Effect of Preparation on Anthropometric and Physiologic Characteristics of Divers

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Abstract

This study has been conducted to assess the effect of preparation course on anthropometric and physiologic characteristics of divers. Participants of this study include 60 members of 20-23 year old forces of the Army of Islamic republic of Iran selected as sample size. 30 members were selected as control group (with average score of physical readiness of 69/2±3/12, age average of 21/46±1/06 old, average fat-free mass of 64/2±3/03 Kg, average height of 175/74±6/55 Cm and average weight of 74/95±11/35 Kg) and 30 members were chosen as experimental group (with average score of physical readiness of 70/46±3/12, age average of 21/33±1/39 old, average fat-free mass of 64/46±6/98 Kg, average height of 176/86±6/50 Cm and average weight of 74/46±11/46 Kg). Experimental group did relevant exercises to preparation course of Army Navy divers through 16 weeks and 3 sessions in each week. Control group were continuing their daily activities including public morning - morning exercise - training programs – military queue - and afternoon training programs, specialized exercise and duties then they were tested at the end of course. Dependent and independent t tests were applied for data analysis. The obtained results of this study indicated that there was not any difference between fat-free mass of divers after preparation course and divers of control group; hence, preparation course could not effect on fat-free mass of divers. On the other hand, preparation course could improve physical readiness of divers of Army Navy Force so that there was a significant difference between physical readiness of divers after preparation course and divers of control group ($p<0/05$, $\alpha=0/001$) while there was not any significant effect on anthropometric characteristics of divers ($p<0/05$, $\alpha=0/88$). Conclusion: although exercises of preparation course had not any significant effect on fat-free mass of divers (compared to control group) but it could considerably increase physical readiness and improve motor skills of them.

Keywords: *physical readiness, fat-free mass, diving, body composition*

1. Introduction

Underwater floating technique is done with or without artificial respiration equipment of scuba (Baumqartner, 2006). Diving has industrial, research, military, and sport application. Today sport of diving and recreational diving has been a public sport as a beneficial, entertaining, enjoyable, and source of income within ecotourism industry of countries all around the world. The simple definition of this sport is that a person is diving underwater in this sport and the only available air is the amount of stored air in lungs for diver (Noori, 2013). Physical readiness and motor function in divers depend on the functioning of some organs such as heart, lung, muscles, and other organs of body in order to have an effective action within practicing and working conditions as well as a reasonable motor skill for implementing motor activities under water or on the ground in accordance with assigned mission. Different people need a sufficient level of physical readiness for job requires (Jafari, 2011). Diving is a sport that requires a high-level physical readiness since this is one of the most important martial and operational trainings in armed forces (Mogharnasi, 2003). When it comes to the anthropometric and motor functioning level of people, all of attentions will be toward athletes participating in professional competitions while there are other jobs in society with a direct relation to physical readiness and motor and anthropometric performance (Khorshidi, 2010). Hence, some specialized principles should be applied to understand the required features related to the best performance in this profession (Jafari, 2011). According to the effect of anthropometric factors (thickness of subcutaneous fat of arm triceps, subscapular, above iliac, and crus) as well as effect of physiologic factors on improvement of tasks of divers, researchers have aimed to identify the mentioned factors and use them in design of practicing programs to make effective skills (Manna, 2012). According to conducted studies, every position of military jobs has its special anthropometric and physiologic features (Abd, 2011). Tasks of a diver is related to

his physical capabilities such as speed, power, endurance, agility, high maximum level of oxygen consumption, technical and tactical skills, sufficient information about physiology and the role of nutrition in order to deal with unexpected incidents and events when implementing the mission (Mortazavi, 2014). The most important skill of a diver is correct use of lungs within a correct breathing and sufficient air containing in diving; hence, it is vital to consider this important point when choosing divers (Fesharaki, 2013). According to the mentioned points, this study aims to assess level of physical readiness and motor performance of divers of military force. On the other hand, this study has been conducted to investigate the relationship between anthropometric factors, physical readiness and operational abilities of this group to suggest acceptable results in order to improve performance and productivity of military divers based on the obtained results.

2. Methodology

This applied study is semi experimental. Statistical population of this study includes all 20-30 year old members of Army Navy of Islamic Republic of Iran in Manjil during 2015. There were 60 members chosen as available sample size that 30 members participated in this study as control group and the remained 30 members as experimental group. Participants were tested through initial tests of measuring fat percent through Caliper of three points of abdomen, thighs and breasts. Shuttle Test was applied to measure cardio-respiratory endurance. Measurements were done through three steps of pre-test, during preparation readiness (end of eighth week) and post-test. Each step of physical readiness and measurement of fat percent was implemented within two days (morning and afternoon) and Shuttle test of thigh was collectively conducted. After implementation of pre-test, participants in control group continued their daily activities. Experimental group practiced for 16 weeks (3 sessions each week) based on the complied program of preparation for divers of Army Navy of Islamic republic of Iran. Then, post-test was conducted for all participants in accordance with pre-test. Independent t test was applied to compare average of groups and dependent t test was used to compare average scores within pre-test and post-test of each groups. Variance analysis through repetitive measurement was used to compare groups in different steps of test. Bonferroni post hoc test was applied to find differences. All data were analyzed at significance level of 0/05 using SPSS 18 software.

3. Findings of Study

Mean, standard deviation, relevant minimum and maximum levels to variables of study are described in this part of study after measurement and analysis of variables.

Table 1 - Distribution of mean score of physical readiness of participants in pre-test

Statistic of groups	Frequency	Mean	Standard deviation	Maximum	Minimum
Control group	30	69/2	3/12	75	63
Experimental group	30	70/46	3/12	77	65

Table 2 - Distribution of mean score of physical readiness of participants during the course

Statistic of groups	Frequency	Mean	Standard deviation	Maximum	Minimum
Control group	30	70/62	2/98	76/43	64/43
Experimental group	30	74/16	3/12	78/70	68/70

Table 3 - Distribution of mean score of physical readiness of participants in post-test

Statistic of groups	Frequency	Mean	Standard deviation	Maximum	Minimum
Control group	30	71/66	2/03	76/20	66
Experimental group	30	85/36	1/83	89/90	79/90

Table 4 - Distribution of mean of fat-free mass (Kg) of participants during different steps

Steps	Group	Frequency	Mean	Standard deviation	Maximum	Minimum
Pre-test	Control group	30	64/2	3/03	81	64/30

	Experimental group	30	64/46	6/98	80	64
During test	Control group	30	64/35	4/10	80/70	63
	Experimental group	30	64/42	7/31	79/96	63
Post-test	Control group	30	64/1	3/99	80/85	62/38
	Experimental group	30	64/66	7/01	80/20	62/65

Table 5 - Results of independent t test to assess differences between groups related to fat-free mass (Kg) of preparation course

Levin test		df	t value	Sig
F value	Sig			
1/12	0/29	58	0/14	0/88

According to table 5 and lack of difference of fat-free mass between two experimental and control groups, preparation practices during preparation course has no effect on fat-free mass (Kg) of participants.

Table 6 - Results of independent t test to assess differences between groups related to physical readiness (Kg) during preparation course

Levin test		df	t value	Sig
F value	Sig			
0/002	0/96	58	4/37	0/0001**

According to table 6 and significant t test, it can be found that there is a significant difference between mean score of physical readiness of two experimental and control groups. According to higher mean score of physical readiness of experimental group during preparation course, it can be resulted that practices have improved physical readiness score of participants of the eight week.

Table 7 indicates results of dependent t test to assess the difference between two mean scores of physical readiness of two groups within pre-test and post-test.

Table 7 - Results of t test of dependent samples to assess the effect of preparation course on participants

Groups	Difference between pre-test and post-test	df	t value	Sig level
Control group	2/46	29	-3/246	0/809
Experimental group	14/90	29	+2/967	0/001

According to table 7, test has been significant at higher level of 0/001. Therefore, H_0 is rejected; hence, it is resulted that significance change in physical readiness score of participants in experimental group has been affected by preparation course ($p<0/05$).

Table 7 indicates results of dependent t test to assess the difference between two mean scores of fat-free mass of two groups within pre-test and post-test

Table 8 - Results of t test of dependent samples to assess the effect of preparation course on participants

Groups	df	t value	Sig level
Control group	29	1/246	0/189
Experimental group	29	1/9	0/568

According to table 8 and t test results, there is not any significant difference between fat-free mass mean of participants within pre-test and post-test ($p=0/56$, $t= 1/90$). Accordingly, preparation course could not significantly effect on fat-free mass (Kg) of divers; hence, the relevant hypothesis of study was rejected ($p<0/05$).

4. Discussion and Conclusion

According to the obtained findings of this study, it could be found that there was not any significant difference between anthropometric characteristics of divers within preparation course and members of control group while there was a significant difference between physical readiness of divers during preparation course and control group so that preparation course had a significant effect on physical readiness of navy divers. Therefore, preparation course could significantly effect on physical readiness of divers. The mentioned findings have been matched with obtained results of conducted studies by Noori et al (2013), and Kisi et al (2001). Noori et al (2013) have studied the effect of a selected practicing course on lung capacity and breath holding ability of scuba divers. For this purpose, 9 scuba divers and 8 breath holders were chosen among divers of Isfahan, Iran. All of participants were tested through Spirometry test of Jaeger as pre-test and forced expiratory volume in one second, a maximum of inspired oxygen, forced vital capacity and inspiratory capacity were recorded. Submaximal exercise program was measured for each group of parameters after two months. The obtained results indicated that scuba divers had improvement in their pulmonary test because of equipment and adaptation with respiratory tract after one training course and this was similar to improvement of breath holder divers who had some exercises to increase breath-holding record (Motamedi, 2010).

The other findings of present study indicated that preparation course had not any significant effect on anthropometric characteristics of divers so that this result was not matched with obtained results of conducted studies by Napradit et al (2001), Noori et al (2013), and Kisi et al (2001). The mentioned mismatch between the results of this study and other researches can be related to type of implemented tests, type of exercises and initial readiness level of divers. Napradit et al (2009) have assessed the relationship between anthropometric characteristics and physical readiness of military divers of Thailand. Participants of this study included 40 members of divers of Thailand Army with age domain of 30-60. To assess the hypothesis of study, height, weight, waist circumference, hip circumference, and blood pressure were calculated. Body mass index (BMI) and Waist-to-hip ratio (WHR) were also measured. Physical readiness tests of one-minute sit-ups and 2 Kilometers running were conducted to assess cardiovascular endurance and muscular endurance. MBI mean for divers was equal to ($24\pm3/3$ kg/m^2). There was a positive significant relationship of BMI and two systolic and diastolic blood pressures. There was a negative correlation between sit-ups and BMI while there was a positive relationship between 2-kiometers running and BMI. The obtained results of this study indicated that the higher MBI divers had, the lower level of physical readiness they had (Napradit et al, 2009).

The reason for mismatched results of present study and study of Napradit might be related to different tests to measure physical readiness as well as different anthropometric characteristics. On the other hand, Napradit et al have conducted a comparative study while the present paper has assessed the effect of preparation course on anthropometric characteristics and physical readiness.

According to the obtained results of this study, it can be cautiously stated that preparation exercises for divers of Islamic Republic of Iran Navy can improve physical readiness of divers so that divers of Islamic Republic of Iran Navy can use the considered exercises in preparation course in order to increase their physical readiness; on the other hand these exercises can be include in annual program of divers to keep their physical readiness. However, it is required to conduct more studies in order to clarify effect of different types of exercises on physiologic and anthropometric indices a s well as sport implementation.

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