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# Liver Function Test Elevation in Moderate IntensityPhysical Exercise

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**Abstract.**Liver enzymes can be used as a sign of liver injury include Serum Alanine Amino Transferase (ALT) also called Serum Glutamic Pyruvic Transaminase (SGPT) and Serum Amino Transferase Aspartate (AST) also called Serum Glutamic Oxaloacetic Transaminase (SGOT). Elevation of liver transaminase is generally caused by liver injury due to liver diseases and also may be elevated by extra hepatic process such as physical exercise. However, there is no consensus on what type of exercise can cause liver function test elevation. Moderate intensity of physical activity was being carried out by running on a treadmill with an intensity of 70% - 80% of the maximum heart rate for one hour. Then, blood sample was taken to measure SGOT and SGPT. Data obtained were statistically analyzed using paired t-test with a significance level of below 0.05 ($p<0.05$) and 95% confidence level ($\alpha=0.05$). Serum SGOT was increased 1.8 times, mean 39.54 u/L, $p<0.001$. Serum SGPT was increased 1.7 times, mean 49.4 u/L, $p=0.002$. Moderate intensity of physical activity could increase significantly liver function tests. However, more research is needed to compare the liver function test elevation among mild, moderate, higher intensity physical exercise.

**Keywords:** Liver function test, moderate intensity, physical exercise

## 1 Introduction

The liver is the largest organ inabdominal cavity weighing 1.2-1.8 kg,or approximately 25% of adult body weight which occupy mostright upper quadrant of the abdomen andis the body's metabolic center withvery complex function (Amiruddin, 2009). Liver is verypotential to get damage because it is the first organ after the digestion channel which exposed by toxic ingredients. Metabolic process of the liver will detoxify toxic ingredients, but this process can producemetabolites that are more toxic to liver.

Liver cells contain various enzymes, some of which are important for diagnostic damage to liver function. Enzyme activity can be measured in the blood so that it can indicate liver disease. Liver enzymes that can be used as a sign of liver damage include serum Alanine Amino Transferase (ALT), also called Serum Glutamic Pyruvic Transaminase (SGPT) and serum Aspartate Amino Transferase (AST), also called (Serum Glutamic Oxaloacetic Transaminase (SGOT) (Guyton & Hall, 2008).

Damage to the liver is characterized by increased liver function or with increased liver enzymes. Increased liver function during clinical trials may be drug-related, but other factors, such as exercise (Giboney, 2005) and diet (Purkinset al., 2004), may also have this effect. Plasma liver enzyme activities, is influenced by the duration, intensity, type and mode of exercise training changes (De Lemoset al., 2012).

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Physical activity that affects the increase in health status and is recommended is the intensity of moderate-medium exercise with a dose ranging from 40-60% of maximum work capacity (Rompa, 1994). Based on the statement that has been submitted, it is important to carry out this study which aims to determine the effect of moderate intensity physical activity on changes in liver function characterized by changes in AST, ALT levels and Alkaline phosphatase.

## 2 Methods

This research is a pre-experimental study with one group pretest-posttest research design. Sample used in this study were 16 untrained male students, aged 19-22 years, the average age of 20.5 years. Before starting, the sample must first fill out the consent form for participation in the research. The sample in this study was not using drugs, alcohol, not having metabolic disease or infection, and was in a healthy condition that had been tested by a doctor.

Intensity of physical activity is being carried out by running on a Treadmill with Intensity of 70% - 80% of maximum pulse for one hour. Blood is taken before and after physical activity and then measured in a laboratory using a Spectrophotometer Micro Lab 300 for examination of SGOT and SGPT. Data obtained from the study were statistically analyzed using t-test with a significance level below 0.05 ($p<0.05$) and 95% confidence level ($\alpha = 0.05$).

## 3 Results

Data were analyzed first by normality test, it was found that SGOT and SGPT data were normally distributed ($p>0.05$). The mean SGOT level before exercise was 24.71 ± 11.66 u / L and after exercise was 39.54 ± 10.47 u / L. This data shows there is an increase in SGOT level of 1.8 times after physical exercise. The results of paired t-test showed a significant increase in SGOT levels, $p <0.001$, after moderate intensity physical activity.

While, the mean level of SGPT before exercise was 30.80 ± 13.22 u / L and after exercise was 49.41 ± 12.90 u / L. This data shows there is an increase in SGPT of 1.7 times after physical exercise. Paired t-test results showed a significant increase in SGOT levels, $p=0.002$, after moderate intensity physical activity.

## 4 Discussion

Liver function test is conducted by measuring the levels of different biological indicators (proteins). These proteins show different aspects of normal function of liver (Rahmioglu *et al*., 2009). For example, the amount of Alanine Aminotransferase (ALT or SGPT) and Aspartate Aminotransferase (AST or SGOT) indicates healthy liver cells, although the serum activity of both enzymes will be increased whenever the integrity of liver cells are affected by the diseases.

The most widely used liver enzyme is aminotransferase. Aspartate aminotransferase is an enzyme that exists in many cells of the body, especially the heart and liver. Lower amounts are in the kidneys and muscles. This enzyme is in the transaminase group; aspartate

aminotransferase transfers amino factors from amino acids to alpha acids; which means catalyzing the transfer of one amino group from alpha-ketoglutaric acid and vice versa; and that's why it's called aminotransferase (Nazarali, 2015).

Aminotransferases have low activity in natural serum and their activity increases based on the trainings and endurance activities, short-term and high intensity, eccentric sports and even sports where no weight is endured (Cordova *et al*., 2006; Kalyani*et al*., 2006). Increased levels of transaminases that are mild in physical activity are often temporary (Lazo, 2009). More than 30% of adults with AST and ALT levels initially increase, if retested then normal results are obtained (Lazo, 2009). It is known that an increase in liver function tests (LFT) is usually caused by liver injury due to alcohol, non-alcoholic fatty liver disease, hemochromatosis, hepatitis B, hepatitis C, illegal drugs, dietary supplements, and over-the-counter and prescription medications medicine, including many psychiatric drugs (Oh, 2011). Transaminase levels sometimes forget that they can increase due to extrahepatic causes (Chalasani, 2008).

Although AST levels are highly concentrated in the liver, AST can also be found in muscles, heart, kidneys, red blood cells, brain and small intestine, while ALT can be found in the liver, muscles and kidneys (Chalasani, 2008). In fact, AST and ALT levels in the muscles are greater than those in the liver because of the larger mass of tissue. As a result, transaminase levels can increase due to various types of muscle disorders or injuries (eg, heart attack, surgery, and strenuous exercise), hemolysis, and small intestinal ischemia (Chalasani, 2008).

Changes occur in metabolism depending on duration, intensity, type and mode of exercise; possible changes in blood values before and after exercise (Sonmez, 2002; De Lemos, 2012). Variations were found between athletes and non-athletes in several parameters in a study conducted to see the effects of chronic exercise on several hematological and liver enzyme parameters (Bijeh, 2013). However, there is no consensus on what forms of exercise can cause changes in clinical chemical parameters, which may be influenced by parameters, or to what extent (Pettersson, 2007).

Skeletal muscle damage in healthy individuals after high intensity exercises are well established and could be the consequences of free radicals produced after exercise. If the muscle damage, enzymes such as aspartate aminotransferase level, alanine aminotransferase level, lactate dehydrogenase level, will increase in blood serum (Sarengsirisuwan, 1998). A significant increase at AST and ALT levels after exercise was found statistically by Nie*et al*., (2011), also in other study, it was reported a significant increase at AST and ALT values of athletes running ultra-marathon after and before competition (Wu *et al*., 2004). In excessive muscle forced exercise-induced, AST and ALT levels in blood can raise in muscle damages(Brancaccio *et al*., 2010).

On the other hand, research has shown that inappropriate recovery periods can also worsen injured muscle fibers so that liver enzyme levels can be increased. Intense and prolonged exercise without proper recovery time causes damage to muscle fibers during contraction, skeletal muscle and connective tissue (Valizadeh, 2016). In addition, factors such as age, sex, fitness, season and exercise are associated with increased volatility of these enzymes (Williams, 2004).

From existing research, improvements in liver function occur in almost all sports. Kawano *et al*., (2017) reported elevated liver function test in ultra-long distance running athletes, increase in liver enzyme AST in football exercise (Ekun*et al*., 2017), elevated AST and ALT in weightlifting (Petterson*et al*., 2007), boxing (Giuseppe *et al*., 2010), and treadmills (Suzuki *etal*.,2006). This is consistent with the results of this study, which obtained

a significant increase in AST levels ($p < 0.001$) and ALT levels ($p = 0.002$) after doing an hour treadmill moderate intensity physical activity.However, Bijeh*et al*., (2013) reported the opposite. AST and ALT levels after 8 weeks of swimming exercise were investigated among healthy women. and no significant changes were observed. Small differences in this observation can be the result of differences in the type of exercise, the intensity of exercise, and the duration of this activity.

## 5 Conclusions

Physical activity that is useful for body fitness and keeping the body healthy is moderate physical activity (40-60%) of the maximum capacity of a person's pulse. However, if the physical activity is excessive and not accompanied by adequate rest, it can cause damage to the liver. This is characterized by increased liver function or liver enzyme levels in blood serum. The enzymes that increase significantly are ALT and AST.

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