BEACH VOLLEYBALL TECHNIQUES AND TACTICS: A COMPARISON OF MALE AND FEMALE PLAYING CHARACTERISTICS

Christina Koch and Markus Tilp

Institute of Sports Science, University of Graz, Austria

Original scientific paper
UDC: 796.325:796.092:167.2(-055.1)(-055.2)

Abstract:

The aim of the study was to compare the playing characteristics of male and female athletes in professional beach volleyball. Video material, including 15 matches from the women's and 14 matches from the men's Grand Slam in Klagenfurt 2005, was analysed with the game analysis software "Statshot". Applied technique, position, quality, direction and movement behaviour of athletes were evaluated. By analysing every action of the six basic beach volleyball elements - *serve*, *reception*, *setting*, *attack*, *block* and *defence* - it was possible to gain complete game statistics.

The comparison indicated that male and female top players apply different techniques for success. Chi-square tests were used to evaluate significant differences between genders. The differences in distributions of applied techniques were significant for all six elements: *service* ($p<.01$), *reception* ($p<.05$), *setting* ($p<.01$), *attack* ($p<.01$), *block* ($p<.01$) and *defence* ($p<.01$). Concerning quality distribution, statistical significance was found only within the elements *serve* and *attack*. Tactical considerations and gender-specific differences in anthropometry and physiology may be reasons for the different approaches.

Key words: *notational analysis, differences, gender*

Introduction

Beach volleyball, which is played two against two on an 8 x 16 m court, is a worldwide growing sport at all performance levels and it became an official sport at the Olympic Games in 1996. The 2006 World Tour featured 29 events in 5 continents, including 15 tournaments for women and 14 for men. This presence of tournaments gives women an equal or even better opportunity than men to perform their sport at high performance events.

Various studies in the past focused on the characteristics of the game (Hömberg & Papageorgiou, 1994; Hansen, 2002; Papageorgiou & Hömberg, 2004). The aim of those studies was to obtain general knowledge about the applied techniques and physical demands (e.g. number of executed jumps, sprints). They also describes the time structure of the game like match duration, recovery time between rallies, time-outs per set and so on.

A change of rules in 2001 (reduction of court dimension and implementation of rally score system) encouraged the authors (Grgantov, 2005; Kröger, 2006; Ronglan & Grydeland, 2006) to find out how these interventions by theFédération Internationale de Volleyball (FIVB) affected the game. Some studies concentrated particularly on the different court dimensions and their effects on performance (Giatsis & Tzetzis, 2003; Giatsis, Papadopoulou, Dimitrov, & Likesas, 2003), others investigated if the changes in the scoring system affected the duration of the game (Giatsis, Zetou, & Tzetzis, 2005). The studies concluded that the improvements have not satisfied all FIVB intentions, such as an increase in successful court defence actions (Grgantov, 2005; Ronglan & Grydeland, 2006). Another focus of research deals with the differences between the winning and losing teams (Giatsis & Tzetzis, 2003; Michalopoulou, Papadimitriou, Lignos, Taxildaris, & Antoniou, 2005). The authors discovered that attack efficiency and error percentage are the primary factors for winning a match. Publications show that such game analysis approaches are very common in sports science and have also been applied in, e.g. indoor volleyball (e.g. Zetou, Tsigilis, Moustakidis, & Komninakidou, 2006).

The results of all the mentioned investigations provide an insight into how world class players perform. However, an objective comparison of male and female playing characteristics is still missing in literature. We hypothesized that the gender differences in anthropometric and athletic properties (e.g. strength) as well as the different net heights (2.24 vs

2.43 m) on the same field size (8x16 m) would be reflected in the game. Therefore, the aim of this study was to analyse the technical and tactical behaviour of female and male beach volleyball professionals and discover any gender differences.

Methods

Sample

Video material was taken at the FIVB Grand Slam in Klagenfurt 2005. The games were recorded with one camera, which was placed behind the court. For a good perspective on the court, the score board and the officials, such as referees and linesmen, the videos were filmed from an elevated position. Exact placement and elevation of the camera was dependent on the local possibilities. Distance from the baseline was about 17 metres and height above the court was about 5 metres.

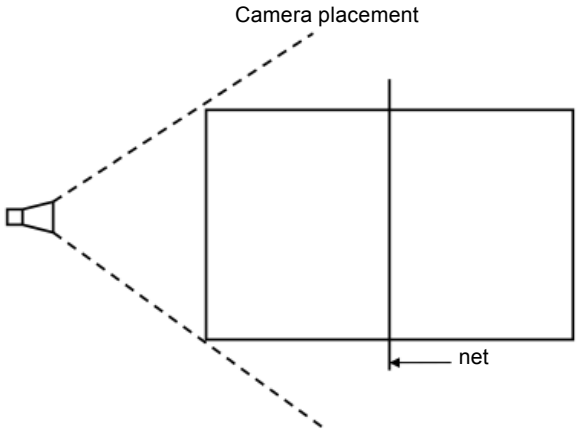

Figure 1. Sketch of the camera placement (overhead view).

The sample included 15 matches from the women's and 14 from the men's competition. Due to the fact that a beach volleyball match is won by the team that wins two sets, a game can last two or three sets. In our study women played on average 2.1 sets and men 2.6 sets per game. Therefore, the women's sample consisted of 7,393 and men's sample consisted of 7,776 analysed actions.

Analysis and statistics

To analyse the beach volleyball games, we used "Statshot" (Tilp, Koch, Stifter, & Rupert, 2006), a software tool for notational analysis in different types of sports. It can be applied for basic game analysis by coaches, who are often interested in immediate information between matches, as well as for comprehensive sport scientific studies. A rally in volleyball or beach volleyball generally consists of six important technical-tactical elements (Hughes & Franks, 2004). In the present study the six elements - *serve*, *reception*, *setting*, *attack*, *block* and *defence* - were investigated with respect to different criteria. Applied technique and quality of execution were collected from all elements. Within the technical elements *reception*, *setting*, *attack* and *defence* it was necessary to gain information about the athlete's action positions. Furthermore, the player's moving behaviour at the moment of defence as well as the direction of serves and attacks were collected.

The quality rating was performed in all cases (except the element *block*) with a 4-point scale: 1) perfect, 2) good, 3) weak, 4) mistake (see Table 1). Depending on weather the analysed interaction was executed with an opponent or a team-mate, quality ratings had to be differentiated. The highest level, "perfect" (1) was either reached if actions led to a direct point (when played to the opponent) or if the ball reached an optimal position for the next action (when played to a team-mate). Similarly, a "good" performance (2) was achieved when the action caused problems for the opponent in the following counter-attack preparation or when reception and defence were played next to the best position for a team-mate (e.g. a "good" setting left all opportunities for the attacker although position or height were not ideal). A performance was estimated "weak" (3) when the opponent had no problems or the conditions for one's own team-mate became worse after the rated action. Direct points for the opponents or passes that could not be reached by a team-mate were categorised as "mistakes" (4). For the element *block* we used a 3-point scale, which will be explained later in the text. The ratings were performed by skilled beach volleyball players who were accustomed to the software used.

Table 1. Description of the four grades of quality (Tilp et al., 2006)

Grade of quality	Description
+	**Optimal:** The action leads to a direct point or the quality of the action is optimal.
*	**With effect:** The action does not allow a counter-attack of the opponents or the quality of the action is good.
0	**Without effect:** The action has no influence on the development of the opponent's play or the quality of the action is fair or poor.
-	**Error:** The action leads to a direct point for the opponent.

Reliability and objectivity tests are described in detail elsewhere (Tilp et al., 2006). Briefly, the Scott's Pi coefficients for reliability and objectivity for a test sample of about 100 scenes were .93 and .90, respectively.

After the annotation of every recorded action "Statshot" provides a game statistics and visual

feedback with the associated video clips. Annotations and clips are saved in a common database. A report panel presenting all categories allows the user to create various queries for the clips. Although "Statshot" contains tools for basic statistical analysis, we processed data with MS Excel®. We used chi-square tests to determine whether any differences between male and female play existed. The main focus was laid on the distribution of applied techniques and the distribution of the execution quality. The level of significance was set to p=.05.

Results

The results demonstrate that men and women differ to a greater extent in the choice of techniques than in performance quality. Significant differences were found for the technique distribution of all six elements. On the other hand, any significant differences in quality distribution could hardly be detected. Therefore, the following presentation emphasizes the technique distribution. Specific outcomes concerning quality are mentioned additionally, if observed.

Table 2. p-values from chi-square tests determining any difference between men and women

	Difference in	
Element	Technique	Quality
Serve	<.01	<.01
Reception	.03	.11
Setting	<.01	.09
Attack	<.01	<.01
Block	<.01	.44
Defence	<.01	.45

Serve

The three categories - *jump serve*, *float serve* and *jump float serve* - were used for classification of serve actions. The techniques varied in approach, toss, take-off, and flight characteristic of the ball. For example, *jump serves* generally have a strong rotation and can achieve high velocities exceeding 100 km/h. *Jump float* serves have no spin and follow an erratic path, similarly to *float serves* without a jump (Kao, Sellens, & Stevenson, 1994; Tilp, 2004).

Table 3. Percentages of serve techniques

Serve technique	Men (*N*=1,287)	Women (*N*=1,147)
Jump serve	46.9%	19.9%
Jump float serve	28.7%	32.2%
Float serve	24.4%	48.0%

The results indicate that men and women start a rally in a rather different way (p<.001). Nearly half (47%) of all the analysed serves played by men belong to the category *jump serve*. On the other hand, women performed 48% *float serves* without a jump, 32% *jump float serves* and 20% *jump serves*. With the techniques used women achieved a better percentage of aces (women 5%, men 3%) and "good" serves (women 33%, men 30%) than men. In both sexes the *jump serve* was the most successful technique in terms of direct points (women 9%, men 5%) but also the one with the highest error rate (women, men=18%).

Women preferred line serves to cross-court serves (women 55%, men 49%). Chi-square test for performance quality showed significant differences (p<.01).

Reception

To classify the actions during reception, we used four categories. The most common way of receiving a serve is to position the trunk behind the ball and play it at the midline of the body (*frontal*). Due to the fact that in beach volleyball only two persons have to manage the reception on a court of 64 m², the control of the ball laterally of the body (*lateral*) is a common technique. The category *kneeling* is used when the player has contact with the sand with at least one knee. If the player falls while receiving the ball or performs the reception in an unusual way, the category *trouble* was used.

Table 4. Percentages of reception techniques

Reception technique	Men (*N*=1,126)	Women (*N*=1,026)
Frontal	44.3%	46.8%
Lateral	37.6%	31.9%
Kneeling	11.6%	14.2%
Trouble	6.5%	7.1%

Table 4 illustrates that men and women used the reception techniques in the same quantitative order. Analysis of ball trajectory showed that the tactics of both sexes was to play the ball to a central zone near the net. The most frequently used technique was the *frontal reception* (men 44%, women 47%). *Lateral reception* technique was ranked second (men 38%, women 32%). Worth mentioning is that 55% of the women's and 60% of the men's receptions were executed perfectly (no difference in quality distribution was found, p>.05). Investigation of reception areas showed in both cases that more than 80% of all serves could be reached with one step.

Setting

A setting can be performed with the *overhand pass* or with the *forearm pass* technique. For the *overhand pass*, the player uses both hands simultaneously and contacts the ball above the head. The forearm pass is carried out with joined forearms and the ball is played with the anterior side of both forearms. If the setter decided to attack during the second contact, the action was categorized as *second ball hit*.

Table 5. Percentages of setting techniques

Setting technique	Men (*N*=1,478)	Women (*N*=1,409)
Overhand pass	45.7%	8.8%
Forearm pass	46.1%	83.9%
Second ball hit	8.2%	7.3%

The percentage of played *forearm passes* by men was similar to that of *overhand passes* (46%). However, women performed 84% of their settings with the forearm pass and only 9% with the *overhand pass*. Only 15 out of 44 female players (34%) applied the *overhand pass* technique. The probability that the setter would attack the ball directly was about 8% in both groups. The success rate of these surprising attacks was 47% for women and 48% for men, and therefore below the percentage of successful attacks after a *setting*. Similar to *reception*, the quality of setting is generally excellent and gender-specific differences are minimal, i.e. 77% "perfect" sets by men and 74% by women. All other criteria that estimated quality showed differences below 2% (p>.05).

Attack

Attacks can be subcategorized into *spikes* and *shots*. Although more detailed differentiations are described in literature (Hömberg & Papageorgiou, 1994), we decided to use these main criteria combined with direction information for reasons of working economy. By definition, the *spikes* are executed with maximum power and the ball trajectory after hand contact follows a straight line. On the other hand, the shots are *relatively* softly attacked balls, which are used to place the ball into unprotected areas of the court.

Table 6. Percentages of attack techniques

Attack technique	Men (*N*=1,359)	Women (*N*=1,301)
Cross-court spike	38.9%	30.6%
Line spike	19.7%	18.9%
Cross-court shot	14.6%	20.5%
Line shot	26.9%	30.0%

The probabilities of *shots* or *spikes* in the women's competition are nearly equal. The difference between these types of attacks is only 1% in women competitions, whereas men clearly favour *spikes* (59%) over *shots* (41%). While cross-court *spikes* are the most popular for men (39%), women play about 30% cross-court *spikes* as well as line *shots*. Differences were also observed in the quantitative distribution of *shot* techniques. Every fifth ball from the female hitters but only every seventh ball from the male hitters was a cross-court *shot*. Quality distribution showed a significant difference (p<.01). Men attained about 3% more kills (55%) with their attacks (kill percentage: number of perfect *attacks* divided by the total number of attacks) and 3% more errors (20%) than women (see Figure 2). Therefore, women achieved more "good" *attacks* (+1%) and more "weak" *attacks* (+4%). Nevertheless, *attack* effectiveness (number of directly lost points subtracted from the number of directly won points and then divided by the total number of *attacks*) of the two investigated groups was very similar with 35% for women and 35.6% for men.

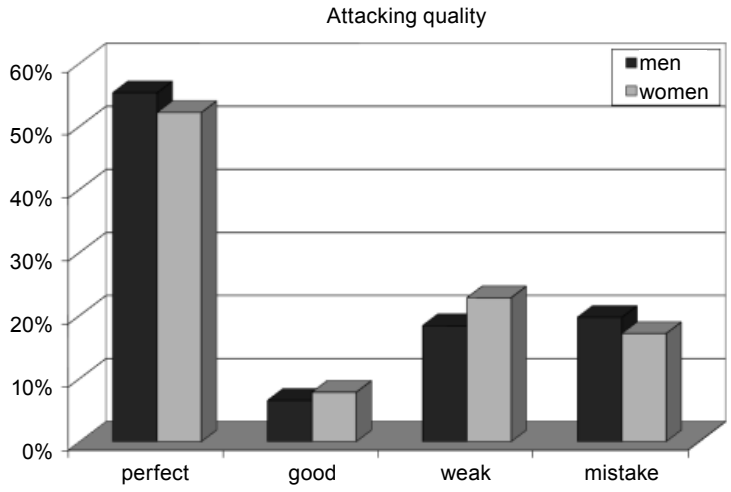

Figure 2. Quality distribution of attacks of male and female world class players in percent (men N=1,359 and women N=1,301).

Block

Blocking actions were annotated in the categories *active block*, *shot block* and *fake block*. If the hands of the blocking player penetrate over the net into the opponent's side, the action was categorized as an *active block*. An action was annotated as a *shot block* if the player reached with her/his hands as high as possible without penetrating into the opponent's court combined with a later timing compared to an *active block*. During a *fake block* a person waits at the net in order to perform a block, but then decides to move backwards to take a defensive position deep in the court.

Table 7. Percentages of block techniques

Block technique	Men (*N*=1,384)	Women (*N*=1,266)
Active block	56.5%	46.5%
Shot block	31.9%	26.6%
Fake block	11.6%	26.9%

The *active block* technique is the most common technique in men's and women's tournaments. During only 12% of all block attempts men leave the net and try to control the opponents attack by court defence. However, in women's tactics the *fake block* is much more important (27%). Female athletes use *fake blocks* to the same extent as shot blocks. The quality of *active blocks* and *shot blocks* was estimated with a three-degree scale (direct point; faultless performance regardless of whether the ball was touched; mistake). No significant differences concerning quality were found for the mentioned techniques between men and women, i.e. 9% direct points and 7% blocking errors by men. Blocks that were performed correctly but did not lead to a point (84%) dominated. A similar situation can be found in women's block statistics. In terms of the effectiveness of *fake blocks*, women achieved better percentages: 67% of their lead to a successful defence or at least to an optimal position for it (men 58%).

Defence

Similar to the attack categories, we divided defence actions in the defences following shots and the defences following spikes. The movement situation of the player at the moment of defence was registered with *in motion*, *after motion* and *standing at a ready position*. Additionally, defences of rebounds were recorded in the category *covering the hitting or the blocking person*. This included rebounds from the opposing blocker after an attack as well as rebounds from the team-mate while blocking the opponent's attack.

While women had to defend more *shots* (46%) than *spikes* (35%), men had more ball contacts following a *spike* (40%) than following a *shot* (38%). The men's statistics also contained more (+3%) annotations in the category *cover the hitting or the blocking person*. The distinction between defences *in motion*, *after motion* and *standing* presents various differences. Men are able to defend attacks (*shots* and *spikes* alike) more often without any movement to the ball *standing* their ready position. In contrast, women often perform defence actions *after motion* (shots +4%, spikes +3%).

Discussion and conclusion

Our results indicate that women apply other strategies than men in international beach volleyball. A statistical difference was found in the selection of serving technique. Although women score twice as many aces with the *jump serve* compared to the other techniques, they use it rarely (just two out of ten). A closer look at the figures gives some ideas as to why women generally prefer the *float serve* without a jump (48%). First, the risk of making a mistake with this technique is the lowest compared to the other techniques, and secondly, it exerts high pressure on the opponent. That means they achieve a greater sum of "perfect" and "good" serves with the *float serve* (42%) than with the *jump serve* (35%). The third explanation could be that it is less exhausting to serve from a standing position than to perform serves that are characterised by a jump. While in 2001 women played 63%

Table 8. Percentages of defended attacks categorised in type of attack and movement of player during defence

Defence technique	Men (*N*=655)	Women (*N*=717)
Digging a shot in motion	27.3%	32.2%
Digging a shot after motion	6.6%	11.2%
Digging a shot at ready position	4.0%	2.4%
Digging a spike in motion	16.3%	14.6%
Digging a spike after motion	6.6%	8.9%
Digging a spike at ready position	16.8%	11.4%
Cover the hitting or blocking person	22.4%	19.2%

float serves (Papageorgiou & Hömberg, 2004), our present results show tendencies towards techniques with jumps. The percentage of jump *float serves* increased from 8% in 2001 to 32% in 2005.

In contrast, the men's data draw a completely different picture. 46% of all serves were *jump serves*. It seems that the fact that male players receive most of the serves in an excellent way, even with the *lateral forearm pass*, forces the serving team to take a high risk. 18% of all *jump serves* ended in a direct point for the opponent. Compared to results from Ronglan and Grydeland (2006), the men's percentage of "perfect" *receptions* in world--class beach volleyball has risen by approximately another 5%, that is, up to 60%.

In the element *reception* the ranking of the used techniques was similar of men and women, though the difference of distribution was significant ($p<.05$). Although the majority of *serves* (85%) came straight towards the receiver, which allowed reaching them with just one step, men used the *lateral reception* technique frequently (38%). This fact can be possibly traced back to the great percentage of *jump serves*, which do not give the receiving person enough time for the second step.

Further differences concerning the use of techniques exist in the element *setting* - 9% of *overhand passes* by women and 46% by men. This is surprising, as experts state that *overhand passing* is the most precise technique. Our results support this statement. While the women's percentage of "perfect" *sets* with the *overhand pass* technique is about 93% and men's about 90%, the proportion of "perfect" *underhand passes* are ranged at 75% (women) and 68% (men). It should be noted that only 34% of all female players and 87% of the male players used the *overhand pass*. This indicates that, especially in the female group, only a small proportion of players seem to favour the *overhand pass* technique. A reason for this behaviour could be the strict penalization of technical errors in overhand passing by referees in recent years. Tilp et al. (2006) analysed data material from the World Championships U18 and U21 in 2003 and their results confirmed a marginal usage of *overhand passes*. Female youth players under the age of 18 played 11% and women under 21 played 6% *overhand passes*. It seems that women have adapted to the rules by avoiding this technique. A more detailed analysis of the *setting* technique revealed that two thirds of the investigated female players, who used this technique, reached a final position below the top ten. Obviously, a good overhand passing technique is an important ability of top--level players.

Unlike the other elements the differences in *attack* were not surprising (Table 6). Female World Tour players use *spikes* and tactical *attacks* nearly to the same extent. Male players favour *spikes* over *shots*. Besides these differences, the cross-court *spike* and the line *shot* are their most frequently played *attacks* in both groups. Compared to Ronglan and Grydeland (2006), the kill percentage of men (in 2001/2002 it was 60% and in 2005 it was 55%) as well as the attack effectiveness have decreased (46% in2001/2002 and 36% in 2005). Also Michalopoulou et al. (2005), who investigated male Greek beach volleyball players in 2000 regarding the effectiveness of their actions, found a higher kill percentage (60%) and attack effectiveness (44%).

For this study every *block* attempt was registered even though the player did not touch the ball. This approach differs from other investigations (e.g. Ronglan & Grydeland, 2006) but was suitable for our research. Thus, for example we obtained information about the defence strategies of teams, how many jumps a world-class player has to manage just to block, and which one of the two players performs the block predominantly. Our study revealed that most of the male teams (18 of 23) performed blocks in a specialized way. This means that one player is either responsible for the *block* or for the *defence*. A male team has to perform on average 44 *block* jumps per match (women 32). The results showed that women used more *fake blocks* (Table 7) while the men's *block* strategy was characterized by energetic activity at the net. *Fake blocks* seem to be more appropriate in a women's competition. This might be the answer to the female tactics of playing more *shots*. Furthermore, *spikes* are not as forceful and the percentage of *attacks* performed far from the net is higher during women's than in men's games.

As expected from the *attack* statistics, men's results show more *defence* contacts *after spikes* while the women's result show that they have to defend more *shots*. A possible reason for the fact that men were able to defend more *attacks*, *spikes*, and *shots* without any movement to the ball could be that the male players were able to reach their defence positions quicker than females. Male defence players also have the advantage that their *block* covers a wider area and therefore it is easier to get into a good defence position. The more aggressive blocking strategy of men, as compared to women, interferes also with the covering behaviour. 22% of all defence contacts are rebounds either from the opposing blocker or from the partner while blocking the opponents attack.

To conclude, quality levels of men and women were alike although they used different techniques in nearly all the investigated elements. Obviously, male and female athletes apply different strategies to reach the required level. Chi-square tests showed no statistical significance in the quality distribution of men and women in the elements *reception*, *setting*, *block* and *defence*. However, quality of *serve* and *attack* depended on the player's gender.

To participate at international tournaments, a particular skill level is needed equally for men or women. The different approaches and solutions of men and women observed in this study might be explained to a certain extent by tactical considerations. Furthermore, some actions might be due to the gender differences in anthropometric characteristics and athletic or physical condition. However, it cannot be clearly answered which of the factors mentioned influences the playing characteristics the most.

References

Giatsis, G., & Tzetzis, G. (2003). Comparison of performance for winning and losing beach volleyball teams on different court dimensions. *International Journal of Performance Analysis in Sport*, *3*(1), 65–74.

Giatsis, G., Zetou, E., & Tzetzis, G. (2005). The effect of rule changes for the scoring system on the duration of the beach volleyball game. *Journal of Human Movement Studies*, *48*, 15-23.

Giatsis, G., Papadopoulou, S.D., Dimitrov, P., & Likesas, G. (2003). Comparison of beach volleyball team performance after the reduction in the court's dimensions. *International Journal of Volleyball Research*, *6*, 2-5.

Grgantov, Z., Katić, R., & Marelić, N. (2005). Effect of new rules on the correlation between situation parameters and performance in beach volleyball. *Collegium Antropologicum*, *29*(2), 717-722.

Hansen, G. (2002). Systematische Spielbeobachtung zur "Weltstandsanaylse" am Beispiel Beachvolleyball. [Systematic game analysis in beach volleyball. In German.] In K. Ferger, N. Gissel & J. Schwier (Eds.), *Sportspiele erleben, vermitteln, trainieren* (pp. 275-282). Hamburg: Czwalina.

Hansen, G. (2003). *Qualitative Spielbeobachtung.* [Qualitative game analysis. In German.] Köln: Sport und Buch Strauß.

Hömberg, S., & Papageorgiou, A. (1994). *Handbuch für Beachvolleyball. Technik, Taktik, Training.* [Handbook for beach volleyball. Techniques, tactics, training. In German.] Aachen: Meyer & Meyer.

Hughes, M., & Franks, I.M. (2004). Notational analysis – a review of the literature. In M. Hughes & I.M. Franks (Eds.), *Notational analysis of sport* (pp. 59–106). New York: Routledge.

Kao, S.S., Sellens, R.W., & Stevenson, J.M. (1994). A mathematical model for the trajectory of a spiked volleyball and its coaching application. *Journal of Applied Biomechanics*, *10*, 95-109.

Kröger, C. (2006). Auswirkungen von Regeländerungen im Beachvolleyball. [Effects of rule changes in beach volleyball. In German.] In M. Raab, A. Arnold, K. Gärtner, J. Köppen, C. Lempertz, N. Tielemann & H. Zastrow (Eds.), *Zukunft der Sportspiele: fördern, fordern, forschen* (pp. 136-139). Flensburg: Flensburg University Press.

Michalopoulou, M., Papadimitriou, K., Lignos, N., Taxildaris K., & Antoniou P. (2005). Computer analysis of the technical and tactical effectiveness in Greek beach volleyball. *International Journal of Performance Analysis in Sport*, *5*(1), 41-50.

Papageorgiou, A., & Hömberg, S. (2004). Vergleichende Strukturanalyse des Sportspiels Beachvolleyball. [Comparative game analysis in beach volleyball. In German.] In K. Zentgraf & K. Langolf (Eds.), *Volleyball – Europaweit 2003* (pp. 33–46). Hamburg: Czwalina

Ronglan, L.T., & Grydeland, J. (2006). The effects of changing the rules and reducing the court dimension on the relative strengths between game actions in top international beach volleyball. *International Journal of Performance Analysis in Sport*, *6*(1), 1–12.

Tilp, M. (2004). Biomechanische Aspekte des Volleyballspiels – Sprung, Schlag und Ballflugbahn. [Biomechanical aspects of volleyball – Jump, smash and ball trajectory. In German.] In K. Zentgraf & K. Langolf (Eds.), *Volleyball – Europaweit 2003* (pp. 99–103). Hamburg: Czwalina.

Tilp, M., Koch, C., Stifter, S., & Ruppert, G. (2006). Digital game analysis in beach volleyball. *International Journal of Performance Analysis in Sport*, *6*(1), 140-148.

Zetou, E., Tsigilis, N., Moustakidis, A., & Komninakidou, A. (2006). Playing characteristics of men's Olympic volleyball teams in complex II. *International Journal of Performance Analysis in Sport*, *6*(1), 172-177.

Submitted: June 2, 2008
Accepted: April 2, 2009

Correspondence to:
Christina Koch, Mag.
Institute of Sports Science
University of Graz
Mozartgasse 14, 8010 Graz, Austria
E-mail: christina.koch@uni-graz.at
Phone: + 43 316 380 8330
Fax: + 43 316 380 9790

Acknowledgement

This study was supported by a grant (Project P 18600) from the Austrian Science Fund FWF.

TEHNIKA I TAKTIKA ODBOJKE NA PIJESKU: USPOREDBA KARAKTERISTIKA IGRE MUŠKARACA I ŽENA

Sažetak

Uvod

Dosadašnja istraživanja u odbojci na pijesku orijentirala su se na utvrđivanje razlika između pobjedničkih i poraženih ekipa, na učinke promjena pravila igre i opće karakteristike igre (vremensku strukturu, tehniku, taktiku i fizičke zahtjeve). Razlike u igri između muškaraca i žena mogle su se vidjeti u tim istraživanjima, ali nisu bile identificirane. Cilj je ovog istraživanja fokusirati se upravo na spolne razlike u igri profesionalnih igrača i igračica odbojke na pijesku. Pretpostavka za istraživanje bila je da će se razlike u antropometrijskim karakteristikama i fizičkim sposobnostima između dva spola, kao i visina mreže (2.24 za žene i 2.43 m za muškarce) na igralištu istih dimenzija (8 x 16 m) odraziti i na samu igru.

Metode

Video materijal, koji je uključivao 15 susreta sa ženskog i 14 susreta s muškog turnira Grand Slam u Klagenfurtu, održanom 2005. godine, analiziran je programom za analizu igre pod nazivom "Statshot". Kamera je bila postavljena oko 9 m iza osnovne linije i 7 m iznad terena. Vrednovale su se korištene tehnike, pozicije, kvaliteta izvedbe te smjer i način kretanja sportaša i sportašica. Analizom akcija svakog od šest osnovnih elemenata odbojke na pijesku: servisa, prijema, dizanja, napada, blokiranja i obrane bilo je moguće dobiti kompletnu statistiku igre. Ukupno su kod muškaraca analizirane 7393 akcije, dok je kod žena analizirano ukupno 7776 akcija. Kvaliteta izvedbe svakog elementa bila je procijenjena skalom od 4 ocjene. Kvalitetni igrači odbojke na pijesku, osposobljeni za rad s programom, vrednovali su kvalitetu izvedbe. Pouzdanost i objektivnost mjernog instrumenta procijenjeni su na uzorku od 100 akcija putem Scottova p-koeficijenta, a iznosili su .93, odnosno .90. Detaljan opis testova može se vidjeti u Tilp i sur., 2006.

Rezultati

Usporedba je pokazala kako se muški i ženski vrhunski igrači odbojke na pijesku razlikuju po primjeni tehničkih elemenata u igri. Za utvrđivanje značajnosti razlika između spolova u primjeni tehničkih elemenata koristio se hi-kvadrat test. Razlike u distribucijama primijenjenih tehničkih elemenata bile su značajne za 6 elemenata: servis ($p<.01$), primanje ($p<.05$), dizanje ($p<.01$), napad ($p<.01$), blok ($p<.01$) i obrana ($p<.01$). Statistička značajnost razlika u kvaliteti izvedbe pojedinih elemenata utvrđena je samo u varijablama *servis* i *napad*.

Rezultati su pokazali da muškarci i žene preferiraju različite tehničke elemente za početak poena. Približno polovina (47%) svih analiziranih servisa u muškoj konkurenciji bili su skok servisi. Naprotiv, u ženskoj konkurenciji zabilježeno je 48% ravnih servisa bez skoka, iako je skok servis zabilježen kao najuspješniji servis i u muškaraca i u žena u smislu izravnog poena (muškarci 5% i žene 9%). Rezultati ovog istraživanja pokazuju da su tehnike prijema podjednako kvantitativno raspoređene i u muškaraca i u žena. I jedni i drugi uspješno su izveli više od 50% prijema lopte (žene 55% i muškarci 60%). Velika razlika zabilježena je u tehničkim elementima koji pripadaju pripremi poena. Muškarci se koriste tehnikom dizanja čekićem i vršnom tehnikom u jednakom omjeru (46% svaki), dok žene ipak preferiraju tehnike dizanja čekićem (84%) u odnosu na vršnu tehniku (9%).

Analizom faze napada potvrđeni su očekivani rezultati da muškarci vole završavati napade smečiranjem (59%). Dok je u muškoj konkurenciji odigrano 41% plasiranih udaraca, u ženskoj je konkurenciji zabilježeno 50% plasiranih udaraca i 50% smečeva. Distribucija kvalitete za fazu napada pokazala je statistički značajnu razliku između muškaraca i žena ($p<.01$). Strategiju bloka u muškaraca karakterizira 88% dinamičnih akcija na mreži, dok se žene odmiču od mreže u 27% zabilježenih situacija u bloku te zauzimaju obrambenu poziciju duboko u samom terenu. Zabilježeno je i da su odbojkašice uspješno obranile više napada koji su izvedeni plasiranjem (46%) dok su se manje morale braniti od napada smečiranjem (35%). Takva razlika u uspješnosti u fazi obrane nije vidljiva i u odbojkaša koji su podjednako uspješno branili napade plasiranjem (38%) i napade smečiranjem (40%).

Diskusija i zaključci

Rezultati ovog istraživanja pokazuju da žene koriste drugačiju strategiju igre nego muškarci, profesionalne igračice i igrači u međunarodnoj odbojci na pijesku. Razlike su osobito naglašene u kvantitativnoj distribuciji korištenih tehničkih elemenata. Najveća razlika između spolova zabilježena je u omjeru dizanja izvedenih vršnom tehnikom, koji su muškarci koristili 46%, a žene 9% u fazi postavljanja napada. Ovaj rezultat je vrlo zanimljiv i zapanjujući budući da su odbojkaški stručnjaci uvjereni da je ova tehnika odigravanja najpreciznija. Zanimljiv je i podatak da odbojkašice kad izvode početni udarac, izvode tek 20% skok-servisa iako njime postižu više izravnih bodova, u čemu su identične s odbojkašima.

Razlozi različitih pristupa igri vjerojatno leže u taktičkim zamislima te spolnim razlikama koje se očituju u antropometriji i fiziologiji odbojkašica i odbojkaša. Budućim istraživanjima potrebno je utvrditi razloge i motiviranost za takav način ponašanja u igri.