

Studying hand grip strength development among students who have taken tennis and massage courses

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Abstract. In this study, the finger and hand force developments of the students who have taken selective/applied Tennis and Massage courses at the University have been examined. From the students of the Department of Physical Education and Sport, 19 healthy females and 73 healthy males (age = 21.25 ± 1.55 years (average \pm SD) who have taken selective Tennis courses; 51 healthy males (age = 22.00 ± 1.04 years (average \pm SD) who have taken Massage courses; and as the control group, 16 healthy women and 50 healthy males (age = 21.72 ± 1.47 years (average \pm SD) have been participated to the study. The age, length, body weight, grip strength of both hands as well as the finger grip strength of the subjects have been recorded. The course schedule has been set as once a week four hours practice for both tennis and massage. Two weeks of the education and training program that takes twelve weeks in total were assigned for theoretical classes. The remaining period of ten weeks was for practice classes and the measurements were performed before and after this ten weeks period. The hand grip strength measurement has been carried out with a Takkei branded hand dynamometer whereas for the measurement of the finger grip strength, a Baseline branded pinch meter has been used. For both the pre-test and final test of the finger grip and hand grip strength measurements, the paired sample t test has been used in terms of in-group comparisons, whereas for the inter-group comparisons, one-way ANOVA has been used. For the significant F values, post hoc Tukey test has been used. The right hand and the left hand grip values of both test groups as well as the values of the control group have been significantly increased between the pre-test and final test. Particularly, preferring the exercises that improve the hand and finger grip strengths would enable a better racket handle grip as well as an improved shot efficiency for tennis. This would also enable masseurs/masseuses to apply an efficient massage therapy with higher pressure.

Keywords: hand grip strength, tennis course, massage course

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1 Introduction

The hand skills are listed as follows according to the difficulty level: Gripping, Rolling, Throwing, Catching and Shoting. The hand is the most important component affecting the functionality of the upper extremity. Among the hand functions, gripping is an important factor for the continuity of the daily life activities [1]. Accordingly, the gripping strength is accepted as an objective measurement with regard to the evaluation of the upper extremity performance [2]. The conducted studies have shown that the hand grip strength, besides being correlated with the muscle strength of the upper extremity, is also related with the overall body muscle strength [3].

It has been indicated that the fore arm volume, fore arm length, fore arm perimeter, hand sizes, age, Body Mass Index (BMI) as well as length are the estimation indicators of the hand grip strength [4]. The massage therapy is used to relieve the pain, to take down the swelling in a certain area, to relax the muscles, to accelerate the recovery of the strain and sprain resulted from injury and it is applied through manual manipulations. The masseurs/masseuses shall regularly practice in order to be able to use both hands with the same ability. S/he would be more efficient if s/he succeeds to use both right and left hands with equal skills. The masseur/masseuse would feel less tired personally. Currently, tennis is an olympic sport branch adopted by the civilized world that is exciting for the players and both exciting and admirable for the audience. This sport branch comprising both aerobic and anaerobic loads is also a performance sport that requires good biomotor skills such as strength, speed, endurance, flexibility and coordination [10, 11]. For an efficient shoting, all physical fitness parameters of a tennis player shall be at the top level. Tennis is an individual sport where the players do not contact each other and the game is based on the fast spins, fast arm movements, jumps and moves [12, 13, 14].

Tennis requires high aerobic and anaerobic strength, but also the muscles generating the strength shall be strong [15, 16]. The most striking aspect of tennis education is to define the most appropriate working schedule for the athlete, to apply this schedule at the optimum level and consequently to obtain maximum performance [5]. At the tennis serve; the fine motor skills improve with the use of the Fore hand, Backhand, angle volleys, lob shot or other techniques' variations. With regard to the physical capacities, tennis improves strength, power, anaerobic performance, flexibility, agility as well as all coordination and conditional skills. These developmental characteristics of the children should be considered when planning their training programs [5].

2 Method

The study has covered 51 male students who have taken Massage courses, 19 female and 73 male students who have taken Tennis courses from Dumlupinar University, Department of Physical Education and Sport. The control group has consisted of 50 males and 16 females. This research is based on pre-test and final test approach. Nineteen healthy female and seventy three healthy male students (age = 21.25 ± 1.55 years (average \pm SD) who have taken the tennis courses; and fifty one healthy male students (age = 22.00 ± 1.04 years (average \pm SD) who have taken the massage courses have been participated to this study carried out within the Department of Physical Education and Sport, and the control group comprised of sixteen healthy female and healthy fifty male students (age = 21.72 ± 1.47 years (average \pm SD).

The age, length, body weight, hand and finger grip strength of the subjects have been recorded. The course schedule has been set as once a week, four hours practice for both tennis and massage. Two weeks of the education and training program that takes twelve weeks in total were assigned for the theoretical classes. The remaining period of ten weeks was for practice classes and the measurements were performed before and after this ten weeks period. The hand grip strength measurement has been carried out with a Takkei branded hand dynamometer whereas for the measurement of the finger grip strength, a Baseline branded pinch meter has been used. The measurements of the athletes have been repeated twice and the average values have been used.

3 Results

Table 1.The variations in the finger and hand grip strength between pre-test and final test

Grup		Mean	Std. Deviation	t	sd	p
Tennis n=92	pinch_sag_ön	9.54	2.60	-9.037	91	.000
	pinch_sag_son	10.15	2.37			
	pinch_sol_ön	8.47	2.37	-7.530	91	.000
	pinch_sol_son	9.06	2.33			
	hadgrip_sag_ön	51.41	5.71	-8.610	91	.000
	hadgrip_sag_son	53.24	5.66			
	handgrip_sol_ön	47.32	5.52	-9.068	91	.000
	handgrip_sol_son	48.80	5.53			
Masaj n=51	pich_sag_ön	11.74	2.30	-6.941	50	.000
	pinch_sag_son	13.19	1.98			
	pinch_sol_ön	10.71	2.31	-7.068	50	.000
	pinch_sol_son	11.59	1.89			
	hadgrip_sag_ön	54.12	3.41	-5.924	50	.000
	hadgrip_sag_son	55.57	3.28			
	handgrip_sol_ön	51.26	3.05	-4.299	50	.000
	handgrip_sol_son	52.35	2.80			
Kontrol n=66	pich_sag_ön	8.12	1.67	-17.186	65	.000
	pinch_sag_son	8.87	1.76			
	pinch_sol_ön	7.20	1.84	-5.174	65	.000
	pinch_sol_son	7.80	1.85			
	hadgrip_sag_ön	49.56	7.53	-7.860	65	.000
	hadgrip_sag_son	51.67	7.85			
	handgrip_sol_ön	45.53	7.21	-7.417	65	.000
	handgrip_sol_son	47.07	6.98			

For both the pre-test and final test of the finger grip and hand grip strength measurements, the paired sample t test has been used in terms of in-group comparisons, whereas for the inter-group comparisons, one-way ANOVA has been used. For the significant F values, post hoc Tukey test has been used. Average and standard deviation have been used for all variables. The significance level has been set as $p \leq 0.05$.

The right hand and the left hand pinch values of both test groups as well as the values of the control group have been significantly increased between the pre-test and final test ($p < 0.05$). The right hand and the left hand grip values of both test groups as well as the values of the control group have been significantly increased between the pre-test and final test ($p < 0.05$).

Table 2. The difference in the finger and hand grip variations between the groups

		Sum of Squares	df	Mean Square	F	Sig.
pinright_diff	Between Groups	23.913	2	11.956	15.671	.000
	Within Groups	157.175	206	.763		
	Total	181.088	208			
pinchleft_diff	Between Groups	3.177	2	1.588	2.202	.113
	Within Groups	148.607	206	.721		
	Total	151.784	208			
handright_diff	Between Groups	12.515	2	6.258	1.542	.216
	Within Groups	835.892	206	4.058		
	Total	848.407	208			
handleft_diff	Between Groups	6.732	2	3.366	217	.298
	Within Groups	569.628	206	2.765		
	Total	576.360	208			

The variations in the right hand pinch values were significant between the groups [$F(2, 208)=15.671, p < 0.05$], whereas the variations in the left hand pinch values were similar between the groups [$F(2, 208)=2.202, p > 0.05$]. The post hoc analysis has revealed that the significant difference is between the tennis and massage group ($p < 0.05$), and between the massage and control group ($p < 0.05$). Accordingly, the improvement in the massage group is higher compared to the tennis and control groups. The variations in the right hand and left hand grip values are similar between the groups [(sirasıyla $F(2, 208)=1.542, p > 0.05$); $F(2, 208)=1.217, p > 0.05$].

4 Conclusion

Mostly, the thumb helps to perform the functional capacity and fine hand skills. A study by Peterson et al. has shown that the dominant hand's grip strength is 10% higher than the grip strength of the non-dominant hand. The 10% rule revealed by Peterson et al. is only valid for those people using their right hands dominantly whereas for those people with dominant left hand, the grip strength of both hands are equal [7].

Hand grip strength is very important in terms of carrying out most of the daily life activities. Mostly, the thumb helps to perform the functional capacity and fine hand

skills. Another study regarding tennis, has revealed that playing tennis during a single academic term improves significantly the strength values as well as the forehand, backhand and serve speed of the male and female students using either right or left hands. It has been reported that the dominant hand or gender has no effect on these improvements [6]. For the generation of the isometric strength during gripping, the participation of the wrist extensors is necessary. Similar to the hand grip strength, the finger grip strength also indicates the efficiency of the hand functions [8].

In another study carried out about massage therapy, it has been reported that among the manipulations carried out with both hands, particularly friction (circular movements; generally carried out with fingers) and petrissage (kneading; generally carried out with palm) improve the strength and that accordingly, giving massage regularly improves the hand and finger grip strength [9]. The hand grip strength is very important for carrying out most of the daily life activities. Mostly, the thumb helps to perform the functional capacity and fine hand skills. In terms of human subjects, particularly for the young age groups, giving massage, tennis or other specific strength trainings in different branches should be correlated with the strength improvement. Particularly, preferring the exercises that improve the hand and finger grip strengths would enable a better racket handle grip as well as an improved shot efficiency for tennis. This would also enable masseurs/masseuses to apply an efficient massage therapy with higher pressure. Although giving massage regularly or playing tennis improve the finger and hand grip strength, in order to obtain significant improvement in the control group, specific strength trainings are needed for this type of branches.

In terms of human subjects, particularly for the young age groups, giving massage, tennis or other specific strength trainings in different branches should be correlated with the strength improvement. The right hand and the left hand grip values as well as the right hand and left hand pinch values of both test groups as well as the values of the control group have been significantly increased between the pre-test and final test. Particularly, preferring the exercises that improve the hand and finger grip strengths would enable a better racket handle grip as well as an improved shot efficiency for tennis.

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