PHYSICAL PERFORMANCE AND PHYSICAL EFFORT REQUIRED IN THE DIFFERENT PLAYING POSITIONS IN SPORTS TEAM

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Abstract

The aim of this study is to examine the effort physical required at footballers during the match, respect to their playing position. The study method is experimental with the division of the sample in 3 groups of 10 players, divided by role (Attackers n=10, Midfielders n=10 and Defenders n=10). Data were collected during (20) friendly matches on (30) elite senior male Italian football players using global positioning system. Analysis of statistical data has been conducted with Analysis of variance to check the differences between the three groups of footballers. The significant differences has been fixed in p<0.05. For all match-related parameters, physical performance was higher for defenders and midfielders compared to attackers. The physical effort demands during a football game differ by game position as well as the distance covered in the different play positions has been confirmed.

Key words: soccer, global positioning systems, metabolic power.

Introduction

Soccer is a high-situational sport with a high agonistic engagement such to require the development of all the conditional capacities (Gaetano & Rago, 2014). It is a team sport where the precision and the power are the most important aspects for achieve a winning (D'Isanto et al, 2017). Adult elite football players cover 8 to 14 km during an official match, of which 1.5 to 3.3 km are performed by high-intensity (Mohr, Krustrup, & Bangsbo, 2003). The physical demands imposed at players have been widely documented in recent years (Rampinini et al, 2007; Bradley et al., 2009; Dellal et al., 2011, Altavilla et al, 2018a). Physical effort required during a football match, differ from each playing position and the coaches should take in account for these positional variations in distance covered and for the metabolic effort (Altavilla et al, 2018a), in order to design position-specific physical drills (Rago et al., 2017). The relationship between match performance and physical capacity has been extensively described (Krustrup et al., 2003). In the last years it has seen a massive entrance of pervasive computing among sport-related technologies, in fact, physical parameters detection during the training and matches through GPS technology is an effective procedure for monitoring workloads (MacLeod et al., 2009). The GPS provide immediate responses to the coaches right after the end of the training session or of the match. The physical parameters (total distance covered, metabolic power, energy cost, distance covered in high acceleration and high deceleration, …) can be detected with GPS (Altavilla et al, 2017). In this study, it will come correlated the ability to develop a metabolic power with the total distance covered from each player. The aim of this study is to examine, with respect to their playing position, the effort physical required at footballers during the match.

Methods

Participants

Thirty Italian professional footballers were selected to in friendly matches analysis. The measurements were made during 20 friendly matches of 90 minutes in the 2017-18. Ten men's soccer players have been tested for each role (Mean ± standard deviation; age: 26.7 ± 3.2 years; height: 178.7 ± 4.1; Body weight: 75.2 ± 3.8) that they played 90 minutes in friendly matches. Positional roles were: Defenders (D), Midfielders (M), Attackers (A), instead the goalkeepers were not included for analysis.

Procedures

The GPS is a valid method that allows you to estimate physical variables that have an impact on performance, such as metabolic power and total distance covered. The collected data were acquired during several friendly matches, using K-Sport GPS technology with a sampling frequency of 10 Hz. All the data was downloaded to a Sony Vaio VPCSA laptop and processed with the Dell 13.2 Statistics Software. The validity and reliability of the GPS for analyzing the matches are attested in numerous studies, see it in Randers et al., 2010. Before the beginning of the warm-up, the GPS units were switched on and placed on the upper back of the

players, using a neoprene harness to avoid its movement during the match. The players' movement pattern during each friendly match game was obtained using unobtrusive portable GPS units. The system used the GPS data and distances were calculated from changes in position. According to the game duration, total distance covered and metabolic power were calculated using a custom Excel spreadsheet from instantaneous raw data of time. Main objective of the analysis was to ascertain whether the differences in the distance covered and for the metabolic power were significant to the point of suggesting specific training plans in relation at the role of the players.

Statistical analysis

It was verified whether the differences related to the position of game in the distances covered and in the relative metabolic power were significant enough to suggest personalized training plans based on the role of the players. The analysis refers to the following variables: Total Distance Covered, Metabolic Power. The data has been grouped in according at the following roles: Defenders (D), Midfielders (M), Attackers (A) and collected on 20 friendly matches. The analysis covered the average, the standard deviation, the variance, Anova with LSD post-hoc. All statistical analyzes were conducted using Dell's statistical software 13.2.

Results and discussion

Table 1. Averages and Standard Deviation of the parameters physical performance in the different roles

Role of players	Defenders (D)	Midfielders (M)	Attackers (A)	Averages	SD	Averages Serie B
Total distance covered	10123,4	10586,6	8656,8	9788,8	775,3	10654
Metabolic power	10,05	11,60	8,84	10,15	0,9	11,5

Table 2. Differences between playing position in metabolic power and endurance capacity

Role of players	Defenders (D)	Midfielders (M)	Attackers (A)	P	Post-hoc test
Total distance covered	10123.4 ± 1097.9	10586.6 ± 1213.2	8656.8 ± 946.97	< 0.05	D, M> A
Metabolic power	10.05 ± 0.87	11.60 ± 1.08	8.84 ± 1.02	< 0.05	D, M > A
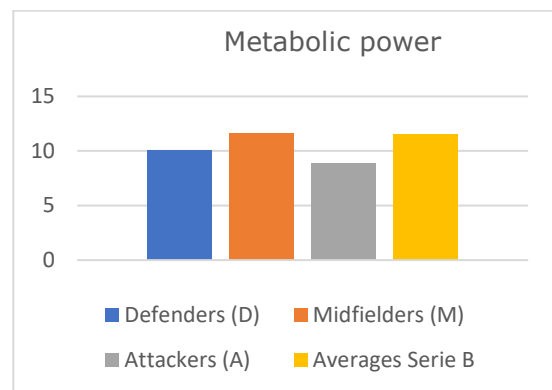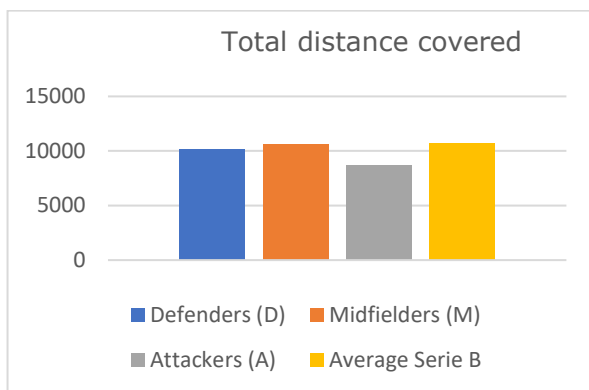
Fig. 1. Comparation of data on the total distance covered in the several roles
Fig. 2. Comparation of data on the metabolic power in the several roles

In Table 1, is shown the results on the total meters covered by the three groups of players: the average total distance covered by the 30 players was 9788.8 meters, but with the Defenders (D) and Midfielders (M) covering a greater distance than the Attackers (A); in particular, the midfielders (M) also produced the highest metabolic power (11,60) between the groups and compared to the average of the Italian championship. In Table 2, it is shown which are the differences between three groups, while the analysis Anova with LSD post-hoc has given these results: with regard to the total distance covered and the development of metabolic power, the groups (M) and (D) are result very different from group (A). This study is based on the use of GPS technology to determine the physical demands during the matches. The differences detected between the game positions on total distance covered and

metabolic power, suggests the need to develop specific training programs in relation to the role performed by the players (Fig. 1 e 2).

Is very important that the research and training, in Italy as in the world, must to contrast the doping (Raiola et al., 2018), because there are individuals always ready to improve in artificial way their performances, in manner legal or illegal, (Mazzeo et al., 2018). The GPS technology has become a very useful tool to monitor training workloads in team sports (Larsson, 2003), contributing to define a more precise vision of physical commitment. In fact, it has allowed to detect the impact of performance parameters and positive correlations between the metabolic power and endurance capacity (Castagna, 2012), therefore when it improves the performance on the total distance, it also improves the metabolic power. The total distance traveled in friendly matches by professional Italian players monitored with GPS devices has been on average of about 10 km. This characteristic has been evidenced also a feature of other studies conducted on European professional footballers (Spanish and English), where midfielders (M) have covered greater distances, while defenders (D) have covered smaller distances (Bradley et al., 2009; Dellal et al., 2011). Metabolic power performs a fundamental role in professional football, as it represents the ability to perform a quantity and quality of movements (Altavilla et al, 2018b), in terms of energy, in the unit of time (Osgnach et al., 2010). This led to the need to redefine the concept of high intensity exercise on base on current metabolic power rather than on speed. In our opinion, in the field of motor and sports sciences (D'Elia et al., 2018), this and other similar studies have a practical value is mainly seen in the planning and organization of soccer players' training, particularly during conditioning technical-tactical and the physical preparation.

Conclusion

The midfielders (M) and the defenders (D) showed great physical performances during the matches, both in terms of total distance covered and in terms of expressed metabolic power. The midfielders (M) reached the greatest distance covered in meters (10586.6) and produced a metabolic power (11.6) higher than the reference average (Italian Serie B championship). The results of this study demonstrate that physical needs are influenced by player gaming positions and must be used to program specific training plans based on their role. It is desirable to have a deep theoretical knowledge of these aspects, with the aim of identifying the best training methods for improving the sports performance. Coaches and anyone involved in training of young player should account for these methodological indications with the aim of specific training program. Our data should be interpreted with caution given the reduced sample size. However, further studies should account for further variables such as recovery times, accelerations and decelerations per positional role.

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RAZLIKE U ZAHTIJEVIMA ZA FIZIČKIM NAPORIMA U ODNOSU NA POZICIJE U NOGOMETNOJ IGRI

Sažetak

Cilj ove studije je ispitati fizički napor koji je potreban nogometašima tijekom utakmice, s obzirom na njihov položaj u igri. Metoda istraživanja je eksperimentalna s podjelom uzorka u 3 skupine od 10 igrača, podijeljenih po ulozi (Napadači n = 10, Vezni igrači n = 10 i Branči n = 10). Podaci su prikupljeni tijekom (20) prijateljskih utakmica na (30) elitnih seniorskih talijanskih nogometaša pomoću sustava globalnog pozicioniranja. Analizom statističkih podataka provedena je analiza varijance kako bi se provjerile razlike između tri skupine nogometaša. Utvrđene su značajne razlike. Za sve parametre vezane za utakmicu, fizička izvedba bila je veća kod braniča i veznjake u usporedbi s napadačima. Potvrđeni su zahtjevi za fizičkim naporima za vrijeme nogometne utakmice, ovisno o poziciji igre, kao i udaljenosti koja je pokrivena različitim pozicijama.

Ključne riječi: nogomet, sustavi globalnog pozicioniranja, metabolička snaga