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Effects of 8-Week Core Exercises on Free Style Swimming Performance of Female Swimmers Aged 9-12

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Abstract

With this study, it is aimed to review the effects of 8-week core exercises, which are scheduled before the routine exercises, on changes over certain physical and motoric attributes and freestyle swimming performance of female athletes of the youngest age group, which is 9-12. For the study, a group of 12 female licensed swimmers who had a swimming background of 3 years in city of Van is chosen to be core exercise group (CEG) and set as experimental group. And 12 female swimmers are chosen to be in control group. The athletes are scheduled to perform regular swimming exercises for competition, five days a week and for approximately 90 minutes per day. In addition to control group, CEG is scheduled to perform 20 minutes of low intensity, fixed duration and repetitive core exercises before every routine exercise for 8 weeks. Chosen measurements are obtained from the athletes both at the beginning and after 8 weeks and the change between pretest and posttest values is evaluated. For the statistical data analysis, non-parametric tests of Wilcoxon and Mann Whitney U tests are used. As a results of the study, the group of swimmers aged 9-12 who underwent 8 weeks of low intensity core exercises showed differences compared to pretest and posttest values of control group, even though not statistically significant (p>0,05). As a result, compared to the control group, a 1-2 seconds of decrease – especially when it is a very important amount for this sport – in 25 m and 50 m free style swimming ranks is attributed to the effect of core exercises, and it is reckoned that low intensity core exercises may positively affect the free style swimming performance of female swimmers aged 9-12.

Keywords: Freestyle, Swimming, Core training.

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Ethical: This study follows all ethical practices during writing.

Contents

1. Introduction

Swimming, which has ever-increasing popularity, is a sports branch of high demand in Olympic games and international championships. Swimming enables symmetrical and balanced development of human muscles and it ensures that 80% of the muscle mass is being used when in water. For this reason, it could be said that an athlete swimming a certain distance burns the energy of 4 times more than that of the athlete who runs it. When it is performed as a sport, swimming contributes to the improvement of attributes such as skill, coordination, power, stamina, speed, velocity and mobility. Additionally, it is among the sport activities which provide a sense of discipline and confidence (Bozdogan, 1986; Odabaş, 2003). There are four branches of swimming: crawl stroke, butterfly stroke, back stroke and breast stroke. Crawl, in other words free style swimming, is the fastest form of swimming among other competition styles (Hannula and Thornton, 2001; Yapıcı *et al*., 2016).

Certain anthropometric attributes may affect performance of swimmers. Successful swimmers are generally tall and have long extremities and wide shoulders. And also mid and upper parts of their body hold a large muscle mass. When the factors effecting the performance are reviewed, it is seen that the power of muscles is a major contributing factor (Troup, 1999). In swimming, there are certain studies in which the athlete uses certain materials in water (such as pedals, pallets, pull-buoys and stamina rubber) to help increase the velocity and also to keep it. Power exercises in swimming are divided into two groups: the ones performed in the water and the ones performed on the ground. Power studies performed on the ground include weight exercises, medicine ball exercises, leaping exercises, exercises for the core area, exercises of body weight, vasa trainer or isokinetic swim bench studies in which isokinetic movements are done, thera band and rubber exercises, trx exercises, foam-roll usage and many others which are used during any period (Yapıcı *et al*., 2016). Core exercises have gained a great deal of popularity recently and have an important place in exercise plans (Riewald, 2003).

The physiological effects of exercises on athletes have been subject matter for many studies (Sarikaya *et al*., 2016). Day by day, when the compatibility of physical attributes of athletes for the performed branch of sports is evaluated among the small or young athlete category who has taken up the sports rather recently, anthropometric and bio-motoric attributes of athletes of that age and their effect on the athlete's performance have captured the attention of researchers. With this study, it is aimed to review the effects of 8-week core exercises, which are scheduled before the routine exercises, on changes over certain physical and motoric attributes and freestyle swimming performance of female athletes of the youngest age group, which is 9-12.

2. Method

For the study, a group of 12 female licensed swimmers who had a swimming background of 3 years in city of Van is chosen to be core exercise group (CEG) and set as experimental group. And 12 female swimmers are chosen to be in control group. The athletes are scheduled to perform regular swimming exercises for competition, five days a week and for approximately 90 minutes per day. In addition to control group, CEG is scheduled to perform 20 minutes of low intensity, fixed duration and repetitive core exercises before every routine exercise for 8 weeks. After core exercises, the athletes are given 10 minutes of breaks and then moved on to swimming exercises. With both groups, repetition method is used for rapid swimming of short distances in water exercises and in order to avoid accumulated lactic acid, break periods between work outs are paid attention to. Chosen measurements are obtained from the athletes both at the beginning and after 8 weeks and the change between pretest and posttest values is evaluated.

Core Exercise Program: The below stated actions are applied in low intensity and one set for every motion with 1 minute of intervals in between every different motion.

Bridge: 5 minutes of static standing in bridge position and then lowering is performed for 10 times.

Body Extension: Athlete sits on the ground with bent knees and lifts the arms towards the front and moves them towards the back with 45-degree angle. After 10 seconds of waiting at this position, athlete changes the position to the beginning. This is repeated for 10 times.

Sit-ups: After raising the head and shoulders up for 10 times, 5 seconds of static standing is followed by the position change to the beginning.

Sit-ups on Roman Chair: Athlete performs a static standing for 5 seconds on roman chair with bent knees and with hands cross positioned on the chest in sit up position and then changes position to the beginning, with 10 repetitions.

Abdominal Contraction: Athlete is requested to contract and loosen abdominal muscles for 5 seconds with knees bent and hands cross positioned on the chest while breathing in and out. This is repeated for 10 times.

Lower extremity ground rotation: In lying back position, arms are spread to the sides and body stabilization is ensured with bending the knees at 90 degrees. Then, the athlete is requested to do a rotation to right and left. This rotation is repeated for 10 times, to be 5 seconds on the left and 5 seconds on the right.

Leg Scissors Movement: In lying back position, legs are stretched and the heels are raised by 10 cm off of the ground and then lowered. The athlete is asked to repeat this movement for 10 times for each leg (Kahle and Tevald, 2014; Yuksel *et al*., 2016).

Height measurements of participants are taken with measurement machine of brand Detecto, with 0,1 cm sensitivity. Weight measurements are taken with measurement machine of brand Detecto with 100 grams of sensitivity. Height and weight measurements are used to calculate body mass indices. Right and left grip force measurements are taken by using Takei brand hand dynamometer. For vertical jumps, Takei brand vertical jump meter, for horizontal jumps standard meters with 0,1 cm sensitivity, for 30 m running test Sinar Photocell Telemetric Stop Watch are used. Durations of 10 push-ups that are performed in fastest possible way and also in a regular way are recorded in seconds. Additionally, the best of 2 trials of 25 m and 50 m free style swimming ranks are recorded by using Colorado Time Systems-SSF device in seconds and split seconds with scoreboard. For the statistical data analysis, non-parametric tests of Wilcoxon and Mann Whitney U tests are used.

3. Findings

Mean age for experimental group is 10,58±1,31, and for control group it is 10,75±1,29.

Table-1. Control and CEG group pretest and posttest comparison

Variables	N	Tests	Control Group			CAG		
			X±Ss	Z	P	X±Ss	Z	P
Weight (kg)	12	Pre-Test	38,58±5,17	-1,604[a]	,109	36,37±7,65	-2,278[a]	,023*
		Post-Test	38,86±5,29			37,31±8,01		
Height (cm)	12	Pre-Test	145,08±12,17	-2,588[a]	,010**	140,92±13,76	-3,081[a]	,002**
		Post-Test	146,08±12,24			143,67±12,94		
BMI	12	Pre-Test	18,34±1,35	-1,362[b]	,173	18,19±1,83	-,941[b]	,347
		Post-Test	18,21±1,25			17,93±1,88		
Horizontal Jump (cm)	12	Pre-Test	130,83±14,87	-3,069[a]	,002**	140,50±24,63	-3,065[a]	,002**
		Post-Test	134,92±14,74			146,92±23,24		
30m (sec)	12	Pre-Test	6,08±,47	-1,142[a]	,253	5,97±,40	-2,199[b]	,028*
		Post-Test	6,10±,47			5,80±,47		
Push-up (sec)	12	Pre-Test	10,25±1,54	-,944[a]	,345	10,44±1,58	-2,040[b]	,041*
		Post-Test	10,24±1,57			9,59±1,40		
Vertical Jump (cm)	12	Pre-Test	41±5,80	-2,831[a]	,005**	41±4,55	-2,958[a]	,003**
		Post-Test	42,91±5,76			43,25±4,82		
Anaerobic Power (kg/sec)	12	Pre-Test	547,62±97,47	-2,934[a]	,003**	516,88±119,69	-2,981[a]	,003**
		Post-Test	564,32±99,07			544,71±127,68		
Hand Grip Force Right	12	Pre-Test	18,88±3,47	-3,061[a]	,002**	19,05±4,66	-3,061[a]	,002**
		Post-Test	20,23±3,85			21,40±4,95		
Hand Grip Force Left	12	Pre-Test	16,75±3,31	-3,064[a]	,002**	18,92±6,63	-3,062[a]	,002**
		Post-Test	17,45±3,12			20,91±7,46		
25m Free Style (sec)	12	Pre-Test	20,13±2,21	-554[b]	,580	20,21±2,40	-3,059[b]	,002**
		Post-Test	20,03±2,10			18,85±1,90		
50m Free Style (sec)	12	Pre-Test	42,19±4,42	-2,353[b]	,019*	42,33±4,28	-3,059 [b]	,002**
		Post-Test	41,77±4,16			40,25±3,93		

([a] Negative Direction, [b] Positive Direction *p<0,05, **p<0,01)

As can be seen in Table 1, in the pretest and posttest comparisons, in all parameters, significant differences are seen (*p<0,05, **p<0,01) except for height, vertical and horizontal jumps, hand grip right and left, anaerobic power and 50 m free style swimming parameters for control group and except for Body Mass Index (BMI) for CEG.

Table-2. Comparison of Control and CEG groups pretest and posttest results

Variables	N	Tests	CEG X±Ss	Control Group X±Ss	Z	P
Age (year)	12	Pre-Test	10,75±1,29	10,58±1,31	-,363	,717
Weight (kg)	12	Pre-Test	36,37±7,65	38,58±5,17	-,808	,419
		Post-Test	37,31±8,01	38,86±5,29	-,462	,644
Height (cm)	12	Pre-Test	140,92±13,76	145,08±12,17	-,752	,452
		Post-Test	143,67±12,94	146,08±12,24	-,347	,728
BMI	12	Pre-Test	18,19±1,83	18,34±1,35	-,231	,817
		Post-Test	17,93±1,88	18,21±1,25	-,346	,729
Horizontal Jump (cm)	12	Pre-Test	140,50±24,63	130,83±14,87	-,983	,326
		Post-Test	146,92±23,24	134,92±14,74	-1,416	,157
30m (sec)	12	Pre-Test	5,97±,40	6,08±,47	-,635	,525
		Post-Test	5,80±,47	6,10±,47	-1,704	,088
Push-up (sec)	12	Pre-Test	10,44±1,58	10,25±1,54	-,202	,840
		Post-Test	9,59±1,40	10,24±1,57	-1,155	,248
Vertical Jump (cm)	12	Pre-Test	41±4,55	41±5,80	-,174	,862
		Post-Test	43,25±4,82	42,91±5,76	-,289	,772
Anaerobic Power (kg/sec)	12	Pre-Test	516,88±119,69	547,62±97,47	-,866	,386
		Post-Test	544,71±127,68	564,32±99,07	-,404	,686
Hand Grip Force Right	12	Pre-Test	19,05±4,66	18,88±3,47	-,058	,954
		Post-Test	21,40±4,95	20,23±3,85	-,433	,665
Hand Grip Force Left	12	Pre-Test	18,92±6,63	16,75±3,31	-,809	,419
		Post-Test	20,91±7,46	17,45±3,12	-1,328	,184
25m Free Style (sec)	12	Pre-Test	20,21±2,40	20,13±2,21	,00	1,000
		Post-Test	18,85±1,90	20,03±2,10	-1,501	,133
50m Free Style (sec)	12	Pre-Test	42,33±4,28	42,19±4,42	-,115	,908
		Post-Test	40,25±3,93	41,77±4,16	-,866	,386

(p>0,05)

As can be seen in Table 2, no statistically significant difference is seen in the comparison of pretest and posttest of CEG and control group.

4. Conclusion

As a results of the study, the group of swimmers aged 9-12 who underwent 8 weeks of low intensity core exercises showed differences compared to pretest and posttest values of control group, even though not statistically significant. Due to the fact that in the control group there are no statistically significant differences between the pretest and posttest values of parameters such as weight, 10 sec push up, 30 m running and 25m free style swimming, it is reckoned that control group developed less than the CEG in terms of 10 sec push up, 30 m running and 25m free style swimming. When literature is reviewed, core exercises especially play an important role in the development of motor skills (Samson, 2005; Samson *et al*., 2007; Ping *et al*., 2011; Saeterbakken *et al*., 2011; Atıcı, 2013; Afyon, 2014; Afyon and Boyacı, 2016; Rostami and Ghaedi, 2017). However, contradictory results are also seen on their effect on the performance (Cissik, 2011; Patil *et al*., 2014). In alignment with the performed study, Gönener *et al*. (2017) found out that core exercises have effects on 100 m swimming performance of male swimmers aged 13-15, with back stroke style and they emphasize that core exercises should be used in groundwork exercises. Patil *et al*. (2014) state that, as a result of the study they carried out with 60 young swimmers with a mean age of 14,2±1,49, 6 weeks of core exercises have effect on 50 m free style swimming ($p<0,05$). In the literature, effects of core exercises on performance are a topic which has been scarcely studied on (Hibbs *et al*., 2008; Martens *et al*., 2011; Patil *et al*., 2014). However, for other branches there are various studies carried out. Yuksel *et al*. (2016) put forward their effect on hit rates of basketball players and state that this is due to the effect of core exercises on the balance parameter. Michael *et al*. (2005) checked the effects of core exercises on rowers and in alignment with this study, report that there is significant change in vertical jump parameter. Bilici and Selçuk (2018), as a result of their study performed with female volleyball players aged 14-16, state that 10 weeks of core exercises strengthen jumps and also the central area. Aslan (2014) puts forward that there is significant change in non-dominant leg force however core exercises do not affect dominant leg force. Even though in CEG's pretest and posttest comparison, the fact that there was no significant change makes one think that additional core exercises do not statistically affect the development of athletes, it is seen that in-group development of CEG is higher than that of control group both in terms of value and in terms of parameter. As a result, compared to the control group, a 1-2 seconds of decrease – especially when it is a very important amount for this sport – in 25 m and 50 m free style swimming ranks is attributed to the effect of core exercises, and it is reckoned that low intensity core exercises may positively affect the free style swimming performance of female swimmers aged 9-12.

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