EDWARDS TL METHOD AND D_SHI(M): INTENSITY DESCRIPTORS

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Abstract
The purpose of this study is to describe the intensity of training in response to internal and external load in professional football players during training sessions (199 sessions, 43 weeks) and official matches (32 official matches). Twenty-two male professional soccer players (n = 22) of the Italian national championship Primavera U-19 are involved in this study during the season 2014-2015 (mean ± DS: age 20 ± 11.8 years, height 181.0 ± 0.1 cm, weight 73.6 ± 6.6 Kg, BMI 23.0 ± 1.1 Kg / m²,% fat mass 9.3 ± 2.7%, sit and reach 47.0 ± 8.0cm, IR1 2575 ± 600m, Vo2max 58.1 ± 0.8 ml / Kg / min, HRmax 195 ± 4.7 bpm, High Blood Pressure 137 ± 10mmHg, Low Blood Pressure 69 ± 6mmHg; CMJ 39.5 ± 3.6cm; CMJb 47.0 ± 3.6cm; 20mt Sprint 3.05 ± 0.17s; C2OD Agility Test 7.59 ± 0.24s). The Edwards method (internal load analysis) of the 5 heart rate zones (Z1: 50-60% HRmax; Z2: 60-70% HRmax; Z3: 70-80% HRmax; Z4: 80-90% HRmax; Z5: 90-100% HRmax) allows you to check the distribution of work intensity throughout the entire training session and to check the percentage time at high intensity (90-95% HRmax) to generate specific cardiovascular adaptations at the aerobic level (High intensity aerobic training). By this method we can quantify in arbitrary units (A.U.)work produced during the day and week. Furthermore, with GPS technology (external load), we established statistically relationship among D_SHI (m) (> 16 Km / h) (High Intensity Speed Distance > 16Km/h) and Edwards TL Method to describe how internal and external load are related (R = 0.75). The statistical analysis showed that both are effective methods for describe high-intensity work for soccer player during training and game.

Key words: *Internal Load, External Load, Edwards Method, GPS, High Aerobic Intensity*

Preface

Actually, it is necessary for high-level football to establish the correct relationships between these parameters to adapt more accurately and individually workload for player during regular weekly training sessions. It all comes from observation of daily work on the field as a professional physical trainer which is closely linked to the trainer's work and its demands. At this historic moment, it is necessary to establish the right workload for each individual athlete / player according to his role and physical daily condition, because measure with "eye" our proposals is deleterious and conflicting element with current technological possibilities. Training science has made extraordinary progress, but alone is not enough if it is not supported by the correct application of the guidance provided by the physical trainer and the technical staff of the training team. The numbers alone do not give us definitive answers, apply to field practice. Establishing correct technical/tactical and physical relationships in weekly training program allows you to maximize what is done in daily practice so that everyone can make the most of it. The common thought is to "think" that football is not a science, but a game, that is correct and right in all points of view, but science can help improve football. The issue is very complex in several respects and must be tackled by objectifying what is proposed, making it scientifically and practically at the same time. The applicability of what is done makes it possible to evaluate the situation quickly and to give more information to the physical trainer, but also and above all to the coach. Our aim is also to make the trainer find useful and practical-scientific what he is told and comes from such data so as to strengthen the coach and physical trainer relationship more and more. In our view, it is very important to avoid using what is not have a scientific validity to justify what happens in practice, as observing the training science parameters can make significant improvements in all physical and technical/tactical aspects, that are closely linked to each other. In conclusion, a sport practiced with adequate scientific input to improve sports performance, practice and science-science and practice.

Introduction

The interest in this topic is of particular importance in the football world in which the number of training sessions suggests the use of exercises with and without ball with physical valence. Specific profiles of single player and team for internal loading (ITL) and external load (ETL) are crucial to planning and guaranteeing excellent physical performance during football match. Because of the very complex variables, it is necessary to determine specific constructs relevant to the practice of the game. Firstly, quantify your weekly workload and get the right answers at the end of it is a decisive step to verify the work you are doing. Training monitoring with and without ball in today's football is necessary to make each proposal more specific

than past period. Understanding the correct relationship between physical aspect and technical-tactical aspect makes it possible objectify what we see in the reality of each practice and match: thinking that a team runs more than one other just by considering the physical aspect and overlooking the technical-tactical is devoid of any sense. The vision you want to give must be global, open to understand that every element needs to be evaluated and analyzed in advance to limit as many errors as possible. Doing no reference to this would deprive our work in the field of any sense. Reading key must start from the concept of team game model and lead to a detailed analysis of what it says to us: it is not enough to program less-functional workouts for what we need, but it is necessary to create workouts according to game model their own team (individual) and roles covered by the single player in the field. Everything until now seems very clear and applicable with simplicity, but there is a question that makes this analysis much more complex: What are the relationships between internal load and external load? What are the most important parameters to "really" consider for internal load and what for external load? What are simple and pure "descriptive" analysis of the match and training situation that do not allow a correct job programming? Early technological developments were related to internal load, such as heart rate monitor, which in the early 1970s allowed to training methodologists to undertake in-depth studies with various methods of HR (Edwards Method, Banister Method (TRIMP), Lucia Method, Method of Blood and Muscle lactate samples) to obtain useful information to quantify response to training load administered. Next, will be added to the heart rate variability study (HRV). In the 1960s, with studies of physiologist Gunnar Borg (1962), was published the Borg Scale CR-10 for quantifying the perceived effort (RPE) post training(RPE has a high correlation with heart rate: increased perceived effort increased HR achieved during activity). All these methods with precision and scientific validity give an adequate indication of the level of intensity achieved during practice and with in-depth analysis allow to quantify correct weekly internal load (e.g. the percentage of time where subject was over 90 % of HRmax, SRPE etc.). Here we have a correct indication of how much our athlete has given in every single workout and week in terms of internal workload and we are able to answer the question: did you train? Following the technological evolution, Match Analysis (physicals and technical-tactics aspects) and use of GPS have brought a number of remarkable information to be used in field practice and for scientific sports research in terms of external load. Where's the problem? Match Analysis is a match descriptor that team and players perform and makes us understand longitudinally (whole championship period, match by match, what is the physical condition and the technical-tactical disposition of individual player and group). Up to this point becomes very useful and clarifies dilemma between teams and players who run and the quality of game and run on the field. The analysis of GPS that is made and applied to football starts with a scientifically not validated "historical and dated" principle of training with the average of the game: create exercises that reach averages of the game parameters with a simple red light (insufficient), yellow (excess), and green (sufficient). Virtually no scientific validity. Therefore, it is necessary to correctly apply the use of GPS to sports training, especially in ball training on respect of scientific and sport research. The aim of this study in relation to scientific articles is to establish the correct relationship between the internal and external load parameters and to scientifically understand what are the most useful ones in the external load to give an indication to adequate workload, so as to avoid staying in a simple "description" of the training. In the analysis of training by GPS it becomes crucial for the physical trainer to analyze the correct spaces of the exercises proposed with the ball and have a correct information from occupied field space by each player and to better understand if it is a workout for example with more or less accelerations, decelerations at different intensity or more runs at very high intensity speeds. Copying the game does not have scientific validity; instead, training by achieving the established intensity (according to the daily workout targets) generates the physiological modifications needed for performance. "Evidence Based Coaching", the starting point for an adequate analysis of scientific research applied to sports and, in this case, based-football training on scientific evidence. Many studies have been changes and improvements in this purview. Gunnar Borg, introduced the practical application of perceived effort through his CR-10 scale (1950, 1962). It indicated the correct approach for application of the Borg scale for subjects that suffering from heart disease and subsequently applied to football training. Impellizzeri et al. (2004) performed all RPE correlations with different methods of quantifying the internal load by heart rate. This research shows a high correlation of them with the Borg Scale CR-10, which makes the latter useful for analyze football practice. Following diffusion and use of different technologies, the internal load analysis has become more and more detailed. Castagna et al. (2011), starting from a "case study", analyzed weekly distribution of aerobic training in high-level professional football players to quantify the right weekly workload designed to generate specific. Later on, Castagna C. et al (2013)**,** in a "team study" refer to preseason variations in aerobic fitness and how they affect in professional football players in terms of internal workload response , laying the basis for the "efficacy dose" and "efficacy intensity" during day and week. Subsequently, Manzi et al. (2013) proposed TRIMPi (Individual Training Load Impulse) to give a correct indication of the "dose efficacy" needed to ensure a "weighted" workload with scientific basis. From these three articles we can see how the most important indicators for quantifying the daily, weekly and monthly work load are: HR Validity RPE CR-10, TRIMPi validity,

Efficacy Intensity> 90% HRmax, Efficacy Dose > 500AU from Aerobic Fitness, Efficacy Dose> 400 AU from Sub-max Aerobic Fitness, Maintenance Dose and Development Dose 7-10% Weekly Load (> 90-95% HR max). In the study conducted by Barbero et al. (2009) Yoyo Intermittent Recovery Test was validated for young football players and established correlation between total distance covered during the match (> 16-17Km/h) and the result obtained on test in meters, using the GPS at 1Hz. This research shows a high correlation between test and distance in competition: the most powerful players in test were also those who performed a greater intensity in the game. However, this 1hz GPS did not allow to analyze the acceleration and deceleration phases, but not because they were not important and not considered, but rather due to shortage in technological development of the first sat systems for sport. As previously confirmed, the technological evolution from the year of the first study with use of 1hz GPS has allowed us to deepen the study of external workload guaranteeing an important opening to evaluate those parameters of work: from this moment on not only matches could be analyzed by match analysis, but also training through use of technology (Castagna et al., 2009). The innovation it has been try to apply match average and create training similar to own team game model. The problem arises when we only think about replicating the game's averages, and we do not analyze what might be useful for other types of training solutions. Who tells us that it's just enough to train with match average and replicate only what is happening in the game without ever getting higher training intensity to improve the performance of our athletes? If we were to think in this way, it would be enough to just play the game every workout, but this is a science-free thought, the science of training and physiology tell us much more, we need to adapt the body to overcoming the "barriers" from point physical view to generate specific adaptations. Properly integrate work with the ball and without ball to our prestige model: physiological balance. A new approach, with evolution of tracking systems and GPS, was carried out by Osgnach et al. (2010), with introduction of new concept about "Metabolic Power (MP)" with which tried to create indicators that were valid for the analysis of those phases that in the past seemed to be forgotten, such as acceleration and deceleration, but which could not be studied because of underdeveloped technology systems. Manzi et al. (2014),correctly examined the relationship of the new approach of the "Metabolic Power MP" with Aerobic Fitness to high-level players. Di Prampero et al. (2015), have deepened this study and defined a work method applicable to training starting from game model: Training programmed according to the mean of the game. But the problem is the same that we analyzed above: not have physiological balance. Izzo et al. (2015; 2016) referred to aspects of acceleration and deceleration phases in soccer, in relation to mentioned aspects. Very important aspect of external load analysis.

Starting from that there is a very important question from methodological point of view: what are appropriate field dimensions to achieve corrects training intensity for football players? This allows us to understand how can we improve the use of GPS, especially in training with the ball which are functional and specific to our game. A first experimental approach was validation of super small sided games (S-SSG) (Castagna et al., 2014), in which the principle applied was to ensure that single player occupied a space equal to square meters of football match: the hypothesis was 300 square meters occupied by each player (10 vs 10 excluding the goalkeeper) and create the right (e.g. 5vs5 + 2GK on 85x34mt) to work more specifically on high speeds run (high intensity> 16 km/h and very high intensity>20 km/h) compared to narrow field dimensions. Thus dimensions in which vertical measurements were larger than the horizontal, the number of small players guaranteed major developments on run speeds. On the other hand, smaller field dimension with a small number of players and where the vertical dimension was smaller or equal to the horizontal dimension developed more acceleration and deceleration phases, so it was a purely neuromuscular training (Castellano et al., 2015). These indications provided by scientific research confirm us the tendency for a change on approach of data analysis from GPS, as we agree on the quantity of numbers coming from it but need to be contextualized in relation to the game size used during workouts. Filetti et al. (2016) analyzed the relationship between high intensity run (>16 and> 20 km / h) and the technical tactical skills of the professional football player during the matches. This study shows scientifically how the physical and tactical aspects are closely linked and in the programming of the practices it's necessary to create the most functional workouts to everything that respect the high workout intensities from the psycho-physical point of view, both in terms of external load and internal load, on determinate days of workouts week. Gabbett et al. (2016) referred to importance of detailed external load analysis as a preventive factor for injury risk: use external load parameters to calculate the likelihood of injuries, the relationship between acute load (fatigue) and chronic load (fitness). All this highlights how there are different approaches to workload analysis and how it is necessary to draw from the external load of the appropriate responses to gain benefits. An example of this new approach is the following: ATL (Acute training load, fatigue) = Average workload of the last 7 days. So if I have to calculate for my team and single athlete this ratio, I will only take the moving average of the distance covered to very high intensity accelerations (> 3m/s²) or decelerations (<-3 m/s²) or distance covered to very high intensity (> 20 km/h) or total SRPE for last 7 days. CTL (Chronic Training Load) FITNESS = Average workload of the last 42 days (or 4 weeks). So if I have to calculate for my team and for the single athlete this report, I will only do the moving average of the distance covered at high intensity accelerations (> 3m/s²) or decelerations (<-3 m /

s²) or the very high intensity distance (> 20 km/ h) or average SRPE of the last 42 days or 4 weeks. Subsequently, I will perform the ATL / CTL ratio (A/C WL ratio), the result of which will be a low-risk injury for the single player and team will have to be between 0.8-1.3, whereas> 1.5 the risk of injury will be much higher. What is to be considered is also the difference in workload increase between one week and the next: according to literature data the increase must be between 10-15%, not higher, so as not have greater risks of injuries. What is important to analyze at present is what is the relationship between internal and external loads in relation to their indicators? What are the most important parameters of external load? In the state of the art, in training science the latter is only a "descriptor" of the work and not a precise and detailed load indicator as the internal load. According to Burges D. (2016), one of the values predicting an increased risk of injuries in sports is the average load of the last 7 days, expressed in meters covered in acceleration (> 2 and 3 m/s²). The external load does not describe the stress, as the perceived effort does not describe performance (Mujika, 2016), it is necessary to collect all the available data, but respecting the rule by which you can immediately get a couple of practical information and take the time needed to scientifically study phenomenon in its complexity using necessary statistical techniques. Transform knowledge into information. This is also confirmed by Coutts's (2001) studies, which has always offered practical training solutions for TL (Training Load): scheduling the week's workload according to the individual's history, checking at weekends how much it has been done really compared to the programmed and the relationship between the workload done in the last few days and the previous weeks, avoiding sudden swings of TL by observing all available parameters (GPS, FC, SRPE), change content of the workouts to avoid the onset of monotony, modify individual programs by adding work without ball or gym work and changing exercises considered dangerous to the individual. Piggott et al. (2009), Gabbett et al. (2016) have shown that 40% of muscle injuries are associated with a rapid change in training load (> 10%) compared to the previous week. When training load increases by 15% compared to the previous week, the risk of injury increases between 21 and 49%. To minimize these risks the weekly load must not exceed 10% of the previous week. The relationship between weekly workload (acute) and work done in the previous 6 weeks (chronic) is a specific analysis of the condition and individual athlete's preparation.

Materials and Methods

The workload was analyzed throughout the season (199 sessions, 6 workouts per week, 32 official races) on twenty-two professional football players of the Italian national championship Primavera U-19 during the season 2014-2015.For this study, the Pearson's Correlation Coefficient was used to relate internal and external load variables between them.

For heart rate analysis and its respective training zone it was used Suunto Professional Team System (Vaanta, Finland) memory belt with respective software (Suunto Professional Team Manager 2.3.0). In addition, we used the external load analysis K-GPS 10 Hz and K-Fitness software (K-Sport Universal Montelabbate, Italy). The Edwards method consists of: a) Individualize HRmax for every athletes with incremental test and make setting in the dedicated software, in relation with work percentages; b) Working time note in their respective heart rate zone (e.g. Zone 1 = 50-60% HRmax = 16.4'; Zone 2 = 60-70% HRmax = 9.1'; Zone 3 = 70-80% HRmax = 9.5 '; Zone 4 = 80-90% HRmax = 17.1; Zone 5 = 90-100% HRmax = 4); c) Multiply working time of each zone for K Coefficient (K Constant) corresponding to the zone: (ie Zone 1 = 50-60% HRmax = 16.4'x K1 = 16.4; Zone 2 = 60-70 HRmax = 9.1'x K2 = 18.2; Zone 3 = 70-80% HRmax = 9.5' x K3 = 28.5; Zone 4 = 80-90% HRmax = 17.1’ x K4 = 68 , 4; Zone 5 = 90-100% HRmax = 4’ x K5 = 20); d) Add respective values of the 5 heart rate zones to get training load (TL) of practice session; TL: 16.4 + 18.2 + 28.5 + 68.4 + 20 = 151.5 Arbitrary Units (A.U.).

Results

Existing relationship between two workload analysis methods and therefore the training intensity achieved by player shows how both are useful and effective for calculating daily training load (TL) (Figure1). This scientific evidence allows us to have more information especially regarding practice with the ball.

Work percentage is referred to the amount of percentage time the athlete, in a given exercise, is in Match Zone: i.e. the heart rate range between 80 and 100% of the HRmax. Exercises are intense when work percentage is over 70% (i.e. for a least 70% of time exercise player has been in Match Zone) and for a time longer than 20% there is a HR between 90-95% HRmax. D_SHI (mt)> 16 Km / h, produced during training (Fig.2), which can be verified by K-GPS and K-Fitness, is an excellent indicator of the high intensity produced by the player during the session. Last step possible over or near this threshold to ensure specific physiological adaptations at organic level.

These instructions are very important for correct program training session so that athletic trainer can to program adequately and quantify objectively the workload given to his players. An important analysis was carried out on training intensity distribution where it is noted that the index (amount) of weekly development for high intensity (90-95% HRmax) is equal to 7-10% of total weekly load to be performed at this threshold. Substantially (2) high intensity must be at least 8% of weekly time.The result of our work shows that using one of the two methods of analysis we can find that a detailed work analysis with a high statistical correlation (r = 0.75) (Fig.3).

Coefficiente K	%Hrpeak	Zona%	Tempo(min.)	TL
1	50-60%	27	16,4	16,4
2	60-70%	15	9,1	18,2
3	70-80%	16	9,5	28,5
4	80-90%	29	17,1	68,4
5	90-100%	7	4	20
Totale		94	56,1	151,5
Carico Lavoro	80-100%	35	21,1	

Figure 1. Calculation Table Edwards Method

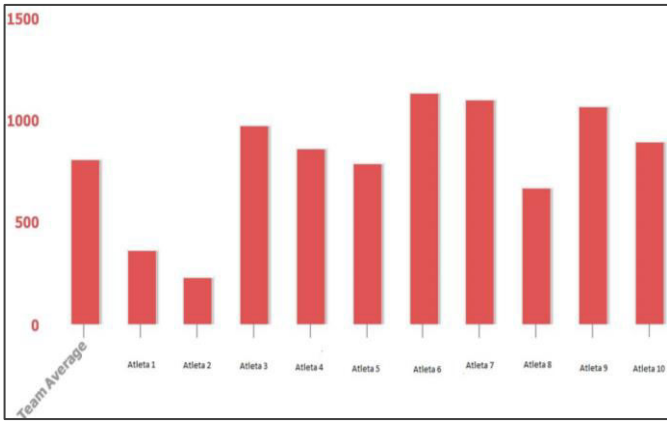

Fig.2. D_SHI(mt) >16 Km/h

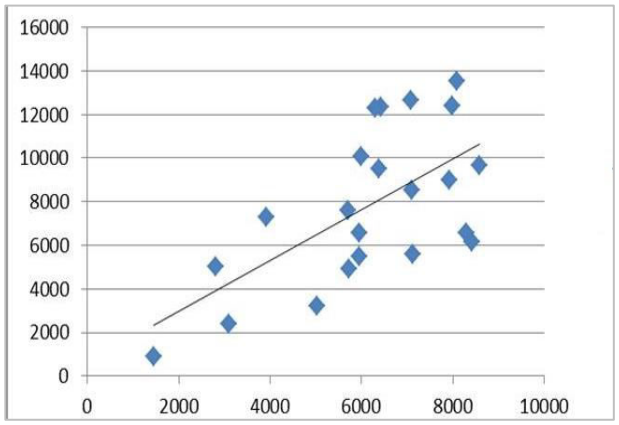

Figure 3. Edwards TL relationship with D_SHI(m)

It is clear the importance of heart rate training> 90% HRmax, such as distance covered above 16 Km /h of speeds that are related to the latter. It is evident from scientific literature that while for internal load there is a determined weekly total volume quantification to achieve positive physiological adaptations in the athlete, for external load analyzed by GPS, there is no precise indication of meters and total volume to produce specific effects. This is because the D_SHI (m) varies according to the exercises proposed by the physical trainer with ball and without the ball. In fact, if the space increases (> 250m² per player), it will change speed at high intensity run (> 16 Km / h) performed by individual player on the field and are reduced accelerations and decelerations, which increase with narrow space(<250 m²; square meters per player) (3-6). All this changes programming of work done, which will be more directed with large spaces at increase in aerobic components with high intensity and running speed, whereas smaller spaces will result in an increase in anaerobic strength components with more accelerations and decelerations. Internal load is an index of what happens, this is largely evidenced by the studies of scientific literature. The external load is greatly affected by the size and play spaces. The proposal for team sports and in this case for football is not to train for the match average, because this would not allow to prepare for decisive moments with greater intensity. This is the physiological principle based on supercompensation.

Discussion

There are different approaches to workload analysis, literature has always put a lot of emphasis on the analysis of what is happening in the field, technological evolution has brought important improvements to guarantee more and more insights and better results . What can hardly be changed is about physiological analysis and compliance with the laws regulating this matter. Foster C. (2016), considered one of the world's leading experts on tracking exercise workload, the author of the session rating of perceived exertion (SRPE), has repeatedly emphasized in its studies the importance of quantity and quality athletes training. He has identified some aims independent of technological development (GPS, Match Analysis) over the next few years: Improving the ability to establish day-to-day load management based on what is monitored, minimizing the time between detection of data and information given to trainer, until you get to evaluations that do not require a full day of dedicated training. Training and its monitoring as the interface between the athlete and the coach. The external load does not describe the stress, as the perceived effort does not describe the performance (Mujika, 2016), it is necessary to collect all available data, but observing the rule: fast athletic trainer and low researcher, whereby it is possible to obtain immediately a bit of practical information and take the time to scientifically study the phenomenon in its complexity using the necessary statistical techniques. Transforming data into knowledge. This is also confirmed by Coutts's (2016) study, which has proposed practical training tracking (TL) solutions: scheduling the week's workload according to the individual's history, checking at weekends how much it is really doing to programmed and the relationship between the workload done in the last days and the previous weeks, avoiding sudden swings of TL by observing all available parameters (GPS, FC, SRPE), varying the content of practice to avoid onset of monotony, modify individual programs by adding work without ball or gym workout and changing the exercises considered dangerous for the individual. It is important to increase performance by minimizing injuries, and can be considered as a team performance index, giving more players available.

Among the situations that lead to an increase in injuryare reported high run levels at high speeds, repeated high intensity efforts, constantly load high or insufficient (both in terms of internal load RPE, Edwards, and external load TD (mt), D_SHI (mt). Sudden changes load (acute and chronic load ratio : Ratio between the last week and the average of the last four) and the history of previous accidents are other trigger factors. Therefore, it is necessary to hold load variations between 10-15% between per week and the next training (calculation of the percentage difference between SRPE, Edwards (UA), D_SHI (mt), D_ACCHI (mt), D_DECHI (mt)) to reduce the likelihood of accidents. Not just the training load causeinjuries but also the content of training with its purposes. Training load analysis is very important and it's impossible to reduce that at simple interpretation, in fact it is necessary have (for external training load), in this case GPS, correct parameters of reference, to use their with a specific aim: for example likelihood injury. Different research, have established that analyze all with average match not have a meaning. The correct approach is: put into each other's relationship all parameters (ITL and ETL) to create reference values. In fact if I know ITL (e.g. daily and weekly rpe, srpe, Edwards etc) I will quantify exactly my practice and If I know ETL (e.g. daily and weekly D_SHI(m), acceleration, deceleration etc.) I will calculate likelihood injuries and it's possible to do longitudinal analysis of players and team performance during exercises with the ball (training) and matches.

Conclusions

The internal load is the main descriptor of what happens, this is largely evidenced by the studies of the scientific literature. The external load is greatly affected by the field dimension (size and square meters).The proposal for team sports and in this case for football is not to train for the match average, because this would not allow to prepare for the decisive moments with greater intensity. High intensity training means training to achieve specific intensity established by physiology (90-95% HRmax) when referring to high-intensity aerobic training as in our case. The optimum condition for physical trainer is to analyze the work done in the first place with the internal load and put it in relation to the external load values determined by the GPS for the reasons listed above.

In conclusion:
1. Establish training objectives to be performed
2. Select correct training content (exercises with and without ball)
3. Quantify the volume and intensity to reach in the session for each athlete during the week
4.Analyze training in real time if possible (real time GPS, telemetry, single exercise RPE)
5. Post-work load analysis: correct interpretation of internal and external load data.
6. Classify the exercises proposed according to the intensity achieved during practice.

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EDWARDOVA TL METODA I D_SHI(M): DESKRIPTORI INTENZITETA

Sažetak
Svrha ove studije je opis intenziteta treninga kao odgovor na unutarnje i vanjsko opterećenje profesionalnih nogometaša tijekom treninga (199 sesija, 43 tjedna) i službenih utakmica (32). Profesionalni nogometaši (n = 22) talijanskog državnog prvenstva Primavera U-19 uključeni su u studiju tijekom sezone 2014-2015 (uzrast 20 ± 11,8 godina, visina 181,0 ± 0,1 cm, težina 73,6 ± 6,6 kg, BMI 23,0 ± 1,1 kg / m2, maseni udio masti 9,3 ± 2,7%, sjedenje i doseg 47,0 ± 8,0 cm, IR1 2575 ± 600m, Vo2max 58,1 ± 0,8 ml / Kg / min, HRmax 195 ± 4,7 bpm, visoki krvni tlak 137 ± 10 mmHg, niski krvni tlak 69 ± 6 mmHg; CMJ 39,5 ± 3,6 cm; CMJb 47,0 ± 3,6 cm; 20 m Sprint 3,05 ± 0,17; C2OD Agility Test 7,59 ± 0,24 s). Metoda Edwards (interna analiza opterećenja) od 5 zona otkucaja srca (Z1: 50-60% HRmax; Z2: 60-70% HRmax; Z3: 70-80% HRmax; Z4: 80-90% HRmax; Z5: 90 -100% HRmax) omogućuje provjeru raspodjele intenziteta rada tijekom cijelog treninga i provjeru postotka vremena visokog intenziteta (90-95% HRmax) da bi se generirale specifične kardiovaskularne prilagodbe na aerobnoj razini (aerobna vježba s visokim intenzitetom). Pomoću ove metode možemo kvantificirati u proizvoljnim jedinicama (A.U.) rad koji nastaje tijekom dana i tjedna. Nadalje, s GPS tehnologijom (vanjsko opterećenje) uspostavili smo statistički odnos između D_SHI (m) (> 16 Km / h) i Edwards TL Metode kako bismo opisali kako su povezani unutarnji i vanjski teret (R = 0,75). Statistička analiza je pokazala da su obje metode učinkovite za opis intenzivnog rada tijekom treninga i igre.

Ključne riječi: *interno opterećenje, eksterno opterećenje, Edward methoda, GPS, visoki aerobni intenzitet*

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