DEFENCE EFFICACY IN PRACTICE AND COMPETITION. A CASE STUDY IN WOMEN'S VOLLEYBALL

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Abstract. The aim of this study was to compare the player positions, situations, techniques, and efficacy in defence between practice and competition for a women's professional volleyball team. The sample was a Spanish professional women's volleyball team. The defence actions carried out in three sessions of the competitive season and two in-season matches were studied (794 rallies in practice and 166 rallies in competition). The variables studied were: actions done, defence zone, player role, type of attack, court defence technique, game phase, situations, level of execution of the defence team system, block efficacy, defence efficacy, and result of the rally for the analysed team. Descriptive and inferential analyses of the data were done (Mann-Whitney U, and Chi-Square Test and likelihood ratio). Differences in defence systems and efficacies were found between practice and competition. A higher collective efficacy was found in competition, and higher levels of individual block and defence efficacies were found in practice. The results show the need to reconsider the way match analysis is done. Consideration should not only be given to the actions done with the ball when analysing players' performance.

Key words: team sports, performance, coaching, monitoring, volleyball

Introduction

In team sports, such as volleyball, the level of a team depends on the players' abilities and their coordination in executing team strategies and tactics. Matches are the situations in which teams demonstrate the level of achievement of their techniques, tactics, and strategies. In order to increase performance, teams must practice in an organised and systematic manner to master their skills, actions, and movements. Most of the research done in relation to performance analysis for team sports is focused on studying performance in competition. There are few studies that assess the way teams practice, and those focus on physical aspects (Häkkinen 1993; Gabbett 2008; Marques et al. 2008).

Practice is the key to achieve success in competition (Travassos et al. 2012). The reference that guides practice is competition. Therefore, the first step in planning is to know what the competition involves. The information that is available in relation to team sports' characteristics and performance indicators in competition shows that these are topics that are studied by researchers (Drikos and Vagenas 2011; Palao et al. 2004; Peña et al. 2013; Zetou et al. 2007). However, less information is known about reference values to monitor and guide practices in team sport (Thiess et al. 2004). The criteria given by experts to guide practices follow several pedagogical and biological principles (specificity, overload, progression, diminishing returns, variation, reversibility, individual differences, and moderation) (Martens 2012). Therefore, coaches try to create practice situations that involve their players and teams, that are adapted to their specific and individualised needs, that challenge them (competitive), and that are presented in progression and intensity (Nash et al. 2011).

The characteristics of each sport affect the way that they can be monitored and the implications on the players (Palao and Morante 2013; Van del Pol and Kavussanu 2012). Indoor volleyball is a team sport in which most of the actions are not terminal, there is a high number of ball contacts per time, the ball cannot be held, and the concepts of offense and defence are different than in other team sports (FIVB 2012). A team can score while on defence, through a block. Most of the studies in this sport assessed the offensive phase in competition (serve, reception, set, and attack). However, the defence is critical because it is the basis for neutralising the opponent's attack and trying to score. At least fifty percent of the points are achieved in actions that involve defence and/or counter-attack (Palao 2004). In defence, teams must adapt to the opponent's attack system under conditions that involve a time deficit (different possible zones and tempo attacks) and coordinate the players' actions (block and court defence). The success of this phase depends on different aspects, such as reaction, anticipation, and adaptation skills; displacement skills, players' motivations; and players' and teams' technique and tactics (Selinger and Ackerman-Blount 1986; Hernández-Hernández et al. 2004).

No studies have been found in the bibliography review that was carried out in relation to the way teams defend in volleyball competitions and practices regarding technical actions. The studies that compare practice and competition have been focused on physical aspects of the game (Edwards and Kurlander 2010; Gonzalez et al. 2005). For individual sports, such as golf, research shows that at higher levels, players' practice efficacy is also higher and they use highly structured and consistent routines in practice and in competition (Douglas and Fox 2012). Elite golfers presented higher efficacies and better mental states in competition than in practice. Douglas and Fox (2012) hypothesize that it could be due to their ability to cope mentally with the demands of the situation. To our knowledge, no information is available about these aspects in open skills done by players of a team sport, where the skills depend on the opponents' actions and the teammates. Research has shown that it is more difficult for players of team sports to feel a sense of personal accomplishment and they are less focused on task orientation (van del Pol and Kavussanu 2012). Further studies are needed to increase the knowledge about how teams practice and the specific relationship between the level of achievement in practices and competitions. This will allow us to obtain information about how successfully players and teams are practicing and how reference values from the competition should be adapted to establish real and challenging goals. In practice, coaches try to create challenging real situations using their own players (starters and reserve players). The aim of this study was to compare the player positions, techniques, situations, and efficacy in defence between practice and competition for a women's professional volleyball team.

Method

The sample was a professional women's volleyball team. The team was composed of eighteen players (average height of 1.85 ±0.07 meters and average age of 25.2 years) and a technical staff of three coaches, a strength and conditioning coach, and a statistician (combined average age of 31.5 years and 7.2 years of experience). Ninety-four percent of the team players played that season with their national team. Thirty-eight percent were Spanish players. The rest of the players were from the Dominican Republic, Belgium, Brazil, Russia, Poland, the United States, and Puerto Rico. This team won all the official competitions they played (National league, National Cup, and Top Team Cup (European Club Competition)). The defensive actions carried out in three practice sessions of the competitive season and two in-season matches played against the second-ranked team of the National Competition were studied (794 rallies in practices and 166 rallies in competitions). The second-ranked team of the National Competition finished that season in the third position in the CEV Women's Champions League (European Club Competition). The Research Ethics Committee of the University of Murcia (Spain) pre-approved the study.

An observational study (one-time, nomothetic, and multidimensional) was done (Anguera 2003). The variables studied were: actions done (block or defence), defence zone (court zone), player role (setter, opposite, middle blocker, outside hitter, or libero), type of attack (attack in zone 1, 2, 3, 4, 6, or one-leg slide attack), court defence technique (bump, overhead, acrobatic, or other), game phase (defence of side-out or defence of counter-attack), situation (practice or competition), level of execution of the defensive team's system, block efficacy, defence efficacy, and result of the rally for the team analysed (win, loss, or neutral).

The players' level of execution of the defensive team's system was established by comparing the criteria established by coaches and the position adopted by players. The head coach was interviewed, and he established the standard position of the defensive system for the different types of opponent attack (attack in zone 1, 2, 3, 4, 6, or one-leg slide attack). The head coach established the exact position that players must adopt against the opponent's attack (in Table 1, an example of the criteria set is described).

Table 1. Description of the defence position in an opponent attack in zone 4 (right side of the net)

Zone 1 player	Player in court defence. Player´s left foot on the side line and 3–4 meters from the net.
Zone 2 player	Player in block. Player must be a half meter from the antenna and/or with her inside arm in front of the attacker´s shoulder.
Zone 3 player	Player in block. Player must be close to the player of zone 2. No space between them is allowed.
Zone 4 player	Player in court defence. Player must be on the back row line and one to two meters inside the court laterally.
zone 5 player	Player in court defence. Player must in the long diagonal spike trajectory (3–4 meters from the end line and two meters inside the court).
Zone 6 player	Player in court defence. Player must be in centre of the court and 1–2 meters from the end line.

The efficacies of the block and defence were evaluated in relation to their success and the options that the actions gave the analysed team and the opponent. The statistical system of the Fédération Internationale de Volleyball (FIVB) was utilised, adapted from Coleman et al. (1969). Four levels to categorise the defence performance were differentiated: error (0), no attack options (1), limited attack options (2), and maximum team attack options (3). Five levels to categorise the block performance were differentiated: error (0), maximum team attack options (1), limited attack options (2), no attack options (3), and point (4). With the categories of defence and

block efficacy, an efficacy coefficient was calculated (sum of the attempts per category multiplied by the value of the category and divided by the total attempts (Coleman et al. 1969)).

The result of the rally was established by the way the rally ended (the analysed team won or lost). In practice, if in some exercise the coach did not let the rally continue (e.g. the coach did not let the ball be attacked after the court defence) or there was not a full opponent against the attack and the goal set by the coach was fulfilled, the result of the rally was categorised as neutral. If the goal was not achieved, the rally was categorised as lost.

All analysed periods, both in training and competition, were recorded from the same place (from a plane that was perpendicular to the net) with a digital video camera (HD 720 p 50Hz). The recording included the entire volleyball court and its adjacent areas where play could take place. The observation was done by one observer who was previously trained following the criteria established by Anguera (2003). The observer had a degree in sport science and was a former volleyball player. After training and during the analysis, the inter-observer and intra-observer reliability percentages of the studied variables were calculated between the observer, the head coach, and one of the researchers (Anguera 2003). The observer had an inter- and an intra-observer reliability above 0.85 for all the studied variables (Cohen's kappa). Descriptive and inferential analyses of the data were done using the SPSS 20.0 software (Mann-Whitney U for the continuous variables and Chi-Square Test and likelihood ratio for the categorical variables) with a level of statistical significance set at $p < 0.05$.

Results

Similar proportions of actions in the different game phases are carried out by the analysed team in practice and in competition. The team's actions done in the different game phases were significantly better in competition than in practice. Different proportions of defence actions related to the opponent's attack were found in practice and in competition. A significantly higher proportion of attacks from zones 2 and 3 and setter attacks were found in practice, and a significantly higher proportion of attacks from zone 2 (one-leg slide attack) and zone 4 were found in competition. The team's actions were carried out significantly better in competition than in practice. Regarding the actions where players contact the ball, similar proportions of technique are done against the different types of opponent attack by players in practice and competition, except for the acrobatic defence, where a higher use was found in competition. The actions done involving the players contacting the ball were significantly better in practice than in competition.

Table 2. Types of actions done in practice and in competition and number of correct actions by the team and individual

	Practice				Competition			
	total	%	correct	%	total	%	correct	%
	1	2	3	4	5	6	7	8
Game phase								
Defence of side-out	346	43.6	36*	10.4	78	47.0	25*	32.1
Defence of counter-attack	448	56.4	129*	28.8	88	53.0	54*	61.4
Attack zone								
Zone 1 (Back row)	29	4.0	4⁻	13.8	7	4.4	3⁺	42.9
Zone 2	158⁺	21.8	14⁻	8.9	13⁻	8.1	8⁺	61.5
Zone 2 (one-leg slide)	42⁻	5.8	0⁻	0.0	20⁺	12.5	2⁺	10.0
Zone 3 (quick attack)	191⁺	26.3	10⁻	5.2	26⁻	16.3	9⁺	34.6

	1	2	3	4	5	6	7	8
Zone 4	224⁻	30.9	63⁻	28.1	84⁺	52.5	38⁺	45.2
Zone 6 (Back row)	72	9.9	10⁻	13.9	10	6.3	5⁺	50.0
Setter attack	10⁺	1.4	0	0.0	0⁻	0.0	0	–
Technique								
Bump	333	70.7	299	89.8	21	63.3	16	82.3
Overhead	79	16.8	71*	89.9	62	21.4	51	76.2
Acrobatic	21⁻	4.5	16*	76.2	12⁺	12.2	5	41.7
Other	38	8.1	22*	57.9	3	3.1	0*	0.0

* Statistically significant at a level of $p < 0.000$ in relation to correct execution of the defence system by the team (Mann-Whitney U).
⁺ or ⁻ Statistically significant increase or decrease at a level of $p < 0.000$ (Chi-square Test).

The percentage of correct executions of the defence system was significantly higher in competition than in practice. The percentage of the team's players that properly adopted the position of the defence system was significantly higher in competition than in practice (Table 3).

Table 3. Players' level of execution of the defence system in relation to game phase and opponent's type of attack in practice and competition

	Practice		Competition	
	average	standard deviation	average	standard deviation
Execution of defence system				
Defence of side-out	66*	19	85*	13
Defence of counter-attack	75*	18	88*	15
Total	71*	19	86*	14
Attack zone				
Zone 1 (Back row)	68*	12	92*	14
Zone 2	67*	13	93*	12
Zone 2 (one-leg slide)	59*	16	77*	14
Zone 3 (quick attack)	64*	19	88*	10
Zone 4	78*	18	85*	11
Zone 6 (Back row)	74*	13	95*	9
Setter attack	44*	12	–*	–

* Statistically significant at a level of $p < 0.000$ in relation to the team´s correct execution of the defence system (Mann-Whitney U).

With regard to the execution of the defence system by the different players (Table 4), better execution of the defence system was found in competition than in practice, except in zone 3 (middle blockers) and zone 6 (outside hitters). For block efficacy, similar proportions of efficacy were found between practice and competition, except for in block points, where a higher proportion of occurrence was found in practice. The defence efficacy was significantly higher in practice for the defences that allowed maximal options and significantly higher in competition for the defences that did not allow attack options. From a general perspective, the efficacy coefficients of the block and defence were higher in practice than in competition. Similar tendencies were found regarding the result of the rally. A significantly higher number of the rallies were won by the team studied in defence in practice than in competition.

Table 4. Execution of the defence system position and efficacy of the defence actions by player in practice and competition

	Practice		Competition	
	n	percentage	n	percentage
Team player				
Zone 1 (Setter & Opposite)	539⁻	74.2	134⁺	89.9
Zone 2 (Setter & Opposite)	375⁻	51.7	136⁺	91.3
Zone 3 (Middle blocker)	591	81.4	113	75.8
Zone 4 (Outside hitter)	445⁻	61.3	109⁺	73.2
Zone 5 (Libero & Middle blocker)	552⁻	76.0	144⁺	96.6
Zone 6 (Outside hitter)	587	80.9	136	91.3
Block				
Error (0)	47	18.7	13	26.5
Max opp. attack options (1)	58	23.0	8	16.3
Limited attack options (2)	47	18.7	12	24.5
No attack options (3)	47	18.7	10	20.4
Point (4)	53⁺	21.0	6	12.2⁻
Efficacy Coefficient	2.00		1.76	
Court defence				
Error (0)	82	16.7	12	16.2
No attack options (1)	124⁻	25.3	42⁺	56.8
Limited attack options (2)	196	39.9	19	25.7
Max attack options (3)	89⁺	18.1	1⁻	1.4
Efficacy Coefficient	1.59		1.12	
Result of the rally				
Win	164 *	27.6	89 *	47.6
Loss	246 *	41.3	98 *	52.4
Neutral (positive for coach)	185 *	31.1	–*	–

* Statistically significant at a level of $p < 0.000$ in relation to situation and result of the rally (Mann-Whitney U).
⁺ or ⁻ Statistically significant increase or decrease at a level of $p < 0.005$ (Chi-square Test).

Discussion

Regarding proportions of the work done on the different defence actions between practice and competition, similar proportions were found in the use of different techniques, and different proportions were found in the work done to prepare for the opponents' attack types. These results coincide with proposals in the literature regarding creating competition-like situations in practice (Travassos et al. 2012). These results could be due to the reserve team creating similar practice situations to those of competition due to their characteristics or because the coach demands certain actions or ways of playing. Also, the results could be due to the types of attack technique depending mostly on the reserve players' characteristics. Therefore, players in both circumstances have the same tendency to resolve the game's situations using the same techniques. The only difference was found in the use of acrobatic techniques, which shows that players in competition try to resolve more difficult situations or they are more involved in the game (van del Pol and Kavussanu 2012). The differences found regarding attack type show how these aspects depend on the characteristics of the team and its strong points. In the case studied, the opponent teams attacked most often from zone 4, where half of the attacks are done. These results show that in order to adequately prepare matches, scouting opponents' tendencies is needed. This type of work is common in volleyball (Palao and

Hernández-Hernandez 2014). These tendencies are similar to the ones found in the literature (Palao et al. 2007). Teams must scout opponents, and after that, they must scrimmage in practice and have bench players simulate this type of attack in order to get specificity in their defence work (speed, positions, options, etc.) (Travassos et al. 2012).

The results show that collective efficacy is higher in competition than in practice. These results are similar to findings in elite female golfers (Douglas and Fox 2012). The reasons for these results are probably a combination of the following: starting teams know the level of the bench teams and adapt their effort to the situation, low motivation or involvement by starting players in practice, higher time in practice than in competition, absence of public, and/or importance of the situation (practice vs. competition). In team sports, it should also be considered that this finding could be influenced by aspects related to team dynamics, such as the fact that players from a team practice together every week, which results in a lack of variability in practice. It is important for coaches to introduce environments that provide variation and provide a challenge for the players in practice (coaching and training principles) (Nash et al. 2011). The opposite tendency was found in relation to the ball contact efficacy by the players. A higher efficacy was found in practice, which is related to a higher number of ball contacts on defence in practice than in competition. The reason for this is probably because in practice, coaches plan exercises with the goal of having players carry out a high number of repetitions. There, attackers (a teammate or a coach) seek out the defensive player, something that rarely occurs in competition. This may be the reason for the higher block and defence efficacies found in practice. Another possible cause is that practices are less challenging for players, due to less focus on task-orientation or feeling less involved in familiar situations (e.g. attack repertoire of their teammates and/or coaches) (van del Pol and Kavussau 2012) .

The criteria set by the head coach regarding team defensive positions were not achieved by his team on many occasions in competition (on average, less than half of the time). In practice, the levels were even lower. Additionally, a high level of fluctuation in the ability to adapt the defence system to the type of attack was found. The one-leg slide was the type of attack with the lowest values (10% in competition), and the attack for zone 2 was the attack with the highest values (60% in competition). These values show the number of times that all the team's players are in position for the defence system at the same time. When analysing this data by player, it is found that in practice, an average of 4–5 players out of six are in the correct defence system position, and in competition, an average of 5-6 players out of six are in the defence position system. These values show that the criteria established as ideal by the coach are difficult for the team to achieve. However, the type of criteria set by the coaches is similar to the one established by other elite coaches on a tactical level (Beniscelli et al. 2014). The results show that the goals set may be too challenging for the players. Further studies are needed to establish reference values of the achievement of the defence system proposed by the coaches in peak performance. These studies must assess the difference between the coaches' criteria and the level of their competitions and teams. In this analysis, it should be taken into consideration whether the purpose of the goal set by the coaches is to push the players to the limit, individually or collectively (Nash et al. 2011). Data from this study show that goals set for defence are achievable by players, but they are too hard for the team. In volleyball, defence is done under a time deficit. In volleyball defence, players do not know what they have to do and where they have to be until the ball leaves the hands of the setter and the hitter. For example, to contextualize these data, the goal set by the head coach that the block carried out at the side of the net should be done by two players is only achieved in 70% of the cases by women's national teams (Palao et al. 2004).

The present study monitors the defence utilizing information about the way the ball is contacted but also by analysing whether the player adopts the theoretical position established by the coach. The combination of the two aspects provides more information to coaches, which allows them to give more specific feedback to players. The position adopted by the players provides information about whether each player makes the proper decision (execution and timing) for their role and their interaction with the rest of their teammates (Beniscelli et al. 2014). This provides a better perspective of the team effectiveness in defence. For the analysed team, the results show that in competition, the player role that achieved the set position in the defence system was the middle blocker in the front row (zone 3). This type of analysis provides information to coaches which allows them to focus their attention on the aspects that need improvement in practice and in competition and it provides objective data for working with the players and monitoring their improvement. Volleyball is a sport where many actions occur in a short period of time. This makes it more difficult for coaches to give feedback to the players. Monitoring players' actions is done frequently in practice and competition (Palao and Hernández-Hernández 2014). However, these statistical systems are only focused on collecting and analysing the ball contact actions done by players in volleyball. New technologies have simplified the task of collecting and analysing player actions in volleyball, in addition to allowing data to be combined with video (Carling et al. 2008; Liebermann et al. 2002). A critical review must be done about the ways players' actions are analysed in volleyball in order to give players feedback about the actions that they do. In this way, game statistics must collect the data in the same way that coaches analyse the team's tactics (Beniscelli et al. 2014).

The aim of this paper was to study the practice done by a women's peak performance professional volleyball team in relation to defence. The data obtained are from a case study. Therefore, the generalization of the data is not possible, because it is obtained from the practice of one team and confrontations between two teams. However, the information provides a reference of the type of requirements that the competitions involve for the studied team in order to compare the specificity of their practice. Data from peak performance teams provide information about the way players and teams practice. This information is useful for coaches, researchers, sport pedagogists, psychologists, etc. to have a reference about how to monitor and analyse technical and tactical aspects in practice and in competition (Beniscelli et al. 2014; Nash et al. 2011). This is the first step to provide adequate feedback and communication in team sports to improve their performances (Eccles and Tran 2012; van del Pol and Kavussanu 2012).

Conclusions

Differences in the defence system and efficacy were found between practice and competition. In volleyball, the defence is conditioned by the attack system. Therefore, the study of the opponent's tendencies and the simulation of them in practice could be a solution to reduce these differences and increase the specificity of the practice. A higher level of efficacy in collective efficacy was found in competition, and higher levels of the individual block and defence efficacy were found in practice. The results show the need to reconsider the way match analysis is done. Traditionally, statistical analysis in volleyball is done by only taking into consideration the ball contacts done by players. Following that criteria, collective actions are not evaluated. Currently, the focus in volleyball game analysis is on individual executions.

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