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

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ABSTRACT

The pandemic of COVID-19 has created the "New Normal" lifestyle and limited people to performing 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 putting them at risk of having negative effects due to being physically inactive. This condition may down regulate the human immune system, making it more vulnerable to various diseases. Oral supplementation of fish oil has been proposed to have benefits for 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 of fish oil for 8 weeks. The effect of submaximal exercise was carried out by the sit-up and bleep tests, which were 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 values of -0.529 and -0.658, respectively) performed during the COVID-19 pandemic. This study concludes that the administration of fish oil supplementation affects the degree of fatigue perception after doing submaximal exercise, especially during the COVID-19 pandemic.

Keywords: Fish oil; sit up test; bleep test; fatigue perception

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INTRODUCTION

Fish oil contains lots of fatty acids, including 25% saturated fatty acids and the remaining 75% unsaturated fatty acids (Faizah et al., 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 et al., 2020). Omega-3 is a type of unsaturated fatty acid, and its 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 et al., 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 effect of the COVID-19 pandemic makes the immune system more susceptible to various diseases. This is worsened by the policy of self-isolation and working from home, which causes people to become less exercised, thus affecting the degree of VO2max values, which were reported decreasing drastically (Christensen et al., 2021). After the COVID-19 pandemic, the government implemented a new "New Normal" policy that requires people to maintain and improve their immune systems by doing lots of exercises, consuming balanced nutritious foods, and taking supplements that can strengthen the immune system to stay fit while 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 et al., 2022), self-ability and skills to become increasingly honed, as well as a better and healthier lifestyle (Sepriadi, 2017), Strenuous exercise, on the other hand, may have a paradoxical effect after a long period of physical inactivity during the COVID-19 pandemic.

Regular exercise can improve physical fitness and postpone the onset of significant fatigue conditions. Two main aspects of physical fitness that are related to health are the endurance capacity of the heart and lungs (cardiorespiratory), muscle strength, muscle endurance ability, body flexibility, and body mass (Milanović et al., 2019). Cardiorespiratory endurance influences physical fitness by influencing the quality and volume of oxygen inhaled during the respiration process and also the body's ability to utilize oxygen afterwards (Durmic et al., 2015; Price et al., 2016). The increase of carbon dioxide production in exhalation as well as oxygen demand during muscle and cell work will in turn increase lung ventilation and therefore affect the respiratory rate (Hakked et al., 2017; Nugraheni et al., 2017). Exhaling oxygen during exercise can reduce the amount of oxygen reaching the lung alveoli, resulting in a faster respiratory rate and even less oxygen reaching the alveoli. A high respiratory rate is therefore detrimental to the body. Regular physical exercise can train a person's breathing frequency to occur regularly and appropriately (Rusmanto et al., 2020).

Other aspects are also related to physical fitness, such as speed, strength, balance, agility, coordination of body movements, and the speed of body reactions in carrying out certain activities (Sujarwo et al., 2018; Widiastuti, 2011). This level of physical fitness can be achieved by changing factors that influence physical condition, such as regular physical exercise, ensuring proper exercise load, getting adequate rest, maintaining healthy environmental conditions and a healthy lifestyle, and ensuring healthy and balanced food intake and nutrition. Regular physical activity can improve cardiovascular endurance and bone muscle strength, preventing the accumulation of body fat. Haqiyah (2016) while stated a healthy lifestyle and daily diet can support the body's resistance to regular physical activity. One effort that can be made is to take supplements that can help improve work and endurance.

In sports, athletes, bodybuilders, and other sport players commonly perform submaximal physical exercise with the intensity of strenuous weight training, which affects the work of the cardiovascular system, increases muscle strength, and affects blood fat levels (Lesmana & Broto, 2018). The increased range of motion in physical exercise requires a lot of energy, so muscle glycogen used as an energy source decreases, causing the body to use fatty acids as a backup energy source. Continuous movements can lead to fatigue perception, resulting in a reduction in muscle work ability (McArdle et al., 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 et al., 2011); fatigue perception occurs because the muscles are unable to move or contract (Utami et al., 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 the muscles to move to decrease (Simon, 2017).

Fish oil supplements are popular among athletes because of their anti-inflammatory properties. This anti-inflammatory function is considered to boost muscle strength, reduce muscle pain so that muscle health

improves, and be more optimal in performing body motion during exercises (Rannu et al., 2020). Fish oil supplements containing EPA and DHA, which are consumed regularly by athletes, are expected to strengthen muscles, thereby 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 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. Demonstrates that dietary fish oil had a direct slowing effect on resting heart rate without altering its response to autonomic nerve modulation (Macartney et al., 2021). A review study shows the effect of fish oil on DOMS in various populations, i.e., 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 improving 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 COVID-19 pandemic with different doses on the degree of fatigue after submaximal endurance and strength exercise, especially during the COVID-19 pandemic. 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 COVID-19 pandemic.

METHOD

Forty-four participants were recruited using a purposive sampling technique based on predetermined inclusion criteria. The criteria included college students ages 18-23 who had 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 that the participant did not suffer from a serious infectious disease or musculoskeletal injury at least a week before 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 of fish oil for 8 weeks. The effect of submaximal exercise was carried out by the sit-up and bleep tests, which were measured before and after 8 weeks of fish oil supplementation. The degree of fatigue perception was measured with the BORG Scale. The research data obtained were analyzed using SPSS. The 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 (VO2max) is 42.443; sit-ups are 25.53; and bleep test is 6.63; these values are significantly different from the respective standard deviation values, which are as follows: VO2max

is 5.351; sit-ups are 4,478; and bleep test is 1,732; while the mean value of the measurement results for the degree of fatigue (BORG) is 2.

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, the 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 smaller than those of 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 revealed that the KS and SW numbers for the VO2max variable before fish oil supplementation were 0.033 and 0.091, respectively, and 0.125 and 0.02 after supplementation. 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 and 0.035, respectively; after giving fish oil supplements, the result was 0.122 and 0.053. The test results for 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 and 0.426, respectively, after giving fish oil supplements the value was 0.200 and 0.120. This figure shows that the data is normally distributed. The results of testing the normality of the data distribution revealed 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, which 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 0.0020.05), 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 and 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 post-tests given submaximal exercise, but a weak relationship in the post-test before consuming fish oil (-0.348) and the 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 post-test.

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 Pre test	BORG-1 Post test	BORG-2 Pre 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, in general, requires more energy than other activities. 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 analysis 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 for eight weeks can improve the degree of fatigue perception following submaximal exercise. Optimal and routine supplementation (before, during, and after exercise) in sport 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 et al., 2012). Submaximal physical exercise is one of the conditions that can decrease physical fitness since submaximal exercise leads to an increase in 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 oils are dietary supplements that contain omega-3 fatty acids, which are essential for health and may be the most important fatty acid due to their anti-inflammatory and anti-blood clotting properties. It is also good for maintaining the function of the central nervous system and preventing 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 at a light, moderate, or heavy intensity, fish oil supplements can also maintain blood glucose levels in the body and increase the energy needed to perform muscle activity. A previous fish oil supplementation study among FIK UNM students also demonstrated that fish oil supplements can reduce fatigue perception levels, are safe for 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 to consider regular 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, which is likely to have subjective value; therefore, future research needs to use more reliable tools for evaluating the fatigue level. This research was conducted using a one-group pre- and post-study design without involving a control subject. The next study should be performed with a randomized controlled study design to reduce bias and provide a rigorous tool to examine cause-and-effect relationships between an intervention and outcome. Further research is important to investigate the effect of fish oil supplements in different doses on specific body functions including memory and attention, visualization, body agility, and coordination among athletes and sports players after doing submaximal exercise, especially after the Pandemic of COVID-19.

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CONFLICT OF INTEREST

The author hereby declares that he has no conflict of interest with any of the research materials.

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