

Analysis of the impact of twin games on the participation time of youth football players in a competitive environment

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Abstract - Objective: This study aimed to analyze the impact of using twin games on the playing opportunities of U-11 football players in youth competitions. **Study design:** This study involved 21 recreational football players from the U-11 age category (10.31 ± 0.83 years) who had not yet reached their peak growth velocity by the day of the first competition (maturity offset = -3.23 ± 0.54). Three different competitive contexts were conducted: Competition 1 - a 7-a-side format; Competition 2 - a 5-a-side format with Twin Games and free substitutions; and Competition 3 - a 5-a-side format with Twin Games adjusted to match players' skill levels. The variables of players' participation time within the game, Ranking (as perceived by the coaches), and centesimal ages were collected, which were used to group these players into age quartiles. **Results:** In Competition 1, players with a higher skills level (as ranked by the coaches) had significantly more game time than those considered to be of a lower level ($p = 0.027$). However, with the implementation of Twin Games (Competitions 2 and 3), it was not possible to identify the effect of both the competitive level and the age of the players on participation time ($p > 0.05$). **Conclusion:** In this sense, the use of Twin Games as a strategy to adjust children's competitive environments optimized greater participation from all players during the competition, thereby minimizing the impact of social effects on children's opportunities to participate in competitive games.

Keywords: competition, participation time, twin games, football, social effects.

Introduction

Sports practice during childhood and adolescence should be guided to create an environment that is consistent with the development and training of young athletes. Sports competitions, often structured to promote results, can negatively influence players' involvement, affecting their adherence to and continuation in the sport. When participating in competitions, it is common for children and young people to devote almost all their time to specialized sports practice at an early age, driven by the pursuit of results¹. This traditional format of sports competition encourages young people to drop out due to the exclusion of those who are deemed less capable or, indeed, due to the exhaustion of those who bear a heavy burden of responsibility at a very young age, culminating in the exhaustion promoted by this environment^{2,3}.

As a means of overcoming such tendencies, competitions should be treated as an environment capable of developing skills and competencies⁴⁻⁶, and for this to occur, modifications are necessary to transform them into a learning environment tailored to the potential of young players^{6,7} and to stimulate the development of competencies and skills in individuals who do not yet possess them fully developed⁸. Although offering equal competitive opportunities for all to access competition may be one means to achieve this⁹, realizing this competitive model remains a challenge in the youth age categories. In football, coaches disregard the developmental process of some athletes and select those who have a maturational advantage over their teammates¹⁰, which influences participation opportunities due to the advantage held by athletes born in the early months of the year¹¹, also

manifesting in the greater opportunity for participation in youth category competitions in football^{12,13}.

Through such complexity, which directly involves the coach as a decision-maker regarding a more or less equitable competitive space, there are studies that present alternative models to the traditional context of children's competition in sports^{17, 18, 19}, with the aim of democratization and positive development of youth players. These proposals focus on the overall design of the competition, that is, on the proposition of rules that adjust the game and competitive format according to its participants, which may reduce the way the coach manages their decision-making regarding the participation of children and young people in the competitive space, exceeding the mere choice based on the immediate sporting performance of children and young people.

In addition to models aimed at proposing more equitable competitive structures, some strategies seek to promote a competition design that is more appropriate to the current skill levels of children and youth, which could initially mean an experience that is more suited to the physical and strategic-tactical demands of the game. Another proposal is the use of twin games²⁰, which can be understood as a strategy aimed at adjusting the environments of youth's competition to reduce the afore mentioned social effects. In competitions with Twin Games, the matches are transformed into two simultaneous contests between the same teams on two pitches with the same format, rules, and playing conditions. It has been demonstrated that these are suitable for providing athletes with similar playing time, increasing engagement, and the technical-tactical performance of players in U-9 competitions²⁰.

However, no studies have been found that investigate how twin games can be used to reduce social effects in sport, particularly the EIR and the EP. Considering the context presented, this study aims to: (i) analyze the impact of using twin games on the participation time of children in the U-11 age category, and (ii) investigate the impact of twin games on the manifestation of social effects (EIR and EP). The study hypothesizes that twin games will help equalize children's participation time in football competitions and that they will also help mitigate the social effects of EIR and EP.

Methods

Participants

This study involved 21 recreational football players (19 male and 2 female) from the U-11 age category (10.31 ± 0.83 years) and had not reached their peak growth velocity by the day of the first competition (maturity offset = -3.23 ± 0.54) (Mirwald et al., 2002),

belonging to three soccer schools selected by invitation, who agreed to participate in all competitions. All methodological procedures of the research were previously approved by the Research Ethics Committee (CEP) of the University where the study was conducted (Approval number 6.064.129).

Methodological procedures

This is an exploratory study of a quantitative nature, conducted in three unofficial competitions held for the U-11 category, which were organized in festival formats with a duration of one day each. The competitions had distinct rules and were held at one-month intervals. Competition 1 was used as a reference competition for comparison with the other experimental competitions (Twin Games), which consisted of three matches held in a 7-a-side format. This format was chosen because studies highlight that it is the most suitable format for this age group²¹ and stimulate players to explore the game space more and performed more shots on the opponents' target²². On the day of this competition, the weather at the time of the competition was around 27 °C (80.6 °F), with a wind chill of 30 °C (86 °F). The city experienced muggy weather, with wind speeds around 5 km/h (3.1 mph) and relative humidity around 85%.

The twin games^{20,23} were used as an alternative strategy in Competitions 2 and 3. In Competition 2 (Free Twin Games), three matches were held featuring twin games in a 5vs5 format, where the teams faced off in simultaneous contests, conducted on different pitches (Pitch A and Pitch B), with the same rules and pitch dimensions (48.20 m x 30.15 m). In this competition, coaches were free to substitute players from one pitch to the other (players from Pitch A could be substituted and enter Pitch B and vice versa). On the day of the competition, the weather was around 29 °C (84 °F), with a wind chill of 35 °C (95 °F). The city experienced a muggy climate, with wind speeds around 2 km/h (2 mph), and relative humidity was around 84%.

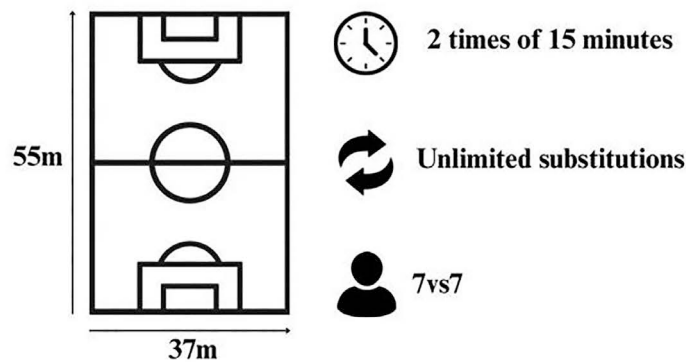
The Competition 3 followed the rules of Competition 2 (format, pitch dimensions, and individual area per player), but the coaches, at the time of players' registration in competition, divided their athletes into two distinct teams (High level of performance and Low level of performance teams), considering, according to the criteria set by the coach, the skill level of their players (skill-banding). The teams composed of players with a high level of performance (HLP) faced each other on one pitch (Pitch A), while the teams formed by players with a low performance level (LPL) competed on another pitch (Pitch B). Furthermore, swapping between pitches was not allowed (HLP could not play on LPL pitch and vice versa). On the day of this

competition, the weather was around 29 °C (84 °F), with a wind chill of 35°C (95°F). The city experienced muggy weather, with wind speeds around 7 km/h (4.5 mph), and relative humidity ranged from 51% to 92%. At this stage, only two teams registered for the competition, resulting in a competition with only two (2) teams and two (2) home-and-away matches.

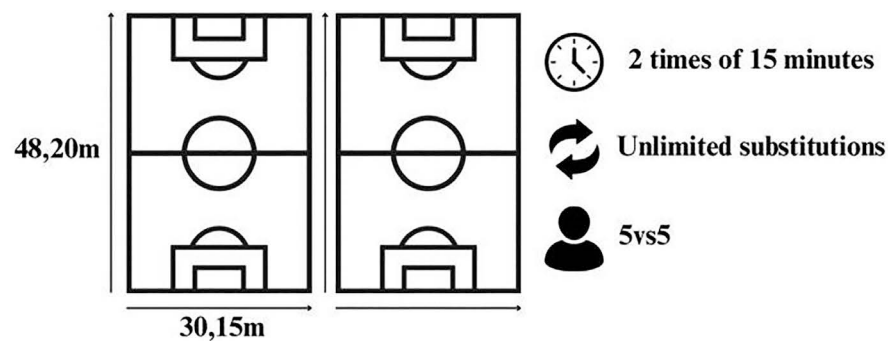
In all competitions, a time regime of 30 min was used, divided into 2 halves of 15 min and

unlimited substitutions within each playing field. Goalposts with 5 × 2,2 m were used in the first competition, whereas futsal goalposts were used in competitions 2 and 3. The individual area per player was a criterion used to determine the size of the fields for Competitions 2 and 3, using that of Competition 1 as a reference, aiming to maintain the same individual area per player in all competitions (145.3 m²) (see Figure 1).

a) 1st Competition - 7vs7



b) 2nd Competition - 5vs5 Free Twin Games



c) 3rd Competition - 5vs5 Skill-banding Twin Games

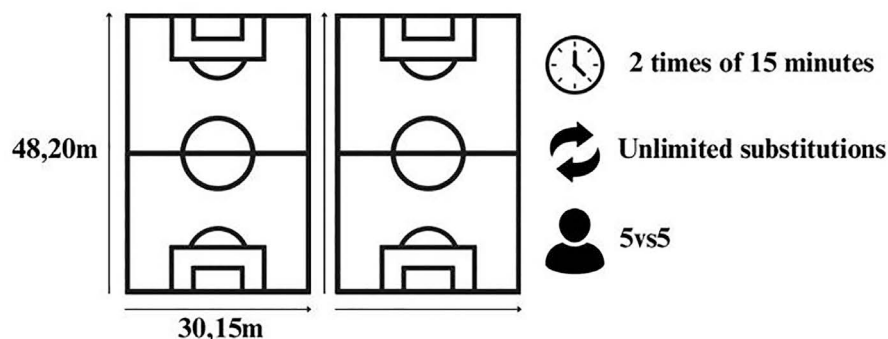


Figure 1 - Information about the competitions held.

Instrumentation

In this study, the following variables were analyzed: playtime (a variable related to the level of participation of each player); age quartile (a variable related to the EIR); and Ranking (a variable related to the EP, as it represents the coaches' expectations about their players).

To identify the playing time of each athlete, the Wimu^{Pro} GPS Tracking System (RealTrack Systems, Almeria, Spain) was used. The SPRO analysis software was utilized to record the exact moments when the player entered and exited the playing field. The system requires manual input of substitutions, and this was done by synchronizing GPS data with the match video, to only insert the moment the player is on the field. As in some games, additional time was added due to player injuries; we opted to use the percentage of the total game duration during which the players were actively playing as a playing time indicator.

For the age quartile variable, the centesimal ages (CA) of the players were collected through the competition registration form. The CAs were chosen for this study because this strategy may be more appropriate than total age for distinguishing athletes grouped in similar age categories²⁴. To group these players, the age quartile strategy was used²⁵, in which players from each team were listed by CA, in descending order (from oldest to youngest) and the quartile division was made within each team using Microsoft Excel. That is, each team had its own age quartile division.

Finally, the ranking variable was gathered based on each coach's perception of their teams²⁶. In the 1st Competition, coaches were asked to rank their players according to their perception of the players' performance levels, a strategy already used in other studies^{15,27-30}. Players were classified based on the coach's perception of their performance level on a 5-

point Likert scale, where: Rank 1: below team average performance; Rank 2: performance between average and below team average; Rank 3: average; Rank 4: performance between average and above team average; Rank 5: above team average performance.

Data analysis

The data collected were analyzed using the Shapiro-Wilk normality test. The Kruskal-Wallis test was used to verify the differences in percentage of playing time among players from different rankings and quartiles across the three competitions, and Dunn's post-hoc test was used to identify statistically significant differences. Statistical significance level adopted was 5% ($p < 0.05$), Biserial Rank Correlation (BRC) was calculated to determine effect sizes. Values of $BRC \leq 0.1$ were considered as small effect sizes, $0.1 > BRC \leq 0.5$ as medium, and $BRC > 0.5$ as large and the statistical data processing was performed using Jamovi 2.7.12.0 software.

Results

In Table 1, the percentage of playing time for players from different rankings in the three competitions is presented. The results indicated significant differences in playing time during 1st Competition between Rank 2 and Rank 5 ($p = .012$; $r = -.060$), revealing that players ranked with performance above the team's average (Rank 5) played significantly longer than players ranked with performance below the team's average (Rank 2). Furthermore, it was noted that players ranked with performance on average (Rank 3) spent more time on the field than players in Rank 2 ($p = .016$; $r = -.084$).

In Table 2, the percentage of playing time for players from different quartiles in the three competi-

Table 1 - Percentage of players' playing time from different rankings in different competitions.

	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
Competition 1 - 7-vs-7 format	No occurrence	37,70 ± 29,98 ^{*,#}	70,92 ± 24,49 [*]	74,84 ± 4,83	89,39 ± 14,99 [#]
Competition 2 - Free Twin Games	No occurrence	68,34 ± 22,47	77,76 ± 25,62	95,31 ± 6,62	95,58 ± 6,23
Competition 3 - Twin Games with <i>Skill-Banding</i>	No occurrence	53,77 ± 18	47,01 ± 30,71	66,67 ± 47,14 [*]	80,47 ± 0,67

^{*}Statistically significant difference between Rank 2 and Rank 4;

[#]Statistically significant difference between Rank 2 and Rank 5.

Table 2 - Percentage of players' playing time of players from different quartiles in different competitions.

	Quartile 1	Quartile 2	Quartile 3	Quartile 4
Competition 1 - 7-vs-7 format	67,01 ± 14,74	83,23 ± 14,91	55,67 ± 40,42	44,98 ± 34,70
Competition 2 - Free Twin Games	86,14 ± 18,67	47,06 ± 41,60	89,64 ± 12,41	72,27 ± 21,16
Competition 3 - Twin Games with <i>Skill-Banding</i>	66,38 ± 32,40	40,82 ± 29,70	62,54 ± 15,22	52,60 ± 29,25

tions is presented. It was observed that the playing time of the players was not affected by their age.

Discussion

The present study aimed to analyze the impact of using twin games on the participation time of children in the U-11 age category, as well as to investigate the impact of twin games on the manifestation of social effects (EIR and EP). The results of this study highlight that players better ranked by their coaches had higher percentage of playing time only in the first competition, which suggests that players with a higher performance level, in relation to their team, receive more playing opportunities in competitions with a traditional format. This relationship can be interpreted considering the expectations of coaches, which result in the occurrence of the EP, whereby players who receive more playing time are more likely to be perceived as better by their coaches, as they are observed for longer, leading to their classification in higher positions in the rankings.

The study by Hancock, Adler, and Côté¹⁴ asserts that family, coaches, teammates, and opponents are significant factors in an athlete's development. This study observed how coaches' perceptions of their athletes' performance affect the opportunities they have to participate in matches during competitions. It is important to emphasize that in the context of expectancy phenomena, the expectations of coaches influence the performance of players; in other words, athletes who receive more competitive opportunities and positive feedback may be motivated to reach their maximum potential, reinforcing the initial expectations of the coaches¹⁶. Expectancy phenomena are also present in recent studies concerning handball¹⁵, volleyball³¹, and athletics³², which demonstrates that the level of a coach's perception regarding their players affects the time spent participating competitively in various team sports.

In the second and third competitions, it was not possible to observe differences in the percentage of playing time of athletes from different rankings, which may indicate that the strategies used in this study - promoting competitions in the format of twin games - decreased the performance expectations (EP), allowing athletes perceived as being of lower level to receive competitive opportunities similar to those of players higher positioned in the ranking. According to Rabelo et al.³³, the lack of playing experience is a significant factor in the underestimated performance perception of younger athletes in a team; therefore, providing more playing time to these athletes may lead them to be observed and better assessed by their coaches, which was evident in this study, as players from Rank

2 received more playing opportunities in the last competitions.

The performance in the youth age categories may not be the only determining factor for the playing time duration of players' participation¹⁵, thus it is important to allow competitive time for the majority of athletes, so that they also have the opportunity to experience the competitive environment just like the athletes who are better positioned in the rankings. Furthermore, providing better guidance for coaches during the long-term development process of athletes is crucial to avoid an excessive focus on victory³¹.

In this study, it was not possible to identify differences in the percentage of playing time for players from different age quartiles, unlike the results found by¹⁵, which asserts that coaches have higher performance expectations regarding older players, leading them to offer more competitive opportunities to these athletes, characterizing the EIR. The EIR was observed in professional men's football in the ten best European leagues (Spain, Germany, France, England, Portugal, the Netherlands, Italy, Turkey, Austria, and Belgium) during the 2016-2017 season, with greater evidence among midfielders and less among forwards³⁴. Although it was not observed in the current study, which suggests that coaches did not consider age as a factor in team assignment, the EIR is a factor that influences the coach's decision, as pointed out by Hancock, Adler, and Côté¹⁴, and therefore, it should be taken into consideration by coaches and sports organizations, which shows us that although the EIR exists, it is not a determining factor for sporting success. Thus, coaches and sports organizations need to develop rules and strategies that reduce the EIR in the long term, allowing athletes to develop more appropriately. This was implemented in this study using different competitive strategies.

It is also important to highlight that the increase in playing time for lower-ranked players throughout the second and third competitions may be linked to the fact that the coaches' perceptions changed during the competitions, as the competitions took place over three different months and the players began to receive more playing opportunities, and those players who were ranked at lower levels may have progressed in line with the coaches' perceptions. Wood et al.³⁵ states that coaches need to learn to continuously adapt to the dynamic landscape of sports performance and athlete development, as improvements in performance frequently occur within the age group of the players in this study, influenced by various factors such as the learning process, physical growth, and maturation.

The results of this study should be interpreted considering some limitations. Although the findings offer valuable insights into the impact of twin games

on the participation time of young football players, the small sample size ($n=21$) limits the generalizability of the findings to the general population. Furthermore, the selection method based on invitation may introduce a self-selection bias. Another limitation lies in the focus exclusively on players residing in the capital of Amazonas, in the North region of Brazil. Due to regional economic and infrastructural disparities, these results may not reflect the reality of other geographic areas. The findings of this research cannot be generalized to other populations because, in addition to the sample being predominantly male, these data depend on the competitive context and the coach-athlete relationship, which may vary according to the competitive context analyzed. We suggest that future studies seek to replicate these games in different regions with a larger sample size and explore other competitive contexts for comparison purposes.

Conclusion

This study aimed to analyze the impact of using twin games on the participation time of children in the U-11 age category. The implementation of twin games as a competitive strategy has increased the participation time of lower-performing children. Thus, the use of twin games in a competitive context can be understood as an important strategy to mitigate potential negative influences arising from the coach's performance perceptions related to the social effects (EP) on the playing opportunities that athletes have during children's competitions, allowing for experience in a context with greater equity for the players. However, it is necessary to develop studies that also analyze how the use of twin games contributes to creating playing environments tailored to the players' potentialities.

With this study, we hope to generate evidence that may encourage federations, leagues, and sports programs focused on children's and youth football to reconsider the role of youth competition from a long-term perspective, overcoming the innate bias that a child deemed talented should be exploited as such, and that, conversely, a child perceived to have low skills should be prematurely prevented from continuing in the process. We understand that, as advocated by new trends related to the development of sporting talent, competition needs to be viewed similarly within the complex long-term sports training system.

AI use statement

No AI was used in this research.

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Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflict of interest statement

The authors have no conflicts of interest to declare. All co-authors have seen and agree with the contents of the manuscript and there is no financial interest to report.

Author contributions (CRediT)

Felipe Guerra Monteiro: investigation, methodology, formal analysis, writing – original draft, writing – review & editing. **João Cláudio Machado:** conceptualization, investigation, methodology, formal analysis, writing – original draft, writing – review & editing, visualization. **Ruan Marcelo Lopes dos Santos:** formal analysis, investigation. **Thiago Leonardi:** writing – original draft. **Tathiane Krahenbühl:** conceptualisation, investigation, methodology, formal analysis, writing – original draft. **Enrique Ortega-Toro:** writing – original draft. **Mateus Rossato:** conceptualisation, investigation, methodology, formal analysis, writing – original draft. **Lucas Leonardo:** conceptualisation, investigation, methodology, formal analysis, writing – original draft.

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