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The effect of fish oil supplementation on fatigue perception following submaximal exercise during the pandemic of covid-19

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ABSTRACT

The Pandemic of Covid-19 has created the "New Normal" lifestyle and has limited people to perform their daily activities from home. These changes in turn affect the level of physical activities including the intention to engage in regular exercise in most people subsequently put them to the risk of having negative effects due to being physically inactive. This condition may downregulate the human immune system to become more vulnerable to various diseases. Oral supplementation of fish oil has been proposed to have benefits on decreasing pro-inflammatory markers induced by exercise. This study aimed to analyze the effect of fish oil supplementation on the degree of fatigue perception following submaximal exercise. Forty-four male college students participated in this non-equivalent pre-posttest experimental research. The participants were supplemented with 2 soft capsules of 1.5 grams fish oil for 8 weeks, the effect of submaximal exercise was carried out by the sit-up and bleep tests which was measured before and after 8 weeks of fish oil supplementation. The research procedure was approved by the ethics committee of the Makassar State University research institute. The results showed that there was a strong relationship between the administration of fish oil supplements and the level of fatigue perception following sit-ups and bleep tests (p value:-0.529 and -0.658 respectively) performed during the pandemic of Covid-19. This study concludes that the administration of fish oil supplementation affects the degree of fatigue perception after doing submaximal exercise especially during the Pandemic of Covid-19.

Keywords: fish oil ; sit up test, bleep test, fatigue perception

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Authors' Contribution: a – Study Design; b – Data Collection; c – Statistical Analysis; d – Manuscript Preparation; e – Funds Collection

INTRODUCTION

Fish oil contains lots of fatty acids including 25% of saturated fatty acids and the remaining of 75% unsaturated fatty acids (Faizah, Andhiarto, & Wijayanti, 2018). Sources of fish oil can be obtained by direct consumption of various types of fish or in the form of fish oil supplements (Rannu, Nurussyariah, & Sahabuddin, 2020). Omega-3 is a type of unsaturated fatty acid with main ingredients are Eicosapentaenoic Acid (EPA) and Docosahexaenoic Acid (DHA). This fatty acid is required to support physiological human body function where its long term consumption provides many benefits, including reducing the risk of sudden death by up to 45%, lowering blood cholesterol (LDL), anti-platelet aggregate, and anti-inflammatory (Harris, 2004; Phang, Sinclair, Lincz, & Garg, 2012), and can increase the number of natural

antioxidants that can suppress oxidative stress in patients undergoing hemodialysis (Tayebi-Khosroshahi et al., 2013).

The direct impact of Covid-19 pandemic leads the immune system to become more vulnerable to various diseases. This is worsen by the policy of self-isolation and working from home causing people to become less exercised thus affecting the degree of VO_2max values which was reported decreasing drastically (Christensen, Arneja, St. Cyr, Sturrock, & Brooks, 2021). After the Covid-19 pandemic, the government implemented a new "New Normal" policy that requires people to maintain and improve their immune system by doing lots of exercises, consuming balanced nutritious foods, and taking supplements that can strengthen the immune system to stay fit in carrying out daily activities. Sports or physical activity that is strenuous and carried out for a long time can cause fatigue because it uses a large amount of energy obtained from nutrients and oxygen in the body (Hall & Hall, 2020). Although engaging in regular physical activity can maintain physical fitness (Yanti, Gustian, Gani, & Setiawan, 2022), self-ability, and skills to become increasingly honed, as well as a better and healthier lifestyle (Sepriadi, 2017), however performing strenuous exercise may have paradoxical effect after long period of physical inactivity during the Pandemic of Covid-19.

Engaging in regular exercise can improve the level of physical fitness including delay in significant fatigue conditions. Two main aspects of physical fitness, which are related to health, are the endurance capacity of heart and lung (cardiorespiratory), muscle strength, muscle endurance ability, body flexibility, and body mass (Milanović et al., 2019). Cardiorespiratory endurance influences physical fitness by the quality and volume of oxygen inhaled during respiration process and also the body ability to utilize oxygen afterwards (Durmic et al., 2015; Price, Hull, Ansley, Thomas, & Eyles, 2016). The increase of carbon dioxide production in exhalation as well as oxygen demand during muscle and cell work will in turn increase the lung ventilation and therefore affect the respiratory rate (Hakked, Balakrishnan, & Krishnamurthy, 2017; Nugraheni, Marijo, & Indraswari, 2017). Oxygen exhalation during exercise can limit oxygen to reach the lung alveoli, leads to more frequent the respiratory rate and even further less oxygen reaches the alveoli. This in fact making a high respiratory rate is disbenefit for the body. Regular physical exercise can train a person's breathing frequency regularly and appropriately (Rusmanto, Lardika, & Gazali, 2020).

Other aspects are also related in physical fitness such as speed, strength, balance, agility, coordination of body movements, and the speed of body reactions in carrying out certain activities (Sujarwo, Tangkudung, & Hanif, 2018; Widiastuti, 2011). This level of physical fitness can be obtained through modifying aspects affecting physical condition, including performing regular physical exercise, proper exercise load, adequate rest, healthy environmental conditions, lifestyle, healthy and balanced food intake and nutrition. Regular physical exercise can increase the ability of cardiovascular endurance and maintain bone muscles so as to prevent the accumulation of body fat (Haqiyah, 2016) while the healthy lifestyle and daily diet can support the body's resistance to regular physical activity. One effort that can be done is to take supplements that can help improve work and endurance.

In sports, athletes, bodybuilders and other sport players commonly perform of submaximal physical exercise with the intensity of strenuous weight training affects the work of the cardiovascular system, increases muscle strength, and affects blood fat levels (Lesmana & Broto, 2018). The range of motion that continues to increase in physical exercise requires a lot of energy so that muscle glycogen used as an energy source decreases and causes the body's use of fatty acids as a backup energy source. Movements that are carried out continuously can cause fatigue perception so that the ability to work muscles also decreases (McArdle, Katch, & Katch, 2010). Fatigue perception is defined as fatigue produced due to exercise (Parwata, 2015); or inability of the body to maintain the working strength of the muscles produced (Kusnanik, Nasution, & Hartono, 2011); fatigue perception occurs because the muscles are unable to move or contract (Utami, Azumah, Multazam, & Rosidah, 2020); fatigue perception occurs when the amount of oxygen in the body decreases and lactic acid levels in the blood increase so that the fluid balance in the body is disturbed causing the strength and speed of muscles to move to decrease (Simon, 2017).

Sport players who regularly consuming fish oil supplement are due to the consideration of its anti-inflammatory function. This anti-inflammatory function is considered can boost muscle strength, reduce muscle pain so that muscle health improves, and is more optimal in performing body motion during exercises (Rannu et al., 2020). Fish oil supplements containing EPA and DHA which are consumed regularly by the sport players are expected to strengthen muscles hence altering fatigue perception during strenuous exercise. This is the novelty of this study to see the effect of giving fish oil supplements on the degree of fatigue perception and immune markers after doing submaximal exercise during the Covid-19 pandemic.

This study aims to evaluate the effect of fish oil supplementation on the degree of fatigue perception following submaximal exercise after 8 weeks of fish oil supplementation at a certain dose. Studies have been conducted to assess the effect of fish oil supplementation on general health (Faizah et al., 2018; Harris, 2004; Rannu et al., 2020; Tayebi-Khosroshahi et al., 2013), including the effect of fish oil on the regulation of the body's inflammatory cascade. When it comes to submaximal exercise ability. A study assessed the effect of fish oil on pulse regulation in the less trained population (Macartney, Ghodsian, Noel-Gough, McLennan, & Peoples, 2021) shows dietary fish oil caused a direct slowing effect on resting heart rate, without altering its response to autonomic nerve modulation. A review study shows the effect of fish oil on DOMS in various population that is fish oil supplementation reduced muscle soreness after eccentric exercise (Lv, Zhang, & Zhu, 2020). Meanwhile, fish oil supplementation on physical performance has also demonstrated positive effects including reducing perceived exertion during submaximal steady-state exercise in normal healthy untrained men and improves the exercise response in elderly individuals with co-morbidities, such as chronic inflammatory disease or sarcopenia (Kawabata et al., 2014; Kunz et al., 2022). However, all these studies were conducted outside Indonesia and only assessed the effect of fish oil supplementation at the same dose. There are not many studies that examine the effect of fish oil supplementation with different doses on the degree of fatigue after submaximal endurance and strength exercise especially during the pandemic of Covid-19. Therefore, the novelty of this study is to examine the effect of fish oil administration with different doses on the degree of fatigue after submaximal exercise during the pandemic of Covid-19.

METHOD

Forty-four participants were recruited using purposive sampling technique based on predetermined inclusion criteria. The criteria were including college students age between of 18-23 years, no cognitive dysfunction and were willing to participate in the study by signing a research approval letter and an informed consent form. Additional inclusion criteria include participant did not suffer from a serious infectious disease and musculoskeletal injury at least a week prior the study commenced, and did not have a history of heart, lung, or blood vessel disorders. This research procedure has been approved by the ethics committee of the Universitas Negeri Makassar Research Institute.

The participants were supplemented with 2 soft capsules of 1.5 grams fish oil for 8 weeks, the effect of submaximal exercise was carried out by the sit-up and bleep tests which was measured before and after 8 weeks of fish oil supplementation. The degree of fatigue perception was measured with BORG Scale. The research data obtained were analyzed using SPSS. Statistical analysis used is descriptive statistics to find out the general picture of respondents based on the maximum, minimum, and standard deviation values from the data obtained, then proceed with a normality test on the sample to see the distribution of the sample. The relationship between the fish oil administration variable and the degree of fatigue perception before and after performing submaximal exercise was analyzed using the Spearman Rank Test. The closeness of the relationship between variables was assessed based on the range of correlation coefficient values for each variable (Gani & Amalia, 2008).

RESULTS AND DISCUSSION

The average test (means) is used to describe the difference in data for each variable consisting of two or more sample groups used in the study (Gani & Amalia, 2008). Table 1 shows the measurement results of

several variables used in this study. Statistically descriptive, the measurement results show that the mean value for the maximal oxygen volume variable (VO_2max) is 42.443; sit-ups 25.53; and bleep test 6.63; significantly different from the respective standard deviation values, namely: VO_2max 5.351; sit-ups 4,478, and bleep test 1,732; while the mean value of the measurement results of the degree of fatigue (BORG) is 2.23 and the standard deviation value is 2.044 almost identical because the values are not much different.

Table 1. Statistic Descriptive

Variable	N	Minimum	Maximum	Mean	Std. Deviation
VO_2max	44	32.44	54.10	42.443	5.351
BORG	44	0	7	2.23	2.044
Sit Up	44	19.00	37.00	25.53	4.478
Bleep Test	44	3.00	9.00	6.63	1.732

The statistical value shows that of the 44 students who were being responded to mean value was greater than the standard deviation value. It shows that the data obtained is homogeneous because the standard deviation value is smaller than the mean. The differences between the mean value and standard deviation value of the BORG variable are smallest than other variables. It showed the level of homogeneity of the sample for measuring the degree of fatigue is more accurate or valid and can be continued for further statistical testing.

Table 2. Normality Test

Variable	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
VO_2max1	.139	44	.033	.956	44	.091
VO_2max2	.119	44	.125	.941	44	.026
BORG1	.226	44	.000	.847	44	.000
BORG2	.241	44	.000	.862	44	.000
Sit Up1	.136	44	.150	.966	44	.426
Sit Up2	.125	44	.200*	.945	44	.120
Bleep Test1	.210	44	.001	.926	44	.035
Bleep Test2	.143	44	.122	.931	44	.053

1. Before received fish oil supplements
2. After received fish oil supplements

Normality testing of the sample and population is carried out to see whether the distribution of data in groups or variables is normally and representatively distributed or not. This needs to be done to fulfill one of the requirements in testing whether the data is homogeneous or not when compared with a significance level of $p > 0.05$ (Rusman, 2015) and is related to the selection of the next test. Table 2 shows the results of normality testing using the Kolmogorov-Smirnov test (KS) and the Shapiro-Wilk test (SW) before and after fish oil supplementation. The test results obtained that the KS and SW numbers for the VO2max variable before fish oil supplementation were 0.033; 0.091 and after supplementation was 0.125; 0.02. For the fatigue perception variable, the test results before and after fish oil supplementation were 0.000; while the results of the KS and SW tests for the bleep test variable before giving fish oil supplements obtained the results of 0.001; 0.035; after giving fish oil supplement the result was 0.122; 0.053. The test results of the three variables indicate that the data are not normally distributed in general. While the results of the sit-up exercise test before giving fish oil supplements obtained KS and SW figures of 0.150; 0.426 and after giving fish oil supplements the value was 0.200; 0.120. This figure shows that the data is normally distributed. The results of testing the normality of the data distribution obtained more variables whose data were not normally distributed so the test of the relationship between each variable was carried out by the Spearman Rank Test, where this test did not require the data to be normally distributed.

Table 3 reveals the relationship between fish oil supplementation and the degree of fatigue perception before and after performing the submaximal exercise as indicated by sit-ups and bleep tests. The results show that the relationship between sit-ups performed by respondents before and after fish oil supplementation during pre and post-submaximal exercise is very weak giving a negative but significant

correlation value (Sig 0.002<0.05) with a strong relationship after doing submaximal exercise and consuming fish oil in a certain time span. This shows that there is a relationship between giving fish oil supplements to the physical condition of the respondents after doing submaximal exercise. Similarly, the bleep test was given before and after fish oil supplementation. The results showed a negative correlation in the pre (-0.223) and posttest given submaximal exercise but had a weak relationship in the posttest before consuming fish oil (-0.348) and pre-test after consuming fish oil (-0.462), but the relationship was quite strong (-0.658) and the results were significant (Sig 0.000 0.05) after the posttest was administered.

Table 3. Spearman Rank Correlation Test for Sit Ups and Bleep Tests on the Degree of Fatigue Before and After Submaximal Exercise and Fish Oil Supplementation

Variable		Before Fish Oil Supplementation		After Fish Oil Supplementation	
		BORG-1 Pra test	BORG-1 Post test	BORG-2 Pra test	BORG-2 Post test
Sit Up	Correlation Coefficient	-.084	-.299	-.189	*-.529***
	Sig. (2 tailed)	.661	.177	.318	*.002*
	N	44	44	44	44
	Correlation level	Weakly	Weakly	Weakly	Strong
Bleep Test	Correlation Coefficient	-.223	-.348	*-.462*	*-.658***
	Sig. (2 tailed)	.236	.112	*.010*	*.000*
	N	44	44	44	44
	Correlation level	Weakly	Weak	Weak	Strong

**. Correlation is significant at the 0.05 level (2-tailed).

Physical exercise that is carried out requires more energy than other people in general. Giving fish oil supplements before doing submaximal exercise can help manage energy during training, maintain muscle mass, maintain average blood glucose concentrations, and recover quickly after doing submaximal exercise. The statistical value of the degree of fatigue after giving fish oil supplements showed a significant relationship after doing submaximal exercise. While the statistical of the degree of fatigue before giving fish oil supplements shows a weak relationship after doing sub-maximal exercise, it appears that giving fish oil supplements can help reduce the degree of fatigue of respondents after doing sub-maximal exercise. This is in accordance with the results of research which shows that providing nutrition in the form of supplements at the proper dosage can help maintain energy, reduce fatigue, increase focus, and accelerate recovery after training or matches (Zahra & Muhlisin, 2020)

Overall, regular daily doses of fish oil supplements intake for eight weeks can improve the degree of fatigue perception following submaximal exercise. Optimal and routine supplementation (before, during, and after exercise) in sport players can reduce fatigue, accelerate recovery conditions due to fatigue, assist recovery from injury, and help restore body energy so that it affects the stamina and fitness of athletes (Rodek, Sekulic, & Kondric, 2012). Submaximal physical exercise is one of the conditions that can decrease physical fitness since submaximal exercise leads to the increase of fatigue perception due to prolonged strong muscle contractions. Therefore, supplements should be given to maintain physical fitness, increase stamina, and restore fatigue perception or muscle injury (Mason & Lavallee, 2012).

Fish oil are dietary supplements which contain omega-3 by means essential for health, even the most important among other fatty acids because of its anti-inflammatory and anti-blood clotting effects. It is also good for maintaining the function of central nervous system and prevent from cardiovascular diseases. It is well documented that EPA and DHA act as a defensive wall for the cell membranes of every cell in the body, including brain cells, and support brain function and emotional well-being. Before exercising light, moderate, and heavy intensity, fish oil supplements can also maintain blood glucose levels in the body and can increase the energy needed to perform muscle activity. Previous fish oil supplementation study among FIK UNM students also demonstrated that fish oil supplements can reduce fatigue perception levels, are safe for the body function, and have no adverse effects on health as long as they are consumed accordingly (Rannu et al.).

CONCLUSION

This study demonstrates strong and significant relationship between the regular administration of fish oil supplements before and after submaximal exercise and the improvement of physical condition indicated by decreasing the degree of fatigue perception. The results of the study are expected to become recommendation for athletes, coaches, doctors, and sports nutritionists for considering regular the administration of fish oil supplements to reduce and restore fatigue perception after submaximal exercise. This research has several limitations including the measurement of fatigue perception that is likely to have subjective value therefore future research need to use more reliable tools for evaluating the fatigue level. This [research was conducted using one group pre and post study design without involving control subject. The next study should be performed with randomized controlled study design to reduces bias and provides a rigorous tool to examine cause-effect relationships between an intervention and outcome. Further research is important to investigate the effect of fish oil supplements in different dose on specific body function including memory and attention, visualization, body agility and coordination among athletes and sport players after doing submaximal exercise especially after the Pandemic of Covid-19.

CONFLICT OF INTEREST

The author hereby declare no conflict of interest upon any material of this research

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