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# Level of opposition constrains offensive performance in consecutive game situations. An analysis according to game principles

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## ABSTRACT

**Background:** In the last few decades, Nonlinear Pedagogy (NLP) has emerged with the goal to promote a holistic approach through the use of Small-Sided Games (SSG), to optimize specific tactical defensive and offensive behaviours of players. These SSG are designed through the manipulation of relevant task constraints. Specifically, the balance on the number of outfield players is a constraint that has been recently studied because it can change players' behaviour. However, most of the studies in this domain have only analysed the acute effects of the manipulation of different SSG without any idea about the implications for learning or to improve the transfer between practice tasks to the context of performance.

**Purpose:** The main purpose of this study was to understand the effect of the use of a task of numerical superiority in attack (5 vs 4; NS) before a task of equal number of player in comparison with the use of only two numerical equality (5 vs 5; NE) tasks. A second objective was to examine this effect according to the game principles: keep the ball possession and progress to the goal.

**Method:** Twenty footballers (U14 yrs), grouped in teams of five players, participated in this study. Each team performed two different sequences of SSG (NS + NE and NE + NE) and in two different conditions regarding the game principle. 2176 actions were analysed. Decision-making was measured through the GPET instrument. Also, it was assessed the duration of ball possession and the number of ball touches through a hand notation analysis system.

**Results:** Results show a tendency to decrease the offensive performance in the sequence (NS + NE). However, if we compare both initial situations, significant higher values were observed in the situation with NS. In addition, regarding the two final situations, there are hardly any differences between them.

**Conclusion:** This study highlighted some key pedagogical principles of the constraints-led approach for designing training environment in team games. Coaches in formative stages should promote unequal game situations with superiority number of players in attack, to facilitate the decision-making and develop the technical skills thanks to a greater participation and a greater duration of ball possession. As

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learning progresses, coaches should design equal situations to facilitate an adaptation to the real game and promote long-term adaptations on players' performance. Finally, the game principle is another constraint to take into account since it promotes variability and boosts the discovery and exploration of players' movement solutions.

## Introduction

In team sports, such as football, the manipulation of task constraints in Small-Sided Games (SSG) seems to be an effective approach to skill acquisition (Coutinho et al. 2018; Sgrò et al. 2018). SSG are modified games that optimize, firstly, the physical and physiological aspects and, secondly, the technical and tactical demands of sports instead of replicating the play of real match (Sarmiento et al. 2018). However, advantages of playing SSG are dependent on game design (Davids et al. 2013). In this sense, coaches have to manipulate the relevant constraints (e.g. level of opposition and task aim, referred as the tactical principles of game play) to develop the technical skills and tactical awareness and to highlight some informational constraints that promote adaptations in players' tactical behaviour to this specific demands (Gonçalves et al. 2016). For example, in a 3 vs 2, with the goal to improve depth in attack, a line could be drawn and players instructed that to pass to the next zone they need to receive a pass while running.

The manipulation of task constraints boosts the discovery and exploration of players' movement solutions (Hristovski et al. 2011). To promote such motor exploration for adaptability, Seifert, Button, and Davids (2013) suggest the creation of tasks with additional variability (e.g. combine two task constraints). In line with that, functional variability, as a principle emanating from an ecological dynamic (Chow 2013), encouraging the emergence of functional movement solutions within game situations (Schmidt and Lee 2019). Finally, these functional movements will be developed through the improvement of perceptual attunement (i.e. capability to identify and explore the better information for performance in each context of practice) and motor calibration (i.e. capability to adjust movement solutions to spatial-temporal conditions of game) to game environments (Seifert, Button, and Davids 2013; Pizarro et al. 2019). That is, the learner is implicitly challenged to pick up the information that supports their actions and develop their adaptability to the context of performance (Chow 2013)

Based on such ideas and within the framework of Non-Linear Pedagogy (NLP), and more specifically in football, one of the most studied task constraints, and one that has been shown to change tactical behaviour, is the level of opposition. Level of opposition can be understood as the level of difficulty presented by a task due to the numerical equality or inequality of the participating teams (Araújo and Davids 2009; Sampaio et al. 2014; Travassos et al. 2014). Several authors have proposed simple games, where continuity is favoured, should be included at the beginning of the teaching-learning process and that become more complex as the athlete reaches the proposed goals (Tan, Chow, and Davids 2012). Likewise, in another work, results showed improvements on the decision-making after an intervention programme based on SSG with numerical superiority in attack. However, after the intervention which was based on numerical equality, no significant improvements were observed for decision-making (Práxedes et al. 2018), although this programme was developed after another one. This result seems to indicate coaches must implement tasks with a lower level of complexity than experienced in competition.

Also, it was argued that the manipulation of task aim, specifically related with the accomplishment of the game principles to perform (Serra-Olivares et al. 2015) is paramount to help players to explore and develop tactical behaviour in learning programmes. These are refereed as to: (i) keep the ball possession, (ii) to progress towards the goal or (iii) to shoot at goal with the lowest level of opposition (Bayer 1992). For example, Pizarro et al. (2019) revealed that the task aim is crucial during the design of practice tasks due to its influence on the tactical behaviour of young football

players (Pizarro et al. 2019). In this study, in the pass action, results revealed significant differences after the intervention programme for decision-making in the first and second game principles (keep the ball possession, and to progress towards the goal, respectively). However, such differences were not found in the third game principle. Moreover, these results were different depending on the action (passing or dribbling). Thus, these results seem to indicate that different scenarios leading to the emergence of opportunities for action (Coutinho et al. 2018; Travassos et al. 2012) and adaptive behaviours (Gonçalves et al. 2016).

In recent years, many studies have shown how the manipulation of constraints in SSG can cause changes in individual and collective tactical behaviour in football (Ometto et al. 2018). However, most of the studies in this domain have only analysed the acute effects of the manipulation of different SSG without any idea about the implications of the sequence of practices for the learning process. Thus, the main purpose of this study was to understand the effect of the use of a task of numerical superiority in attack (5 vs 4) before a task of equal number of player in comparison with the use of only two numerical equality (5 vs 5) tasks. A second objective was to examine this effect according to the game principles: keep the ball possession and progress to the goal. For these purposes, the offensive performance was measured with the decision-making of pass and dribbling actions, the number of ball touches and the duration of ball possession.

## Material and methods

### Participants

The participants were 20 male football players from the Under-14 category from two Spanish clubs. In each club, 10 players from the same team were selected by their coaches to participate in this research. All had the same age (team 1,  $M = 13$ , 1 yrs and  $SD = 0.73$ ; team 2,  $M = 13.2$  yrs and  $SD = 0.42$ ), had the same experience (team 1,  $M = 7$  yrs and  $SD = 1.69$ ; team 2,  $M = 6.8$  yrs and  $SD = 1.68$ ), had the same level of expertise (i.e. average skill level). In this regard, these players had not been selected as the best of their category and play in the same competition (second division of the U-14 category). Both teams had the same amount of training. Players perform two training sessions (90 min) per week with an official 11-a-side match played during the weekend in a regular football field ( $104 \times 64$  m).

The research project was fully approved by the Ethics Research Committee of a Spanish University. The participants and their parents were informed of the study and an informed written consent was obtained from the parents/guardians. Participants were treated in agreement with the ethical guidelines of the American Psychological Association with respect to participant assent, parent/guardian consent, confidentiality and anonymity.

### Design

The study designed consisted of a repeated measure approach under four experimental conditions (i.e. four sequences of two SSG considering the Game Principle (GP) and the level of opposition; see

**Table 1.** Sequences of the study design.

Experimental condition	Game principle	Initial Game Situation	Final Game Situation	Sequence
1	1st principle	NS	NE	5 vs 4 + 5 vs 5
2	2° principle	NS	NE	5 vs 4 + 5 vs 5
3	1st principle	NE	NE	5 vs 5 + 5 vs 5
4	2° principle	NE	NE	5 vs 5 + 5 vs 5

Note: NS: numerical superiority in attack; NE: numerical equality; 1st principle: to keep the ball possession; 2° principle: to progress towards the opposite goal.

**Table 1**). In this regard, the first SSG was identified as the initial game situation (GS) and the second as the final GS.

From the NLP perspective, the use of SSG seems to be an effective teaching-learning approach to skill acquisition. These SSG are designed through the manipulation of task constraints because they change the way players explore and act on the game context. In this research, the level of opposition and the game principles are the task constraints that were manipulated. The level of opposition is understood as the level of difficulty that the task presents due to the numerical equality or inequality of the participating teams (Sampaio et al. 2014). In this regard, two game situations were considered (numerical superiority in attack, 5 vs 4; and numerical equality, 5 vs 5). The game principles were related to the collective tactical principles of play (Bayer 1992; Mitchell, Oslin, and Griffin 2006). In this research they were only considered the first and second offensive game principles: (i) to keep the ball possession without the objective of progression towards the goal; and (ii) to progress towards the goal beating a defence line and to be near from the opposite goal.

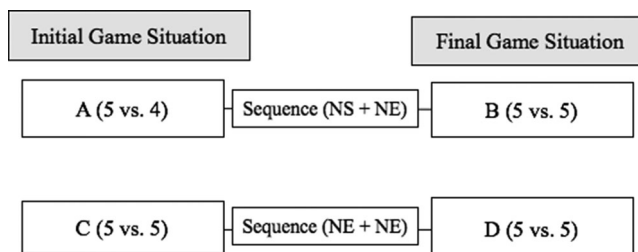
### Procedure

The design was conducted in four testing sessions, in non-consecutive days, for four weeks. Each testing day consisted of one of the four experimental conditions (a sequence of two GS) randomly selected. **Figure 1** show both sequences with their initial and final situations, for each principle.

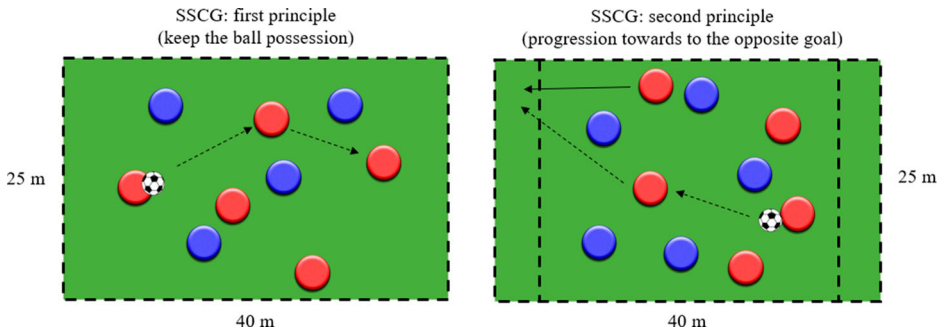
Players of each club were divided into two teams of 5 players, constituted in a homogeneous way by the head coach according to his perception of their physical, technical and tactical skills (Sampaio et al. 2014), and then divided into two balanced teams.

All the games were played in the afternoon, during the same hours of the day (between 6 pm and 7 pm), and under warm temperatures (18–24°C). The size of the field was 40 × 25 m (length × width). Each sequence lasted for a total of 16-min, based on two game situations of 7-min with a recovery time of 2-min between them to avoid fatigue. Games were developed after a 3-min standardized warm-up (general mobility and stretching exercises), as in the study by Serra-Olivares et al. (2015). Time procedures and pitch sized employed in previous research concerning SSG in soccer were also considered (Almeida, Ferreira, and Volossovitch 2012; Serra-Olivares et al. 2015). Several balls were placed around the field to allow its replacement as fast as possible, with the aim of decreasing the time lost during the games. Game situations were explained and participants were asked to play at their best level in order to succeed in SSG. No coach feedback or encouragement was allowed during the conditions. All the official rules of football were implemented apart from the offside rule.

In **Figure 2**, it can be seen the two SSG developed according to the game principle. The SSG first principle was focused on the tactical problem to keep the ball possession. The main objective is to score as many points as possible. One point is scored when the team with the ball execute successfully five consecutive passes between teammates (i.e. without losing the ball) (see **Figure 2**, left side). The SSG second principle was focused on the tactical problem to progress towards the opposite



**Figure 1.** Sequences with the Game Situations (initial and final). A: 5 vs 4 of the sequence NS + NE; B: 5 vs 5 of the sequence NS + NE; C: 5 vs 5 initial of sequence NE + NE; D: 5 vs 5 final of the sequence NE + NE.



**Figure 2.** SSCG based on the first principle (left panel) and SSCG based on the principle second (right panel) with numerical equality.

goal, specifically, to penetrate the defence. The main objective is to score as many points as possible. One point is scored when an offensive player receives the ball from a teammate behind the opposing team's goal (an imaginary line of 5 m). To achieve it, dribbling was not permitted. Each team defends its own goal and attacks the opposing team's goal (see Figure 2, right side).

Finally, it is important to point out that in unequal situations, the defence team had to play with one less player. In each offensive sequence, the player was different and he was outside (in the game with the objective to progress, he was in the own goal line). Furthermore, when the own team recover the ball, the sequence started from this player.

### Data collection

All the game situations were recorded using a Sony HDRXR155 video camera, recording angle conversion lens ( $\times 0.75$ ): VCL-HGA07B and a Hama Gamma tripod Series. The camera was always placed in the background of the playing field, at a height of 4 m, guaranteeing an optimal view of all the game actions performed by the participants. Videos were transferred to a computer (SONY VAIO laptop) via USB and viewed in Windows Media Player. Afterwards, data were recorded on a Microsoft Office Excel 2007 sheet and exported to the SPSS Statistics, version 24.0 (Chicago, IL). Offensive performance was analysed through indirect and external systematic observation, a methodology that had been used in previous studies to measure players' decision-making in real game situations, which represents the influence of the environment on decision-making (Travassos et al. 2013). The observation was developed by two external researchers.

The decision-making of pass and dribbling actions, the number of ball touches and the duration of ball possession were analysed. *Decision-making*. It is defined as the process whereby learners select one type of game action from a series of alternatives to execute it at a specific moment and in a real game situation (Bar-Eli, Plessner, and Raab 2011). The Game Performance Assessment Instrument (GPAI; Oslin, Mitchell, and Griffin 1998), adapted by García-López et al. (2013), was used to assess the decision-making of the pass and dribbling actions. This instrument permitted evaluating the player's tactical problem-solving skills, by means of selecting an appropriate technique, and evaluating the measure in real game situations, as it has had in previous studies (Práxedes et al. 2019; Serra et al. 2015; Sevil et al. 2017). Through this instrument, decision-making was coded as 1, if successful (e.g. for passing action, passing to a teammate who is unmarked; for dribbling action, the player advances by positioning his body between the opponent and the ball in order to protect the ball) or 0 if unsuccessful (e.g. for passing action, passing to a player who is marked closely or there is a defensive player in a position to cut off the pass; for dribbling action, dribbling when there is an unmarked team-mate in a better position). All the pass and dribbling actions of each player in the team were analysed. A total of 1531 passes (first principle,  $n = 886$ ; second principle = 645) and 645 dribblings (first principle,  $n = 235$ ; second principle = 223).

### **Number of ball touches**

It was defined as the number of touches of one or more players do in each sequence (defined according to criteria of beginning and end of ball possession). This measure was observed through the hand notation analysis systems.

### **Duration of ball possession**

It was defined as the time a team keep the ball possession in each sequence. This measure was observed through the hand notation analysis systems.

### **Reliability**

With respect to the inter-observer reliability, two research observers were trained to analyse decision-making and the execution of pass action. These observers were trained by an expert in football (Level 2 by the Spanish Football Federation), who has 4 years of experience in observational methodology (researcher with experience in research projects).

As a preliminary step, the expert met with the observers to clarify possible doubts about the observation instrument and the coding criteria of each dependent variable (decision-making for the pass and dribbling action, number of touch and duration of ball possession). Subsequently, the observations of decision-making were carried out, and 180 passes and 65 dribbling were analysed, a sample of more than 10% of the total (Tabachnick and Fidell 2007). Inter-observer reliability was calculated using the following formula:  $\text{agreements}/(\text{agreements} + \text{disagreements}) \times 100$  measure. Once this value was calculated, the Cohen kappa index was used. All training values were observed to be above .90, surpassing the value .81 from which an adequate agreement is considered (Fleiss, Levi, and Cho Paik 2003), thus achieving the necessary reliability for the subsequent coding of the dependent variables.

To guarantee the time reliability of the measurement, the same sample of matches was analysed with a time difference of 10 days, obtaining intra-observer reliability results of .92. These results reflected very good concordance, thus obtaining the necessary reliability for the subsequent coding of the dependent variable.

### **Statistical analysis**

The statistical program SPSS v21.0 (Chicago, IL) was used for the data analysis and processing. The asymmetry measures, kurtosis, Shapiro–Wilk (for samples of 30 or less) with Lilliefors correction, verified that the sample distribution did not follow a normal distribution ( $p < .005$ ), establishing the need to use non-parametric statistics. Finally, in order to verify the existing differences between the different measures (decision-making, number of ball touches and duration of ball possession), an inferential analysis was performed using the Wilcoxon test for repeated measured.

## **Results**

*Decision-making:* with respect to the comparison between two initial GS (A and C, see Figure 1), significantly higher values of the decision-making variable were obtained in the GS A (NS, 5 vs. 4) in comparison to the GS C (NE, 5 vs 5). These differences were found in both actions but only in the GS that promoted the first GP (to maintain the ball possession). Regarding both sequences, significant higher values at the GS D (NE final, 5 vs 5) in comparison to the GS C (NE initial, 5 vs 5), in the pass action and in the GP were observed. On the contrary, within the sequence GS A + GS B (5 vs 4 + 5 vs 5), no significant differences were observed. Finally, there were not found any differences between two final GS (GS B: NE final, 5 vs 5; & GS D: NE final, 5 vs 5) (see Table 2).

**Table 2.** Descriptive statistics and pairwise comparison in analyses of *decision-making* between the different situations, regarding the two tactical principles.

Act	GP	Level of Opposition (I)			Level of Opposition (J)			Mann-Whitney U	Z	p
		GS	M	SD	GS	M	SD			
Pass	1st	A	.972	.514	B	.979	.451	189.50	-.388	.698
		C	.894	.102	D	.952	.676	129.50	-2.019	<b>.043</b>
		A	.972	.514	C	.894	.102	99.50	-2.941	<b>.003</b>
		B	.979	.451	D	.952	.676	162.50	-1.289	.197
		A	.945	.798	B	.894	.121	150.50	-1.433	.152
		C	.884	.167	D	.886	.105	179.50	-.582	.561
	2nd	A	.945	.798	C	.884	.167	171.00	-.872	.383
		B	.894	.121	D	.886	.121	186.00	-.389	.697
		A	.845	.364	B	.769	.328	138.00	-1.931	.053
		C	.570	.436	D	.737	.364	154.50	-1.324	.186
		A	.845	.364	C	.570	.436	123.50	-2.354	<b>.019</b>
		B	.769	.328	D	.737	.364	190.00	-.293	.770
Dribbling	1st	A	.751	.356	B	.530	.400	136.00	-1.798	.072
		C	.603	.442	D	.617	.475	191.00	-.265	.791
		A	.751	.356	C	.603	.442	169.00	-.894	.371
	2nd	B	.530	.400	D	.617	.475	172.50	-.786	.432

Note. Act: action; GM: game principle; GS: game situation; A: NS of the sequence 5 vs.4 + 5 vs 5; B: NE of the sequence 5 vs 4 + 5 vs 5; C: NE initial of sequence 5 vs 5 + 5 vs 5; D: NE final of the sequence 5 vs 5 + 5 vs 5; M: mean; SD: standard deviation.

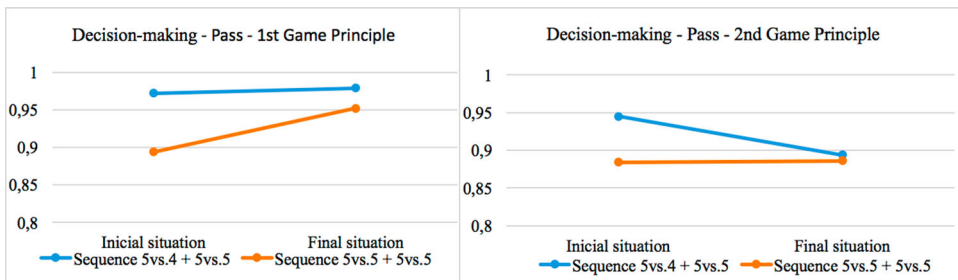
In addition, **Figures 3 and 4** show the results of the decision-making according to each action and each GP, to favour a better understanding. These show the initial and final values of each sequence.

*Number of ball touches:* with respect to the comparison between two initial GS (A and C), significantly higher values were obtained in the GS A (NS; 5 vs 4) in comparison to the GS C (NE, 5 vs 5), in both GP (maintenance of ball possession; and progression towards the goal). Regarding both sequences, higher values at the GS A (NS initial; 5 vs 4) in comparison to GS B (NE final; 5 vs 5), in both GP were observed. On the contrary, within the sequence NE + NE, no significant differences were observed. Finally, in the comparisons of the two final situations (B and D), significantly higher values were obtained in the GS B (NE of the sequence NS + NE) in comparison to the GS D (final NE of the sequence NE + NE). These differences were found in the second GP (to progress towards the goal) (see **Table 3**).

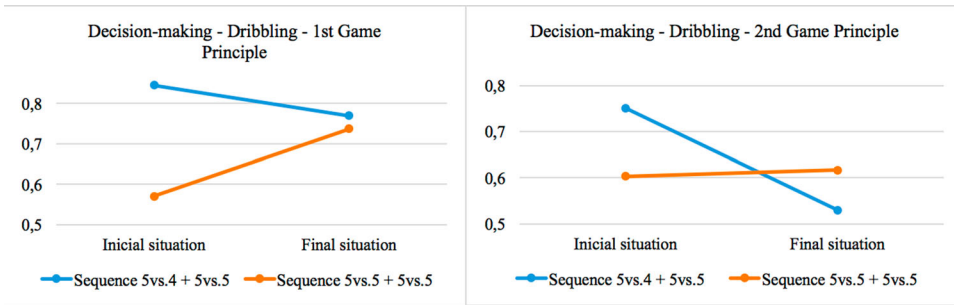
In addition, **Figure 5** shows the results of the number of ball touches according to each principle, to favour a better understanding. These show the initial and final values of each sequence.

*Duration of ball possession:* in **Table 4** it can be seen that the results are identical than the variable ‘number of ball touches’.

In addition, **Figure 6** shows the results of the duration of ball possession according to each principle, to favour a better understanding. These show the initial and final values of each sequence.



**Figure 3.** Decision-making of the pass action of the two sequences in the first principle (left panel) and in the second principle (right panel).

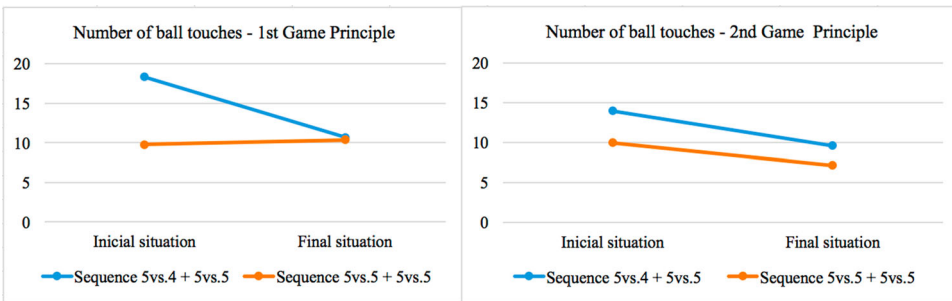


**Figure 4.** Decision-making of the dribbling action of the two sequences in the first principle (left panel) and in the second principle (right panel).

**Table 3.** Descriptive statistics and pairwise comparison in analyses of *number of ball touches* behaviours between the different situations, regarding the two tactical principles.

GP	Level of opposition (I)			Level of opposition (J)			Mann-Whitney U	Z	p
	GS	M	SD	GS	M	SD			
1st	A	18.35	16.294	B	10.69	6.179	537.50	-2.077	<b>.038</b>
	C	9.76	7.141	D	10.37	8.459	1493.00	-.426	.670
	A	18.35	16.294	C	9.76	7.141	567.50	-2.860	<b>.004</b>
2 <sup>nd</sup>	B	10.69	6.179	D	10.37	6.179	1169.50	-.851	.395
	A	13.98	7.363	B	9.59	5.586	690.50	-3.087	<b>.002</b>
	C	9.94	6.914	D	7.12	4.134	1151.50	-1.630	.103
	A	13.98	7.363	C	9.94	6.914	674.50	-2.719	<b>.007</b>
	B	9.59	5.586	D	7.12	4.134	1105.50	-2.523	<b>.012</b>

Notes: GM: game principle; GS: game situation; A: NS of the sequence 5 vs 4 + 5 vs 5; B: NE of the sequence 5 vs 4 + 5 vs 5; C: NE initial of sequence 5 vs 5 + 5 vs 5; D: NE final of the sequence 5 vs 5 + 5 vs 5; M: mean; SD: standard deviation.



**Figure 5.** Number of ball touches of the two sequences in the first principle (left panel) and in the second principle (right panel).

## Discussion

The main purpose of this study was to understand the effect of the use of a task of numerical superiority in attack (5 vs 4) before a task of equal number of player in comparison with the use of only two numerical equality (5 vs 5) tasks. A second objective was to examine this effect according to the game principles: keep the ball possession and progress to the goal. For this purpose, the offensive performance was measured with the decision-making of passing and dribbling actions, the number of ball touches and the duration of ball possession. In general, results show a tendency to decrease the offensive performance in the sequence (NS + NE), while in the sequence (NE + NE) results show

**Table 4.** Descriptive statistics and pairwise comparison in analyses of *duration of ball possession* behaviours between the different situations, regarding the two tactical principles.

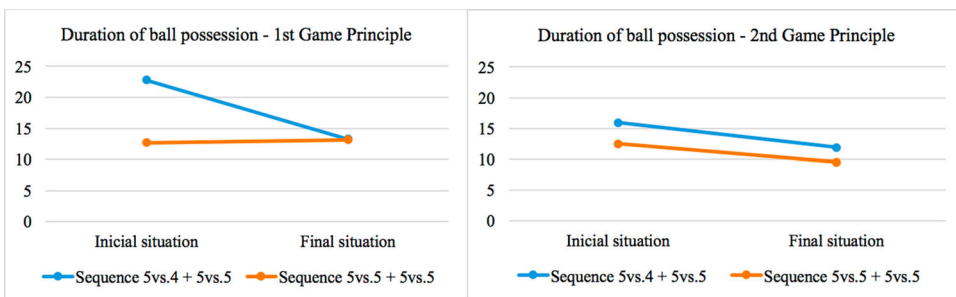
GP	Level of opposition (I)			Level of opposition (J)			Mann-Whitney U	Z	p
	GS	M	SD	GS	M	SD			
1st	A	22.81	19.773	B	13.25	7.236	513.50	-2.319	<b>.020</b>
	C	12.66	8.256	D	13.13	9.994	1557.50	-.050	.960
	A	22.81	19.773	C	12.66	8.256	580.00	-2.751	<b>.006</b>
	B	13.25	7.236	D	13.13	9.994	1187.00	-.732	.464
2nd	A	15.95	8.021	B	11.90	6.139	749.50	-2.638	<b>.008</b>
	C	12.47	7.871	D	9.50	4.942	1160.50	-1.569	.117
	A	15.95	8.021	C	12.47	7.871	719.50	-2.354	<b>.019</b>
	B	11.90	6.139	D	9.50	4.942	1161.00	-2.188	<b>.029</b>

Note: GM: game principle; GS: game situation; A: NS of the sequence 5 vs 4 + 5 vs 5; B: NE of the sequence 5 vs 4 + 5 vs 5; C: NE initial of sequence 5 vs 5 + 5 vs 5; D: NE final of the sequence 5 vs 5 + 5 vs 5; M: mean; SD: standard deviation.

a tendency to increase. Thus, regarding both initial situations, significant higher values were observed in the situation with NS but if we compare final situations there are hardly differences between them. Finally, and regarding the game principles, the differences between the two initial situations in all the variables studied are higher in favour of the first principle (maintain the ball possession).

As it has been point out before, in the comparison of two initial situations, results show significant differences between the two initial game situations (5 vs 4 and 5 vs 5). Specifically, significantly higher values were found in NS in comparison to the NE. These differences have been obtained in all variables studied. However, the decision-making occurs only in the first principle (maintain the ball possession).

These findings indicate that the decision-making is better in situations with a lower level of opposition (numerical superiority in attack). In this regard, previous studies demonstrated when the level of opposition was lower, the distance between the defenders decreases and the defender-attacker distance increases and (Sampaio et al. 2014; Travassos et al. 2014). As result, the trajectory of the ball was greater, and it may have allowed the player in possession of the ball to have more time to make decisions (Práxedes et al. 2016a). However, with respect to the second principle (progression towards the opposite goal), in the decision-making, there are not differences between both game situations. This may be due to the fact that the defensive team tends to retreat on field, dropping deeper towards their own goal (Vilar et al. 2014). In this regard, Travassos et al. (2012) observed that training tasks with numerical disadvantage promote a retreatment of defenders in the field in order to prioritize protecting the goal against ball displacements more so than against movements of the attackers. Consequently, the defenders improve the spatial-temporal balance with the attackers even in numerical inferiority (Corrêa et al. 2012). Thus, this spatial variation on field led an increase in the attacking team’s affordances to perform safe passes, in both situations



**Figure 6.** Duration of ball possession of the two sequences in the first principle (left panel) and in the second principle (right panel).

(NS and NE), no obtaining significant differences as occurs in the first principle. On the other hand, and regarding the participation of the football player in the game, these findings seem to indicate that the NS favours the duration of the ball possession and the number of ball touches in comparison with NE. The main aspect to be considered in order to justify these results is the greater interpersonal distances between defenders and to attackers that increase the time and space to manage and pass the ball (Vilar et al. 2014), and therefore the participation in the game (Koklu et al. 2011).

The key point of the NLP approach is the facilitation of adaptive and functional behaviours to performance environment through acting and perceiving (Renshaw et al. 2010). In this regard, reducing the number of players per team could be a good strategy to develop the performance of players. In a previous study, Práxedes et al. (2016b) confirmed that in situations of numerical superiority there is more continuity in the game and therefore a greater participation with respect to the number of touches in the ball and a more continuous exploration of possibilities for action. In this line, the greater participation of the players in the game, facilitated by a greater continuity in ball possession, could promote a greater development of the calibration of technical actions at the initial stages of players' development. Thus, coaches, through the process of task simplification (e.g. reducing the number of defenders), can reduce reliance on the traditional method of task decomposition, to manage the complexity level of the task while keeping the critical temporal-spatial relationships available in SSG (Renshaw et al. 2010). Therefore, these results seem to indicate that to improve the technical abilities, the numerical superiority is a better option than the numerical equality. But, are transferred these abilities to the situations with the same number of players per team, as occur in the competition?

Regarding the comparison of both sequences (NS + NE and NE + NE), it was found different results according to each variable. However, it seems that they follow the same idea. The analysis of decision-making results revealed significant differences in the sequence NE + NE, with higher values in pass action in the final situation (tendency to increase). It means that players have enough technical and tactical capabilities to discover new and more adjusted possibilities for action and consequently to improve their performance according to the requirements of the task used (Renshaw et al. 2010). In the sequence NS + NE the opposite was observed (tendency to decrease). Maybe due to the easy performance environments of NS that the players explored before, they cannot transfer such behaviour to the actual context of NE. It means that the process of learning and sequence between practice tasks is not a linear process as advocated by NLP approach (Chow 2013; Tan, Chow, and Davids 2012). Also, it means that the process of progression is not immediate and there is a need that further studies analysed such sequences in a long time period. The process of learning and transfer between tasks in youth players seems to be a long-term process of exploration (Canton et al. 2019) and thus requires additional time of practice and analysis for further understanding. Really, the results of NE after NS were higher for almost all of the variables in comparison with the sequence NE after NE. It means that despite the decrease on the performance of players that participated in the NE after NS, their results were better than the players that played only in NE. It means that, in line with previous research, the transfer of performance from NS to NE was a perception-action issue. These constraints are promoting changes in the breadth of attention and in tactical behaviour of players (Memmert and Roth 2007). In line with that, functional variability, as a principle emanating from an ecological dynamic (Chow 2013), encouraging the emergence of functional movement solutions within game situations (Schmidt and Lee 2019) through the improvement of perceptual attunement and motor calibration to game environments (Seifert, Button, and Davids 2013; Pizarro et al. 2019). In line with that, NPL advocates the use of open contexts characterized by the presence of variability and uncertainty but in which the manipulations guide players to become more proficient at perceiving environment cues and constant changes in game situations (Santos et al. 2016). This is an important way to facilitate the emergence of novel and functional solutions through adaptive movement patterns.

Summarizing, different scenarios leading to the development of different capabilities through the emergence of different adaptive actions (Gonçalves et al. 2016). These findings provide useful

insights for coaches when designing learning tasks. In this sense, the use of more ecological training situations allows players to attune relevant sources of information based on information-movement coupling. Specifically, Torrents et al. (2016) revealed that the use of numerical unbalance game contexts when compared to balance ones, allow players to explore more individual and collective tactical/technical actions that support their success. Moreover, this dynamical change develops exploratory behaviour that encourage players to discover new action possibilities (Santos et al. 2016).

Finally, the study results should be treated with some caution due to the utilization of a small sample and only one age category, which limits the capacity to extrapolate the results. Thus, in futures studies, we recommend to include groups of different age categories. Moreover, due to the nature of the adaptations on attunement and calibration process, the results cannot be transferred to other practice, what makes as recommend the development of this study in other sports. Finally, it would be interesting to add a third situation to know the evolution in each sequence, which would provide more power to detect significant differences.

## Conclusions and practical implications

This study highlighted some key pedagogical principles of the constraints-led approach for designing training environment in team games. Mainly, the manipulation of the level of opposition (i.e. relative number of players in SSG) seems to be an effective strategy to facilitate skill acquisition in football. Coaches in formative stages should promote, instead numerical equality situations, tasks with superiority number of players in attack to develop the technical skills thanks to a greater participation and a greater duration of ball possession. As learning progresses, coaches should design equality situations to developed tactical skills such as decision-making, to facilitate an adaptation to the real game and promote long-term adaptations on players' performance. On the contrary, continuing with these easiest situations (numerical superiority in attack) could interrupt this adaptation. Finally, the game principle is another constraint to take into account since it promotes variability and boosts the discovery and exploration of players' movement solutions.

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