EVOLUTION OF RECEPTION EFFICACY AND EXECUTION IN WOMEN'S VOLLEYBALL ACCORDING TO LEVEL OF COMPETITION — A DESCRIPTIVE STUDY AGED FROM 14-YEAR-OLD TO ADULT PROFESSIONAL PLAYERS

Carlos J. Echeverría,[1, B, C, D] Enrique Ortega,[1, C, D, E] José M. Palao[2, A, C]

[1] University of Murcia, Department of Physical Activity and Sport, Spain
[2] University of Wisconsin-Parkside, Department of Health, Exercise, Science and Sport Management, Kenosha
[A] Study Design; [B] Data Collection; [C] Statistical Analysis; [D] Manuscript Preparation; [E] Funds Collection

Address for correspondence:
José M. Palao
University of Wisconsin Parkside (Kenosha, United States)
Department of Health, Exercise Science and Sport Management
900 WOOD ROAD · P.O. BOX 2000 · KENOSHA, WI 53141-2000
E-mail: palaojm@gmail.com

Abstract The aim of this study was to determine the technical performance profile of service reception with regard to execution and efficacy level according to level of competition in women's volleyball. The sample of the study was composed of a total of 6,311 game phases from 187 sets in 48 matches played during season 2005–2006 by the following divisions: under-14, under-16, under-18, 2nd national senior division, 1st national senior division, and international senior division. The design of the study was a descriptive and inter- and intra-group correlational one. The variables studied included level of competition, technique used to serve, technique used to receive, zone where the reception was executed, and efficacy of reception. The results indicated that at higher levels of competition: a) there is higher efficacy in reception; b) number of errors decreases; and c) proportion of receptions that allow one or more attacking options for the receiving team increases. As level of competition increases, the effect of service on reception decreases, and receiving zones are more diverse. This study establishes the technical and tactical service-reception profiles in women's volleyball, compares them, and establishes the dependence between variables to understand how the action changes throughout the levels of competition.

Key words team sport, sport performance, match analysis, developmental stage

Introduction

Athletes improve their performance all over their learning process (Stamm et al., 2003). This improvement comes from gaining skills, experience (Elferink-Gemser, Visscher, Lemmink, Mulder, 2007; Grgantov, Katic, Jankovic, 2006; Rikberg, Raudsepp, 2011; Viviani, 2004) and changes in physical maturation (e.g. gains of weight

and height) (Malina, Eisenmann, Cumming, Ribeiro, Aros, 2004). In team sports, performance in-game actions is the result of the interaction between players of both teams. In volleyball, these interactions are affected by the height of the net that separates both teams on the court, and the number of ball contacts allowed in a rally. The team with the ball tries to send it over the net in such a way that it touches the opponent's court floor or in a way that the opponents cannot control (Selinger, Ackermann-Blount, 1985). On the other hand, the opponent team tries, with its arrangement and actions, to neutralize the ball and build an offensive movement (Federation Internationale de Volleyball [FIVB], 2016). These interactions should change, as well as the characteristics of players along their training process (technical proficiency, physical abilities, aging expertise, etc.).

In volleyball, the game begins with the serve-reception sequence. Receivers try to neutralize the serve and pass the ball as best as possible to the setter (João, Carvalho, Sattler, Mota, 2007; Palao, Ahrabi-Fard, 2014; Silva, Lacerda, João, 2014b; Zetou, Moustakidis, Tsigilis, Komninakidou, 2007). If the passing action achieves its goal, chances of success in the rally increase significantly (Bergeles, Barzouka, Nikolaidou, 2009; Costa et al., 2011; Laios, Kountouris, 2005; Palao, Santos, Ureña, 2006). Reception performance is linked to serving performance (Afonso, Moraes, Mesquita, Marcelino, Duarte, 2009; Stamm et al., 2003; Ureña, León, González, 2013), and throughout the whole developmental process of players arise imbalances between both performances (García-Alcaraz, Palao, Ortega, 2014). In youth women's volleyball, serving is more relevant than passing in rally success (Grgantov et al., 2006), though passing improves its performance over the years of player development (Inkinen, Häyrinen, Linnamo, 2013; Zadraznik, Marelic, Resetar, 2009). In the developmental stages, there are a few issues that affect passing performance, such us height of the net (FIVB, 2016), type of serving techniques (Gil, Moreno, Moreno, García, Del Villar, 2011), physical condition (Stamm et al., 2003), own technical performance of the receivers (Zadraznik et al., 2009), or team's tactics (Dávila-Romero, García-Hermoso, 2012).

As age increases, there is an increase in serving performance, regardless of serving technique, in women's volleyball (García-Alcaraz et al., 2014). The changes in physical condition (Costa, Afonso, Brant, Mesquita, 2012), serving techniques (Gil et al., 2011), and height of the net (FIVB, 2016) may alter the serve-receive sequence. Understanding techniques of reception, zones where it is made, tactics in reception or the reference values of efficiency on every competition level could enhance the knowledge about the developmental process of female volleyball players. The aim of the study was to know the technical profile of performance in reception according to the competition level in women's volleyball.

Methodology

The sample included 6,311 receptions played in 187 sets, corresponding to 48 volleyball matches, eight matches of each level of competition (U-14, U-16, U-18, 2nd national division, 1st national division, and international level), during season 2005–2006. It was an incidental sample (Pereda, 1987). The distribution of the sample is described in Table 1. The study project was pre-approved by the ethics commission of the principal researcher, in compliance with the principles of Helsinki's Declaration.

The design of the study was descriptive punctual, nomothetic, multidimensional, inter- and intra-group correlational (Anguera, 2003). The variables discussed in the study were: level of competition (Spanish national U-14 championship, Spanish national U-16 championship, Spanish national U-18 championship, Spanish senior 2nd national division, Spanish senior 1st national division, and senior international level (World Championship)), serve technique (standing serve, float-jump serve, and power-jump serve), reception technique (forearm, overhead, and

others), reception efficacy (on a scale from 0 to 3), and reception zone (6 zones). The variables registered are part of the observation instrument (Observation Instrument of Techniques and Efficacy in Volleyball) that was designed and validated by J. Palao and P. Manzanares (2009) and J. Palao, P. Manzanares and E. Ortega (2015), respectively.

Table 1. Distribution of the sample for the different age groups and levels of competition (women volleyball)

Sample	Levels						Total
	U-14	U-16	U-18	2nd national	1st national	international	
Matches	8	8	8	8	8	8	48
Sets	29	35	32	27	31	33	187
Sequences	1,142	1,036	922	1,136	1,118	957	6,311

Reception efficacy was evaluated in relation to the success of the action and the options it gave to the offense of the team. The following four levels of efficacy were differentiated: error, no attack options, limited attack options, and maximum attack options (Palao et al., 2015). For the categories of reception performance, an efficacy coefficient (sum of attempts per category multiplied by value of the level and divided by total attempts (0–3)), a point-to-error ratio, and an efficiency value (points or perfect actions minus errors) were calculated.

All recordings were made in public sporting events without any influence in the game. All of them were official matches recorded with a video camera in live performance by the researchers or coaches. The observation was made by a single observer. He had a Sport Science university degree, had the highest coaching certification in Spain, and had more than five years of experience as a coach and volleyball analyst. The observer was previously trained in the TEVOL observation instrument (Palao, Manzanares, 2009). After the training period, inter- and intra-observer reliability were calculated (Cronbach's Alpha). To calculate the intra-observer reliability, another researcher's conclusions were used as a reference. This researcher also held a Sport Science degree, had the highest coaching certification in Spain, and had more than ten years of experience. The results showed 0.82 in inter-observer reliability and 0.96 in intra-observer reliability.

A TEVOL observation sheet was generated for each match of the sample. In those sheets were the descriptive variables of the match: level, teams, player line-up, position, and starting rotation. After that, all observation sheets were joined in a single Excel spreadsheet and then it was transferred to the statistical software SPSS 21.

A descriptive analysis (occurrence, occurrence percentage, arithmetic mean, standard deviation of the mean and coefficient of performance values) and an inferential analysis was made. The Kolmogorov-Smirnov test was used to analyze the normality of the sample. The chi-square test was used to study the differences in each category. The U of Mann-Whitney was used to analyze the differences between categories. The analysis was made with the SPSS 21 software. The level of significance was established by $p < 0.05$.

Results

There were no significant differences between levels of competition in the frequency of the use of the forearm technique (Table 2). In the use of the overhand technique there was a significant lower use from the U-16 category to U-18 and senior levels. The 'errors' had significantly higher occurrence in U-14 level and significantly lower in international level. Comparing efficiency between levels in both techniques, there was noted a significantly higher

coefficient of efficacy, percentage of efficacy and efficiency, which increased with every next level (from younger to senior levels). The percentage of errors was significantly higher in U-14 and U-16 than U-18 and the senior levels.

Table 2. Efficacy of service reception technique according to levels of competition (women volleyball)

Service reception technique	U-14		U-16		U-18		2nd national		1st national		International	
	mean	SD	mean	SD	mean	SD	mean	SD	mean	SD	mean	SD
Forearm contact												
Coefficient	1.53[cdef]	0.04	1.75[cdef]	0.02	1.94[abdef]	0.06	2.17[abce]	0.05	2.26[abcd]	0.02	2.29[abc]	0.11
Efficacy (%)	7.57[bdfe]	1.68	15.3[adef]	1.30	19.62[def]	8.97	34.56[abce]	7.46	40.04[abcd]	3.61	38.86[abc]	6.17
Error (%)	17.38[def]	2.27	13.8[def]	1.99	17.25	17.79	4.92[ab]	1.77	2.98[ab]	0.82	2.82[ab]	1.95
Efficiency	−9.8[bdef]	3.20	1.5[adef]	3.19	2.38[def]	14.82	29.64[abc]	8.05	37.06[abc]	3.11	36.04[abc]	8.07
Ratio	1 : −1.11[bdef]	2.29	1 : 8.4[adef]	2.22	1 : 11[def]	8.42	1 : 32.1[abc]	7.71	38.55[abc]	3.34	1 : 37.45[abc]	7.12
Occurrence	958		973		884		1,089		1,072		914	
Frecuency (%)	88.1		91.1		93.9		94.0		93.8		94.3	
Underhand contact												
Coefficient	1.46	0.06	1.66[de]	0.25	1.97[de]	0.10	2.15[ab]	0.14	2.27[abc]	0.15	2.41	0.47
Efficacy (%)	2.6[f]	3.09	12.9	9.90	14.6	10.49	20.6	13.96	28.28	16.35	20.4[a]	9.50
Error (%)	16.82[cdef]	6.54	15.9	12.61	3.62[a]	4.27	1.66[a]	3.71	–	–	2.07[a]	4.15
Efficiency	−14.22[cdef]	6.73	−3	19.10	10.98[a]	8.58	18.94[a]	12.48	28.28[a]	16.35	18.32[a]	11.31
Ratio	1 : −5.81[cdef]	4.09	1 : 4.95	13.85	1 : 12.79[a]	9.34	1 : 19.77[a]	13.11	1 : 28.28[a]	16.35	1 : 19.36[a]	10.23
Occurrence	89[+]		58		36		38[−]		45		40	
Frecuency (%)	8.2		5.4		3.8		3.3		3.9		4.1	
Other technique												
Coefficient	–	–	1.41	0.96	–	–	0.69	0.94	0.75	1.5	1.25	0.96
Efficacy (%)	–	–	–	–	–	–	31.25	52.04	–	–	–	–
Error (%)	–	–	–	–	25	0	12.5	28.87	–	–	–	–
Efficiency	–	–	–	–	−25	50	18.75	62.5	–	–	–	–
Ratio	–	–	–	–	1 : −12.5	25	1 : 25	54	–	–	–	–
Occurrence	–		5		2		9[+]		1		3	
Frecuency (%)	–		0.5		0.2		0.8		0.1		0.3	
No contact												
Occurrence	40[+]		32		19		23		25		12[−]	
Frecuency (%)	3.7		3.0		2.0		2.0		2.2		1.2	

Note. [a] $p < .05$ in U-14; [b] $p < 0.05$ in U-16; [c] $p < 0.05$ in U-18; [d] $p < 0.05$ in 2nd national division; [e] $p < 0.05$ in 1st national division; [f] $p < 0.05$ in international, – o + statistical significance of .05 (chi square test); – o + relationship found (positive or negative).

In reception performance (Table 3), forearm and overhand techniques was noted with a statistically significant decrease in percentage of errors and receptions that limit attack options, from the lower level of competition to the highest. Receptions that allow all options in attacking had a significantly higher increase from the lower levels to the U-18 and the senior levels. With respect to areas of service reception (Table 4), both forearm and overhand techniques had a higher number of zones used at professional levels than at the lower levels of competition.

Table 3. Performance of service reception technique according to levels of competition (women volleyball)

Service reception technique	U-14		U-16		U-18		2nd national		1st national		International	
	n	%	n	%	n	%	n	%	n	%	n	%
	Forearm contact											
Error	168[+]	17.5	133[+]	13.7	62	7.0	55[−]	5.1	29[−]	2.7	34[−]	3.7
No attack	193[+]	20.1	161[+]	16.5	100	11.3	98[−]	9.0	87[−]	8.1	40[−]	4.4
Limit attack	524	54.7	530	54.5	544[+]	61.5	586	53.8	542[−]	50.6	509	55.7
All attacks allowed	73[−]	7.6	149[−]	15.3	178[−]	20.1	350[+]	32.1	414[+]	38.6	331[+]	36.2
	Underhand contact											
Error	14[+]	15.7	10[+]	17.2	2	5.6	1	2.7	–	–	1	2.5
No attack	22[+]	24.7	8	13.8	4	11.1	1	2.7	1[−]	2.2	–	–
Limit attack	50	56.2	32	55.2	23	63.9	26	70.3	28	62.2	31	77.5
All attacks allowed	3[−]	3.4	8	13.8	7	19.4	9	24.3	16[+]	35.6	8	20.0
	Other technique											
Error	–	–	2	100.0	3[+]	33.3	–	–	–	–	–	–
No attack	1	20.0	–	–	2	22.2	–	–	1	33.3	1	20.0
Limit attack	4	80.0	–	–	3	33.3	1	100.0	2	66.7	4	80.0
All attacks allowed	–	–	–	–	1	11.1	–	–	–	–	–	–

Note. – o + statistical significance of $p < 0.05$ (chi square test); – o + relationship found (positive or negative).

Table 4. Efficacy of service reception technique according to performing area and levels of competition (women volleyball)

Performing area	U-14		U-16		U-18		2nd national		1st national		International	
	n	coefficient	n	coefficient	n	coefficient	n	coefficient	n	coefficient	n	coefficient
1	2	3	4	5	6	7	8	9	10	11	12	13
	Forearm contact											
Zone 1	140[−]	1.64[bcdef]	147[−]	1.65[acdef]	168	1.88[abdef]	250[+]	2.05[abc]	230	2.21[abc]	225[+]	2.24[abc]
Zone 2	3	1.67[bdef]	3	1.33[af]	4	2.00[f]	5	2.20[a]	10[+]	2.00[a]	5	1.80[af]
Zone 3	3[−]	1.00[cdf]	12	1.25	10	1.80[a]	16	1.94[a]	18	2.61	6	2.00[a]
Zone 4	3	2.33[df]	8	1.88[e]	6	1.17	1[−]	2.00[a]	14[−]	2.57[b]	6	2.17[a]
Zone 5	221[−]	1.56[f]	246	1.74	280[+]	1.89	310	2.11	356[+]	2.21	247	2.26[a]
Zone 6	588[+]	1.48	557[+]	1.73	416	2.03	507	2.19	444[−]	2.28	425	2.25
Total in frontrow	9	1.67[cdef]	23	1.49[def]	20	1.66[adef]	22	2.02[abc]	42	2.39[abc]	17	1.99[abc]
Total in backrow	949	1.56[cdef]	950	1.71[def]	864	1.93[a]	1,067	2.12[ab]	1,030	2.23[ab]	897	2.25[ab]
	Underhand contact											
Zone 1	8[−]	1.88[def]	10	1.60[def]	5	1.80	11	2.27[ab]	15	2.53[ab]	16[+]	2.06[ab]
Zone 2	–	–	–	–	–	–	1	2.00	1	2.00	–	–
Zone 3	–	–	–	–	2	1.80	1	3.00	2	2.50	–	–
Zone 4	1	1.00	–	–	–	–	–	–	–	–	–	–
Zone 5	22	1.23	17	1.76	12	1.75	12	1.92	16	2.25	15	2.27
Zone 6	58[+]	1.52	31	1.61	17	2.29	12	2.25	11[−]	2.18	9[−]	2.11
Total in frontrow	1	1.00	0	–	2	1.80	2	2.50	3	2.25	0	–
Total in backrow	88	1.54[def]	58	1.66[def]	34	1.95	35	2.15[ab]	42	2.42[ab]	40	2.15[ab]
	Other tecnique											
Zone 1	–	–	1	2.00	–	–	–	–	1	1.00	3	1.25
Zone 2	–	–	–	–	–	–	1	0.00	–	–	–	–
Zone 3	–	–	–	–	–	–	1	0.00	–	–	–	–
Zone 4	–	–	–	–	–	–	2	1.00	–	–	–	–

	1	2	3	4	5	6	7	8	9	10	11	12	13
Zone 5	–	–	–	–	1	0.00	1	2.00	–	–	–	–
Zone 6	–	–	4	1.75	1	0.00	4	1.75	–	–	–	–
Total in frontrow	–	–	–	–	–	–	4	0.33	–	–	–	–
Total in backrow	–	–	5	2.87	2	0.00	5	1.87	1	1.00	3	1.25

Note. [a] $p < 0.05$ in U-14; [b] $p < 0.05$ in U-14; [c] $p < 0.05$ in U-14; [d] $p < 0.05$ in 2nd national division; [e] $p < 0.05$ in 1st national division; [f] $p < 0.05$ in international, – o + statistical significance of $p < 0.05$ (chi square test); – o + relationship found (positive or negative).

In the reception performance according to serve technique (Table 5), there was a significant decrease of errors and receptions that did not allow attack options for the standing serves and the jump-float serves from the younger levels of competition to the U-18 and the senior levels. Passes that allowed all offense options from the standing serves, and the jump-float serves had a significantly higher increase from U-14 and U-16 levels to international level. Efficacy in reception that allowed all attack options in a game-sequence rose significantly from the U-14 and U-16 levels to the 1st national division level.

Table 5. Performance of service reception according to serving technique and levels of competition (women volleyball)

Performance	U-14		U-16		U-18		2nd national		1st national		International	
	n	%	n	%	n	%	n	%	n	%	n	%
	Reception of standing serve											
Error	203+	20.04	124+	13.84	58	8.61	48–	6.10	21–	3.08	22–	4.19
No attack	195+	19.25	143+	15.96	72	10.68	69–	8.77	57–	8.37	17–	3.24
Limit attack	539	53.21	486	54.24	396	58.75	422	53.62	321	47.14	280	53.33
All attacks allowed	76–	7.50	143–	15.96	148	21.96	248+	31.51	282+	41.41	206+	39.24
	Reception of power-jump serve											
Error	14+	19.72	26+	37.14	3	15.79	18	10.78	14–	6.70	14–	6.36
No attack	20+	28.17	13	18.57	2	10.53	18	10.78	16	7.66	17	7.73
Limit attack	35	49.30	25–	35.71	10	52.63	80	47.90	105	50.24	134+	60.91
All attacks allowed	2–	2.82	6–	8.57	4	21.05	51	30.54	74+	35.41	55	25.00
	Reception of jump-float serve											
Error	–	–	19+	20.00	24	9.84	11	5.56	17	6.85	10	4.63
No attack	–	–	18+	18.95	29+	11.89	12	6.06	15	6.05	6–	2.78
Limit attack	–	–	52	54.74	158	64.75	108	54.55	141	56.85	124	57.41
All attacks allowed	–	–	6–	6.32	33–	13.52	67+	33.84	75	30.24	76+	35.19

Note. – o + statistical significance of $p < 0.05$ (chi square test); – o + relationship found (positive or negative).

Table 6. Efficacy of service reception according to serving technique and levels of competition (women service)

Reception's technique	U-14		U-16		U-18		2nd national		1st national		International	
	n	coefficient	n	coefficient	n	coefficient	n	coefficient	n	coefficient	n	coefficient
1	2	3	4	5	6	7	8	9	10	11	12	13
	Reception of standing serve											
Forearm	894	1.53[bcdef]	825	1.76[a]	635	1.97[adef]	743	2.17[ac]	638	2.26[ac]	498	2.34[ac]
Underhand	84	1.49[def]	48	1.8[def]	26	1.99	29	2.12[ab]	33	2.28[ab]	25	2.09[ab]
	Reception of power-jump serve											
Forearm	64	1.45[def]	59	1.27[def]	16	2.22	156	2.08[ab]	198	2.28[ab]	211	2.14[ab]
Underhand	7	1.33	–	–	2	2.00	–	–	3	2.25	–	–

1	2	3	4	5	6	7	8	9	10	11	12	13
				Reception of jump-float serve								
Forearm	–	–	86	1.52[cdef]	233	1.85[bdef]	189	2.17[bc]	233	2.21[bc]	219	2.29[bc]
Underhand	–	–	6	1.22	8	1.83	7	2.27	8	2.29	13	2.29

Note. [a] $p < 0.05$ in U-14; [b] $p < 0.05$ in U-14; [c] $p < 0.05$ in U-14; [d] $p < 0.05$ in 2nd national division; [e] $p < 0.05$ in 1st national division; [f] $p < 0.05$ in international.

In the reception efficacy according to reception technique (Table 6), the forearm technique had a significantly higher coefficient of efficacy from lower levels to senior levels. The overhand technique significantly increased its efficiency of standing services from lower levels to senior levels.

Discussion

The results show the evolution of reception execution and its performance throughout the different levels of competition in women's volleyball. The results showed that forearm technique was the most employed in all levels. The significantly higher occurrence of error in the lowest level studied, U-14, showed the importance of experience and practice during the early stages of training. The tactical reception system needs time to develop, in addition to the development of technical abilities (Dávila-Romero, García-Hermoso, 2012), knowledge of its organization and the right decision of what is needed (Grgantov et al., 2006; Rikberg, Raudsepp, 2011). The occurrence of these errors in early stages could be related to a problem of the player's ability to estimate the ball's trajectory, a wrong choice of the place where it could be played or a mistake in the decision making (miscommunication among players). All of these issues are related to the lack of experience and maturity in early stages of training (Elferink-Gemser et al., 2007; Malina et al., 2004).

The results of reception performance showed that a higher level of competition, there is higher performance in reception. These results coincide with other studies about the evolution of service reception in different levels (Elferink-Gemser et al., 2007; García-Alcaraz et al., 2014; Grgantov et al., 2006; Inkinen et al., 2013). It is confirmed that the experience and maturity does influence the execution of this action and the decision making involved (Araujo, Afonso, Mesquita, 2011; Berry, Abernethy, 2009; Malina et al., 2004). The improvement in reception is so significant that it becomes a predictor of success in the final score of competitions at high levels (Afonso et al., 2009; Silva et al., 2014a; Zetou et al., 2007). All of this is related to the prior action in a game, the service. The authors of this study analyzed the performance of reception according to serving technique. All serving techniques produced a significantly lower reception performance at U-14 and U-16, and higher at U-18 and senior levels. This could be possible due to the improvement in a technique's capacity and the decreased imbalance between serving and reception as observed in U-14 and U-16 (Ureña et al., 2013).

Regarding zones of reception, U-14 showed a low level of performance in four out of six zones compared to higher levels of competition. These findings support the observations done previously about the lower efficacy in reception in early stages of training and the imbalance between service and reception (Selinger, Ackermann-Blount, 1985; Ureña et al., 2013). The results showed that reception done in different zones had the same efficiency. In early stages, zone 6 was the one that had the highest occurrence of receptions. This data may be related to the fact that in early stages of training the servers do not have the intention or the skill to serve to certain zones, trying to hinder the opponent's reception (McGown, Fronske, Moser, 2001; Selinger, Ackermann-Blount, 1985). That could be explained by the conscious decision of trying to prevent any mistakes hitting the ball out, rather than trying a more successful but risky option (Ureña, Santos, Martínez, Calvo, Oña, 2000). There is a connection between

the evolution of serve and reception. The reception is influenced by the power or the hit height in which the serve is made (MacKenzie, Kortegaard, LeVangie, Barro, 2012). Mastery in service technique is required if the players want to broaden the options in opposing zones, as seen in high level of competition.

The information about the zones of reception is helpful comparing the performance in both front row and back row zones in the field. Reception in front-row zones had a significantly lower performance in U-14 and U-16 than the rest of the levels. The reason why it is this way could be connected with the speed and mobility of the player. To do this as well as possible, the players need to have a good physical condition, reaction capacity and technical ability (Elferink-Gemser et al., 2007; Grgantov et al., 2006; Stamm et al., 2003; Ureña et al., 2000). Because of that, coaches in early stages often make use of tactics with more players involved in reception (Selinger, Ackermann-Blount, 1985), and those tactics become more complex and involve less players every time they improve their technique and increase both their ability to move and their decision making.

Conclusions

The results of this study show the performance profile of service reception in women's volleyball, from the lowest to the highest level of competition. The most used reception technique in all analyzed levels was the forearm, regardless of the serving technique. As competition level increases, higher performance of reception is presented. The receptions in front row zones are less efficient in the early stages than at higher levels. Nevertheless, the serving technique has less influence on reception as the level of competition increases. With the level of competition, reception deals with more destination zones of the services.

This information provides insight into the long-term development of this technical skill for female players. This information could help coaches to analyze and evaluate this game action of their players in order to design a working plan adapted to the level of competition. More information is needed about the relationship of this action with other parts of the performance through different developmental stages, such as: tactical variables (efficiency of receiving techniques according to reception systems and the number of players involved), physical condition (of specialist players in reception or of players who need to be added to the attack options), or psychological indicators (performance of reception in the final points of a set or match).

References

Afonso, J., Moraes, J. C., Mesquita, I., Marcelino, R., Duarte, T.C. (2009). Relationship between reception effect, attack type and tempo with performance level in high-level men's volleyball. *Journal of Sports Sciences*, *27*, 128.

Anguera, M.T. (2003). Observational methods (general). In: R. Fernandez-Ballesteros (ed.), *Encyclopedia of psychological assessment* (vol. 2, pp. 632–637). London: Sage.

Araujo, R., Afonso, J., Mesquita, I. (2011). Procedural knowledge, decision-making and game performance analysis in female volleyball's attack according to the player's experience and competitive success. *International Journal of Performance Analysis in Sport*, *11* (1), 1–13.

Bergeles, N., Barzouca, K., Nikolaidou, M.E. (2009). Performance of female setters and attackers on Olympic-level volleyball teams. *International Journal of Performance Analysis of Sport*, *9* (1), 141–148.

Berry, J., Abernethy, B. (2009). Developmental influences on the acquisition of tactical decision-making expertise. *International Journal of Sport Psychology*, *40* (4), 525–545.

Costa, G., Afonso, J., Brant, E., Mesquita, I. (2012). Differences in game patterns between male and female youth volleyball. *Kinesiology*, *44* (1), 60–66.

Costa, G., Caetano, R., Ferrerira, N., Junqueira, G., Afonso, J., Costa, P., Mesquita, I. (2011). Determinants of attack tactics in youth male elite volleyball. *International Journal of Performance Analysis in Sport, 11*, 96–104.

Dávila-Romero, C., García-Hermoso, A. (2012). Acciones finales discriminantes de voleibol en categorías de formación masculina: importancia del saque en los partidos igualados. *International Journal of Sport Science, 8* (28), 151–160.

Elferink-Gemser, M.T., Visscher, C., Lemmink, K.O.P.M., Mulder, T. (2007). Multidimensional performance characteristics and standard of performance in talented youth field hockey players: A longitudinal study. *Journal of Sports Sciences, 25* (4), 481–489.

Fédération Internationale de Volleyball (2016). Official Volleyball Rules 2017-2020. Retrieved from: http://www.fivb.org/EN/Refereeing-Rules/documents/FIVB-Volleyball_Rules_2017-2020-EN-v06.pdf (21.04.2016).

García-Alcaraz, A., Palao, J.M., Ortega, E. (2014). Technical-tactical performance profile of reception according to competition category in men volleyball. *Kronos, 13* (1). Retrieved from: http://g-se.com/es/journals/kronos/articulos/perfil-de-rendimiento-tecnico-tactico-de-la-recepcion-en-funcion-de-la-categoria-de-competicion-en-voleibol-masculino-1706 (2015).

Gil, A., Moreno, M.P., Moreno, A., García, L., Del Villar, F. (2011). Estudio del saque en jóvenes jugadores/as de voleibol, considerando la eficacia y función en juego. *Retos. Nuevas tendencias en Educación Física, Deporte y Recreación, 19*, 19–24.

Grgantov, Z., Katic, R., Jankovic, V. (2006). Morphological characteristics, technical and situation efficacy of young female volleyball players. *Collegium Antropologicum, 30* (1), 87–96.

Inkinen, V., Häyrinen, M., Linnamo, V. (2013). Technical and tactical analysis of women's volleyball. *Biomedical Human Kinetics, 5*, 43–50.

João, P.V., Carvalho, J, Sattler, T., Mota, M.P. (2007). *Attack organization in-system and off-system by the setter, in volleyball team of Castelo Da Maia Ginásio.* Paper presented at the XII Annual Congress of the ECSS, Jyväskylä, Finland.

Laios, Y., Kountouris, P. (2005). Evolution in men's volleyball skills and tactics as evidence in the Athens 2004 Olympic Games. *International Journal of Performance Analysis in Sport, 5* (2), 1–8.

MacKenzie, S., Kortegaard, K., LeVangie, M., Barro, B. (2012). Evaluation of two methods of the jump float serve in volleyball. *Journal of Applied Biomechanics, 28*, 579–586.

Malina, R.M., Eisenmann, J.C., Cumming, S.P., Ribeiro, B., Aroso, J. (2004). Maturity-associated in the growth and functional capacities of youth football (soccer) players 13-15 years. *European Journal of Applied Physiology, 91*, 555–562.

McGown, C., Fronske, H., Moser, L. (2001). *Coaching volleyball: building a winning team.* Needham Heights: Allyn & Bacon.

Palao, J.M., Ahrabi-Fard, I. (2014). Effect of jump set usage on side-out phase in women's college volleyball. *Journal of Sport Human Performance, 2* (3), 1–10.

Palao, J.M., Manzanares, P. (2009). *Manual for observation instrument of techniques and efficacy in volleyball.* Spain: Murcia.

Palao, J.M., Manzanares, P., Ortega, E. (2015). Design, validation, and reliability of an observation instrument for technical and tactical actions in indoor volleyball. *European Journal of Human Movement, 34*, 75–95.

Palao, J.M., Santos, J.A., Ureña, A. (2006). Effect of reception and dig efficacy on spike performance and manner of execution in volleyball. *Journal of Human Movement Studies, 51* (4), 221–238.

Pereda, S. (1987). *Psicología experimental.* Madrid: Pirámide.

Rikberg, A., Raudsepp, L. (2011). Multidimensional performance characteristics in talented male youth volleyball players. *Pediatric Exercise Science, 23* (4), 537–548.

Selinger, A., Ackermann-Blount, J. (1985). *Arie Selinger's power volleyball.* New York: St. Martin Press.

Silva, M., Lacerda, D., João, P.V. (2014a). Game-related volleyball skills that influence victory. *Journal of Human Kinetics, 41* (1), 173–179.

Silva, M., Lacerda, D., João, P.V. (2014b). Match analysis of discrimination skills according to the setter defense zone position in high level volleyball. *International Journal of Performance Analysis in Sport, 14* (2), 463–472.

Stamm, R., Veldre, G., Stamm, M., Thomson, K., Kaarma, H., Loko, J., Koskel, S. (2003). Dependence of young female volleyballers' performance on their body build, physical abilities, and psycho-physiological properties. *The Journal of Sports Medicine and Physical Fitness, 43* (3), 291–299.

Ureña, A., León, J., González, M. (2013). Study about game continuity in children's volleyball. *Revista Internacional de Medicina y Ciencias de la Actividad Física y el Deporte, 13* (49), 149–162.

Ureña, A., Santos, J.A., Martínez, M., Calvo, R., Oña, A. (2000). Defensive facilitation through serving in high level female volleyball. *Revista Motricidad, 6*, 175–189.

Vivinai, F. (2004). The somatotype of "amateur" Italian male volleyball-players. *Papers on Anthropology, 13*, 286–293.

Zadraznik, M., Marelic, N., Resetar, T. (2009). Differences in rotations between the winning and losing teams at the youth European volleyball championships for girls. *Acta Universitatis Palackianae Olomucensis Gymnica*, *39* (4), 33–40.

Zetou, E., Moustakidis, A., Tsigilis, N., Komninakidou, A. (2007). Does effectiveness of skill in complex I predict win in men's Olympic volleyball games? *Journal of Quantitative Analysis in Sport*, *3* (4), 1–11.