STUDIA UBB EDUCATIO ARTIS GYMN., LXIX, 3, 2024, pp. 27-35
(RECOMMENDED CITATION)
DOI:10.24193/subbeag.69(3).19

DOES THE EXTERNAL LOAD HAVE AN IMPACT ON WINNING MATCHES IN FOOTBALL?

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Article history: Received 2024 September 09; Revised 2024 October 21; Accepted 2024 October 28; Available online: 2024 November 30; *Available print: 2024 November 30*

ABSTRACT. The present study was conducted to examine the impact of external load on winning matches in football. The study group comprised players of the football team in the Spor Toto 1 st League. A total of 13 matches, including 6 won matches and 7 lost matches, were used in the analysis. The data on matches were taken from the 2022-2023 season of the Spor Toto 1st League. The following external load parameters were used in the analysis: total running distance (m), total high-speed running (HSR) distance, total sprint distance (m), acceleration distance (m), deceleration distance (m), ACD load, and maximum sprint reached (km/h). Data were collected with the wearable technology tracking system on football players during matches via GPS. The independent t-test was used in the program (SPSS 26.0) when analyzing normally distributed research data. The analysis of research data found a statistically significant difference in the total distance covered, total HSR distance, total sprint distance, and acceleration values among the external load results for the won and lost matches ($p<0.05$) but did not find a statistically significant difference in the deceleration, ACD load, and sprint speed values ($p>0.05$). Consequently, it can be concluded that differences in many values that are considered necessary for success in the football field have an effect on winning matches in football. For values with no statistical difference, it may be recommended to conduct studies in a higher league, with more matches and more players.

Keywords: *football, external load, gps*

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INTRODUCTION

Football is one of the sports branches followed by large masses in the world (Güllü & Yıldız, 2019; Ergen, 2018; Yaşar & Sunay, 2018). The unpredictability of match results is the main reason why soccer is watched and loved by millions of people (Lago 2010).

Football is a complex competitive game that requires bio motor skills such as speed, strength, endurance, coordination, dribbling, kicking, tackling, tackling, quickness, agility, jumping, and high neuromuscular endurance, where tactics and technique are of great importance (Djaoui, 2017). Players need to have optimal performance in each of these bio motor and skill areas (Stølen et al., 2005). The physical performance of the players individually and as a team during the match directly affects the outcome of the match (Faude, 2012). In football matches played in top leagues, a player covers an average distance of 7 to 14 kilometers (Krustrup, 2006; Thatcher, 2004; Rampinini, 2007; Carling et al., 2008). Of this distance, 2-3 kilometers are completed as high-speed running (>15 km/h) and 0.6 kilometers as sprinting (>20 km/h) (Iaia, Ermanno, & Bangsbo, 2009). In addition, elite players perform more than 700 turns and 30-40 sprints at different speeds and distances until the end of the match (Bloomfield, Polman, & O'Donoghue, 2007). Workloads of players differ according to the position they play. For example, defenders have less total running distance than midfielders (Di Salvo, Gregson, Atkinson, Tordoff, & Drust, 2009). However, the workload of soccer, which is still competitive in nature, is increasing regardless of position due to advances in exercise physiology, ergogenic supplements and training science (Eniseler, 2010). The concept of workload in soccer is divided into external load and internal load. While external load refers to concepts such as total distance run, total high-speed running distance, acceleration-deceleration distance, total sprint distance and maximum speed reached during the match, internal load refers to relative physiological and psychological stressors (Vanrenterghem et al., 2017). External loads are objective measures that can be used in the evaluation of players (Bourdon et al., 2017). There are many methods used to measure the external burdens of players (Akyıldız & Akarçeşme, 2020). Among these methods, the most reliable and valid measurements are made with GPS devices (Global Positioning Systems) (Scott et al., 2016; Varley, Fairweather, & Aughey, 2012; Coutts & Duffield, 2010). Since 2003, GPS devices have been used extensively to measure external load outputs in team sports (Cunniffe et al., 2009; Jennings et al., 2012). The use of GPS devices in soccer provides ease of use in analyzing distance, time, speed and movement (Arrones, 2014).

In previous studies, it has been stated that external loads such as the total distance run by players during the match are related to the outcome of the match (Stolen, 2005; Lago, 2010; Bradley, 2009). The aim of this study is to analyze selected parameters that constitute the external load in soccer and to evaluate the effect of these parameters on match winning.

METHOD

This study was conducted to examine the effect of external load on match winning in football. The study data were collected in the 2022-2023 football season. Experimental research model was used in the study. Before the external load data of the football players were monitored, study permission was obtained from Aydın Adnan Menderes University Faculty of Medicine Ethics Committee (E- 453308) with decision number (05). In addition, a study permission letter was obtained from Denizlispor Club for the use of the data.

Research Group

The players of a soccer team competing in the Turkish Spor Toto 1st League voluntarily participated in this study. The data tracking of the players were analyzed over a total of (n=13) matches, including wins (n=6) and losses (n=7). While goalkeepers were not included in the study, the external load follow-ups of defenders, midfielders and forwards were evaluated. The external load parameters used in the study analysis were total running distance (m), total high-speed running (hsr) distance, total sprint distance (m), acceleration distance (m), deceleration distance (m), acdload and sprint speed (km/h).

Vehicle Used for External Load Data Collection (GPS)

Global Positioning Systems (GPS) were used for data collection of won and lost matches and data tracking. GPS systems were made ready 30 minutes before the footballers went to the matches. Each soccer player's GPS sensor was previously defined to the system on their own behalf in line with their anthropometric values. The soccer players wore the sensors that were defined to them before the matches. During the matches, each soccer player's external load was monitored via their own GPS systems. The external load data of the soccer players were monitored with Fitogether brand (Hangang-daero 95, Yongsan-gu, Seoul, 04378, Republic of Korea) wearable technology product. After the won and lost matches, the data of the players were transferred to the computer environment and classified within themselves.

Statistical Analysis

For data showing normal distribution because of Shapiro-Wilk normality distribution analysis in SPSS (26.0) program. Independent T Test was used. Statistical difference in the analyzed data was accepted for values below ($p<0.05$).

RESULTS

According to the results of the analysis, the external load differences between the won (n=6) and lost (n=7) matches are shown in table 1.

When Table 1. is examined, statistically significant differences were found in total distance traveled, total hsr distance, sprint distance and acceleration data ($p>0.05$), while no statistically significant differences were found in deceleration, acdload and max speed distances between won and lost matches ($p>0.05$).

Table 1. External load parameters in won and lost matches

Variable	Matches	Number of Match	Distance	Sd	t	p
Total Distance	Win	6	10010.90	233.73	42.83	0.05*
	Lost	7	7708.79	355.96	21.65	
Total Hsr Distance (mt)	Win	6	639.26	228.24	23.43	0.05*
	Lost	7	539.74	313.06	14.42	
Sprint (mt)	Win	6	147.33	103.36	11.94	0.05*
	Lost	7	115.09	96.98	10.06	
Acceleration	Win	6	50.47	49.56	8.52	0.05*
	Lost	7	34.65	19.75	14.67	
Deceleration	Win	6	75.67	23.25	16.35	0.919
	Lost	7	74.54	15.80	14.80	
Acdload	Win	6	1874.84	899.45	0.38	0.712
	Lost	7	2008.77	251.88	0.45	
Maks. hız (mt)	Win	6	29.86	2.02	123.23	0.382
	Lost	7	29.55	2.23	110.60	

DISCUSSION

Within a soccer competition that meets the requirements of the period, players perform a large number of high intensity actions. In intermittent high intensity soccer, players move from low intensity tasks to near maximum or maximum intensity tasks in a short period of time on the pitch. Considering the seasonal differences, soccer players cover an average distance of 9-14 kilometers during the match, 600-110 meters of this distance covered by high intensity running (Aquino et al. 2022). In addition, while soccer players perform an average of 1400 actions on the field during the competition, 700 of them are recorded as directional activities, 600 accelerations and 600 decelerations (Dolci et al. 2020). Among these data, running distance defines the volume of the match, while acceleration, deceleration, high-intensity running, and sprint distances are considered as match-defining actions (Akyıldız et al. 2020). These data, which are defined as external load in football, are important for the success factor of the player and protection against injuries. In this study, the external load data of football players in winning and lost matches were examined and the question of the effect of external load on winning matches was sought. According to the findings, while there was a statistical difference in total distance traveled, total hsr distance, sprint distance and acceleration ($p<0.05$), there was no significant difference in acceleration, acd load and maximum speed data.

In soccer, high-intensity movements should be performed at a high level for a long time and at certain intervals. These examinations are also reflected in today's studies. According to the results of the analysis, it was determined that athletes playing football in La Liga traveled a maximum distance of 13.7 km and an average distance of 11.3 km. In another study, it was found that the total distance traveled by professional soccer players playing in the Premier League in England was 10.7 km, 11.3 km in the Championship and 11.6 km in League 1 (Bradley and Noakes 2013; et al. 2007), following the external load values of Brazilian professional soccer players throughout the season 2022. In their study findings, they found that high intensity running, acceleration and total distance travel were higher in winning matches than in losing matches. In a study of 23 matches, Miguel et al. (2022) found that the external load data of soccer players such as total distance, acceleration, high intensity running differed according to positions and home advantage and emphasized that external load training should be determined in this way. Since the physical requirements of soccer are much more diverse than other sports branches, it is possible to reach studies and significant results on this subject in the past years. Rhodes et al. (2021) examined acceleration and deceleration values in England 2nd Football League as one of the studies in this field and statistically significant

results were obtained in favor of the matches won. In addition, Rhodes also revealed that in the 4-3-3 format, wingbacks and center forwards accelerate and decelerate with higher intensity than players playing in other positions. Although there was no statistical difference in the results of the study, the high intensity running distance was higher in the matches in which victory was achieved compared to the other two results. As a similar study in the field, won and lost matches in the Iranian First League were examined, because of the study, Nobari et al. (2021) found that the average speed and sprint distance were higher in won matches than in lost matches. Moalla et al. (2018) found a significant difference in total distance travel, high-speed running distance and sprint distance and obtained similar results to our study. Smpokos et al. (2018), found that total running distance was higher in winning matches than in losing matches.

In a study conducted with soccer players from Ankara Demirspor, Taştan and Özcan (2023) found a statistically significant difference in total running distance and maximum speed of soccer players in competitions as a result of 8-week training. In a study comparing the match performances of professional soccer players with GPS technology (Başaran, 2023), a statistically significant difference was found between the groups in the sprint number and sprint distance parameters as determinants of victory. Güler et al. (2019) examined the changes in total distance and regions in case of victory, draw and defeat in their study on soccer players. Total distance (m) was found to be 108686.27 m in won matches and 10160.77 m in lost matches, and a statistically significant negative difference was found.

Football is a sport with high expectations and a wide range of requirements for success. Recent soccer competitions are faster, more intense, with less recovery time and higher intensity than in the past. Elite level coaches develop their players according to the period. For this reason, to win matches and be successful, it is imperative to follow the literature correctly, follow player development and fulfill the requirements of today's football. With this study, it has been shown in the reviewed literature that external load parameters are metrics that affect match winning in soccer. In line with this information revealed by statistical data, it is recommended that coaches should follow soccer player data with the use of GPS, use GPS data sets not only in training but also in matches, and exchange information by giving more importance to the field of athletic performance.

REFERENCES

Akyıldız, Z., & Akarçeşme, C. (2020). Futbolda Antrenman Yükü Takibi Ve Veri Analiz Yöntemleri. *Beden Eğitimi Ve Spor Bilimleri Dergisi*, *14*(3): 481-493.

Aquino, R., Guimares, R., Junior, G.O.C., Clemente, F.M., Caalvo-Garcia, T. Pulido, J.J., Nobari, H., & Parça, G.M. (2022). Effects Of Match Contextual Factors on Internal and External Load İn Elite Brazilian Professional Soccer Players Though Th Season. *Scientific Reports*, 12: 1-9.

Arrones, L. S., Torreno, N., Requena, B., De Villareal, E. S., Casamichana, D., Carlos, J. & Barbero-Alvarez, D. M. I. Munguia-Izquierdo D. (2014). Matchplay Activity Profile İn Professional Soccer Players During Official Games and The Relationship Between External And İnternal Load. *J Sports Med Phys Fitness*, 55(12):1417-22.

Başaran, M.S. (2023). Profesyonel Futbolcuların Maç Performanslarının Gps Teknolojisi İle Karşılaştırılması. Karamanoğlu Mehmetbey Üniversitesi Sosyal Bilimler Enstitüsü, Beden Eğitimi Ve Spor Anabailim Dalı Yüksek Lisans Tezi. 31-34.

Bloomfield, J., Polman, R. & O'donoghue, P. (2007). Physical Demands of Different Positions İn Fa Premier League Soccer. *Journal Of Sports Science & Medicine*, 6(1): 63

Bourdon, P. C., Cardinale, M., Murray, A., Gastin, P., Kellmann, M., Varley, M. C. & Cable, N. T. (2017). Monitoring Athlete Training Loads: Consensus Statement. *International Journal of Sports Physiology and Performance*, 12(2): 12-16.

Bradley P. S, & Noakes T. D. (2013). Match Running Performance Fluctuations İn Elite Soccer: Indicative of Fatigue, Pacing or Situational İnfluences. *Journal Of Sports Sciences,* 31(5): 1627 – 1638.

Bradley, P. S., Sheldon, W., Wooster, B., Olsen, P., Boanas, P. & Krustrup, P. (2009). High-İntensity Running İn English Fa Premier League Soccer Matches. *Journal Of Sports Sciences*, 27(2): 159-168.

Carling, C., Bloomfield, J., Nelsen, L. & Reilly, T. (2008). The Role of Motion Analysis İn Elite Soccer. *Sports Medicine*, 38(10): 839-862.

Coutts, A. J. & Duffield, R. (2010). Validity And Reliability of Gps Devices for Measuring Movement Demands of Team Sports. *Journal Of Science and Medicine İn Sport,* 13(1), 133-135.

Cunniffe, B., Proctor, W., Baker, J. S. & Davies, B. (2009). An Evaluation of The Physiological Demands of Elite Rugby Union Using Global Positioning System Tracking Software. *The Journal of Strength & Conditioning Research*, 23(4): 1195-1203.

Di Salvo, V., Baron, R., Tschan, H., Calderon Montero, F., Bacl, N., & Pigozzi, F. (2007). Performance Characteristics According to Playing Position İn Elite Soccer. *International Journal of Sport Medicine,* 28:222-227

Di Salvo, V., Gregson, W., Atkinson, G., Tordoff, P. & Drust, B. (2009). Analysis Of High İntensity Activity İn Premier League Soccer. *International Journal of Sports Medicine*, 30(3): 205-212.

Djaoui L., Haddad M., Chamari K., & Dellal A. (2017). Monitoring Training Load And Fatigue İn Soccer Players with Physiological Markers. Physiology & Behavior. 181, 86-94

Dolci, F., Hart, N. H., Kilding, A. E., Chivers, P., Piggott, B., & Spiteri, T. (2020). Physical And Energetic Demand of Soccer: A Brief Review. *Strength & Conditioning Journal*, 42(3): 70–77.

Eniseler, N. (2010). Bilimin Işığında Futbol Antrenmanı. (Birinci Baskı). İzmir: Birleşik Matbaacılık, 2,245.

Ergen, Y. (2018). Twitter Örneğinde Sosyal Medya Gündemi: Bir Gündem Belirleme Aracı Olarak Futbol. *Anadolu Üniversitesi İletişim Bilimleri Fakültesi Uluslararası Hakemli Dergisi*, 26(3): 502-520.

Faude, O, Koch, T, & Meyer, T. (2012). Straight Sprinting İs The Most Frequent Action İn Goal Situations İn Professional Football. *Journal Sports Science* 30: 625-631

Güler, A. H. (2019). Futbol Müsabakasında Farklı Hızlarda Gerçekleştirilen Koşu Mesafelerinin Müsabaka Sonucuyla İlişkisinin İncelenmesi. Yüksek Lisans Tezi, Sağlık Bilimleri Enstitüsü, Marmara Üniversitesi, İstanbul. 24-28

Güllü, S., & Yıldız, S. M. (2019). Stres Kaynaklarının Futbol Hakemlerinin Performansına Etkisinin İncelenmesi. *Spormetre Beden Eğitimi Ve Spor Bilimleri Dergisi*, *17*(1): 146-155.

Iaia, F. M., Ermanno, R. & Bangsbo, J. (2009). High-İntensity Training İn Football. International *Journal of Sports Physiology and Performance*, 4(3): 291-306.

Jennings, D., Cormack, S. J., Coutts, A. J. & Aughey, R. J. (2012). Gps Analysis of an İnternational Field Hockey Tournament. International *Journal of Sports Physiology and Performance*, 7(3): 224-231

Krustrup P, Mohr M, Steensberg A, Bencke J, Kjaer M, & Bangsbo J. (2006). Muscle And Blood Metabolites During a Soccer Game: Implications for Sprint Performance. *Medicine & Science İn Sports & Exercise* 38: 1165-1174

Lago, C., Casais, L Ominguez, E, & Sampaio, J. (2010). The Effects of Situational Variables on Distance Covered at Various Speeds İn Elite Soccer. *Europen Journal Sport Science* 10: 103-109

Miguel, M., Oliveira, R., Brito, J. P., Loureiro, N., García-Rubio, J., & Ibáñez, S. J. (2022). March). External Match Load İn Amateur Soccer: The İnfluence Of Match Location and Championship Phase. In *Healthcare,* 10(4): 527-537.

Moalla, W., Fessi, M.S., Makni, E., Dellal, A., Filetti, C., Di Salvo, V., & Chamari, K. (2018). Association Of Physical and Technical Activities with Partial Match Status İn A Soccer Professional Team. J. *Strength Cond. Res,* 32:1708–1714.

Nobari, H., Oliviera, R., Brito, J.P., Perez-Gomez, J., Clemente, F.C., & Ardigo, L.P. (2021). Comparison Of Running Distance Variables and Body Load İn Competitions Based on Their Results: A Full Season Study of Professional Soccer Players. *Int J Environ Res Public Health*, 18(4): 1-11.

Rampinini E, Coutts Aj, Castagna C, Sassi R, & Impellizzeri F. (2007). Variation İn Top Level Soccer Match Performance, *International Journal of Sport Medicine*, 28(12):1018–1024

Rhodes, D., Valassakis, S., Bortnik, L., Eaves, R., Harper, D., & Alexander, J. (2021). The Effect of High-İntensity Accelerations and Decelerations on Match Outcome of An Elite English League Two Football Team. *International Journal of Environmental Research and Public Health*, 18(18):9913

Scott, M. T., Scott, T. J. & Kelly, V. G. (2016). The Validity and Reliability of Global Positioning Systems İn Team Sport: A Brief Review. *The Journal of Strength & Conditioning Research*, 30(5): 1470-1490.

Smpokos E, Mourikis C, & Linardakis M. (2018). Seasonal Physical Performance of a Professional Team's Football Players İn A National League and European Matches. *J Hum Sport Exerc,* 13(4): 720-730.

Stølen, T., Chamari, K., Castagna, C. & Wisløff, U. (2005). Physiology Of Soccer. *Sports Medicine*, 35(6): 501-536.

Taştan, S., & Özcan, S. (2023). Profesyonel Futbolcuların Antrenmandaki Dış Yük Takibinin İncelenmesi. *Akdeniz Spor Bilimleri Dergisi,* 6(1): 821- 832.

Thatcher, R., & Batterham, M. (2004). Development And Validation of a Sport-Specific Exercise Protocol for Elite Youth Soccer Players. Journal Of Sports Medicine and Physical Fitness, 44: 15-22

Vanrenterghem J., Nedergaard Nj., Robinson Ma., & Drust B. (2017). Training Load Monitoring İn Team Sports: A Novel Framework Separating Physiological and Biomechanical Load-Adaptation Pathways. *Sports Medicine*. 47(11): 2135-2142.

Varley, M. C., Fairweather, I. H. & Aughey, R. J. (2012). Validity And Reliability of Gps for Measuring İnstantaneous Velocity During Acceleration, Deceleration, And Constant Motion. *Journal Of Sports Sciences,* 30(2): 121-127.

Yaşar, O.M., & Sunay, H. (2018). Futbol Antrenörlerinin İş Doyumlarının Ve Örgütsel Bağlılıklarının İncelenmesi. *Uluslararası İnsan Bilimleri Dergisi,* 15(2): 952-969.