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Technical and tactical soccer players' performance in conceptual small-sided games

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Abstract—Conceptual small-sided games (CSSGs) may be interesting as a methodology for training soccer players given its connection to the unpredictability that is inherent to soccer. Our aim was investigate, through videogrammetry, if the technical and tactical principles promoted through the adoption of distinct rules from two distinct CSSGs (maintaining ball possession; and progression to the target) would actually be achieved. The study included 24 athletes assigned to 6-player teams. Our data showed that the CSSGs' organising principles create situations with differing levels of difficulty that obey the propositions of maintaining ball possession and progression to the target, i.e., CSSGs permit systematic training on technical and tactical components in order to emphasize the concepts adopted in this study in games context. Our data credit the CSSGs for teaching technical and tactical lessons that, when coupled with adequate physical conditioning, can facilitate a player's capacity to merge thoughts and events in different situations.

Keywords: soccer, conceptual small-sided games, technical, tactical

Resumo—"Desempenho técnico e tático de jogadores de futebol em jogos reduzidos conceituais." A utilização de jogos reduzidos conceituais (JRC) pode ser uma metodologia de treino interessante para treinar a imprevisibilidade inerente ao jogo de futebol. Nosso objetivo no presente estudo foi investigar por videogrametria os princípios técnico-táticos adotados em resposta as respectivas regras de dois jogos reduzidos conceituais distintos (manutenção de posse de bola e progressão ao alvo). Participaram do estudo 24 atletas separados em equipes de 6 jogadores. Nossos dados comprovaram que os princípios organizadores dos JRC criam situações distintas com graus de dificuldade diferentes. Ou seja, é possível sistematizar o treinamento dos componentes técnicos e táticos de forma a enfatizar os conceitos adotados neste estudo e inseridos no contexto do jogo. Nossos dados credenciam os JRC para o aprendizado de situações técnico táticas que, aliadas ao condicionamento físico adequado podem contribuir para produzir um jogador treinado para aproximar cada vez mais pensamentos e ações em situações diversificadas.

Palavras-chave: futebol, jogos reduzidos conceituais, técnica, tática

Resumen—"Rendimiento técnico y táctico de jugadores de fútbol en juegos reducidos conceptuales." El uso de los juegos reducidos conceptuales (JRC) puede ser una interesante metodología para entrenar a la imprevisibilidad inherente en el juego de fútbol. Nuestro objetivo en este estudio fue investigar por videogrametría los principios técnico-tácticos adoptadas en respuesta a las respectivas reglas de dos JRC distintos (posesión del balón y la progresión a la meta). El estudio incluyó a 24 atletas divididos en equipos de 6 jugadores. Nuestros datos muestran que los principios de organización de los JRC crean diferentes situaciones con diferentes grados de dificultad. Es decir, es posible sistematizar el desarrollo de los componentes técnicos y tácticos de una manera a enfatizar los conceptos adoptados para este estudio en el contexto del juego. Nuestros datos acreditan JRC para el aprendizaje de situaciones técnicas tácticas que, junto con la preparación física adecuada puede ayudar a producir jugadores capacitados a unir cada vez más pensamientos y acciones en diferentes situaciones.

Palabras claves: fútbol, juegos reducidos conceptuales, técnica, táctica

Introduction

Among the myriad of factors on which soccer performance depends are the requirement of good conditioning and excellent physical capacities, including strength, speed and endurance (Castagna, Manzi, Impellizzeri, Weston, & Barbero Alvarez, 2010; Helgerud, Engen, Wisloff, & Hoff, 2001; Helgerud, Rodas, Kemi, & Hoff, 2011; McMillan, Helgerud, Macdonald, & Hoff, 2005). At the same time, soccer requires players to be highly adaptable to new and unpredictable situations (Garganta & Gréhaigne, 1999; Mamassis & Doganis, 2004; Scaglia, 2003; Scaglia & Reverdito, 2011). To play "smarter," it is important to train with an eye to tactical awareness in response to the constant and unavoidable demands that occur during games.

The use of conceptual small-sided games (CSSGs) is presented as an interesting training methodology for this purpose because CSSGs respect the inherent complexity of the game and allow a range of options for teaching and coaching soccer. In CSSGs, the structural (ball, targets, field size) and functional references (the fulfilment of technical and tactical training) allow develop specific soccer game concepts (Scaglia, Reverdito, Leonardo, & Lizana, 2013). Thus, using this methodology, it is possible to change the field size, the number of players, and the technical and tactical constraints to highlight different technical and tactical capabilities. This methodology is applied according to the organising principle of the training session, which is defined by specific rules (Leonardo, Reverdito, & Scaglia, 2009; Reverdito & Scaglia, 2007; Scaglia & Reverdito, 2011).

The development of videogrammetry for the analysis of this sport has allowed advances in the scrutiny of games, especially during official competitions (Barros *et al.*, 2007; Moura *et al.*, 2013). Studies that investigate the training sessions that primarily emphasise reduced games are mainly concerned with the physical components that are involved (Coutts, Rampinini, Marcora, Castagna, & Impellizzeri, 2009; Hill-Haas, Rowsell, Coutts, & Dawson, 2008; Hill-Haas, Dawson, Impellizzeri, & Coutts, 2011; Rampinini *et al.*, 2007). Thus, it is important to evaluate whether the technical and tactical concepts present in the organising principles of a CSSG are actually achieved (Halouani *et al*., 2014).

Our aim in this study was to investigate two conceptual small-sided games with different organising principles (maintaining possession of the ball and progression to the target) from kinematic data obtained by videogrammetry. The specific objectives were as follows: a) to analyse the technical offensive events (passes, releases, crosses, goals completed with the foot, goals completed with the head, and angles of passes—see Figure 1) used in each of the conceptual small-sided games; b) to analyse the tactical principles with respect to the intervals of time occurring between the studied actions. These intervals allow the analysis of the players' movements because the athletes have enough time to show the impact of decisions made in situations provided by the game (Araujo, 2003, 2005; Raab, Masters, & Maxwell, 2005); and c) to analyse the players' movements in the time unit (an interval of technical action). With these records, we seek to infer whether the technical and tactical principles adopted in response to the respective rules of each CSSG (Costa, Garganta, Greco, & Mesquita, 2009b) were respected.

Methods

Participants

The study included 24 soccer players of the under-20 category from a federated club team in São Paulo, Brazil, with at least five years of experience in competitions. They were divided into teams by the responsible technical committee, so that the teams were balanced regarding the positions of the players (defenders, midfielders, and attackers). This precaution was taken to allow the teams to maintain a high level of competitiveness and concentration during the games. To reduce variability between the participants, the same teams faced off in Games 1 and 2. This study was approved by the Ethics Committee of the Faculty of Medical Sciences, UNICAMP on 07/19/2012 (Report # 62368/2012 and CAAE: 03276612.2.0000.5404).

Experimental design

The experimental design and the CSSGs protocol were specifically created for this study. For both games, the field was 52 m long by 32 m wide, corresponding to 1/4 of the training field, and it included official-size goal posts. The teams were composed of six players plus the goalkeeper, and the games lasted 30 minutes. This study did not analyse the performance of the goalkeepers. The games were preceded by 15 minutes of standardised warm up and were conducted at the same time in the afternoon.

We used two different types of conceptual small-sided games. The first conceptual game (Game 1: maintaining ball possession) was conducted under the following set of rules: only two touches of the ball were permitted, with each extra touch yielding a point to the opponent; carrying the ball from one field line to the other resulted in one point; exchanging five passes in the offensive field without returning the ball to the same teammate from whom the pass was received resulted in two points; and a goal (allowed only after exchanging 5 passes) resulted in 8 points.

The second conceptual game (Game 2: progression to the target) was governed by the following rules: passes could only be made towards the opposing goal; backward passes resulted in one point for the opponent; after regaining possession of the ball, the athletes could perform a free pass in any direction; invasion of the penalty box resulted in three points; goals with backward passes resulted in five points; and goals scored using only forward passes resulted in ten points.

Data collection

Each of the games was filmed with one camera (Casio EX-FH 25, 640x480 resolution, and acquisition frequency at 30

Hz) positioned at the highest point of the bleachers; afterward, the video sequences were transferred to a computer (Intel® Core™ i7-2600k, 3.40 GHz processor, 16 GB, NVIDIA GeForce 9500 GT).

In the reference system associated with the field (the *X*-axis corresponding to the touch line and the *Y*-axis corresponding to the goal line, as defined using a Bosch GPL 5C Professional Point Laser), approximately 16 control points were established directly by measurement of the field using laser distance metre (Leica Disto™ D5 that measure to the nearest 0.001 m). The control points were used to calculate the image-object transformation for the calibration process and to produce a two-dimensional reconstruction using the DLT method (Direct Linear Transformation) (Abdel-Aziz & Karara, 1971). The system accuracy in the determination of athlete position on the field was 0.3 m (Misuta *et al.*, 2005).

The DVideo System (Figueroa, Leite, & Barros, 2003) on manual tracking mode was used to measure the 2D positions of all players and to record each event that occurred during the game with the position on the field of each athlete involved.

Six matches (three of each CSSG) were filmed. Each week was performed one CSSG, changing Game 1 and Game 2. Before each match the participants had a rest period of 72 hours. The total number of technical events was 3086 for Game 1 and 2154 for Game 2. Two primary matrices were created from the 2D kinematic variables of each game, and registration of each event that occurred in the field at the instant in which the technical events occurred was created as well. The first matrix stored the information from the instant that the events occurred: The player who performed the action, which action was taken, and whether it was right or wrong. The second matrix contained a) the interval between technical events, defined as the interval between two subsequent technical events; and b) all players' positions on the field in the moment of each technical event.

Analysed variables

The data's processing and treatment as well as the creation of matrices (primary and secondary) were performed with Matlab. The secondary matrices were structured to include the following: a) the total number of passes; b) percentage of correct passes; c) the main trend of the direction of movement (forward or backward) based on the α angle (Figure 1) associated with the pass line derived from the action taken by a player; d) the total number of shots; e) percentage of correct shots; f) the total number of time intervals between each identified technical event; g) the duration in seconds of the time intervals between each identified technical event; h) the situations of offensive and defensive superiority and numerical equality that were created during the games. For this latter variable, the number of players—opponents and teammates alike—ahead of the ball line at the beginning of each interval were counted, recognising that the ball carrier was also considered to be a participant. This information was organised in the primary and secondary matrix structure to form the basis upon which inferences about the tactical concepts present in conceptual small-sided games were drawn. These variables can be observed in Table 1.

All variables were measured by one researcher and the data quality was confirmed by the reliability test (intra-observer correlation). Thus, the observer analysed a game twice, at an interval of 15 days. The intraclass coefficient values ranged from .95 to .99.

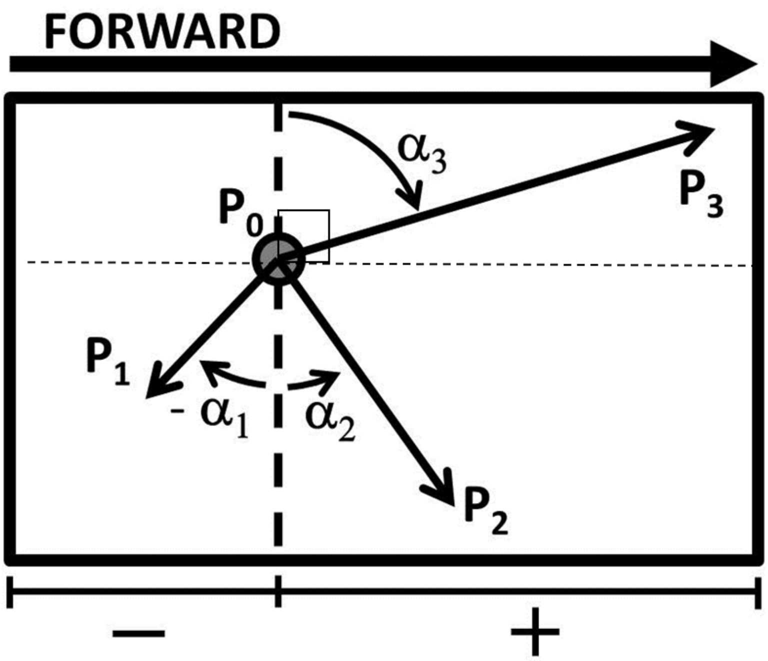

Figure 1. Examples of three situations for the α angle. P_0 is the position on the field of the player with the ball. $P_0 P_1$, $P_0 P_2$, and $P_0 P_3$ are vectors indicating the direction of the ball after the player passes it.

Table 1. Variables analyzed.

a	Number of passes	Passes	Technical Analysis
b	Percentage of correct passes		
c	The α angle of each pass		
d	Number of shots	Shots	
e	Percentage of correct shots		
f	Number of intervals that occurred between the all technical events	Time to decision making	Tactical Analysis
g	Duration of intervals that occurred between the all technical events		
h	The number of cases of offensive superiority, numerical equality, and defensive superiority	Relationship of Attack/Defence	

Statistical analysis

The statistical analyses were performed in Matlab. A one-way ANOVA for independent samples was used for the analysis of possible differences between Games 1 and 2. A 5% significance level was adopted for all cases.

Results

Technical analysis

The offensive technical events (e.g., passing and finishing with the feet or the head, their respective percentages of hits, and angles of actions) in each of the conceptual small-sided games are shown in Figure 2.

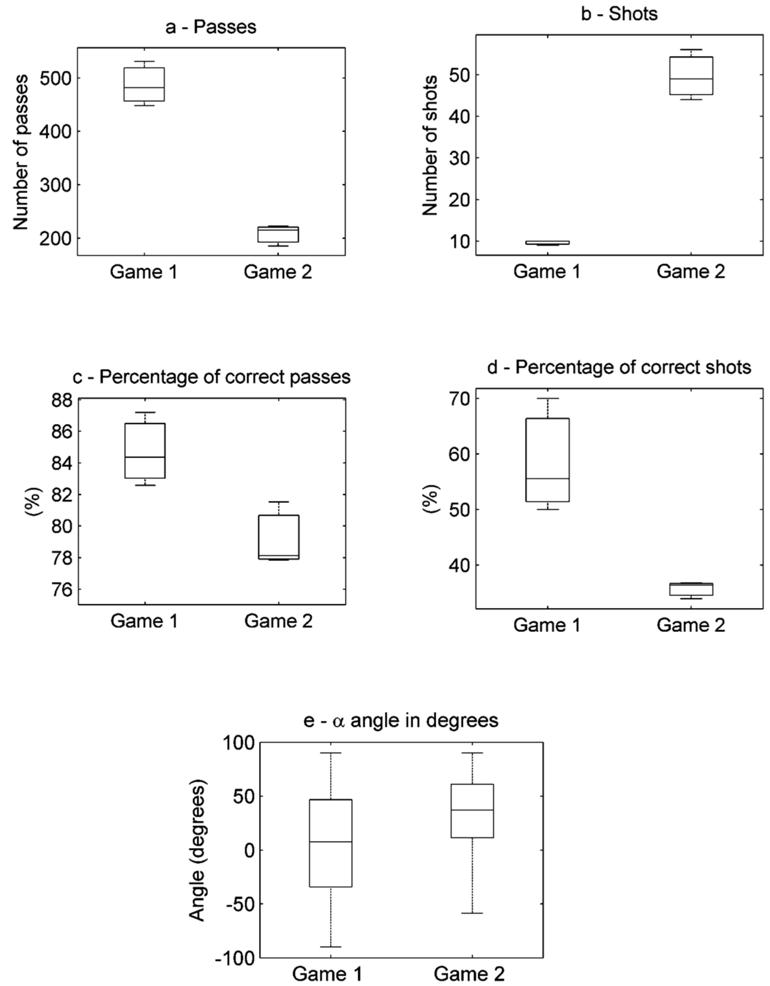

Figure 2. Box plot of the number of passes that occurred in Games 1 and 2 (a); Box plot of the number of shots that occurred in Games 1 and 2 (b); Box plot of the correct passes percentage in Games 1 and 2 (c); Box plot of the correct shots percentage in Games 1 and 2 (d); Box plot of the α angle, measured in degrees, of exchanged possessions of the ball during Games 1 and 2 (e).

The two games presented different characteristics in relation to passes and shots (Figures 2a and 2b). In Game 1, an average of 487 ± 42 passes was performed, twice that of Game 2 (207 ± 20 passes, ($p < .001$). In contrast, the average number of shots using the feet in Game 1 was 10 ± 0.6. This value was much lower compared to Game 2 (49 ± 6 shots), with statistical difference ($p < .001$). Regarding the percentages of correct passes (Figure 2d), the result was an inverse association such that the hit-rate from the shots was greater in Game 1.

In Game 1, the percentage of correct passes was 85 ± 2.3%, statistically higher than the values from Game 2 (79 ± 2.0%) with $p < .05$. The opposite association was found with the number of shots. Although the total number of shots was lower in Game 1, the rate of accurate shots was higher (59 ± 10.3 %). However, the completion rate in Game 2 was 36 ± 1.5 %, with $p < .05$. Moreover, the α angle associated with each action from the ball's transmission (passes, launches, and crossings) occurred in both Games 1 and 2 and showed significant differences (with $p < .05$) in terms of average values (Figure 2e). In Game 1, the value was 4.7 ± 11.8°, whereas in Game 2, this figure was 33 ± 3.8°. It also was observed that 75% of the samples from Game 2 were above the average for Game 1.

Tactical analysis

The methodology used in this study allowed for measurement of the time intervals that occurred between each technical event. These intervals represent the time allowed by players for the analysis of the situation and the planning of their events; a new problem situation is presented to the players at the beginning of each of these intervals, with a different range of possible solutions. This measurement was important to analyse decision-making abilities. Figure 4 shows these results through the number and duration of the intervals (Figures 3a and 3b, respectively). The game centre analysis verified the players' movements both inside and outside the game centre (Figure 3c) and the participation of each player within the game centre (Figure 3d), which was also important for evaluating decision-making abilities.

We observed that the number of intervals was significantly higher in Game 1 (1029 ± 51) than in Game 2 (718 ± 24). The duration of the intervals (1.7 ± 0.08s and 2.5 ± 0.8s for Games 1 and 2, respectively) justifies the larger number of intervals observed in Game 1. Interestingly, the average number of players within the game centre in every technical action did not differ between the two games (Figure 3c). However, the average rates of participation of each player inside the game centre were significantly different (Figure 3d). The athletes in Game 1 had an average of 237 ± 25 participatory events inside the game centre, whereas only 161 ± 5 events were recorded for Game 2.

Figure 4 shows data on the offensive and defensive superiority and numerical equality situations created during the two games, which reflect the conditions from the defensive system at the beginning of each time interval between the technical events.

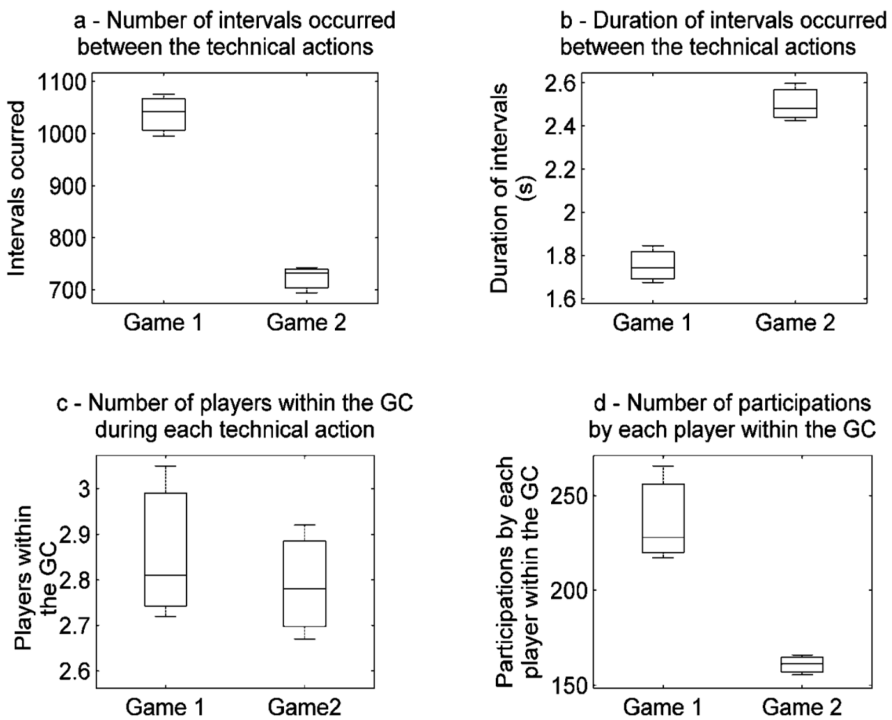

Figure 3. Box plot of the number of intervals that occurred between the technical events (a); Box plot of the intervals duration that occurred between the technical events (b); Box plot of the number of players within the game centre (GC) during each technical action (c); and Box plot of number of participatory events by each player within the GC (d).

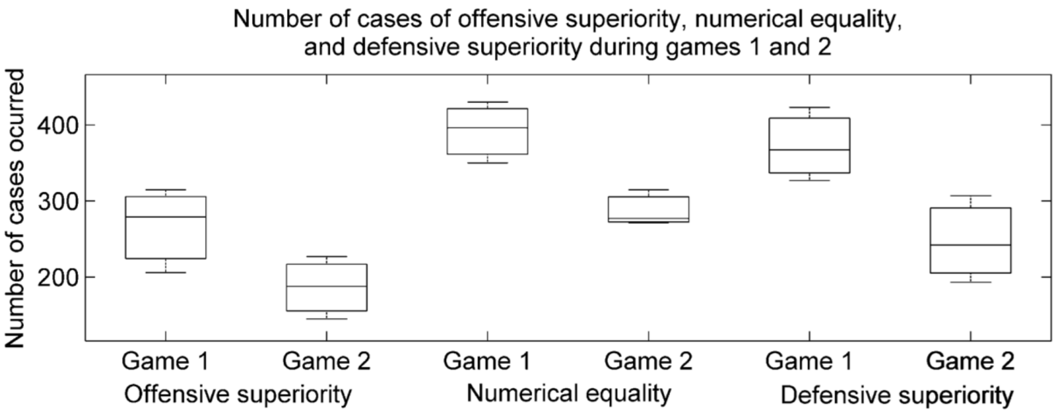

Figure 4. Box plot of the number of cases of offensive superiority, numerical equality, and defensive superiority during Games 1 and 2.

Game 1 promoted more situations of numerical equality and defensive superiority, with cases of equality occurring on 392 ± 40 occasions. In contrast, Game 2 presented only 288 ± 24 such situations. Moreover, 372 ± 48 moments of defensive superiority were found in Game 1 against 247 ± 57 in Game 2 (in both cases $p < .05$).

Table 2. Mean ± SD of each variable analysed in both games and their respective *p* value.

Variable	Game 1	Game 2	*p* value
Number of passes	487 ± 42	207 ± 20	< .001
Percentage of correct passes (%)	85 ± 2.3	79 ± 2.0	< .05
The α angle of each pass (°)	4.7 ± 11.8	33 ± 3.8	< .05
Number of shots	10 ± 0.6	49 ± 6	< .001
Percentage of correct shots (%)	59 ± 10.3	36 ± 1.5	< .05
Number of intervals that occurred between the all technical events	1029 ± 51	718 ± 24	< .001
Duration of intervals that occurred between the all technical events (s)	1.7 ± 0.08	2.5 ± 0.8	< .001
Number of players within the game centre (GC) during each technical action	2.86 ± 0.17	2.79 ± 0.12	= .60
Number of participatory events by each player within the GC	237 ± 25	161 ± 5	< .01
Cases of offensive superiority	267 ± 55	187 ± 41	= .11
Cases of numerical equality	392 ± 40	288 ± 24	< .05
Cases of defensive superiority	372 ± 48	247 ± 57	< .05

Discussion

The retention of ball possession and rapid progression to the target operating principles (Bayer, 1994) were emphasized in Games 1 and 2, respectively. About this, the data presented in this study demonstrate that the rules governed the CSSG protocol was efficient to emphasize the concepts adopted in this study.

Kinematic analysis by videogrammetry showed that the differences found in the two games were associated with the players' adopting different events to solve the problems posed by the distinct rules of the games. In Game 1, the players had action rules that guided them to maintain ball possession. The far greater number of passes and the much higher percentage of correct passes observed in Game 1 relative to Game 2 suggest that the players preferred to pass the ball more safely rather than risk losing possession with moves that might lead to faster goals scored by the opposing team.

The rules from Game 1 enabled greater utilisation of passes because players were encouraged to maintain possession of the ball. Thus, they only progressed to goal-scoring situations when they were able to create safer options for the plays. The rules for Game 1 induced athletes to circulate the ball among one another until they reached clear completion positions. Consequently, the passes that occurred in Game 1 happened in greater numbers and with greater ease.

Progression to the target was more evident in Game 2. An average of five more shots occurred during this type of game, suggesting wider pursuit by the opponents. Because the rules for Game 2 forced the players to constantly seek completion of a goal, the level of difficulty of the passes was higher. In this case, the passes should have reflected a preference to take the ball closer to the opposing danger zone, which, owing to opposition by the other team, led to reduced pass utilisation.

A greater number of shots (associated with low pass utilisation) reinforces the proposition that, when the rules favour rapid progression towards the opposing team's defensive zone, the result may be increased pressure from the opponent and a lower utilisation (Garganta & Gréhaigne, 1999; Leonardo *et al.*, 2009; Reverdito & Scaglia, 2007). It is important to note that off-target shots allow for counterattack situations, which in turn favour progression towards the target. The verticalness of the passes observed in Game 2 (Figure 2e) also demonstrates this increased degree of difficulty because the players had to take the ball closer to the opposing penalty area, which thus hinders the decision-making process.

The results presented in this study show that the changes in organisational rules from Game 1 to Game 2 facilitate characteristic behaviours from the players that interfere directly with their decision-making processes. Each situation required prior organisation from the teams to encourage certain behaviours, corroborating the predominance of one or another structural operating principle of the conceptual small-sided games studied.

From the methodology used in this study, it was possible to measure the time interval that occurred between one technical event and the next (Figure 3). This interval represents the time the players have to analyse the situation and to plan their responses. Thus, during these intervals, the athletes must make the decision that they consider the most appropriate; this decision-making process is performed not only by the ball carrier but also by all other participating players because the systemic organisational process of the collective game depends on the events and movements of all players (Freire & Venâncio, 2005; Scaglia, 2003).

The decisions made by each of the players in each of these moments, in turn, had a direct influence on the following interval by allowing the players to evaluate the results of earlier decisions and to make new decisions for solving the problems that arose within the games. Such a dynamic happens constantly and is present in all group games (Garganta & Gréhaigne, 1999; Grehaigne, Bouthier, & David, 1997; Gréhaigne, Wallian, & Godbout, 2005), especially in ball-based games played with the feet (Scaglia, 2003, 2011).

Our results corroborate data previously presented in the literature (Araujo, 2003; K. Davids, Araújo, Correia, & Vilar, 2013; Keith Davids, Araújo, Vilar, Renshaw, & Pinder, 2013; Vilar, Araújo, Davids, & Button, 2012). They also confirm that the decisions players make are related to the manifestation of the logic that each game requires to approach the goal (Scaglia & Reverdito, 2011), not only regarding the decision made but also regarding the time available to make a certain decision. We must also take into account the difficulty of this decision-making. The higher rate of errors made in Game 2 compared to Game 1 demonstrates that there was a smaller range of possible solutions to the requirements of Game 2. Thus, due to Game 2 it is possible to stimulate the ability to anticipate game situations, and consequently increase the successful decision-making rate (Williams, Ford, Eccles, & Ward, 2011).

The analysis of participation in the game centre (GC) also allows us to make inferences about the possibility of making decisions. The GC is conceptually understood as a circle with a 5 m radius around the ball's location (Costa, 2010; Costa, Garganta, Greco, & Mesquita, 2009a; Costa *et al.*, 2009b). Games with larger numbers of technical events allow for more opportunities for players to participate within the GC. The fact that the number of players within the GC was similar in both games shows that the different manifestations of the logic of the conceptual small-sided games studied are not related to the proximity of the opponents or teammates in the events that were analysed (Figure 3c). These manifestations seem to be associated with the demand for their own solutions to the problems imposed by the rules of the games (Bayer, 1994; Scaglia, Reverdito, Leonardo, & Lizana, 2013).

In this study, we conceptualised a structured defence as one that had numerical superiority over the opponent's attack because such an arrangement facilitates tactical events supporting defensive coverage (Costa, 2010; Costa *et al.*, 2009a, 2009b). It was similarly proposed that, when the ratio is of numerical equality, the defence is balanced. However, it is necessary to emphasise that, in these moments, the defensive organisation becomes more complex and vulnerable in relation to the attack. When numerical superiority is in the attackers' favour, the defence is understood to be unstructured because this critical situation allows the attacker to have a wider range of possible events of offensive tactics with which to set up shots. Our characterisation of the games showed that Game 1 presented more situations of numerical equality and defensive superiority and highlighted the occurrence of more structured and balanced defence situations. We can conclude that better defensive systems from the teams allowed fewer opportunities for the opponents to complete their shots, and because of that, the players of the team in possession were led to choose plays that offered a lower risk of losing possession (Travassos, Vilar, Araújo, & McGarry, 2014)Vilar, Araújo, & McGarry, 2014.

Conclusions

The data presented in this study confirm that it is possible to systematise training through the use of games. Rules imposed in conceptual small-sided games enable the training of technical and tactical components in order to emphasize the concepts adopted in this study. Offering new problem situations to players increase the number of times that they are challenged to make new decisions. Different rules also permit the quality of stimuli to be controlled through events of varying difficulty levels. It was possible to observe a relationship between the difficulty of the situation and the time needed to make a decision.

In summary, our data support the efficacy of CSSGs in creating different situations with different difficulties that facilitate the instruction of technical tactics situations that, coupled with adequate physical conditioning, can help produce players who are trained to think and behave more flexibly in a broader range of situations.

References

Abdel-Aziz, Y.I., & Karara, H.M. (1971). Direct linear transformation from comparator coordinates into object-space coordinates *Synposium Onclosee-Rane Photogrammetrry* (pp. 1-18). Urbana: ASP/UI.

Araujo, D. (2003). A auto-organização da acção tática. *Revista Portuguesa de Ciências do Desporto, 3*, 87-93.

Araujo, D. (2005). *O contexto da decisão: a acção tática no desporto*. Lisboa: Visão e Contexto.

Barros, R.M.L., Misuta, M.S., Menezes, R.P., Figueroa, P.J., Moura, F.A., Cunha, S.A., … Leite, N.J. (2007). Analysis of the distances covered by first division Brazilian soccer players obtained with an automatic tracking method. *Journal of Sports Science and Medicine, 6*, 233-242.

Bayer, C. (1994). *O ensino dos desportos colectivos*. Lisboa: Dinalivros.

Castagna, C., Manzi, V., Impellizzeri, F., Weston, M., & Barbero Alvarez, J.C. (2010). Relationship between endurance field tests and match performance in young soccer players. *Journal of Strength and Conditioning Research, 24*, 3227-3233. doi: 10.1519/JSC.0b013e3181e72709

Costa, I.T. (2010). *Comportamento tático no futebol: Contributo para a avaliação do desempenho de jogadores em situações de jogo reduzido.* (Doutorado em Ciências do Desporto Tese), Faculdade de Desporto, Universidade do Porto, Porto.

Costa, I.T., Garganta, J., Greco, P.J., & Mesquita, I. (2009a). Avaliação do desempenho tático no futebol: Concepção e desenvolvimento da grelha de observação do teste "GR3-3GR". *Revista Mineira de Educação Física, 17*, 65-84.

Costa, I.T., Garganta, J., Greco, P.J., & Mesquita, I. (2009b). Princípios táticos do jogo de futebol: Conceitos e aplicação. *Motriz, 15*, 657-668.

Coutts, A.J., Rampinini, E., Marcora, S.M., Castagna, C., & Impellizzeri, F.M. (2009). Heart rate and blood lactate correlates of perceived exertion during small-sided soccer games. *Journal of Science and Medicine in Sport, 12*, 79-84. doi: 10.1016/j.jsams.2007.08.005

Davids, K., Araújo, D., Correia, V., & Vilar, L. (2013). How small-sided and conditioned games enhance acquisition of movement and decision-making skills. *Exercise Sport Science Review, 41*, 154-161. doi: 10.1097/JES.0b013e318292f3ec

Davids, K., Araújo, D., Vilar, L., Renshaw, I., & Pinder, R. (2013). An ecological dynamics approach to skill acquisition: Implications for development of talent in sport. *Talent Development & Excellence, 5,* 21-34.

Figueroa, P.J., Leite, N.J., & Barros, R.M. (2003). A flexible software for tracking of markers used in human motion analysis. *Computer Methods and Programs in Biomedicine, 72*, 155-165.

Freire, J.B., & Venâncio, S. (2005). *O jogo dentro e fora da escola*: Autores Associados.

Garganta, J., & Gréhaigne, J.F. (1999). Abordagem sistêmica do jogo de futebol: moda ou necessidade? *Movimento, 5*(10).

Grehaigne, J.-F., Bouthier, D., & David, B. (1997). Dynamic-system analysis of opponent relationships in collective actions in soccer. *Journal of Sports Sciences, 15*, 137-149. doi: 10.1080/026404197367416

Gréhaigne, J.F., Wallian, N., & Godbout, P. (2005). Tactical-decision learning model and students' practices. *Physical Education and Sport Pedagogy, 10*, 255-269.

Halouani, J., Chtourou, H., Gabbett, T., Chaouachi, A., & Chamari, K. (2014). Small-Sided Games in Team Sports Training: A Brief Review. *The Journal of Strength & Conditioning Research*, *28*, 3594-3618

Helgerud, J., Engen, L.C., Wisloff, U., & Hoff, J. (2001). Aerobic endurance training improves soccer performance. *Medicine & Science in Sports & Exercise, 33*, 1925-1931.

Helgerud, J., Rodas, G., Kemi, O.J., & Hoff, J. (2011). Strength and endurance in elite football players. *International Journal of Sports Medicine, 32*, 677-682. doi: 10.1055/s-0031-1275742

Hill-Haas, S., Rowsell, G., Coutts, A., & Dawson, B. (2008). The reproducibility of physiological responses and performance profiles of youth soccer players in small-sided games. *International journal of sports physiology, 3*, 393-396.

Hill-Haas, S.V., Dawson, B., Impellizzeri, F.M., & Coutts, A.J. (2011). Physiology of small-sided games training in football: a systematic review. *Sports Medicine, 41*, 199-220. doi: 10.2165/11539740-000000000-00000

Leonardo, L., Reverdito, R.S., & Scaglia, A.J. (2009). O ensino dos esportes coletivos: metodologia pautada na família dos jogos. *Motriz, 15*, 236-246.

Mamassis, G., & Doganis, G. (2004). The Effects of a Mental Training Program on Juniors Pre-Competitive Anxiety, Self-Confidence, and Tennis Performance. *Journal of Applied Sport Psychology, 16*, 118-137. doi: 10.1080/10413200490437903

McMillan, K., Helgerud, J., Macdonald, R., & Hoff, J. (2005). Physiological adaptations to soccer specific endurance training in professional youth soccer players. *British Journal of Sports Medicine, 39*, 273-277. doi: 10.1136/bjsm.2004.012526

Misuta, M.S., Menezes R.P., Figueroa P.J., Cunha S.A. & Barros R.M.L. (2005). Representation and analysis of soccer players' trajectories. *XXth Congress of the International Society of Biomechanics, Cleveland, USA, 415*

Moura, F.A., Martins, L.E.B., Anido, R.O., Ruffino, P.R.C., Barros, R.M., & Cunha, S.A. (2013). A spectral analysis of team dynamics and tactics in Brazilian football. *Journal of Sports Sciences, ahead-of-print*, 1-10.

Raab, M., Masters, R.S., & Maxwell, J.P. (2005). Improving the 'how' and 'what' decisions of elite table tennis players. *Human Movement Sciences, 24*, 326-344. doi: 10.1016/j.humov.2005.06.004

Rampinini, E., Impellizzeri, F.M., Castagna, C., Abt, G., Chamari, K., Sassi, A., & Marcora, S.M. (2007). Factors influencing physiological responses to small-sided soccer games. *Journal of Sports Sciences, 25*, 659-666. doi: 10.1080/02640410600811858

Reverdito, R.S., & Scaglia, A.J. (2007). A gestão do processo organizacional do jogo: uma proposta metocológica para o ensino dos jogos coletivos. *Motriz, 13*, 51-63.

Scaglia, A., Reverdito, R.S., Leonardo, L., & Lizana, C.J.R. (2013). O ensino dos jogos esportivos coletivos: As competências essenciais e a lógica do jogo em meio ao processo organizacional sistêmico. *Movimento*, *19*, 227-249.

Scaglia, A.J. (2003). *O futebol e os jogos/brincadeiras de bola com os pés: todos semelhantes, todos diferentes*. (Doutorado em Educação Física Tese), FEF-UNICAMP, Campinas. Retrieved from http://www.bibliotecadigital.unicamp.br/document/?code=vtls000313822&fd=y

Scaglia, A.J. (2011). *O futebol e as brincadeiras de bola: a família dos jogos de bola com os pés*. São Paulo: Phorte.

Scaglia, A.J., & Reverdito, R.S. (2011). O futebol e os jogos/brincadeiras de bola com os pés: todos semelhantes, todos diferentes". *Revista Portuguesa de Ciências do Desporto*, *11*, 89-90.

Travassos, B., Vilar, L., Araújo, D., & McGarry, T. (2014). Tactical performance changes with equal vs unequal numbers of players in small-sided football games. *International Journal of Performance Analysis in Sport, 14*, 594-605.

Vilar, L., Araújo, D., Davids, K., & Button, C. (2012). The role of ecological dynamics in analysing performance in team sports. *Sports Medicine, 42*, 1-10. doi: 10.2165/11596520-000000000-00000

Williams, A.M., Ford, P.R., Eccles, D.W. & Ward, P. (2011) Perceptual-Cognitive Expertise in Sport and Its Acquisition: Implications for Applied Cognitive Psychology. *Applied Cognitive Psychology, 25*, 432-442.

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