IOSR Journal of Sports and Physical Education (IOSR-JSPE)
e-ISSN: 2347-6737, p-ISSN: 2347-6745, Volume 5, Issue 3, (May - June 2018), PP 09-12
www.iosrjournals.org

An investigation of the role of ipsilateral and contralateral eye-hand dominance in tennis serves accuracy of adolescent tennis players

Efthymios Ziagkas[1], Alexandros Mavvidis[2]
[1]*PhD Candidate,Department of Physical Education and Sport Sciences, Aristotle University of Thessaloniki, GREECE,*
[2]*Professor,Department of Physical Education and Sport Sciences, Democritus University of Thrace, GREECE*
corresponding author: Efthymios Ziagkas[1]

Abstract: *Eye and hand dominance, as a laterality index, represents structural and functional asymmetries of brain hemispheres. Since the second half of the twentieth century, researchers were concerned with the contribution of hand and eye dominance to aiming skills. The aim of this study was to investigate the role of ipsilateral and contralateral eye-hand dominance of adolescent tennis athletes in tennis serve accuracy. Thirty-sixadolescent tennis players, 23 males and 13 females, mean age 13.3 (SD= ±1.47 years) participated in this study. Participants mean training age was two to ten years. According to ipsilateral and contralateral eye-hand dominance, sample was divided into two groups: contralateral eye-hand dominance group, including 18 participants (12 males and 6 females) and ipsilateral eye-hand dominance group, including 18 participants (11 males and 7 females). Eye and hand dominance were evaluated using a self-reported questionnaire. Participants were asked to serve 20 times (10 serves from the "deuce side" of court and 10 from the "advantage side"). Serve accuracy was examined by two experienced, independent examiners. One way Anova analysis has shown no significant differences in accuracy test between the two groups of contralateral and ispilateral eye-hand dominance. However, contralateral group achieved higher scores in accuracy from both sides of the court against the ipsilateral group (with mean score 5.72to 5.33 on deuce side and 6.00 to 5.56 on advantage side). Those findings are in line to previous studies with regard to eye hand dominance and tennis serve accuracy in amateur tennis players and athletes.*

Key words: *eye, hand, preference, tennis, serve, accuracy, adolescents*

Date of Submission: 02-06-2018 Date of acceptance: 18-06-2018

I. Introduction

Serve is the most important shot in tennis (Cauraugh, Gabert& White,1990; Bahamonde, 2000; Elliott & Wood, 1983). Tennis serve has been developed in recent times, thus serving speed has been significantly increased. In Rolland Garros for example, from 2002 to 2009 the mean difference in average serving speed has been reported to increase from 165,1 to 188,9 km/h, the percentage of first serve accuracy from 60,2% to 64,2% and aces from 2.2 to 8,6 (Pollard, Pollard, Barnett &Zeleznikow, 2009; Born, 2011). Considering that in this period there was no change in athletes body characteristics, we may support the hypothesis that serve speed is independent of body strength or advantages due to body characteristic, although depends on improved tennis serve technique, as has been mentioned in recent studies (Pugh, Kovaleski, Heitman, & Gilley, 2003; Reid, Elliott & Alderson, 2007; Reid, Whiteside, & Elliott, 2011).

Coordination seems to be the main factor affecting tennis serve performance (Schoenborn, 1998; Durovic, Lozovina&Mrduljas, 2008; Reid, Whiteside, & Elliott, 2011). Muscle synergy and coordination depends on the side of the serving court. A critical detail at this point, is player's eye dominance when tossing the ball with the non-dominant hand and just before the contact between the ball and the head of the racquet.

The problem of motor lateralization in ontogenesis is important for understanding adaptation development (Kurzina, Aristova&Volnova, 2018). About 35% of right-handers and 57% of left-handers being left eye dominant (McManus, Porac,Bryden& Boucher, 1999). The majority of right-handers (66%) and left-handers (57%) display side congruent (right/right or left/left) eye-hand preference. However, there are substantial numbers of people with crossed preference where the preferred hand and the preferred eye are on opposite sides of the body. Left-eye preference occurs for 34% of right-handers while 43% of left-handers show right-eye preference (Hiraoka,Igawa, Kashiwagi, Nakahara, Oshima&Takakura, 2018).

From the beginning of the 20th century studies about eye dominance mentioned that about 15% of humans have no eye preferences, i.e., are ambiocular. On the average 64% have a right monocular preference and 21% a left monocular preference. There seems to be no perfect matching between hand preference and eye

preference (Snyder & Snyder, 1928). To the best of our knowledge, despite a few researches who mentioned eye movements when tossing the ball (Knudson et al., 1994) and the eye hand coordination while hitting the ball (Sahan&Erman, 2009), there are no many studies investigating eye hand dominance in tennis (Ziagkas, Mavvidis, Grouios&Laios, 2017).

Hand dominance, as a laterality index, represents structural and functional asymmetries of brain hemispheres. Their contribution to phylogenic and ontogenetic development of human, have been well documented by neuroscientific data. Since the second half of the twentieth century, researchers and sport psychologists were concerned with the contribution of hand and eye preference to aiming skills.

To the best of our knowledge, despite a few researches who mentioned eye movements when tossing the ball (Knudson et al., 1994) and the eye hand coordination while hitting the ball (Sahan&Erman, 2009), there are no studies investigating eye hand dominance in tennis. The purpose of this study was twofold. At first to investigate the ipsilateral and contralateral eye hand dominance in adolescent tennis players. Secondly to investigate the effect of ipsilateral and contralateral eye hand dominance in tennis serve accuracy. To fulfill the purpose, two hypotheses raised.

II. Materials and Methods

Participants: 36 club level, adolescent tennis players participated in this study, 23 male and 13 female(table1). The average age was 13.3 (SD= ±1.47 years). The training years in tennis were between 2 and 10 years.

(Table 1 here)

Procedure – tools – measures: Eye and hand dominance were evaluated using the self-reported questionnaire "Lateral Preference Inventory" of Coren (Coren, 1993) and by the use of two tests, which gave the same results. According to ipsilateral or contralateral eye-hand preference model, the sample was divided into two groups: the ipsilateral eye-hand dominance group and the contralateral eye-hand dominance group. Then, tennis players performed 20 serves (10 from the advantage court and 10 from the deuce court). During the field test, the participants' relevance and technical execution of the serve was evaluated by two independent experienced tennis coaches.

Statistical analysis: Data was processed using SPSS v.24. We performed descriptive statistical analysis (means, standard deviations and cross-tabulation of qualitative variables) and tested the hypothesis (One way ANOVA). The significance level was set at p = 0,05.

III. Results

The evaluation of eye-hand dominance and after crossbreeding (cross-tabulation) qualitative, categorical variables such us "gender*Hand dominance" and "gender* Eye dominance", indicated that out of the 36 participants, 86.1% (N = 31) showed right hand dominance while 13.9% (N = 5) showed left hand dominance.

In the subgroup of 31 right-handed, 64.5% (N = 20) were male and 35.5% (N = 11) female athletes. In the subgroup, which displayed left hand dominance, 60% (N =3) was male and 40% was (N = 2) female. Regarding the eye dominance, 47.2% (N = 17) of participants showed right eye dominance and the rest 52.7% (N = 19) left eye dominance. In the subset of 17 participants with right eye dominance 58.8% (N = 10) were male and 41.2% (N =7) female, while in the subset of 19 who showed left eye dominance, 68.4% (N = 13) were male and the rest 31.6% (N = 6) female. More details about the cross-tabulation of the variables gender, eye dominance and hand dominance are presented in table 2.

(Table 2 here)

Considering contralateral and ipsilateral eye and hand dominance, participants were separated into two subsets. The contralateral group included 50% (N=18) of participants. In this group 61.1% (N=11) were male and 38.9% (N=7) were female. The ipsilateral group included the other 50% of the participants (N=18) in which 66.7% (N=12) were male and 33.3% (n=6) were female. More details about the ipsilateral and contralateral subgroups are presented in table 3.

(Table 3 here)

With regard to tennis serve accuracy between the ipsilateral and contralateral groups, one way analysis of variance (One way ANOVA) showed no significant differences between the two groups. No significant differences were found either at the advantage ($F(35,1.778)=0.859$, $p= 0.631$) or at the deuce court ($F(35,1.361)=0.474$, $p=0.496$). In particular, from the deuce court, ipsilateral group performed at means 5.33 (S.D.=±1.72) succeeded serves and the contralateral group succeeded at means 5.72 (S.D.=±1.67) serves. From the advantage side court ipsilateral group performed at means 5.56 (S.D.=±1.58) succeeded serves and the contralateral group succeeded at means 6.00 (S.D.=±1.28) serves. Results from tennis serve performance between contalateral and ipsilateral eye-hand dominance groups are presented in table 4.

(Table 4 here)

IV. Discussion

This study was designedin order to investigate the role of the ipsilateral and contralateral eye-hand dominance in tennis serve accuracy of adolescent tennis players. The findings confirm the hypothesis that there are no significant differences in tennis serve accuracy between players with ipsilateral or contralateral eye –hand dominance. However, it was observed that tennis players who have contralateral eye hand dominance tend to achieve higher scores than ipsilateral eye hand dominance players, while serving from both sides of the court. According to the up-to-date international literature, only one similar study, concerning tennis serve performance among individuals with ipsilateral or contralateral eye hand dominance was found (Ziagkas et al., 2017).

Our results are online with the findings of Ziagkas et al.(2017), althoughtheir study included amateur adult tennis players. As reported in the literature regarding other ball sports, athletes who are contralateral seem to benefit, especially right-handed players using the left eye for targeting (Siefer, Ehrenstein, Arnold-Schuiz-Gahmen, Sökeland&Luttmann, 2003; Mann, Runswick& Allen, 2016). On the contrary, in sports without ball, which require aiming skills e.g. archery or darts (dart skills) recent findings (Laborde, Dosseville, Leconte&Margas, 2009; Razeghi, Shafie, Shebab&Maleki, 2012) demonstrate that athletes with ipsilateral eye hand dominance have the advantage. The present study does not confirm this view, because we found no significant differences between ipsilateral or contralateral eye-hand dominance groups leading us to conclude that the ipsilateral eye hand dominance gives no advantage in tennis serve performance. Possible causes leading to this discrepancy between this study and other related studies conducted in other sports, occur probably due to the specific nature of sport. The handling of tennis racket differentiates the targeting process from other ball sports like football or basketball. Similar differences are presented in other aiming sports, such as archery, where ipsilateral eye-hand dominance is required (Laborde, Dosseville, Leconte&Margas, 2009).

Regarding the fact that the results showed higher performance in tennis serve from the advantage court, it should be mentioned that greater attention is shown on the technical execution of tennis serve from the advantage court during training or during performance assessment of tennis serve, particularly in novice athletes, even more in women. This can probably be explained by the difficulty of right handed beginners to serve from the left side, as opposed to professionals, who are accustomed serving both sides.

V. Conclusion

In conclusion, the effect of the eye hand dominance in sports performance appears to depend on the particular requirements of each sport on visual perception. However, the present study showed that the ipsilateral or contalaretal eye-hand dominance does not affect performance of adolescent tennis players in tennis serve.

Acknowledgement

The authors would like to acknowledge those who kindly took the time to participate in the study.

References

[1]. Born, H. P. (2011). Die Bedeutung des Aufschlages und die Folgen des Training. Tennissport, 2, 18-21.
[2]. Cauraugh, J. H., Gabert, T. E., & White, J. J. (1990). Tennis serving velocity and accuracy. Perceptual and Motor Skills, 70, 719-722.
[3]. Coren, S. Bull. Psychon. Soc. (1993) 31: 1. https://doi.org/10.3758/BF03334122
[4]. Hiraoka, K., Igawa, K., Kashiwagi, M., Nakahara, C., Oshima, Y., &Takakura Y. (2018). The laterality of stop and go processes of the motor response in left-handed and right-handed individuals, Laterality, 23, 51-66.
[5]. Knudson, D., Luedtke, D., and Faribault, J. (1994). How to analyze the serve. Strategies, 7, 19-22.
[6]. Kurzina, N., Aristova, I., &Volnova, N. (2018). Lateralization of motor reactions and formation of behavioural tactics during learning in the eight-arm radial maze in adolescent and adult rats. Laterality, 23, 101-112.
[7]. Laborde, S., Dosseville, F. E., Leconte, P., and Margas, N. (2009). Interaction of hand preference with eye dominance on accuracy in archery. Perceptual and motor skills, 108, 558-564.
[8]. Mann, D. L., Runswick, O. R., and Allen P. M. (2016). Hand and Eye Dominance in Sport: Are Cricket Batters Taught to Bat Back-to-Front? Sports Medicine, 46, 1355-1363.
[9]. McManus, I. C., Porac, C., Bryden, M. P, & Boucher, R. (1999). Eye-dominance, writing hand, and throwing hand, Laterality, 4, 173-192.
[10]. Pollard, G., Pollard, G., Barnett, T., and Zeleznikow, J. (2009). Applying Tennis Match Statistics to Increase Serving Performance during a Match in Progress. Journal of Medicine and Science in Tennis, 14, 16-19.
[11]. Pugh, S. F., Kovaleski, J. E., Heitman, R. J., and Gilley, W. F. (2003). Upper and lower body strength in relation to ball speed during a serve by male collegiate tennis players. Perceptual and motor skills. 97, 867-872.
[12]. Razeghi, R., Shafie, N. P., Shebab, N., and Maleki, F. (2012). Effect of interaction between eye-hand dominance on dart skill. Journal of Neuroscience and Behavioral Health, 4, 6-12.
[13]. Reid, M., Elliott, B., and Alderson J. (2007). Lower-Limb Coordination and Shoulder Joint Mechanics in the Tennis Serve. Medicine & Science in Sports & Exercise, DOI: 10.1249/mss.0b013e31815c6d61
[14]. Reid, M., Whiteside, D., and Elliott, B. (2011). Serving to different locations: set-up, toss, and racket kinematics of the professional tennis serve. Sports Biomechanics, 10, 407-414.
[15]. Sahan, A., and Erman, A. (2009). The effect of tennis technical training on coordination characteristics. The Open Sports Medicine Journal, 3, 59-65.
[16]. Schoenborn, R. (1998). Tennis Techniktraining, Aachen: Meyer und Meyer.

[17]. Siefer, A., Ehrenstein, W. H., Arnold-Schuiz-Gahmen, B. E., Sökeland, J., and Luttmann, A. (2003). Populationsstatistik und AssoziationsanalysesensomotorischerSeitenbevorzugung und derenRelevanzfürverschiedeneberuflicheTätigkeitsfelder. ZblArbeitsmed, 53, 346-353.
[18]. Snyder, A. M., & Snyder, M. A. (1928). Eye preference tendencies. Journal of Educational Psychology, 19, 431-433.
[19]. Ziagkas, E. Mavvidis, A. Grouios, G. Laios, A. (2017). Investigating the role of ipsilateral and contralateral eye-hand dominance in tennis serve accuracy of amateur tennis players. Journal of Physical Education and Sport, 17, 867-870.

Tables

Table 1
The gender of participants

		Frequency (n)	Percentage (%)
Gender	Male	23	63.9
	Female	13	36.1
	Total (N)	36	100.0

Table 2.
Descriptive statistics regarding gender and hand dominance / gender and eye dominance.

			Hand dominance		Eye dominance		
			right-hand	left-hand	right-eye	left-eye	Total
Gender	male	Count	20	3	10	13	23
		% within gender	87,0%	13,0%	43,5%	56,5%	100,0%
		% within dominance	64,5%	60,0%	58,8%	68,4%	63,9%
		% of Total	55,6%	8,3%	27,8%	36,1%	63,9%
	female	Count	11	2	7	6	13
		% within gender	84,6%	15,4%	53,8%	46,2%	100,0%
		% within dominance	35,5%	40,0%	41,2%	31,6%	36,1%
		% of Total	30,6%	5,6%	19,4%	16,7%	36,1%
Total		Count	31	5	17	19	19
		% within gender	86,1%	13,9%	47,2%	52,8%	52,8%
		% within dominance	100,0%	100,0%	100,0%	100,0%	100,0%
		% of Total	86,1%	13,9%	47,2%	52,8%	52,8%

Table 3.
Descriptive statistics regarding gender and eye-hand dominance.

			Gender		
			male	female	Total
Eye-hand dominance	Ipsilateral	Count	11	7	18
		% within eye-hand dominance	61,1%	38,9%	100,0%
		% within filo	47,8%	53,8%	50,0%
		% of Total	30,6%	19,4%	50,0%
	Contralateral	Count	12	6	18
		% within eye-hand dominance	66,7%	33,3%	100,0%
		% within filo	52,2%	46,2%	50,0%
		% of Total	33,3%	16,7%	50,0%
Total		Count	23	13	36
		% within eye-hand dominance	63,9%	36,1%	100,0%
		% within filo	100,0%	100,0%	100,0%
		% of Total	63,9%	36,1%	100,0%

Table 4.
Descriptive statistics regarding tennis serve accuracy between contralateral – ipsilateral eye-hand dominance groups, performing serves from the deuce and advantage court.

		N	Mean	Std. Deviation
Deuce court	Ipsilateral eye-hand dominance	18	5,33	1,715
	Contralateral eye-hand dominance	18	5,72	1,674
	Total	36	5,53	1,682
Advantage court	Ipsilateral eye-hand dominance	18	5,56	1,580
	Contralateral eye-hand dominance	18	6,00	1,283
	Total	36	5,78	1,436

EfthymiosZiagkas "An investigation of the role of ipsilateral and contralateral eye-hand dominance in tennis serves accuracy of adolescent tennis players." IOSR Journal of Sports and Physical Education (IOSR-JSPE) 5.3 (2018): 09-12.