

**Research article**

**COMPARISON AND ASSESSMENT OF THE SETTING ZONE CHOICES BY ELITE MALE AND FEMALE VOLLEYBALL SETTERS IN RELATION TO THE QUALITY OF DEFENCE**

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**Abstract.** *The aim of this study was the assessment and comparison of the setting zone choices by male and female elite setters, in relation to the quality of the defensive actions which were carried out in Complex II (KII) and III (KIII). A three-member group of coaches assessed the actions of male (M) and female (F) setters and defenders from 20 volleyball games (M=10, F=10) of National Teams competing in the final phase of the World League 2017. The assessment was based on a 5-point rating scale and included actions that composed a set of 2 contacts in KII and KIII. The test of independence for the variables ("setting zones", "defense quality") was carried out using Fisher's exact test. Following the overall independence test we tested the difference in proportions between genders for each level of the "setting zone" variable. Results showed that in KII the differences in proportions between genders for each level of the "setting zone" variable were found for zone 4 in favor of the male and zones 2 and 6 in favor of the female players. In KIII and under excellent defensive actions the difference in proportions between genders was found in zones 1 and 6 in favor of the males. In conclusion, under suboptimal and optimal conditions, male setters set the ball to zones 4, 6 and 1 more frequently than females, incorporating them into their offensive strategy, while the latter under good conditions preferred setting to zones 2 and 6.*

**Key words:** *volleyball, elite setting, defense, gender*

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## INTRODUCTION

Volleyball is probably one of the most popular sports in the world (Reeser & Bahr, 2003). Therefore, numerous studies have investigated players' performance with the aim to determine the factors that result in improving the effectiveness of training and consequently competition. Among those factors, the setting is the one that determines the next action's efficacy and up to a certain level the final result of the game (Buscà & Febrer, 2012; Palao, Santos, & Urena, 2005; Silva, Lacerda, & João, 2013). Setting is an essential action in volleyball, not only from the technical point of view, but also from the tactical one, as it affects the attack, since the setter is the specialist player who is responsible for organizing the game (Silva et al., 2013; Ureña & González, 2006). It is not uncommon to hear the claim that he or she is "the brains of the team" (Vujmilović & Karalić, 2013). The setter is the player who takes the majority of tactical decisions as he or she is responsible for deciding where the ball is to be passed. The setter has to evaluate the limitations encountered in agreement with the game context (Afonso, Mesquita, Marcelino, & Silva, 2010), seeking, with his or her action, to impair the attack-defense of the opposite team (Palao & Martinez, 2013). The higher the performance of the setter, the higher the performance of the attackers of both genders (Bergeles, Barzouka, & Nikolaidou, 2009). Regardless of the previous action efficacy, high-level setters are able to achieve optimum sets from unfavorable preconditions (Zetou, Moustakidis, Tsigilis, & Komninakidou, 2006; Palao et al., 2005; Papadimitriou, Paschali, Sermaki, Mellas, & Papas, 2004; Palao, Santos, & Ureña, 2004). This results in the setters being able to diversify the attack of their teams, producing a high variability of the setting action (Marcelino, Sampaio, & Mesquita, 2012). This variability causes the teams to be less predictable in the attack (Marcelino, Afonso, Moraes, & Mesquita, 2014), destabilizing the opposing block (Mesquita & Graça, 2002). Defense is characterized by complex II (KII or transition: defined as the situation when the opposing team will perform the actions of serve, block, floor defense, set and counter-attack in a sequential order) and if the rallies continue after the first two passages of the ball over the net, by complex III. In the current literature most studies focus on the above-mentioned complexes as being a single unit. However, they should be distinguished because they are different and each one of them should have been analyzed independently (Loureiro et al., 2017). In KII, the ball does not reach the setter in the best conditions (Loureiro et al., 2017; Costa, Afonso, Brant, & Mesquita, 2012). It is shown that after a good or bad floor defense, instead of a perfect one, the efficacy of the setting is decreased, producing a larger number of bad and good settings as well as a decrease in perfect settings (González-Silva, Fernández-Echeverría, Claver, Conejero, & Moreno, 2017). Moreover, their tempo was slow (i.e., 2nd and 3rd tempo) and they were mostly carried out to the extremities of the net (Loureiro et al., 2017). On the contrary, KIII emerged as distinct from KII, especially because after the preceding defensive action, the setters had to move mostly into the acceptable and/or the ideal setting area. However, although the transfer conditions could be characterized as optimal for the use of fast setting tempos, the attacks were carried out mostly from the ends of the net and their tempo was slow. This could possibly be explained firstly by the fact that most attackers were just recovering from the block and might not have the time to participate in quicker attack tempos, and secondly by the fatigue which could negatively affect participation in quick attack tempos (Loureiro et al.,

2017). Irrespective of the defensive actions complex, any increase in the dig efficacy represents better conditions for carrying out the subsequent set, which obviously may affect the final performance of the match (Silva et al., 2013), due to the fact that the basis of good offensive organization is actually a good dig (Zetou et al., 2006). Indeed, the quality of the setting after a floor defensive action equally affects the efficacy of the counter-attack and the strategy of the game. It is important to note that teams that win more points in counterattacking will win a match because it is more difficult to score points in defence than after a service reception (Rennero, Joao, & Moreno, 2015; Durković, Marelić, & Resetar, 2009). However, these conditions may or may not affect the subsequent setting action, depending on the technical mastery of the setter (Matias & Greco, 2011; Barzouka, Nikolaidou, Malousaris, & Bergeles, 2006; Papadimitriou et al., 2004). As in other sports, differences also occur in volleyball depending on whether the players are male or female. Their competitions are governed by the same rules and regulations, with the only exception of being the height of the net. More specifically, in women's competitions the height of the net is at 2.24 m while in men's competitions is at 2.43 m (FIVB, 2018). However, it has been shown that in equally-trained males and females, males are stronger, heavier, have more height, better speed and agility than female players (Bogdanović, Vidaković, Grbić, & Milić, 2014). More specifically, the female's upper and lower body absolute muscular strength corresponded to 55% and 72% of the men's strength, respectively (Bishop, Cureton, & Collins, 1987). These distinguishing differences between genders have been found to be relevant with some performance differentiations between male and female volleyball players. For example, in terms of game complexes, the number of moves carried out in KII is greater among the females than the males (Costa et al., 2012; Bergeles et al., 2009). Moreover, the use of the techniques and their efficacy has been found to be different for males and females (Palao, Manzanares, & Ortega, 2009). Men apply quicker attack tempos (Castro & Mesquita, 2008; Afonso et al., 2005; Palao et al., 2004), stronger attacks (Costa, Ferreira, Junqueira, Afonso, & Mesquita, 2011) and play less often in complex II. According to Mesquita and Cesar (2007) the opposite player's attacks from zone 1 accomplished by men were more efficient than those made by women in the 2004 Olympics. Women's attacks from zone 1 were more likely to be a back-up solution rather than an actual tactical option. They also predominantly use ground serves (Palao et al., 2009), develop slower attack plays (César & Mesquita, 2006; Palao et al., 2004), use placed attacks more often (Costa, Mesquita, Greco, Ferreira, & Moraes, 2010), and provide longer rallies (João, Leite, Mesquita, & Sampaio, 2010). Taking into consideration the above mentioned, it would be logical to hypothesize that the relation between the setting zone of elite female and male setters in conjunction with the performance level of the preceding defensive action might be quite different. In any case, a better knowledge of the specificities of men's and women's volleyball, with a thorough awareness of the differences that distinguish them, would be a useful tool for coaches in order to improve the effectiveness of training and competition. Therefore, the aim of this study was the assessment and comparison of the setting zone choices by male and female elite setters, in relation to the defense which was carried out in KII and KIII.

## METHODS

### Procedures

A three-member group of experienced coaches assessed the setting zone choices of male and female setters and the preceding defensive actions from 20 volleyball games (M=10, F=10) of National Teams competing in the final phase of the World League 2017. Firstly, the coaches were asked to observe and categorize the defense quality according to the 5-point numerical rating scale proposed by Eom and Schutz (1992), which quantifies the effectiveness of skill performance within a range of points from 0 to 4. Secondly, the coaches were asked to observe and categorize the setting choices according to the consequent attacking area i.e., to zones 1, 2, 3, 4, 5 and 6. The evaluated actions constituted sets of 2 consecutive contacts (defense performance-setting zone choice) and there were 1278 participants in total (M=510, F=768). 521 (M=210, F=311) of them were carried out during the KII, while 757 (M=300, F=457) during the KIII. Data analysis did not include any defensive actions that were assessed with a performance score 0, since they were not followed by a setting action. Intra-rater and inter-rater reliability coefficients were found to be  $r=0.983$  and  $r=0.984$  respectively, indicating very high consistency in the assessment procedure.

### Statistical Analysis

The test of independence for the categorical variables (“setting zone” and “defense quality” in KII/KIII) was carried out using Fisher’s exact test (implemented with the statistical package SPSS version 17). Following the overall independence test we tested the difference in proportions between males and females for each level of the “setting zone” variable (the test of proportion differences based on the normal distribution) using the statistical package Statgraphics Plus version 5.1.

## RESULTS

In KII, male and female setters carried out 521 setting actions, in total. Of these, 210 were performed by the male and 311 by the female setters. With regard to male settings 9% of them resulted from moderate digs quality grade (DQG), 51% from good, 14.3% from very good and 25.7% from excellent. With regard to female settings 13.8% of them resulted from moderate DQG, 49.8% from good, 16.1% from very good and 20.3% from excellent DQG (Table 1).

The vast majority of the setting actions performed by both the male and the female setters were carried out as the result of digs which were evaluated with the grade 2 (51% and 49.8%, respectively). The rest of the settings carried out by the male setters resulted from digs which were evaluated with grades 4 and 3 (25.7% and 14.3%, respectively). Similarly, the rest of the settings carried out by the female setters resulted from digs which were also evaluated with grades 4 and 3 (20.3% and 16.1%, respectively). Moreover, it is noteworthy that the settings carried out by both male and female setters, as a result of the moderate quality preceding digs (grade 1), were just the minority of the total setting actions (9% and 13.8%, respectively).

Under good digging conditions the main setting distribution choice for the male setters was zone 4 (68.2%). The rest of their choices were, in a hierarchical order, zones 1, 2 and less zones 3 and 6 (14%, 11.2%, 4.7% and 1.9%, respectively). Under the same circumstances the main setting distribution choices for the females were zones 4 and 2 (41.9 and 28.4%, respectively) ( $X^2$  Test and Fisher's Exact Test, significance value 0.00). The statistically significant difference in the proportions between the males and females for each level of the "setting zone" variable was observed in zone 4 (males had a higher proportion) and in zones 2 and 6 (females had a higher proportion) (Table 2).

In KIII, male and female setters carried out 757 setting actions, in total. Of these, 300 were performed by the men and 457 by the female setters. With regard to the male's settings 7% of them resulted from moderate defensive actions quality grade (DAQG), 40.3% from good, 18.3% from very good and 34.3% from excellent. With regard to female's settings 10.5% of them resulted from moderate DAQG, 49% from good, 18.8% from very good and 21.7% from excellent DAQG (Table 3).

**Table 1** Frequency of setting zone choices for male and female setters in relation to dig quality grade in KII

Males								
DQG	Setting zones						N	%
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6		
1	5.3%	10.5%	10.5%	63.2%	0.0%	10.5%	19	9.0
2	14.0%	11.2%	4.7%	68.2%	0.0%	1.9%	107	51.0
3	6.7%	30.0%	16.7%	36.7%	0.0%	23.1%	30	14.3
4	5.6%	18.5%	20.4%	44.4%	0.0%	11.1%	54	25.7
N	21	33	23	120	0	13	210	
%	10.0	15.7	11.0	57.1	0	6.2		100

  

Females								
DQG	Setting zones						N	%
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6		
1	9.3%	16.3%	9.3%	48.8%	0.0%	16.3%	43	13.8
2	12.9%	28.4%	5.2%	41.9%	1.3%	10.3%	155	49.8
3	8.0%	32.0%	10.0%	38.0%	0.0%	12.0%	50	16.1
4	11.1%	34.9%	23.8%	25.4%	0.0%	4.8%	63	20.3
N	35	89	32	121	2	32	311	
%	11.3	28.6	10.3	38.9	0.6	10.3		100

DQG: Dig Quality Grade in KII (1: moderate, 2: good, 3: very good, 4: excellent)

**Table 2** Setting zone choices for male and female setters in relation to dig quality grade in KII

Gender	DQG	Setting zones						Fisher's Exact Test Value Sig.
		1	2	3	4	5	6	
		% (N)	% (N)	% (N)	% (N)	% (N)	% (N)	
Male		14 (15)	11.2 (12)	4.7 (5)	68.2 (73)	-	1.9 (2)	25.457
Female	2	12.9 (20)	28.4 (44)	5.2 (8)	41.9 (65)	1.3 (2)	10.3 (16)	<b>0.00</b>
Z		0.80	-3.34	-0.18	4.19	-	-2.64	
P		ns	0.01	ns	0.00	-	0.01	

DQG: Dig Quality Grade in KII (1: moderate, 2: good, 3: very good, 4: excellent)

**Table 3** Frequency of setting zone choices for male and female setters in relation to defensive action quality grade in KIII

Males								
DAQG	Setting zones						N	%
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6		
1	14.3%	9.5%	19%	38.1%	4.8%	14.3%	21	7
2	9.9%	22.3%	6.6%	54.5%	0.0%	6.6%	121	40.3
3	16.4%	21.8%	20%	32.7%	0.0%	9.1%	55	18.3
4	13.6%	19.4%	21.4%	30.1%	0.0%	15.5%	103	34.3
N	38	61	45	123	1	32	300	
%	12.7	20.3	15	41	0.3	10.7		100

  

Females								
DAQG	Setting zones						N	%
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6		
1	16.7%	22.9%	0.0%	43.8%	0.0%	16.7%	48	10.5
2	15.2%	23.7%	3.6%	47.8%	1.8%	8%	224	49
3	9.3%	34.9%	7%	34.9%	1.2%	12.7%	86	18.8
4	7.1%	26.3%	29.3%	31.3%	1%	5.1%	99	21.7
N	57	120	43	189	6	42	457	
%	12.5	26.3	9.4	41.4	1.3	9.2		100

DAQG: Defensive Action Quality Grade in KIII (1: moderate, 2: good, 3: very good, 4: excellent)

Under excellent DAQG conditions the main setting distribution choice for the male setters was zone 4 (30.1%). The rest of their choices were distributed in a hierarchical order to zones 3, 2, 6 and 1 (21.4%, 19.4%, 15.5% and 13.6%, respectively). Under the same circumstances the main setting distribution choices for the females were zones 4, 3 and 2 (31.3%, 29.3% and 26.3%, respectively) ( $X^2$  Test and Fisher's Exact Test, significance value 0.047). The statistically significant difference in proportions between the males and females for each level of the "setting zone" variable was observed in zone 6 (the male setters had a higher proportion) (Table 4).

**Table 4** Setting zone choices for male and female setters in relation to defensive action quality grade in KIII

Gender	DAQG	Setting zones						Fisher's
		1	2	3	4	5	6	Exact Test Value
		% (N)	% (N)	% (N)	% (N)	% (N)	% (N)	Sig.
Male		13.6% (14)	19.4 (20)	21.4 (22)	30.1 (31)	-	15.5 (16)	10.660
Female	4	7.1% (7)	26.3 (26)	29.3 (29)	31.3 (31)	1 (1)	5.1 (5)	<b>0.047</b>
Z		1.51	-1.17	-1.29	-0.18	-	2.42	
P		ns	ns	ns	ns	-	0.01	

DAQG: Defensive Action Quality Grade in KIII (1: moderate, 2: good, 3: very good, 4: excellent)

## DISCUSSION

The aim of this study was the assessment and comparison of the setting zone choices by male and female elite setters, in relation with the quality of the preceding defense which was carried out in KII and KIII. As it was already shown, the technical actions executed in the above-mentioned distinctive phases of the game influence each other in a cyclical and sequential pattern (Palao et al., 2004) which implies that the previous action affects the next one (Barzouka et al., 2006; Bergeles et al., 2009; Papadimitriou et al., 2004) i.e., the dig efficacy and type affects the quality of setting and the efficacy of the attack.

The results of the current study revealed that in KII most of the digs carried out by the male and the female setters were evaluated as good. However, irrespective of the dig quality, the current study revealed that the dominant setting position for both genders was zone 4. With regard to the male setters this finding is partially in line with the results of Loureiro et al. (2017) who showed that the extremities of the net were the dominated attacking areas for elite male teams when playing in KII. Moreover, it was found that the second setting distribution choice of the female setters was zone 2. This is in line with the study of Inkinen, Häyrinen, and Linnamo (2013) who observed that the main distribution choices of the high-level female setters, in hierarchical order, seemed to be firstly the set to zone 4 and secondly the set to zone 2. This could be explained by the ability of the outside hitters to attack effectively (Millán-Sánchez, Morante Rábago, & Ureña Espa, 2017) or by the fact that under difficult situations, setters very often sent the ball to position 4 (Grgantov, Jelaska, & Dragutin, 2018), and in a slower tempo especially when they have to move outside the ideal setting zone (Afonso, Mesquita, Marcelino, Silva, 2010). Besides, it was found that in counter-attack the use of zone 4 increases the spikes that limit the opponent team's attacks (Palao, Santos, & Ureña, 2007).

More specifically, this study showed that in the case of moderate dig quality male setters seemed to distribute their sets mainly to zone 4. How they were chosen was possibly because of the role and/or the ability of the left outside hitters to attack effectively (Millán-Sánchez et al., 2017; Araújo, Castro, Marcelino, & Mesquita, 2010). However, it is noticeable that even when they had to move out of the acceptable setting area, male setters equally distributed the rest of their settings to zones 2, 3 and 6, probably indicating their intention to obstruct the formation of the opponent block. On the other hand, female setters sent the ball mostly to zone 4 and to the left outside hitter who elsewhere is referred to as a security player (Mesquita & Cesar, 2007), since their role is to attack effectively even when the setting tempo is slow (Afonso et al., 2010) and the opponent block is organized. Moreover, a remarkable setting actions percentage was set to the right side of the net, while a not negligible one was directed to position 6.

Under very good digging conditions, males distributed their sets almost equally to both ends of the net, as well as to the center of it. This showed that even when setters have to move into the setting area between the acceptable and the perfect one, they intended to distribute their settings taking advantage of the entire length of the net probably aiming to create uncertainty in the opposing team in order to increase the defence deficit of time (Palao et al., 2005). Under the same circumstances, female setters sent the ball to the sides of the net and mainly to the right one. However, the latter has to be interpreted carefully because zone 2 is used not only by the opposite or the outside hitter, but also by the middle one.

According to Palao et al. (2007), 5.1% of the settings to zone 2 are sent to the middle blocker to carry out a one-leg attack, especially when the setter is in the front court.

When the dig was excellent, the male setters seemed to distribute their settings in a balanced manner, taking advantage of not only the entire length of the net but also all the attacking possibilities of their team. However, the vast majority of their total setting actions were directed to the left side of the net and mainly to the outside hitter of the front court. Additionally, a remarkable percentage of their setting actions were carried out to the middle of the net and to positions 3 and 6. On the other hand the attacking area chosen by the female setters more frequently was the right part of the court and especially zone 2. This was probably due to the contribution of both the opposite and the middle hitter who under these circumstances attacked in a fast tempo, not allowing a double or a triple block formation (Tsvardaroglou, Sotiropoulos, & Barzouka, 2018). Besides, it was shown that setting to zone 2 reduces the spikes that do not limit the opposing team's attack (Palao et al., 2007). However, although female setters intended to take advantage of the entire length of the net, it was obvious that they did not implement all the attacking possibilities of their team. Indeed, just a minor percentage of the total setting actions were sent to position 1 and mainly to position 6, reinforcing the indications that the back-court attack for women was not a part of a tactical plan, but just a necessity.

Concerning the setting distribution differences between genders, it was found that female setters transferred the ball to zones 2 and 6 more frequently than male setters, possibly due to the restrictions imposed on the distribution. Under the same circumstances male setters sent the ball to zone 4 more frequently than female ones possibly because of the role and/or the ability of the left outside hitters to attack effectively (Millán-Sánchez et al., 2017; Araújo et al., 2010).

In KIII, a total of 757 defensive actions were evaluated, and most of them were carried out by the female setters. This differentiation found between the genders could be explained by the fact that females produce less power than males in the spike (Forthomme & Corisier, 2005), which positively affects the balance between their attacks and defense (Costa et al., 2012). Besides, the women's performance in volleyball is characterized by actions of continuity that result in longer rallies (João et al., 2010). Regarding men, this study revealed that most of the defensive actions carried out by them were set to zone 4. This was partially in line with the results of Loureiro et al. (2017) who showed that the extremities of the net were the dominated attacking areas for the elite male teams when playing in KIII. As found with males, the dominant setting zone for female setters was also zone 4 while their second distribution choice was zone 2. Their preferences may possibly be explained as previously mentioned, by the ability of the outside hitters and the opposite to attack effectively (Millán-Sánchez et al., 2017), and/or the efficacy of the middle hitter's one-foot attack. More specifically, in the case of moderate defense quality it was showed that male setters mainly chose setting to zone 4, while their second choice was zone 3. The latter supported the results of Papadimitriou et al. (2004) who found that elite setters are able to achieve optimum sets from inappropriate preconditions. However, these could not be statistically verified since the defensive actions performed were only a small percentage of the total (7%). Female setters distributed their sets mainly to zone 4 while their second choice was zone 2. Moreover, they chose to transfer a noticeable setting percentage to the back court and specifically to zones 1 and 6. This showed that when setters had to move out of the acceptable setting area, they used not only the attack



by the extremities of the net but also the outside hitters and the opposite from the back court, possibly due to the restrictions imposed on the distribution.

The results of the current study showed that in KIII most of the defensive actions carried out were evaluated as good. Under these circumstances, men set the ball more frequently to zone 4 although it was noticeable that they intended to distribute their settings to both ends of the net, causing trouble to the opponent middle blocker. Women set the ball mostly to zone 4 and to the left outside hitter, although it was obvious that they tried to implement a more complex setting plan. Indeed, a 38.9% of the good defense actions were set to the right side of the net, while a not insignificant part of this percentage was directed to the back court and specifically to zone 1.

Under very good defense conditions, the dominant setting zone for male setters was zone 4. However, the fact that under these circumstances setters tried to carry out a more complete setting tactical plan as far as the multiplicity of the setting zones involved were concerned is quite significant. Indeed, 38.2% of the total setting actions were directed to the right side of the net and to the opposite hitter while a remarkable percentage was directed to zone 3 possibly in order to leave the opponent defense insufficient time to take up their appropriate positions. Female setters sent the ball mainly to the extremities of the net and especially to its right side where the opposite and/or the middle hitter attack. However, it is important that a not negligible setting percentage was directed to the back court and mainly to position 6 while only 7% of the total very good defensive actions performed in KIII were set to position 3. The latter could possibly be explained by the fact that when it was achievable, female setters preferred to implement the middle hitters' one-foot attack from position 2 instead of the first tempo attack from position 3 in order to use the entire length of the net causing trouble to the opponent middle blocker.

In the case of excellent defense quality, it was obvious that male setters intended to distribute their settings in a balanced manner taking advantage of not only the entire length of the net but also of all the attacking possibilities of their team. Moreover, male setters chose to send a remarkable percentage of their setting actions to the back court and to positions 1 and 6. On the other hand, female setters preferred to set the ball mostly towards the attacking areas of the front court. Indeed, just a minor percentage of their total setting actions were sent to positions 1 and 6. Regarding the setting distribution differences between genders, the males set the ball to zones 1 and 6 more frequently than females reinforcing previous results found before according to which the back-court attack seemed to be for them a part of a tactical plan while for their female counterparts just a necessity.

In total, concerning the setting distribution differences between genders, this study showed that under good defense conditions female setters transferred the ball to zones 2 and 6 more frequently than male setters, possibly due to the restrictions imposed on the distribution. Under the same circumstances male setters set the ball to zone 4 more frequently than female setters. Under optimal defense conditions male setters set the ball to position 6 more frequently than female setters. This corroborates the results of Mesquita and Cesar (2007) who found that the back-court attacks which were carried out by the males were more effective compared to the attacks of the female setters.

## CONCLUSION

In KII and KIII, the dominant setting zone for both genders was zone 4. However, under difficult defense conditions female setters chose to send the ball to zone 2 and 6 more frequently than males. In KIII and under excellent defense conditions, male setters set the ball to zone 6 more frequently compared to females, indicating that this back-court attack was a part of their tactical offensive plan.

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## **POREĐENJE I PROCENA IZBORA ZONA DIZANJA VRHUNSKIH MUŠKIH I ŽENSKIH DIZAČA U ODBOJCI U ODNOSU NA KVALITET ODBRANE**

*Cilj ovog istraživanja bio je procena i poređenje izbora zona dizanja vrhunskih muških i ženskih dizača, u odnosu na kvalitet odbrambenih akcija sprovedenih u kompleksu II (KII) i III (KIII). Trojica trenera procenilo je akcije muških (M) i ženskih (F) dizača i odbrambenih igrača u okviru 20 odbojkaških utakmica (M=10, F=10) nacionalnih timova koji su se takmičili u završnoj fazi Svetske lige 2017. godine. Procena se zasnivala na skali od 5 poena i uključivala je akcije koje su činile skup od 2 kontakta u kompleksu KII i KIII. Postojanje razlika ("zone dizanja" i "kvaliteta odbrane") utvrđivano je uz pomoć Fišerovog egzaktnog testa. Potom je testirana razlika u proporcijama između polova za svaki nivo varijable "zone dizanja". Rezultati su pokazali da su u KII razlike u proporcijama između polova za svaki nivo varijable "zone dizanja" utvrđene za zonu 4 u korist muškaraca i zone 2 i 6 u korist devojaka. U KIII i kod odbrambenih akcija razlika u proporcijama između polova je utvrđena u zonama 1 i 6 u korist muškaraca. U zaključku, u suboptimalnim i optimalnim uslovima, muški dizači dižu loptu u zone 4, 6 i 1, češće od ženskih dizača, inkorporirajući ih u svoju ofanzivnu strategiju, dok u dobrim uslovima preferiraju dizanje lopte u zone 2 i 6.*

*Ključne reči: odbojka, vrhunski dizači, odbrana, pol*