Tysoe et al., 2020). Its use will give us information about the state of fitness or fatigue of the athlete and can be used as a useful tool for the prediction of sports injuries (Blanch and Gabbett, 2016). It should be noted that very high A: C load ratios (related to overtraining) or very low (related to maladjustment) are presented as injury risk factors, considering values between 0.8 and 1.3 as the optimal ratio of acute-chronic load in professional athletes (Blanch and Gabbett, 2016; Malone et al., 2017).

Graph 1: Optimal acute-chronic load ratio for an athlete.

Source: Blanch and Gabbet (2016).

In this order of ideas and taking into account that we are in a period of exceptionality, with characteristics more typical of a post-season transitional period than a competitive one, a study by Loose et al., (2018) highlighted the importance of not making mistakes during tapering, injury recovery or returning to training periods after a period of inactivity or low load, such as the current one. Therefore, the monitoring of internal and external load related to the analysis of player feedback, will help us to know the state of fitness and adaptation of our athletes, taking into account that very high training loads in a short period of time or in periods of maladjustments could considerably increase the risk of injury, but that adequate training modifications will have a protective effect (Cross et al., 2016; Murray et al., 2017).

Another aspect to consider is the percentage of weekly change, especially in those variables that are related to the injury rate. Thus, weekly change percentages greater than 10% would increase the risk of injury while changes greater than 20% could expose our players to situations of maximum vulnerability (Gabbett, 2019). Lastly, it should be noted that despite the fact that during the Covid period the tasks designed by physical education professionals have been aimed at maintaining the athlete's conditional status through strength, resistance and preventive exercises, football players have worked in decontextualized environments of an opposition-collaboration sport, so, upon returning to training and in line with the studies carried out by Carey et al., (2018) and Sclafani and Davis (2016), it would be recommended to introduce specific tasks and gradually increase the level of physical condition.

RECOMMENDATIONS ON THE RETURN TO THE TRAINING

1. NECESSARY PERIOD OF RETURN TO THE COMPETITION.

- 1.1. It is necessary to know the date of incorporation to training and the competitive calendar.
- 1.2. We consider that it will be necessary for the player to take some time to return to competition. We believe that the amount of time should be 50% of the time that the athlete has been without training or competing with their peers.

2. PLANNING ON THE ROUND OF FOOTBALL TRAINING

- 2.1. There should be an adequate progression regarding the load, the contents and the specificity of the sessions on the way back to training, taking into account that weekly increases of more than 10% can put our athletes at risk of injury.
- 2.2. Acute load: chronic ratios of 2 or 3 weeks should be used, with the choice of the acute load ratio: chronic 3:21 being proposed as a good option during the first weeks of training.
- 2.3. The variables of external load that have the highest relationship with the injury index should be taken into account: high speeds/sprint speed; high intensity accelerations and decelerations.
- 2.4. Special attention should be given to the feedback provided by the player through the different questionnaires used by the coaches, such as the RPE or Wellness Questionnaire.

3. FOLLOW PROPER MANAGEMENT OF THE TRAINING LOAD

Our proposal for the control, analysis and management of training load would be composed of 7 phases divided into a total of 3 blocks:

BLOCK 1: Planning and design.

Phase 1 or planning phase, where the contents to be developed in the different sessions of the microcycle will be listed and described taking into account the state of physical and mental fitness of our athletes and the physical-technical-tactical objectives proposed by the coaches.

Phase 2 or design phase, where the tasks proposed for the different training sessions will be designed according to the objectives of phase 1.

BLOCK 2: Analysis, control and immediate management of the training load.

Phase 3 or phase of analysis of the internal load, where the response that the players have had at the physiological level (internal load) in relation to the nature of the proposed tasks (external load) will be

examined.

Phase 4 or feedback phase, where the feedback from the players will be received through the different questionnaires (RPE; Wellness Questionnaire; etc.).

Phase 5 or phase of analysis and triangulation of internal-external load variables and questionnaires, where the state of fatigue or aptitude in which the athlete finds himself will be studied through triangulations of data between internal and external load and feedback from players.

Phase 6 or phase of fitness analysis, where the state of physical and mental fitness of the player will be analysed to carry out the next training session or match.

BLOCK 3: Analysis of the physical condition of the athlete and team.

Phase 7 or phase of study of the athlete's fitness level, where the improvement of the athlete's physical condition during a certain time window will be evaluated through an intra-player analysis. In this phase it would also be advisable to carry out inter-player analysis to compare the fitness of different athletes, advising comparing that of those who play in the same position, as well as an analysis of the general condition of the team. Through the different temporal progressions, we will analyse the modifications (increase or decrease) in the physical condition of our athletes.

Graph 2: Stages for the control, analysis and management of the training load.

CONCLUSIONS

As conclusions, we highlight the importance of carrying out adequate management and control of the loads when returning from training in order to reduce the injury rate and we suggest following all the recommendations proposed in relation to the necessary period of time spent on the return to training and competition through the planning of the different sessions.

Finally, we highlight the important role that the different coaches will have in terms of planning, management and control of loads so that the players, who after all are the main players in the sport, can face the return to competition in optimal condition.

Contributions

Contributed to conception and design: DA, JA.

Contributed to acquisition of data: DA.

Contributed to analysis and interpretation of data: DA.

Drafted and/or revised the article: JA.

Approved the submitted version for publication: DA, JA.

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