PERFORMANCE ANALYSIS OF U19 MALE AND FEMALE SETTERS IN THE BRAZILIAN VOLLEYBALL CHAMPION TEAMS

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Abstract:

The present study aims to analyse the associations between setting variables and gender (male and female). The study sample consisted of 711 setting actions made by the setters/starters of the champion teams from the Brazilian states of Minas Gerais (MG) and São Paulo (SP); 313 setting actions were observed for the male category and 398 for the female category. Statistical analysis showed that there were gender differences in the following variables: *conditions of the setting*, *number of attackers available for the attack*, *set tempo*, *conditions after setting* and the *set's area*. This information is likely to be relevant for the training process of setting, for both males and females.

Key words: *performance, genders, volleyball, setting, training stages*

Introduction

In volleyball, game actions are divided into two groups of finalists and intermediates. Finalist actions are those through which a point can usually be obtained, including serve, attack, and block (Gil, Claver, Fernández-Echeverría, Moreno, A., & Moreno, 2016). Oppositely, intermediate actions are those through which it is not usual to obtain a direct point. This group of actions consists of reception, setting, defence and dig (Mesquita, Manso, & Palao, 2007). Most research has focused on finalist actions because of their relation to obtaining points (Costa, et al., 2017; García-de-Alcaraz, Ortega, & Palao, 2016). Non-finalist actions serve to link actions, thus giving them an influence over finalist actions, and are fundamental in volleyball as a cyclical and sequential sport (Ugrinowitsch, et al., 2014). There is thus a need to conduct research focused on intermediate actions as well (Fernández-Echeverría, Mesquita, González-Silva, Claver, & Moreno, 2017).

The present study will focus on setting due to its relevance in volleyball. Setting is fundamental to the organization of an attack (Silva, Lacerda, & João, 2013), and for determining attack efficacy (Bergeles, Barzouka, & Nikolaidou, 2009).

Ultimately, this means that setting may have an important influence on a team's overall performance (Buscá & Febrer, 2012). By setting, the setter attempts to provide the teammate attacker with the best position to carry out an attack, in other words, to place him/her in front of the fewest number of blockers (Palao & Martínez, 2013).

The setter is a specialized player who plays an essential role in the team, often referred to by volleyball specialists as the brain of the team (Matías & Greco, 2010). This is because the setter is responsible for setting up the team's attacks and counterattacks (Silva, et al., 2013; Zetou, Moustakidis, Tsigillis, & Komnonakidou 2007); he/she also assumes responsibility for the tactical development of the game when having to make a large number of decisions when attacking (Gil, Moreno, Moreno, García-González, & del Villar, 2011). Psychologically, the setter must be a person with leadership skills and an initiator of team spirit (Mesquita & Graça, 2002). From a technical point of view, the setter's ability determines speed and diversity of the team's attack (Mesquita & Graça, 2002), and chances of making the most of bad receptions (Matias & Greco, 2013; Papadimitriou, Pashali, Sermaki, Mellas, & Papas, 2004). Tactically, the

setter has to set the ball taking into account different defensive formations of the opponent (Matias & Greco, 2010) to create attack situations that unbalance the blockers (Afonso, Mesquita, Marcelino, & Silva, 2010).

Out of different volleyball game actions, setting is the first function in play for which specialization occurs on the path of player development (Maia & Mesquita, 2006; Moutinho, Marques, & Maia, 2003), and it is typically recommended that it should start at the age between 14 and 16 years (Milistetd, Mesquita, do Nascimiento, & Sobrinho, 2009). Although specialization begins at the same time for boys and girls, certain gender differences can be observed in setting performance. These differences may be due to differences between genders in terms of anatomy, but also due to the structure of the game, the techniques and tactics used, and the effectiveness of the actions (Costa, Afonso, Brant & Mesquita, 2012) for the different gender categories.

Despite the importance of setting, few investigations have focused on it. Some, such as Silva, Lacerda, and João (2014), have studied the form of the setter and the actions if this player that determine victory. Other studies have focused on understanding how preceding actions affect setting (Afonso, Esteves, Araújo, Thomas, & Mesquita, 2012; González-Silva, Moreno, A., Fernández-Echeverría, Claver, & Moreno, 2019), or how the characteristics of this action influence phases of the game (Palao & Ahrabi-Fard, 2014). Of these investigations, most were conducted at the elite level, with a minority studying training categories (González-Silva, Moreno, Fernández-Echeverría, Claver, & Moreno, 2016).

On the other hand, gender is an underlying variable in the analysis of sports performance, because it generates certain performance differences. Specifically, in volleyball, these differences are manifested in the anthropometric (Mihalik, et al., 2008) and psychological characteristics of female and male players (Malousaris, et al., 2008), as well as in the structure of the game, the technique and tactics used, and the efficacy of the actions (Costa, et al., 2012).

Given the importance of the setter's performance in volleyball and the fact that most previous studies have focused on elite volleyball rather than young players in various training stages, it is important to conduct studies in this area. In addition, it is appropriate to consider the gender in the study, due to the existing differences depending on this variable. Therefore, the present study aims to analyse the associations between setting variables and gender (male and female) in volleyball of U-19 category.

Methods

Sample

The study sample consisted of 711 setting actions, of which 313 were from the male category and 398 from the female category, carried out by the setters/starters of the champion teams from the states of Minas Gerais (MG) and São Paulo (SP) in Brazil. Therefore, the sample comprised four setters, two male and two female.

Observations were made from two matches from the male category, and two matches from the female category. For each category, one game was observed from the end of each of the MG and SP state championships.

This study takes into account the standards established by the National Health Council of Brazil for studies using human participants and was approved by the Ethics Committee for Studies of the Federal University of Minas Gerais (UFMG), see nº ETIC 165/08. The participants agreed to participate voluntarily in our study and accepted the absence of any financial reimbursement. Acknowledgement of the right to withdraw from participation without implication was also collected, and we guaranteed that participants would remain anonymous. The objective of the study was explained to and understood by the participants. Finally, the respective results were presented to each of the participants. Participants recorded their agreement to participate by signing a Terms of Free and Clarified Consent form.

Variables

The variables considered in the study are presented below:

Setting conditions: understood as the zone and delivery characteristics of the ball for the performance of the set. The categories were: *excellent*, the ball reaches the attack zone and allows for a jump set with all the attack options; *acceptable*, the ball reaches the attack zone but only allows for a standing set with just several attack options; *not acceptable*, the ball reaches the attack or defence zone and limits the number of attack combinations available (Afonso, et al., 2012).

Number of attackers available for the attack: defined as the number of attackers available to perform the attack at the time of setting. The categories were: *one*, only one player is available to perform the attack; *two*, two players are available to perform the attack; *three*, three players are available to perform the attack; *four*, four players are available to perform the attack (Matias & Greco 2011a; 2011b).

Tempo of set: "defined as the interaction between the moment when the setter made contact with the ball and the start of the attackers' approach"

(Castro & Mesquita, 2010: 199). An adaptation of the criteria Afonso et al. (2010) and Papadimitriou et al. (2004), used also in the study by González-Silva, Fernández-Echeverría, Conejero, and Moreno (2020), establishes three tempos considering the position of the attacker once the ball gets to the setter: *first tempo*, the attacker is in the air; *second tempo,* the attacker is making the penultimate stride of the approach; *third tempo,* the attacker has not started the attack approach, and *setter attack,* the setter makes the attack on the second contact.

Conditions after setting: defined as the quantitative attacker to blocker/s ratio as a result of the setting. The categories were: *perfect*, setting results in an attacker-blocker ratio of 1:0, that is, no block has been formed; *good*, setting results in an attacker-blocker ratio of 1:1, that is, a single opponent jumps to block; *bad*, setting results in an attacker-blocker ratio of 1:2 or 1:3, that is, two or three opponents jump to the block (adapted from Moreno, Moreno, Ureña, Iglesias, & Del Villar, 2008).

Setting outcome: understood as the result of the final attack process, that is, the outcome of the attack made by the player to whom the setting was sent. The categories were: *good*, the attack limits opposing team's combinations of offensive plays or a first tempo in the construction of a counterattack; *bad*, the attack does not hinder the opposing team's construction of a counterattack and provides them with attack options; *point*, the team scores a point by a direct attack or by the opposing team's inability to defend (Coleman, 1975).

Setting's area, understood as the zone of the court from where the attacker performs the attack (Figure 1). The criteria used by Papadimitriou et al. (2004) were the following: *zone 1, 2, 3, 4, and 6.*

Player to whom the setting was sent: understood as the function of the player function who carries out the attack. Similarly to those used by other investigations (Maia & Mesquita, 2006; Stankoviae, Ruiz-Llamanas, Periae, & Quiroga, 2018), the categories were: *receiver,* the attack is made by the receiving player; *middle blocker*, the attack is made by the middle blocker; *opposite*, the attack is performed by the opposite hitter; *setter*, the attack is made by the setter.

Gender, differentiates two genders, *male* and *female*.
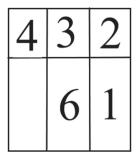

Figure 1. Setting's areas.

Procedure and data gathering

The matches, which were the finals of the championships, were recorded to MiniDVD format (with the camera fixed behind the game area, specifically behind the defence zone, which allowed for recording of the entire court). Later these recordings were transformed to MPG format by connecting the video recorder (Canon ZR-300) to the computer by means of the firewire connection. A database for game analysis was created using the Simi Scout behaviour analysis software (Matias, Costa, Lima, Greco, & Greco, 2005) after video capture and the inclusion of the analysis variables.

Reliability

One observer was trained to carry out the observation, to guarantee the reliability of it. Different training sessions surpass 10% of the sample (Losada & Manolov, 2015). In all the variables, values of .81 of the Cohen's Kappa were obtained (Fleiss, Levin, & Paik, 2003).

Statistical analysis

The association between the study variables and gender (male and female) was verified by the inferential analysis. Specifically, contingency tables, Chi-Square, and Cramer's V values, with the correction of Monte Carlo, were included. The value of p<.05 was the value of significance to be considered. The statistical software package SPSS was used for conducting the analyses.

Results

A significant association was obtained between *gender* and *setting conditions* (χ^2=22.500; Cramer's V=.178; p<.001). Contributed positively: the *male gender* with *excellent setting conditions* and the *female gender* with *acceptable setting conditions* (Table 1).

A significant association was obtained between *gender* and *number of attackers available for the attack* (χ^2=142.174; Cramer's V=.447; p<.001). Contributed positively: the *male gender* with *four available players*, and the *female gender* with *one* or *two available players* (Table 2).

A significant association was obtained between *gender* and *tempo of set (*χ^2=8.641; Cramer's V=.118; p=.034). Contributed positively: the *male gender* with *second tempo*, and the *female gender* with *third tempo* (Table 3).

A significant association was obtained between *gender* and *conditions after setting* (χ^2=11.343; Cramer's V=.126; p=.003). Contributed positively: the *male gender* with *good*, and the *female gender* with *bad* (Table 4).

Statistical analysis was not conducted to test the associations between *gender* and *setting outcome* (χ^2=5.084; Cramer's V=.085; p=.166).

Table 1. Contingency table gender – setting conditions

			Gender		
			Male	Female	Total
Setting conditions	Excellent	Count	174	160	334
		Expected frequency	147.0	187.0	334.0
		Adjusted residuals	4.1	-4.1	
	Acceptable	Count	19	58	77
		Expected frequency	33.9	43.1	77.0
		Adjusted residuals	-3.6	3.6	
	Not acceptable	Count	120	180	300
		Expected frequency	132.1	167.9	300.0
		Adjusted residuals	-1.8	1.8	
Total		Count	313	398	711
		Expected frequency	313.0	398.0	711.0

No cells (.0%) have an expected frequency less than 5. The minimal expected frequency is 33.90.

Table 2. Contingency table gender – number of attackers available for the attack

			Gender		
			Male	Female	Total
Number of attackers available for the attack	One	Count	21	60	81
		Expected frequency	35.7	45.3	81.0
		Adjusted residuals	-3.5	3.5	
	Two	Count	71	158	229
		Expected frequency	100.8	128.2	229.0
		Adjusted residuals	-4.8	4.8	
	Three	Count	117	174	291
		Expected frequency	128.1	162.9	291.0
		Adjusted residuals	-1.7	1.7	
	Four	Count	104	6	110
		Expected frequency	48.8	61.6	110.0
		Adjusted residuals	11.6	-11.6	
Total		Count	313	110	711
		Expected frequency	313.0	110.0	711.0

No cells (.0%) have an expected frequency less than 5. The minimal expected frequency is 35.66.

Table 3. Contingency table gender – tempo of set

			Gender		
			Male	Female	Total
Tempo of set	1º tempo	Count	100	114	214
		Expected frequency	94.2	119.8	214.0
		Adjusted residuals	1.0	-1.0	
	2º tempo	Count	80	74	154
		Expected frequency	67.8	86.2	154.0
		Adjusted residuals	2.2	-2.2	
	3º tempo	Count	125	100	325
		Expected frequency	143.1	181.9	325.0
		Adjusted residuals	-2.7	2.7	
	Setter attack	Count	8	10	18
		Expected frequency	7.9	10.1	18.0
		Adjusted residuals	.0	.0	
Total		Count	313	398	711
		Expected frequency	313.0	398.0	711.0

No cells (.0%) have an expected frequency less than 5. The minimal expected frequency is 7.92

Table 4. Contingency table gender – conditions after setting

			Gender		
			Male	Female	Total
Conditions after setting	Bad	Count	190	289	479
		Expected frequency	210	268.1	479.0
		Adjusted residuals	-3.4	3.4	
	Good	Count	105	94	199
		Expected frequency	87.6	111.4	199.0
		Adjusted residuals	2.9	-2,9	
	Perfect	Count	18	15	33
		Expected frequency	14.5	18.5	33.0
		Adjusted residuals	1.2	-1.2	
Total		Count	313	398	711
		Expected frequency	313.0	398.0	711.0

No cells (.0%) have an expected frequency less than 5. The minimal expected frequency is 14.53

Table 5. Contingency table gender – setting's area

			Gender		
			Male	Female	Total
Setting's area	Zone one	Count	33	16	49
		Expected frequency	21.6	27.4	49.0
		Adjusted residuals	3.4	-3.4	
	Zone two	Count	66	117	183
		Expected frequency	80.6	102.5	183.0
		Adjusted residuals	-2.5	2.5	
	Zone three	Count	74	82	156
		Expected frequency	68.7	87.3	156.0
		Adjusted residuals	1.0	-1.0	
	Zone four	Count	119	163	282
		Expected frequency	124.1	157.9	282.0
		Adjusted residuals	-.8	.8	
	Zone six	Count	21	20	41
		Expected frequency	18.0	23.0	41.0
		Adjusted residuals	1.0	-1.0	
Total		Count	313	398	711
		Expected frequency	313.0	398.0	711.0

No cells (.0%) have an expected frequency less than 5. The minimal expected frequency is 18.05.

A significant association was obtained between *gender* and *setting's area* (χ^2=17.499; Cramer's V=.157; p=.002). Contributed positively: the *male gender* with *zone one*, and the *female gende*r with *zone two* (Table 5).

Statistical analysis was not conducted to test the associations between *gender* and *player to whom the setting was sent* (χ^2=1.109; Cramer's V=.039; p=.775).

Discussion and conclusions

The present study aimed to analyse the associations between setting variables and gender (male and female) in U-19 volleyball.

The results indicated that the variables associated with gender were: *setting conditions, number of attackers available for the attack, tempo of set, conditions after setting* and *seting's area.*

The results indicated a significant association between *gender* and *setting conditions.* For *males*, it was a greater frequency of *excellent setting conditions* than would be expected by random, while for *females* it was a greater frequency of *acceptable setting conditions* than would be expected by random.

Consistent with these results, several previous studies, such as Gil et al. (2011), have shown that for males in various training stages there was a greater frequency of excellent setting conditions than would be expected by random, which allowed for setters to have all the possible attack options. Gil et al. (2011) also found similar results for females, for

whom there was a greater frequency of acceptable setting conditions as would be expected by random, and which did not allow for setters to have all the possible attack options.

Due to the specific characteristics of the game sequence in volleyball, the ball reception and setting are related (Silva, et al., 2013). It is, therefore, necessary to perform a high-quality reception (Marelić, Rešetar, & Janković, 2004; Papadimitriou, et al., 2004) to send the ball to an excellent setting area. As setting efficacy decreases when made from unacceptable areas (Afonso, et al., 2010; Barzouka, Nikolaidou, Malousaris, & Bergeles 2006), the quality of reception can be considered to determine setting efficacy (Afonso, et al., 2012; González-Silva, et al., 2016).

This implies that it is necessary to emphasize high-quality receptions targeted at excellent setting zones when training players, and specifically female players, to give setters an advantage.

For the association between *gender* and the *number of attackers available for the attack*, our results showed a significant association. For *males,* it was a greater frequency of *four available players* than expected by random. For *females,* it was a greater frequency of *one* or *two available players* for the attack than expected by random.

Only a small number of studies have analysed the number of players available for the attack, and of these most have considered the availability of the middle blocker (Afonso & Mesquita, 2011; Matias & Greco, 2011a, 2011b). One investigation of elite men's volleyball (Castro, Souza, & Mesquita, 2011), aimed at identifying the performance indicators that predicted the efficacy of attack in complex II, included the number of available players for the attack as a study variable. This study showed that in this complex, two or three attackers were available to make an attack. Matias and Greco (2011a), in a study of male and female setters who were champions of the Brazilian Superliga, found that the quality of the first contact determined the use of more attackers, the use of attack tempos of different speeds, and the use of different offensive sectors of the court.

Speaking in the most general terms of performance indicators, the level of play tends to be higher in the male gender than in the female gender. The results show that setting to the back zones is more often used as an attack option in males, meaning that a greater number of players can be available to perform the attack.

The results indicated a significant association between *gender* and the *tempo of setting*. For the *male* gender, it was a greater frequency of *second tempo* than expected by random, while for the *female* gender it was a greater frequency of *third tempo* than expected by random.

Similar results were found by Costa et al. (2012), in the study which aimed to understand differences between male and female players in different game actions of young volleyball players. Here, the male players were shown to play a faster game than the female peers.

Since blockers are of a higher level in the male gender compared to the female gender (Zetou, et al., 2007), therefore, to avoid a good block formation, male players need to play quickly (Palao & Martínez, 2013), which may explain gender differences in terms of game speed.

A significant association was obtained between *gender* and *setting's outcome*. For *males,* it was a greater frequency of *a point outcome* than expected by random, while for *females*, it was a greater frequency of a *good outcome* (the attack prevents the opposing team's counterattack combination or the first tempo for the counterattack) than expected by random.

In line with our results, previous investigations have also found significant differences in the attack between men and women (João, Leite, Mesquita & Sampaio, 2010). Forthomme and Corisier (2005) showed that women performed less powerful attacks than men, which may be one of the reasons why in our study the male gender was more strongly associated with point outcome, while the female gender was not.

This finding may be due to the faster game speed in the male gender (Costa, et al., 2012). An increase in attack speed decreases the reaction time of the opposing defence (Costa, et al., 2010) and increases imbalance (Zetou, et al., 2007). The performance of fast attacks (first and second tempos) thus increases the chance of scoring a point (Costa, et al., 2010) and may well explain our results.

Finally, for the association between *gender* and the *zone to which the setting is sent*, our results showed that there was a greater frequency than expected by random of settings sent to *zone 1* for *males*, and a larger frequency than expected by random of settings sent to *zone 2* for *females.*

Palao, Santos, and Ureña (2007) conducted a study of elite players (male and female) in which they wanted to understand attack patterns at the elite level. At the same time, these researchers studied how this affected execution and performance. The authors argued that the player who participated most in attacks was the opposite. The specific position of this player is in zone 2 when he/she is forward and zone 1 when he/she is a defender (Gil, Moreno, M.P, Moreno, García-González, & Del Villar, 2010).

A research conducted in the girl's infant-youth category (Gouvea & Lopes, 2008) has highlighted the increase in the versatility of the opposites, and with this an increased confidence in them felt by

setters. Additionally, previous studies of both males and females (Cesar & Mesquita, 2006; Papadimitriou, et al., 2004) show that the opposites perform well in attack.

In the Brazilian men's youth gender, we found that it was more frequent than expected randomly that: the balls reached an *excellent zone*, *four players were available for the attack*, the *conditions* for the completion of the setting were *good*, the outcome of the setting was a *point*, and the settings were sent to *zone one*. On the contrary, in the *female* gender, it was more frequent than expected randomly that: the balls reached an *acceptable zone*, that only *one or two players were available for the attack*, the *conditions* for the completion of the setting were *bad*, the outcome of the setting was *good* but point not scored, and the settings were sent to *zone two*.

The results confirmed differences in the behavior of the Brazilian U-19 setters that depended on their gender. These results indicate that the standard of male setters is slightly higher than that of the female setters.

This information is likely to be useful for coaches as they offer gender specific guidelines for the orientation of the training process for setting.

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