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ORIGINAL ARTICLE

Analysis of the competitive demands in 7-a-side football players with cerebral palsy

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Abstract Inertial devices allow for obtaining a large amount of information related to external load during official competitions. The study aimed to analyse fatigue in different functional classification players of a Football 7-a-side for people with cerebral palsy or acquired brain injury team, considering the movements, speed changes and impacts during the 2020 Spanish National League matches ($n = 12$). The analyzed independent variables were the different functional classifications (FC) of the players, FC1, FC2 and FC3, and also time. Regarding the dependent variables, kinematic objective external load (displacements and speed changes), and neuromuscular objective external load (impacts) were considered. This study is an empirical investigation that follows an associative and descriptive analysis, ANOVA test, and a Bonferroni post hoc test (multiple comparisons) were carried out between the external load variables based on FC and time. The results show differences between FC1 for people with greater functional limitation to FC3, and athletes with less functional limitation depending on the time of the match. FC2 players presented greater competitive demands in specific moments of the match than FC3 athletes because of the requirements of the competition. Furthermore, evaluating different FC players with inertial devices in official competitions provides useful information regarding the demands of Fa7PC players, which is fundamental for daily training tasks management and injury risk prevention in Fa7PC. The large number of variables associated with inertial devices data collection during training sessions and official competitions in Fa7PC allows us to understand the demands

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of CP players, as well as how to make decisions during the games and training process, namely for reducing the injury risk.

Introduction

In the last decade, technological advances provided the possibility to improve training control processes and facilitated information for coaches and players through the use of training and competition monitoring tools.[1–3] Specifically, inertial devices based on the Global Position Systems (GPS, and others), approved by the Federation Internationale de Football Association,[4] are the most employed and allow to quickly quantify the activity of athletes during intermittent moments in official matches, particularly variables such as speed,[5] distance travelled, high-intensity displacements or the number of accelerations and decelerations (Acc and Dec),[6,7] which can be determinant in the competitive moment result.[8] Furthermore, on certain occasions, the efforts carried out by players are the result of individual technical-tactical actions (passes, shots, and others), and, even, of the opponent's performance characterization.[9] Some actions are carried out independently of others, and due to the opponent's action, may lead to an increase or decrease in the external and internal load of the players.[10] These movements are carried out sporadically and spontaneously during the development of the game, therefore, they are not determined to a specific duration and intensity.[11]

Therefore, researchers have focused on analyzing and understanding the demands of athletes during football games to facilitate specific training strategies,[12] and recovery programs,[13] to reduce the number of injuries and improve performance.[14,15] The control of internal and external load variables using inertial devices (with accelerometer, gyroscope, and others), which collect information from multiple variables, is a method to control performance in invasion sports.[16] Consequently, the presence of investigations related to Football 7-a-side for people with cerebral palsy or acquired brain injury (Fa7PC) has increased in recent years and focused on quantifying the internal and external load in different playeŕs categories.[17–19] Hence, training and game monitoring has become one of the most critical areas of support for Sports Science in football, to generate information related to the sports performance of players.[2,15] Consequently, inertial devices provide a large amount of information that can be used to understand the competitive demands and to design optimal training tasks for football players, as well as to prevent sports injuries.[20] Nevertheless, studies focused on Fa7PC players, are scarce.

The Fa7PC is an invasion sport of low intensity, where the teams that present higher ball possession during the game can end with a winning.[21] Furthermore, to be able to compete, players must have a minimum disability defined by different organizations, which causes a disadvantage that impedes their participation in conventional sports.[22] A functional classification (FC) process must be completed before the competition, which has been improving during the last official competitions to allow each athlete, regardless of their disability, to compete fairly compared to the rest of the opponent's.[23] Currently, FC in Fa7PC is associated with three categories: FC1 (minimum one player on the playing game field), FC2, and FC3 (maximum one player on the playing field).[24] Therefore, FC3 players run greater distances at higher speeds and receive the greatest number of impacts during matches, due to their lower functional limitation,[25] as well as perform a higher number of shots at goal.[21]

Studies related to performance monitoring in Fa7PC players are peaking, however, they are still scarce and very broad in terms of topic. Previously, Boyd et al.[26] investigated the cardiovascular and locomotor demands of 40 elite players during a tournament using GPS and heart rate (HR) monitors. The results showed that FC8 players covered higher distances and HR and maximum speed during matches were higher in FC8 players compared to the rest of FC players (FC5, FC6, and FC7). More recently, Yanci et al.[27] analyzed the external load of 42 players considering their FC (FC5, FC6, FC7, and FC8), during a qualifying tournament for the World Championship of the International Federation of Cerebral Palsy Football. Players with higher functional classification (FT8) performed longer distances in high intensity running and sprinting, they also performed more Acc, Dec, and changes of direction at high intensity in matches compared to other FC athletes (FC5, FC6, and FC7).

On the other hand, Yanci et al.[28] analyzed the external load of an official Fa7PC game without considering the different FC of the players, during a World Championship Classification Tournament. The results showed that Fa7PC athletes completed lower distances at high intensity, performing fewer Acc and Dec of moderate and high intensity compared to conventional football players. Additionally, Reina et al.[29] studied the differences between the limitation of activity (static balance, coordination, vertical jump, horizontal jump, Acc capacity, and change of direction capacity), and the external load of 48 international male players. The FC8 players were the athletes who reported the best performance values, and there was a very large significant difference between the limitation of activity regarding the FC5 and FC6 players.

It is noteworthy that the described research does not consider the current FC. The only study related to the current FC was conducted by Gamonales et al.,[25] who analyzed the influence of the movement of players from a Fa7PC team about the external load, during games of the Spanish National League 2018/2019 (*n* = 6). The study highlights that FC3 players are those who travel the greatest distance per minute, as well as present the higher number of Acc and impacts per minute. On the other hand, Peña-González et al.,[30] study analyzed the relationship between physical performance and load among Fa7PC players, intending to understand the influence of playing two consecutive games in one day. How the players' physical performance and fatigue may affect the match load variables needs more research in CP football.

Considering the lack of studies related to Fa7PC based on the current FC (FC1, FC2, and FC3), and performed with inertial devices, it is necessary to increase the knowledge related to the performance of players in this adapted sport, aiming to understand in detail the physical profile during competition, to provide information to the coaching staff in the perspective of implementing training tasks to enhance performance during the official games.[31,32] Therefore, the objective of this investigation was to analyze the influence of fatigue on FC1, FC2, and FC3 players of a Fa7PC team considering the competitive demands associated with movements, speed changes, and impacts during the games of the Spanish National League 2020.

Methods

Study design

This study is an empirical investigation that follows an associative strategy, which seeks to examine the differences between groups (regarding the FC), and the physical-physiological demands associated with players in the competition, through cross-sectional and evolutionary comparative studies,[33] to understand the influence of fatigue on objective external load in the function of FC in Fa7PC.

Participants

An Extremadura team of Fa7PC was analyzed, made up of 12 players during the games that competed during the Spanish National League 2020 ($n = 7$). The subject's characteristics (age, height, weight, body mass index, body fat, visceral fat, muscle mass, and percentage of water), as well as experience and number of players per FC, are shown in Table 1 (Mean ± Deviation Standard).

The coaching staff and players were informed in advance of the details of the investigation and its possible risks and benefits. The participation of subjects was voluntary, all of them fulfilled an informed consent. The study was developed based on the premises of the Declaration of Helsinki (2013),[34] being approved by the Bioethics Committee of the University of Extremadura (Registration number 79/2022).

Sample

The totality of games ($n = 7$) played by the Fa7PC team during the Spanish National League 2020 were considered for analysis. The games took place during four weekends, in the cities of Ibi, Malpartida de Plasencia, and Barcelona, in the format of a single round where all teams faced each other. Furthermore, data was recorded at a sampling frequency of 100 Hz to extract the largest amount of data in the minimum unit of time, to facilitate analysis and consequent conclusions.

Variables

The FC (FC1, FC2, and FC3) and time (0–10 min, 10–20 min, 20–30 min, 30–40 min, 40–50 min, and 50–60 min) were defined as independent variables. The variables related to the physical-physiological demands of Fa7PC players are shown in Table 2, considering the type of demands in team sports[35] (Ibáñez et al., 2018). Kinematic objective external load variables related to movements and speed changes were employed, as well as neuromuscular objective external load variables linked to impacts. All variables were relativized per minute of play for data analysis.

Equipment and instruments

To understand the contextual data and anthropometric characteristics of Fa7PC players, a questionnaire was used, a wall stadiometer (SECA, Hamburg, Germany), and a portable body composition monitor composed of 8 contact electrodes (Model BC-601, TANITA, Tokyo, Japan). To record kinematic external load variables related to movements and speed changes, as well as neuromuscular external load variables linked to impacts, each player was equipped with an inertial device model WIMU™ (RealTrack Systems, Almeria, Spain), which was fixed using a harness anatomically adapted to each player in each game of the Fa7PC Spanish National League. These devices are composed of multiple sensors (accelerometers, gyroscopes, magnetometers, GPS, and Ultra-wideband - UWB sensors). After data collection, this was reported to Excel using the SPRO™ software (RealTrack Systems, Almeria, Spain).

Table 1 Characteristics of the Fa7PC players.

	FC1	*FC2*	*FC3*
Number of players (n)	5	5	2
Experience (years)	13.8 ± 7.1	9.0 ± 4.94	17.5 ± 10.6
Age (years)	33.0 ± 3.8	30.6 ± 9.12	38.5 ± 7.77
Height (cm)	167.8 ± 5.44	175.4 ± 7.23	175.5 ± 3.53
Body mass (kg)	67.54±9.39	60.84±9.16	62.74±.16
Body mass index (cm/kg^2)	23.84±2.44	19.73±3.90	23.15±2.19
Body fat (%)	22.44±6.7	16.64±7.57	20.35±5.44
Visceral fat (kg)	2.64±0.20	2.52±0.24	2.85±0.07
Muscular mass (kg)	49.12±4.11	47.56±4.32	53.75±0.91
Water percentage (%)	57.66±4.97	61.88±4.48	59.15±3.75

FC: Functional capacity; cm: centimeters; kg: kilograms.

Table 2 Physical-physiological demands of the Fa7PC players.

Variables	Subvariable	Acronym	Description
Movement	Total distance	m/min.	Number of meters covered each minute over a period of time.
	Walking	0,6–6 m/min.	Number of meters traveled at a speed between 0.6 and 6 m per minute for one minute.
	Slow running	6–12 m/min.	Number of meters traveled at a speed between 6 and 12 m per minute for one minute.
	Running	12–18 m/min.	Number of meters traveled at a speed between 12 and 18 m per minute for one minute.
	High-speed running	18–21 m/min.	Number of meters traveled at a speed between 18 and 21 m per minute for one minute.
	Sprint	21–24 m/min.	Number of meters traveled at a speed between 21 and 24 m per minute for one minute.
	Maximum sprint	>24 m/min.	Number of meters traveled at a speed exceeding 24 m per minute for one minute.
Speed changes	Accelerations	Acc/min.	Positive increase in speed made during the game, total per minute.
	Low	1–2 Acc/min.	Number of occasions when the athlete makes a positive increase in speed between 1 and 2 km/h for one minute.
	Moderate	2–3 Acc/min.	Number of occasions when the athlete makes a positive increase in speed between 2 and 3 km/h for one minute.
	High	3–4 Acc/min.	Number of occasions when the athlete makes a positive increase in speed between 3 and 4 km/h for one minute.
	Very high	>4 Acc/min.	Number of occasions when the athlete makes a positive increase in speed above 4 km/h for one minute.
	Decelerations	Dec./min.	Negative increase in speed made during the game, total per minute.
	Low	−2 −1 Dec./min.	Number of occasions when the athlete makes a negative increase in speed between −2 and −1 km/h for one minute.
	Moderate	−3 −2 Dec./min.	Number of occasions when the athlete makes a negative increase in speed between −3 and −2 km/h for one minute.
	High	−4 −3 Dec./min.	Number of occasions when the athlete makes a negative increase in speed between −4 and −3 km/h for one minute.
	Very high	> −4 Dec./min.	Number of occasions when the athlete makes a negative increase in speed above 4 km/h for one minute.
Impacts	Total impacts	Imp./min.	Number of times the athlete sustains strength in the musculoskeletal structures in relation to gravity for one minute.
	Very low	2–5 G n/min.	Number of times the athlete sustains strength between 2 and 5 G on the musculoskeletal structures in relation to gravity per minute.
	Low	5–7 G n/min.	Number of times the athlete sustains strength between 5 and 7 G on the musculoskeletal structures in relation to gravity per minute.
	Moderate	7–8 G n/min.	Number of times the athlete sustains strength between 7 and 8 G on the musculoskeletal structures in relation to gravity per minute.
	High	>8 G n/min.	Number of times the athlete sustains strength between 8 and 9 G on the musculoskeletal structures in relation to gravity per minute.

Procedures

Firstly, permission was requested from the Extremadura Sports Federation for people with CP or with acquired cerebral damage, responsible for the participating team in the Spanish National League of Fa7PC in the 2020 season. After acceptance, informed consents were provided to the players (in all cases aged above 18 years old), with relevant information related to the investigation. Before data collection, participants held several training sessions and friendly games familiarization with the used equipment in the study. Then, all the players were monitored with an inertial device during each match to record the different variables related to the external and internal load. The collected data was normalized during the game, enabling comparisons between different groups of players using their FC. Finally, a report was delivered to the coaching staff of the Fa7PC team, to provide information regarding the performance of Fa7PC players during the competition.

Statistical analysis

A descriptive analysis was carried out to obtain information about each variable (media and typical deviation). Subsequently, an exploratory analysis was carried out using criteria assumption tests.[36] The normality assumption (Kolmogórov-Smirnov Test) was confirmed, obtaining a normal distribution. Afterwards, a one-way ANOVA test was used to carry out a comparison of the external load variables regarding the FC of each player, employing the post hoc test by Bonferroni pairs (multiple comparisons). The significance value was established at $p < 0.05$. To analyze the magnitude of the differences, the partial squared omega statistic ($w_p{}^2$) was used, following Cohen[37]: >0.01 Small, >0.06 Moderate, >0.14 Large. The software used for the analysis was the Statistical Package for the Social Science (v. 27, IBM Corp., IBM SPSS Statistics for MAC OS, Armonk, NY, USA).

Results

In Fig. 1, results related to the movements of Fa7PC players considering FC (FC1, FC2, and FC3) are shown, associated with the time (0–10 min, 10–20 min, 20–30 min, 30–40 min, 40–50 min, and 50–60 min). The differences considering the FC in Fa7PC are a consequence of the functional limitation, severity, or limitation of the disability of the players (hemiplegia, diplegia, or quadriplegia) as shown in the study of Gamonales et al.,[25] in which the FC3 players were those who presented greater mobility during the National League 2019 games.

We found that the FC3 players are those who complete higher distances in the games, as well as present the highest speeds of jogging (6–12 m/min), running (12–18 m/min), and high-intensity running (18–21 m/min). However, during the second periods of the official games and, specifically, within the 40–50 min interval, FC2 players present higher walking speeds (0.6–6 m/min) and sprinting (21–24 m/min), and, even during the last minutes of the first half (20–30 min), and in the second half (30–40 min and 40–50 min) of the games they present higher records at a maximum sprint (> 24 m/min) as a result of Fa7PC competition requirements. Furthermore, significant differences were found between the FC considering the time factor.

In Fig. 2, results related to the types of Acc are shown. In general, FC3 players present a higher total number of Acc, as well as greater records of Acc of low (1–2 n/min), moderate (2–3 n/min), high (3–4 n/min) and very high intensity (> 4 n/min), compared to FC1 and FC2. However, FC2 players present a greater number of low-intensity Acc (1–2 n/min.), from the first minute until the 40–50 min. The significant differences are mainly related to FC1 athletes at different time intervals.

In Fig. 3, results related to types of Dec are shown. FC3 players present a greater number of deceleration records of moderate (–3 –2/min.), high (–4 –3/min.), and very high (> –4/min.) intensity. On the contrary, FC2 athletes present a greater number of total Dec records, and even of low intensity (–2 to –1/min). Regarding the results related to FC1 players, they were the athletes who presented lower demands as a result of their mobility. Furthermore, significant differences were observed depending on the time intervals established in this study.

Regarding the results related to the types of impacts in function of FC and time (Fig. 4), FC3 players presented a higher number of records of total impacts, and, in addition, of very low (2–5 n/min.), and low intensity (5–7 n/min). On the contrary, FC2 players presented a greater number of high-intensity impacts (> 8 n/min), from the 20–30 min interval until the end of the game. Furthermore, significant differences were observed between the FC considering the time factor. This is to say, according to the predetermined time interval in the study, the players present some demands, or others, depending on the FC.

Discussion

In scientific literature, manuscripts related to the monitoring of training and competition based on GPS are at their peak in recent years in football.[2,3] However, in the Fa7PC, an adapted sport, there are few studies related to the monitoring of players.[25] Therefore, the objective of this investigation was to understand the influence of fatigue in FC1, FC2, and FC3 athletes of a Fa7PC team about the competitive demands linked to the kinematic objective external load variables (movements, speed changes: Acc/Dec), and objective external neuromuscular load (impacts), during the Spanish National League 2020 parties.

The main results obtained show the existence of differences between the FC (FC1, FC2, and FC3), in function of the accumulated fatigue in the games. The FC3 players were those who presented higher records in the games considering movements (total distance, jogging speed, running and high intensity), Acc (Acc/min, and low, moderate, high, and very low intensity), Dec (moderate, high, and very high intensity), and impacts (total impacts, and impacts of very low and moderate intensity). FC2 athletes presented higher values in walking (0.6–6 m/min), sprint (21–24 m/min), and maximum sprint (> 24 m/min) speeds. Additionally, they presented low-intensity Acc (1–2 /min.), and a greater number of total Dec (Dec./min.), as well as low-intensity Dec (–2 to –1 /min) and intensity impacts high (>8 G/min), in specific moments of games as a result of fatigue. On the other hand, the FC1 players have the lowest values in most of the variables analysed. Therefore, as the athletes accumulate fatigue, the differences between FCs become more accentuated, regardless of the functional limitation, severity, or disability location (hemiplegia, diplegia, or quadriplegia). Therefore, it is essential to carry out individualized training considering the FC, and the individual player's capabilities.

Regarding the results related to the movements, FC3 players were those who presented the greatest records considering time. Furthermore, depending on the accumulated fatigue, athletes presented significant differences between the time intervals analyzed in this document. Moreover, FC2 players showed significant differences in running, and specifically, at a speed of 0.6 – 6 m/min (walking), compared to FC3 and FC1 players. Likewise, FC2 players

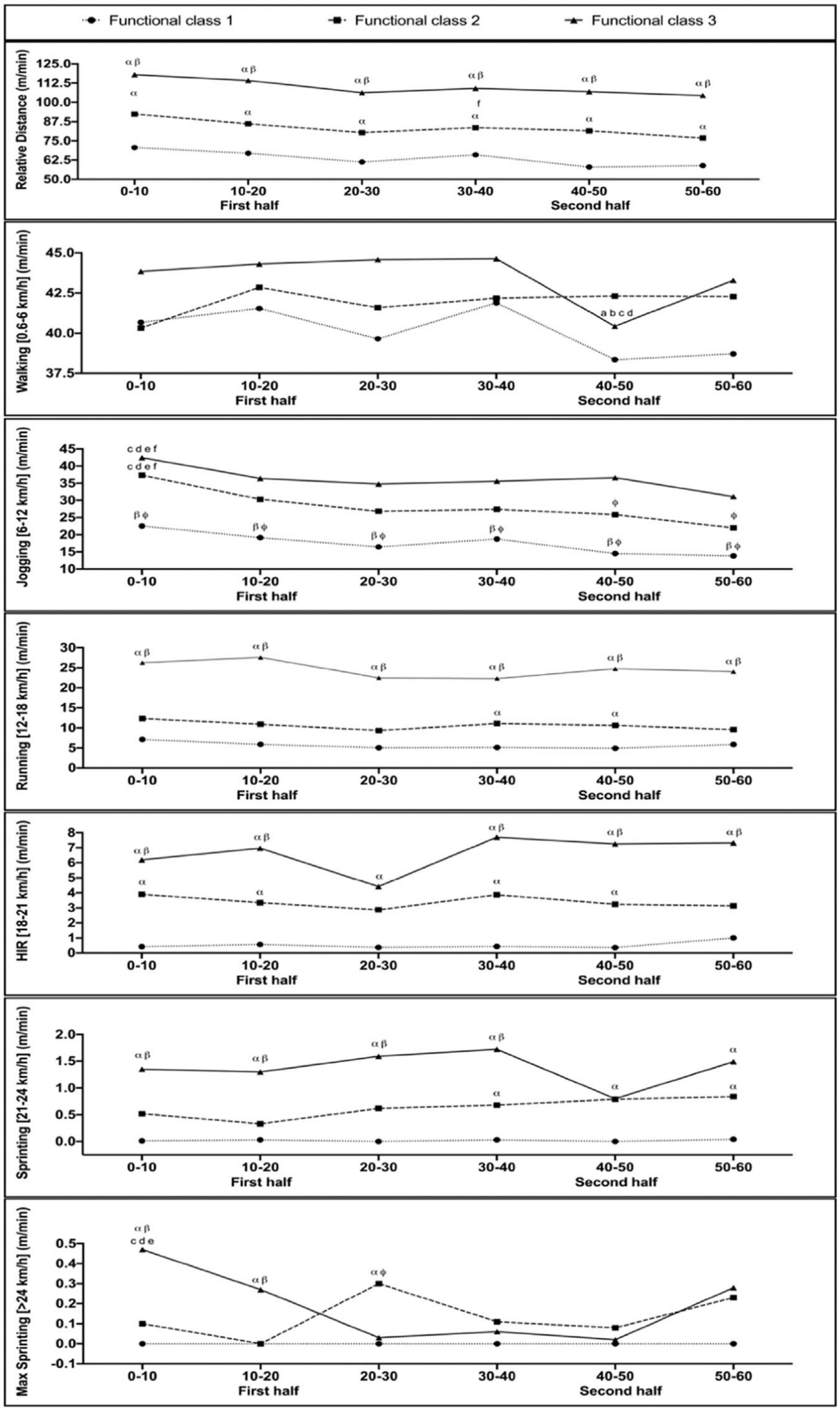

Fig. 1 Descriptive and inferential analysis of the types of movements in function of the functional classification and the time.

presented higher records at maximum sprint speeds (>24 m/min), in intervals of 20–30, 30–40, and 40–50 min. These results do not coincide with existing data in conventional football[12,32,38] and do not corroborate the data obtained in the Fa7PC study by Yanci et al.[28] and Peña-González et al.,[30] because these studies did not evaluate the games in 10 min periods. However, our results are similar to those found by Gamonales et al.,[25] where players with lower functional limitations (FC3), were those who ran longer distances during matches, as well as presenting higher speed records, particularly jogging (6–12 m/min), running (12–18 m/min) and high intensity running (18–21 m/min).

These results could be consequences of the demands of the competition itself, meaning that players with greater functional mobility are those who carry out the majority of shots in the game from the central zones of the playing field, as well as intervening more often in the game, carrying out a higher number of ball recoveries.[21,39] Therefore, FC1 and

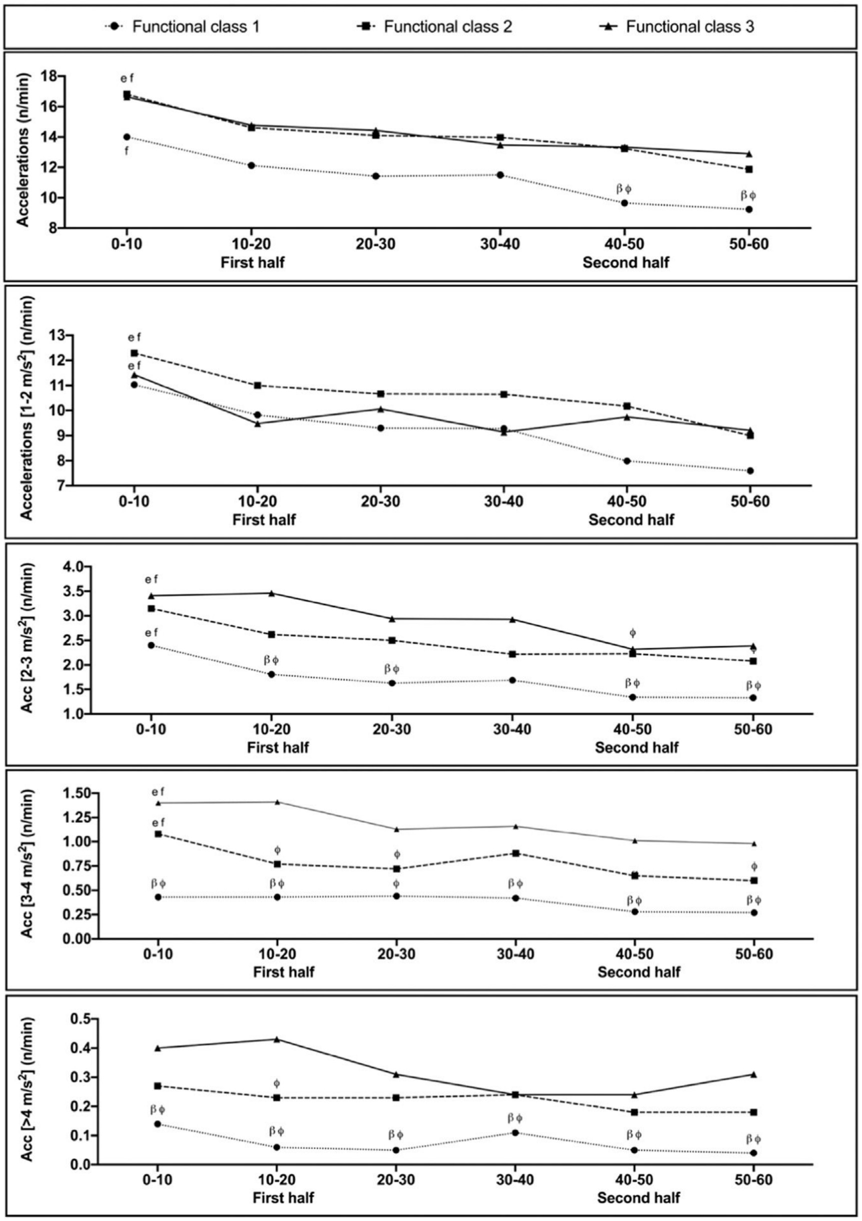

Fig. 2 Descriptive and inferential analysis of types of accelerations as a function of functional classification and time.

FC2 players continually seek to associate themselves with the FC3 player, with the aim of seeking defensive and offensive balance on the playing field, moving the ball from the defensive to the offensive zone, and even, finishing the game plays. Thus, it is recommended to design training tasks and sessions where FC3 players have the greatest protagonist, but, on the other hand, since success is not guaranteed by the individual actions of players with greater functional capacity, Fa7PC coaches will have to design training tasks that assume the tactical aspects of the game.

Data related to speed changes showed the existence of significant differences among athletes both in Acc and Dec in the function of the FC and the time. The FC3 athletes presented a greater total number of Acc, as well as presenting greater records of Acc of low (1−2 m/min), moderate (2−3 m/min), high (3−4 m/min) and very high intensity (>4 m/min) during the games and periods analyzed, compared to FC1 and FC2. However, FC1 players were those who had lower records and showed clear differences compared with the rest of the players as a result of their reduced mobility. Furthermore, the results obtained do not coincide with previous investigations on the Fa7PC,[26,28] except with data from Gamonales et al.,[25] in which they analyze the games in a general way ($n = 6$) played by an Extremadura team from Fa7PC during the Spanish National League 2018/2019.

However, in the present study the data was analyzed in 10 min periods and considering the role of the different FCs, with the aim of understanding with accuracy what happens between the players at different moments of the party. Therefore, the different results we found compared to previous research can be related to the analyzed variables, the employed procedures, as well as the fact that the variables of this study have been relativized per minute of play aiming

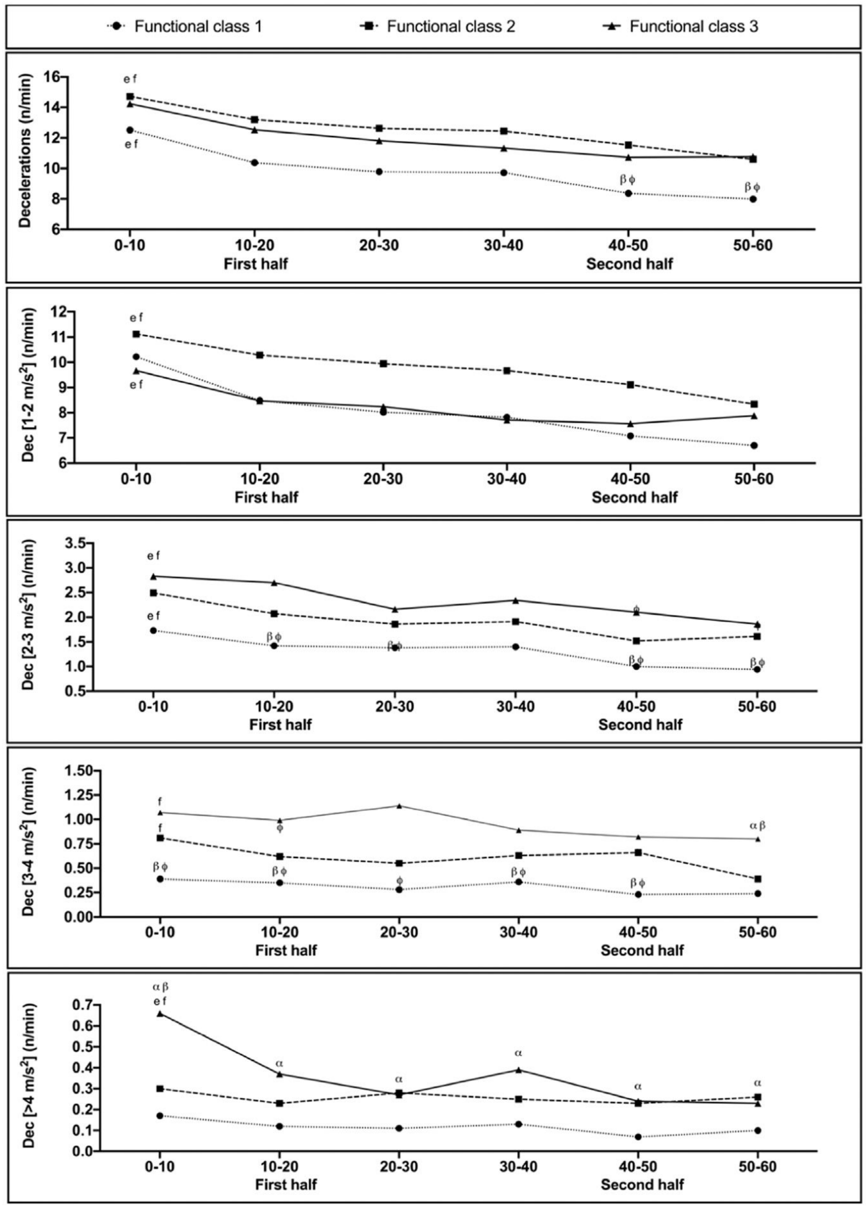

Fig. 3 Descriptive and inferential analysis of types of decelerations as a function of FC and time.

for data equity. The normalization of data during the game is a necessity in investigations focused on game analysis, which allows the comparison of results.[40] On the other hand, the main significant differences occurred in FC1 athletes at different time intervals as a result of accumulated fatigue, or due to their role in the playing field, goalkeepers or forwards.[21] Concerning speed changes linked to Dec, FC3 players presented a higher number of records of Dec of moderate (−3 to −2 /min.), high (−4 to −3 /min.), and very high intensity (> −4 /min). However, FC2 athletes presented a higher number of total records in Dec (Dec/min.), and even of low intensity (−2 to −1 /min). These differences are demonstrated throughout the playing time, and, even, are accentuated even more depending on the analyzed times, and the demands of the sport itself, therefore, FC1 players had lower records because of their functional mobility.

Furthermore, spasticity is strongly influenced by the speed of movement,[41] which influences the ability to accelerate and decelerate.[23] Consequently, Fa7PC players experience coordination problems,[41] and experience greater fatigue than the general population. In conventional football, neuromuscular fatigue is considered the most important etiology in hamstring strain injuries[42] and, in fact, many sports injuries in football are the result of speed changes that players execute in the game and, specifically, due to the impact on the biomechanics of the lower extremities, causing injuries.[43] Hence, Fa7PC players are more likely than conventional football players to sustain injuries as a result of accumulated fatigue during the game because they have a disability. Therefore, it is recommended to carry out injury prevention tasks during Fa7PC training sessions.

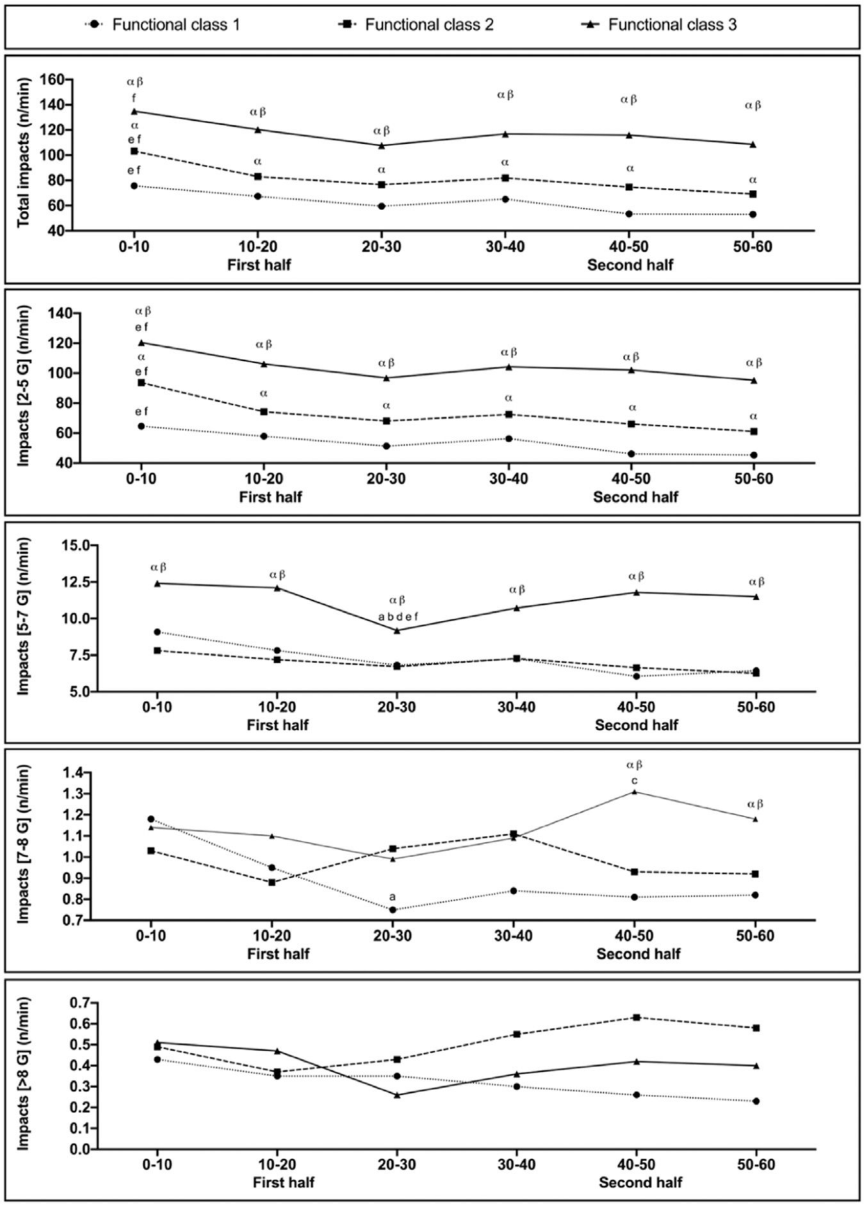

Fig. 4 Descriptive and inferential analysis of types of impacts based on FC and time.

Taking into consideration the results related to the impacts received by Fa7PC players, there were significant differences between the different analyzed FCs. The FC3 players presented differences concerning FC2 and FC1 players in the number of total impacts (n/min) and in the impacts of very low (2–5 G) and low (5–7 G) during the analyzed periods of times of the games. Furthermore, in 40–50 and 50–60 min, they presented higher records in moderate intensity impacts (7–8 G). Therefore, there were significant differences compared to FC2 and FC1 athletes. The results obtained do not corroborate with the data from studies in Fa7PC by Boyd et al.,[26] Peña-González et al.,[30] and Yanci et al.,[28] because none of these considered the impact variable. On the contrary, Gamonales et al.[25] analyzed the impacts received by Fa7PC athletes, and only differences were found in total impacts per minute, and low-intensity impacts, with lower values in FC1 compared to la FC2 and FC3.

One might argue that this study allows us to accurately determine the period of time the players have the lowest number of impacts. Therefore, the use of inertial devices during training and official games in Fa7PC permits the coaching staff to understand the player's fatigue accurately, and consequently, objectively make decisions during and post-game,[25] and design training tasks and sessions adapted to the physical demands required in the competition considering the FC role, as well as individually identifying the potential risk of injuries in each player.

As a study limitation, we should indicate the limited sample number, related to the fact that few teams are involved in this sport, and we needed to guarantee that all players participated in all games of the Spanish National League 2020. We suggest that in the future the sample could increase, as well as study different level teams, and if possible, include technical and tactical variables to more deeply understand the Fa7PC dynamics.

Conclusions

Significant differences between Fa7PC players are evident considering the FC (FC1, FC2, and FC3), and periods (0–10 min, 10–20 min, 20–30 min, 30–40 min, 40–50 min, and 50–60 min), analyzed in relation to the competitive demands associated to external load (movements and speed changes) and neuromuscular objective external load (impacts). The analysis of these variables reports significant results related to the analysis of fatigue, due to the high-intensity action producing higher values of external load, and in consequence, the fatigue is increased.

FC3 players are characterized by covering greater distances at higher speeds and presenting a greater number of impacts according to the studied time, due to having a lower functional limitation. On the other hand, FC2 athletes present, in some specific moments, greater competitive demands than players with lesser functional limitations (FC3). Furthermore, FC1 players are athletes who present lower demands as a result of having small mobility on the playing field.

The large number of variables associated with inertial devices data collection during training sessions and official competitions in Fa7PC allows us to understand the demands of CP players, as well as how to make decisions during the games and training process, namely with respect to reducing the injury risk.

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Conflicts of interest

None

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