

SPEED DIFFERENCES BETWEEN FOREHAND AND BACKHAND IN INTERMEDIATE-LEVEL TENNIS PLAYERS

Alexandros Mavvidis, Kostantinos Koronas, Christos Riganas and Thomas Metaxas

*Department of Physical Education & Sports Sciences,
Democritus University of Thrace, Greece*

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Abstract:

The purpose of this study was to measure the difference in speed between the two basic strokes, backhand (bh) and forehand (fh), in intermediate-level tennis players to identify the differences that exist between the use and effectiveness of the two strokes. The sample consisted of 20 intermediate-level tennis players, 6 males and 14 females. The variables applied were 10 backhand and 10 forehand strokes, for each subject. Data analysis and the comparison did not show any statistically significant differences between the speed of either strokes, whereas the difference was noticed between the males and females. The results showed that the general performance in the forehand stroke was better for males. It was concluded that more practice should be done in backhand than in forehand strokes for both genders, because speed was not lacking but effectiveness was, hence the latter requires further practice.

Key words: forehand, backhand, speed, intermediate-level tennis players

GESCHWINDIGKEITSUNTERSCHIEDE ZWISCHEN VORHAND- UND RÜCKHANDSCHLAG BEI FORTGESCHRITTENEN TENNISPIELERN

Zusammenfassung:

Das Ziel dieser Untersuchung war, festzustellen, ob, in Bezug auf ihre Geschwindigkeit, Unterschiede in Verwendung und Effizienz zwischen den Grundschlagarten Vorhand- und Rückhandschlag in Tennis existierten. Das Niveau der Spieler war mittelmäßige bis gute Leistungsklasse der griechische Rangliste. In der Studie nahmen 20 fortgeschrittene Tennisspieler teil - 6 Männer und 14 Frauen. Jeder Spieler sollte 10 Vorhand- und 10 Rückhandschläge durchführen. Die statistische Datenanalyse hat gezeigt, dass es keine statistisch signifikante Unterschiede zwischen den zwei Schlägen gab in Bezug auf ihre Geschwindigkeit, aber dass die Unterschiede existierten zwischen Geschlechtern. Die Leistung beim Vorhandschlag war besser bei Männern. Sowohl die Männer als auch die Frauen sollten den Rückhandschlag mehr trainieren, weil es, wie aus dieser Untersuchung herauskam, keinen Geschwindigkeitsmangel bei diesem Schlag gab, aber die Effektivität des Schlages war nicht befriedigend. Deswegen sollte der Rückhandschlag mehr geübt werden.

Schlüsselwörter: Vorhand, Rückhand, Geschwindigkeit, fortgeschrittene Tennisspieler

Introduction

Backhand (bh) and forehand (fh) are the two basic groundstrokes in tennis. Both strokes are accomplished by the activation of complex sequences of muscle activity which incorporate smooth coordination patterns of the trunk and lower extremities (Ryu, McCormick, Jobe, Moynes, & Antonelli, 1988). However, differences exist in learning, as well as in muscle activity between the strokes (Anderson, 1979; Beillot, Rodhongar,

Briend, & Le Bars, 1977; Buckley & Kerwin, 1988; Miyashita, Tsunoda, Sakurai, Nishizono, & Mizuno, 1980).

It is more difficult for novice players to perform the correct movements of the trunk and arm in backhand than in forehand strokes. These uncoordinated movements lead tennis players to adopt uncomfortable positions. This eventually leads to a poor technique (Hoffsaess, 1991). Recent findings indicate that a significant difference in backswing

was produced among players by moving the racket behind the hitting shoulder for both strokes (Chow et al., 1998).

It has been reported (Knudson & Bahamonde, 1999) that elite tennis players also differ in racket acceleration and angular velocity between forehand and backhand strokes. The speed of the strokes and the time that is required for learning are determinant points for learning the technique (Hauer, 1987). Moreover, Eason and Smith (1989) suggested that learning the forehand, in contrast to the backhand, may interfere with learning the backhand stroke. Furthermore, the speed in the forehand stroke depends not only on the player's grip, but also on the acceleration of his/her shoulder, arm, forearm and wrist (Elliott, Takahashi, & Noffal, 1977).

Due to an apparent lack of information on the tennis forehand and backhand strokes technique, connected with speed of the ball and time of learning, the purpose of this study was to investigate whether there was a difference in speed of the ball between the forehand and backhand stroke in intermediate-level tennis players since it has been noted that at least at this level players tend to lack both the technique and efficiency of the stroke and make most of the basic mistakes when playing the backhand stroke.

Methods

Subjects

Twenty university students (6 male and 14 female) volunteered to participate in this study. All the subjects were right-handed intermediate-level tennis players and they had played competitive tennis for at least 4 years prior to the initiation of this experiment. They have had no upper extremity injuries for at least one year before testing. The subjects' characteristics are presented in Table 1.

Measurements

The participants performed 10 forehand and 10 backhand strokes from the baseline under the guidance of an experienced coach. A ball machine threw the balls at a speed of approximately 90km/h to the side of the player, so that he/she needed only 1-2

steps to strike it. Each effort was performed independently due to a 30-second pause between particular strokes. Before the test the subjects practised the strokes 4-5 times so that they could become familiar with the test. At the beginning of the test the instruction given to every subject was to hit the ball as hard as possible. The strokes were considered valid only if the ball landed over the net in the opponent's part of the court. One way of inducement for the player to stroke the ball was the fact that the coach who was handling the radar gun could inform the player about the speed of the ball. The two fastest strokes were added together and used as a unique variable in order to provide a greater reliability of the measurements. A video analysis was used during all the strokes. Two experienced coaches graded the technical competence of each subject on a ten-point scale (10 = excellent, 0 = poor). The speed of the ball was measured with a calibrated Juggs radar gun (Tribar CO, Montreal, Canada) in kilometres per hour. The two best-grounded strokes with the highest speed of the ball were used for analysis. Re-measurements were used in order to check the reliability ($r = .898$). The evaluation of this technique by two expert coaches with the help of the video analysis was conducted separately and the objectivity index was found to be $\alpha = .93$.

Statistical analysis

Paired *t*-tests were used to test the differences between the males and females and between their forehand and backhand strokes. The Pearson's coefficient was used to test the correlation between the strokes, the gender, and the efficiency of the strokes.

Results

The results of this study showed that no differences existed in the speed between the forehand and backhand strokes of all the subjects. No statistically significant difference was observed of the sum of the two fastest forehand and backhand strokes which had a mean value of 247.8 and 242.8 km/h, respectively. The male players had a significantly higher speed of the forehand ($p < 0.01$) as compared to the female players. No statistically significant differences were found in the backhand stroke between the genders (Table 2). Figure 1 shows the relationship between the speed of the ball the subjects achieved and the technical evaluation by the coaches. A large number of subjects (7) is of a medium standard, as regards both the speed of the forehand stroke and the technique evaluation. Figure 2 shows

Table 1. Subjects' anthropometric characteristics

Gender	Age (yr)		Height (m)		Weight (kg)	
	M	SD	M	SD	M	SD
Male	22.4	±0.54	1.76	±0.07	77.65	±7.76
Female	22.25	±0.57	1.69	±0.05	60.51	±9.47

the same relationships of the backhand stroke. In both strokes the correlation was highly significant (fh, $r = .803$ $p < .001$; bh, $r = .841$ $p < .001$). Moreover, a close relationship was found in the speed between the forehand and backhand strokes ($r = .684$ $p < .001$).

Discussion and conclusions

This study showed that the speed of basic strokes in intermediate-level tennis players is related to performance technique. The technique of the stroke is one of the most determining factors in performing at a greater speed even in professional players. As reported in previous research (Elliott, Marsh, & Overheu, 1989) the technique, for example, of the racket movement where the individual segments of the upper limbs move relatively to one another is in contrast to the drive with the hitting movement being almost as a single unit

producing higher racket and ball speed for high performance players. The purpose of another study (Michikami, 1988) was to investigate the characteristics of forehand groundstrokes with closed and open stance for world top-level female tennis players. From these results it was noted that the difference in the twisting motion is caused by the stance, and that an open-stance forehand stroke with a shorter stroking time and faster preparation of the feet may be more appropriate to the modern tennis game. The type of technique used for the forehand stroke, as shown in this research, is not decisive, there were no significant differences in the speed of the backhand stroke.

As for the use, beginners and intermediate-level players tend to use the backhand stroke in different ways than elite players. Elite players win more points with the backhand stroke than intermediate-level players (Mavvidis, Tsikrikis, Zachopolou, Mantis, & Dacheva, 2001). Furthermore, not only the elite but also the intermediate-level tennis players and beginners make fewer mistakes in the forehand than in backhand stroke (Bollettieri, 1996; Hauer, 1987).

What are the causes for the superiority of the forehand stroke over the backhand stroke? This study shows that in intermediate-level players there were no differences in speed of executing the two basic groundstrokes. It could be said that if speed were the only component characterizing the two strokes, the players would have the same efficiency in both strokes, which is something that does not happen. Further study seems warranted to resolve the other parameters.

One possible explanation for the inefficiency of the backhand stroke in contrast to the forehand stroke is the fact that the backswing in the backhand stroke is more difficult to perform than the backswing in the forehand

Table 2. Speed in the backhand and forehand strokes of the males and females

	T ₂	P	Mean	±SD
Forehand - backhand	0.428	.335	247.75/242.8	37.18 /±35.85
Forehand males/females	2.557	.009	276.33/235.5	27.8/±34.4
Backhand males/females	0.668	.198	253.5/238.21	23.78/±39.81

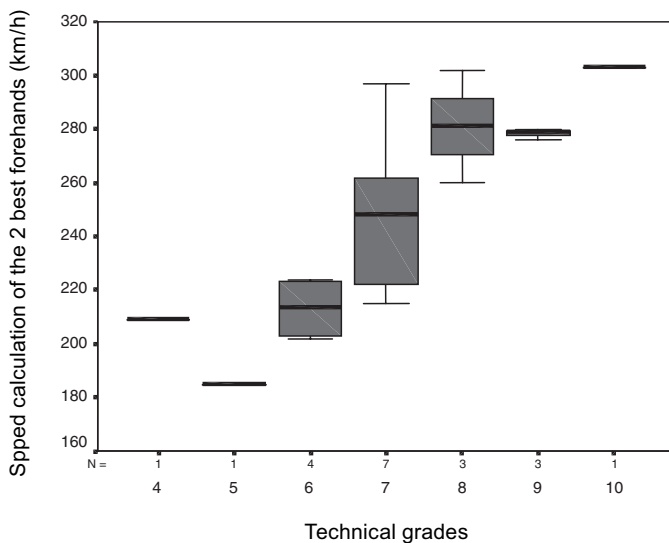


Figure 1. Correlation between the speed in the forehand stroke and technical evaluation.

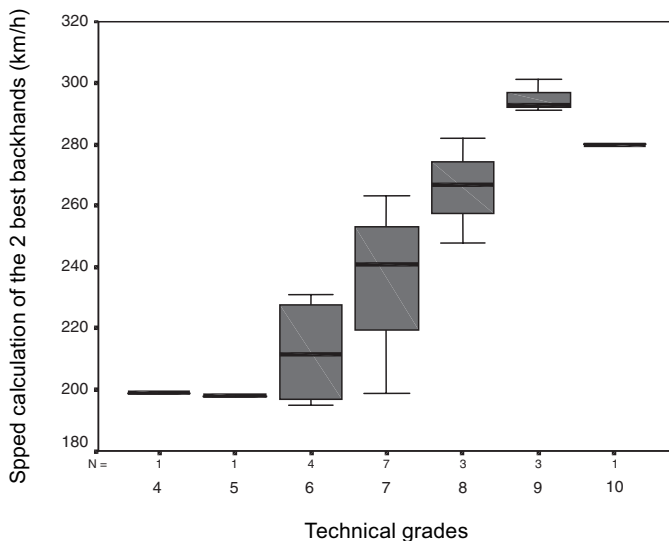


Figure 2. Correlation between the speed in the backhand stroke and technical evaluation.

stroke. The forehand is an easy stroke for the majority of learners since the shoulder joint moves in the direction of the backswing, which makes it a more natural movement, whereas in the backhand stroke the shoulder joint faces the net and the direction of the backswing is opposite to it (Hoffsaeess, 1991). Another explanation is the teaching methods used by the coaches that train novice tennis players. Most of them spend more time on the forehand while teaching tennis since it is easier for them to organize and realize the training plan (Hoffsaeess, 1991; Schoeborn, 1998).

Furthermore, this study suggests that coaches should pay more attention to females' forehand stroke since they fall seriously behind the male performances, something that is not the case in the backhand. Gottfried reported (1998) that world's elite players who devote equal time to training of

both basic groundstrokes have the same level of efficiency in the backhand as in the forehand stroke.

It is concluded that tennis training must pay attention to players with smaller muscle strength. This study showed that women who are generally weaker than men perform the forehand stroke with less speed. Therefore, apart from the required physical conditioning training, which is vital for strength development, the improvement of the technique of strokes is also essential. According to the study, speed of both strokes depends on the players' technique at this intermediate level. The players should dedicate more time to practising the backhand stroke. In novice tennis players the game strategy should impose the use of the backhand stroke because, based on the experience, novices mainly play these games with their "good" stroke and usually that is not the backhand stroke, so they practice backhand stroke less.

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RAZLIKE U BRZINI LOPTICE PRI IZVEDBI BEKENDA I FORHENDA KOD TENISAČA SREDNJE KVALITETNE RAZINE

Sažetak

Uvod

Bekend i forhend dva su osnovna udarca u tenisu koji uključuju fine, usklađene obrasce koordiniranog kretanja trupa i donjih ekstremiteta. Ti pokreti mogu od tenisača zahtijevati da zauzimaju neuobičajene i neudobne položaje tijela, što kod tenisača početnika može dovesti do loše tehnike. Novija istraživanja pokazuju da igrači izvode velik zamah unatrag, dovodeći reket iza ramena ruke kojom udaraju pri izvedbi obaju udaraca.

Knudson i Bahamonde (1999) izvješćuju da i kod vrhunskih tenisača postoje razlike u ubrzanju i kutnoj brzini između bekenda i forhenda. Točnije, kraće vrijeme reakcije u bekendu uvjetovano je činjenicom da taj udarac zahtijeva veći stupanj slobode za rotacijske pokrete ramena i trupa nego forhend. Brzina udaraca jedna je od odlučujućih točaka u učenju tehnike. Brzina forhenda ne ovisi samo o igračevu hvatu reketa, već i o ubrzanju ramena, ruke, podlaktice i ručnog zgloba.

Svrha ovog istraživanja bila je ispitati i usporediti brzinu loptice u navedena dva osnovna udarca kod tenisačica i tenisača srednje razine.

Metode

Ispitanici. U istraživanju je dobrovoljno sudjelovalo dvadeset studenata (6 muškaraca i 14 žena). Svi su ispitanici bili dešnjaci, tenisači srednje kvalitete razine i aktivni natjecatelji najmanje četiri godine prije uključivanja u eksperiment. Nitko nije imao ozljedu gornjih ekstremiteta unatrag barem godine dana prije mjerenja.

Postupak. Svi su ispitanici izveli po 10 forhenda i bekenda pod vodstvom iskusnog trenera. Sve su izvedbe snimane te je provedena analiza video snimaka. Dva iskusna trenera ocijenila su tehničku kompetentnost svakog ispitanika na skali od deset stupnjeva (10 = izvrsna, 1 = slaba). Brzina loptice mjerena je kalibriranom radarskom puškom Juggs (Tribar CO, Montreal, Canada) u km/h. Pokušaj je bi valjan ako je loptica pala u protivnikovo polje. Za

svakog ispitanika dva najbrža pokušaja u svakom udarcu pretvorena su u jedinstvenu varijablu. Ponovljena mjerenja korištena su za provjeru pouzdanosti ($r = .898$).

Kako bi se provjerila razlika u tehnici i brzini udaraca (bh i fh) između žena muškaraca korišten je *t*-test za male zavisne uzorke. Korelacija između parametara udaraca, spola i primjene provjerena je Pearsonovim koeficijentom korelacije.

Rezultati

Rezultati statističkih analiza pokazali su da nema statistički značajne razlike u brzini loptice u bekendu i forhendu, što vrijedi za sve ispitanike. U usporedbi s tenisačicama, tenisači su imali statistički značajno brži forhend udarac ($p < 0.01$). Nije utvrđena razlika u brzini bekend udaraca s obzirom na spol. Utvrđena je visoka povezanost brzine udaraca i ocjena tehnike (fh $r = .803$ $p < .001$, bh $r = .841$ $p < .000$). Također je utvrđena i prilično visoka povezanost brzine loptice u izvedbi i bekenda i forhenda ($r = .684$ $p < .001$).

Rasprava i zaključak

Ovo je istraživanje pokazalo da je brzina osnovnih udaraca kod tenisača srednje kvalitetne razine povezana s tehnikom. U usporedbi dobivenih rezultata s rezultatima dosadašnjih istraživanja može se zaključiti da tenisači srednje razine, jednako kao i tenisači početnici, koriste bekend drugačije od vrhunskih tenisača. Štoviše, ne samo vrhunski, već i tenisači srednje razine i početnici griješe manje pri izvođenju forhenda nego pri izvođenju bekenda.

Na temelju dobivenih rezultata može se zaključiti da ne postoji razlika u brzini izvedbe bekenda i forhenda kod tenisača srednje kvalitetne razine. Moguće je reći da, ukoliko bi brzina bila jedina komponenta koja karakterizira oba udarca, igrači bi bili jednako učinkoviti pri izvođenju oba udarca što, međutim, nije slučaj. Zaključno, ovo istraživanje može biti korisno u praksi kao preporuka trenerima da posvete više pažnje treniranju forhenda kod žena, ali i da više vremena posvete uvježbavanju bekenda općenito.

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Correspondence to:

Prof. Alexandros Mavvidis, PhD

Department of Physical Education & Sports Sciences

Democritus University of Thrace

7th km, National Road Komotini-Xanthi

69100 Komotini, Greece

Phone: ++ 30531029696

Fax: ++ 30531026908

Mobile: ++ 30947691623

E-mail: amavvidis@phyed.duth.gr