



## Effects of Vigorous Intensity Exercises on the Bilirubin level of Liver

Fehmina Bibi<sup>1</sup>, Khalid Zaman<sup>2</sup>, Mehwish Manzoor<sup>3</sup>, Irfan Ullah<sup>4\*</sup>, Azmat Iqbal<sup>5</sup>, Humaira Nawaz<sup>6</sup>, Mehboob Ullah Khan<sup>7</sup>

<sup>1</sup>Lecturer, Department of Sports Sciences & Physical Education Sarhad University of Science and Information Technology, Peshawar

<sup>2</sup>Assistant Professor of Health & Physical Education, Higher Education Department (Colleges) Peshawar, KP

<sup>3</sup>Visiting Lecturer, Department of Physical Education and Sports Government College University, Lahore, Pakistan.

<sup>4\*</sup>Assistant Professor of Health & Physical Education, Higher Education Department (Colleges) Peshawar, KP

<sup>5</sup>Tehsil Sports officer, Department of Directorate of Sports and Youth affairs Punjab, Pakistan

<sup>6</sup>Assistant Professor of Health & Physical Education, Higher Education Department (Colleges) Peshawar, KP

<sup>7</sup>MS Scholar, Department of Sports Sciences and Physical Education Sarhad University of Science and Information Technology, Peshawar

**Email:** <sup>1</sup>fehmina.syed96@gmail.com, <sup>2</sup>[khalidzamanpk2@gmail.com](mailto:khalidzamanpk2@gmail.com), <sup>3</sup>mehwishmanzoor233@yahoo.com, <sup>4\*</sup>[irfanullah949@gmail.com](mailto:irfanullah949@gmail.com), <sup>5</sup>[malikahad969@gmail.com](mailto:malikahad969@gmail.com), <sup>6</sup>humamarwat@gmail.com, <sup>8</sup>mukhan312@gmail.com

**Abstract:** The researchers at Shaheed Benazir Bhutto Women University in Peshawar set out to examine the "effects of vigorous intensity exercises on the bilirubin level of liver" among the students. The study was experimental in nature. Thirty students who were healthy and eager to participate in the study were selected using the Physical Activity Readiness Questionnaire (PAR-Q). The pre-test bilirubin level of the selected subjects was determined using the Liver Function Test (LFT). Subjects were randomly and equally assigned to the Experimental group (vigorous intensity exercises) and the Control (which got no treatment) group. The experimental group participated in vigorous exercise three times a week for 10 weeks as part of their treatment. The subjects of the control group did not get any treatment during this time but went about their routines as usual. The bilirubin post-test data was gathered using the same assay as the bilirubin pre-test. This was done once the full course of intervention had been taken. The minimum, maximum, mean, standard deviation, paired sample t test and independent sample t test were used to conduct descriptive and inferential analyses of the data collected before and after the treatment/intervention. The 0.05 level of significance was applied uniformly throughout this study. The results showed that the bilirubin level of the subjects of experimental group enhanced significantly after 10-week treatment of vigorous intensity exercises. The subjects in the control group did not see significant improvement in their bilirubin level of the liver because they were not given any kind of treatment. It was concluded that vigorous intensity exercises performed on a regular basis would help people in the enhancement of bilirubin level i.e., will enhance the function of liver.

**Keywords:** Vigorous Intensity Exercises, Bilirubin level, Liver

### Introduction

Physical activity is any movement of the body that involves the contraction of muscles attached to the bones and requires the expenditure of energy. Exercise is a specific physical activity that is designed, structured and cyclic for the purpose to sustain and improve the fitness and health or acts as a means of physical rehabilitation (Winter & Fowler, 2009). There are substantial distinctions among the four main types of exercise. Such exercises are categorized as flexibility, balance, endurance and strength exercises (Ullah, Gul, Muhammad & Usman,

2022). According to Nakagawa et al., (2020), Vigorous-intensity exercise that is sometimes called high-intensity exercise or vigorous physical activity is exercise performed with a more amount of attempt, resulting in a considerably higher heart rate and fast breathing.

Numerous benefits have been linked to regular exercise. It improves cardiac output by making the heart's muscles stronger. Improved blood flow is one of the many benefits of regular physical activity (Ullah, Khan, Gul & Ullah, 2022). Exercising regularly has been shown to improve respiratory health. All the breathing muscles get stronger, making it easier to breathe in and out, as reported by Helgerud et al. (2007). It also helps people stay at a healthy weight. The immune system and the liver is boosted by a consistent exercise routine. In order to protect one's health and lower one's risk of getting liver illnesses, research conducted by Bassuk & Manson, (2003) suggests that 25 minutes of strenuous physical exercise each day is necessary.

The liver can be found in the right upper abdominal quadrant, slightly below the diaphragm, and above the stomach. The liver is roughly a three-pound, cone-shaped organ that is normally a dark reddish-brown color. To get oxygenated blood to the liver, the body relies on the hepatic artery. Hepatic portal vein carries nutrient-dense blood into the liver. There are two main lobes in the liver. There are eight distinct parts to each. The liver stores fat-soluble vitamins as well as storage of iron and copper. The digestive fluid called bile is also produced by it which is a nice bonus. Glucose is also stored in a substance called glycogen (Bauer et al., 2022).

It is normal process of breaking and formation of blood cells. The liver is responsible for the breakdown of red blood cells. The bilirubin is created in the liver. Bilirubin is a byproduct of the breakdown of dead red blood cells in the human body. Bilirubin is a dark and yellow enzyme produced by the liver during the breakdown of red blood cells (RBCs), which normally returns to the liver and is deposited in the bile duct. Stools, as stated by Shah (2010), is a reliable means through which bilirubin is removed from the body. Too much accumulation of bilirubin can be toxic. If the bilirubin level is higher than usual, it is the indication of different types of liver or bile duct problems. The gather of more bilirubin in blood can lead to illness and irritate nerves under the skin. It leads to jaundice.

It is important to find out if and to what extent vigorous intensity exercises can enhance bilirubin levels among the students. From this vantage point, the study aimed to ascertain the "effects of vigorous intensity exercises on the bilirubin level of liver" among the university students.

### **Objective of the Study**

- To determine the effects of vigorous intensity exercises on the bilirubin level of liver among the university students (18 to 22 years).

### **Delimitations of the Study**

- 1) Thirty students of Department of Health and Physical Education Shaheed Benazir Bhutto Women University Peshawar were selected as subjects for the study.
- 2) The age range of the subjects was 18-22 years.
- 3) The study was restricted to female subjects only.
- 4) Two groups were formed each of fifteen students which were experimental group and Control Group.
- 5) The duration of vigorous intensity was ten weeks with three sessions per week on alternate days.

### **Methods And Materials**

#### **Participants of the Study**

Participants are all the subjects and persons that are involved in the problem being examined and the data gathering process (Ullah et al., 2023). The study nature was experimental. Shaheed Benazir Bhutto Women University students from the health and physical education department in Peshawar volunteered for the research. Thirty healthy and volunteer students were chosen as subjects for the study on the basis of Physical Activity Readiness Questionnaire (PAR-Q).

#### **Exclusion and Exclusion Criteria**

It is a tool that can be used as criteria utilized for either inclusion or exclusion of the subjects in the study. The PAR-Q was also used in the current study. It's used by fitness instructors before the commencement of an exercise program to pick the right people and lessen the likelihood of any negative health consequences. Most of the time, it is in the form of closed-ended questions, as stated by Warburton, Jamnik, Bredin, and Gledhill (2011). The students of Department of Health and Physical Education Shaheed Benazir Bhutto Women University Peshawar were the participants of the study. The study was experimental in nature. Thirty healthy and volunteer students were selected as subjects on the basis of Physical Activity Readiness Questionnaire (PAR-Q) for the study.

### **Study Design**

A research design is an approach to addressing a research question or topic (Newman & Gough, 2020). The present investigation was experimental in nature, taking the form of pre-test and post-test. The Liver Function Test (LFT) was used to measure the dependent variable (bilirubin) in both groups of participants before the treatment to experimental group. After the initial screening, the experimental group engaged in vigorous intensity exercises on Monday, Wednesday, and Friday for a total of 10 weeks. The control group was neither given any sort of treatment nor were they allowed to take part in any sort of aerobic and anaerobic activity except their routine life activities. After 10 weeks' treatment to the experimental group, post-test of each subject of two groups of dependent variable was taken as the procedure adopted for the pre-test. The post-test score of each subject of two groups was recorded with the reference the dependent variable.

### **Pilot Study**

An initial investigation was performed to ascertain the subjects' present abilities and to verify the usefulness, regularity, and duration of high-intensity exercise. This resulted in the random selection of ten willing individuals, all of whom went on to complete the vigorous intensity exercises that had been planned for them. The results of the ten subjects were averaged to find an overall performance. Vigorous intensity exercises of varied degrees of difficulty were designed based on the findings of the pilot study and followed by the experimental group for 10 weeks. While designing the vigorous intensity exercises training program, the researcher stayed true to the principles of training.

### **Orientation of Subjects**

One of the main goals of the orientation is to collect reliable information. The first session was meant to get the test subjects excited about the training ahead of them and get them acquainted to the vigorous intensity exercises they would be performing. The researcher explained the subjects' role as well as the purpose and importance of the present study. In addition to the first orientation, the researcher met with the experimental group three sessions to go through the specifics of the training they would be receiving. This was done to ensure that everyone taking part in the exercises would have the information they needed to do so safely. The researcher himself gave the demonstration of each exercise in front of the subjects.

### **Instrument for Collection of Data**

The term "instrument" is commonly used to refer to a measuring device. An instrument in a research study is a tool used by the researcher to collect data (Kola, 2017). There are various instruments like questionnaire, interview, test etc., and the selection of instrument depends upon the nature of study. The current study was undertaken to determine the effects of vigorous intensity exercises on the bilirubin level of liver. According to the available literature, Liver Function Test (LFT) was used as criterion measure to collect the pertinent data on the dependent variable (bilirubin) in the present study.

### **Ethical Consideration of the Study**

When people volunteer to take part in scientific studies, it is the researcher's duty to make sure they are not put in danger, either physically or psychologically. Therefore, all participants received comprehensive explanations of the study objective and methods. The subjects were selected through PAR-Q which ensured that they were free from different diseases. Everyone who took part in the study signed a consent form. Likewise, a consent letter was also got from the head of the institution.

### **Training Protocol**

A self-administered vigorous intensity exercises protocol of forty minutes (including warm up and cooling down) was developed for the subjects of experimental group. Warming up for eight minutes (mild dynamic stretching activities and walk) and cooling down for seven minutes (walk, light stretching exercises with deep inhalation) were implemented before and after the training session respectively. The training was continued for 10 weeks.

Each exercise was thoroughly explained and demonstrated to the subjects before the training began. Vigorous intensity exercises consisted of running, stepping up and down, and cycling, with rest periods in between exercises. All the exercises were performed vertically. There was no restriction on the subjects for the repetitions of exercises but the subjects had to do it continuously till the end of stipulated time within heart rate zone. The sequence of exercises was followed according to the protocol. On whistle, the subjects started exercise. At the end of stipulated time for exercise, the whistle was blown and the subjects had to shift over to another exercise after pause. There was also rest between sets.

### **Analyses Of The Data**

#### **Section A: Descriptive analyses**

#### **Table 1: Frequencies and Percentages of Sampled Groups**

Groups	Frequency	Percent
Experimental Group	15	50%
Control Group	15	50%
Total	30	100.0%

The table shows that there are total two groups in the study having identical number of participants i.e. total number of subjects in the experimental group is 15 (50%), and also in control group is 15 (50%). The total sample of the study is 30 (100%).

**Table 2: Anthropometrics/Demographic Measurements of Age, Height and Weight of the Subjects of Experimental Group and Control Group.**

Groups	Variables	n	Minimum	Maximum	Mean	Std. Dev
Experimental Group	Age (years)	15	18.00	22.00	20.21	1.43
	Height (cm)		154.00	175.00	162.80	5.04
	Weight (kg)		49.00	71.00	58.53	8.71
Control Group	Age (years)	15	18.00	22.00	19.80	1.34
	Height (cm)		152.00	171.00	163.27	4.95
	Weight (kg)		51.00	67.00	58.21	5.01

### Section B: Inferential Analyses

#### Pre-treatment Matching Process

**Table 3: Pre-Treatment Comparison Among Age, Height and Weight Measurements of Experimental Group and Control Group**

Variables	Groups	n	Mean	St. Dev	t	Sig.
Age (years)	Experimental Group	15	20.21	1.43	1.766	.072
	Control Group	15	19.80	1.34		
Height (cm)	Experimental Group	15	162.80	5.04	1.531	.098
	Control Group	15	163.27	4.95		
Weight (kg)	Experimental Group	15	58.53	8.71	.401	.672
	Control Group	15	58.21	5.01		

The table shows that there is no significant difference (0.05) among age, height and weight between the Experimental group and Control group before the treatment.

**Table 4: Pre-Treatment Difference between Experimental Group and Control Group in Bilirubin Level**

Variable	Experimental Group n=15	Control Group n=15	T	Sig.
	Mean $\pm$ SD	Mean $\pm$ SD		
Bilirubin Level	.526 $\pm$ .103	.546 $\pm$ .112	-.507	.616

In Table 4, an independent sample t-Test has been used to test the hypothesis about the mean difference of Experimental group and control group in Bilirubin level in pre-test. The table indicates that there is no significant difference between Experimental group and control group in Bilirubin level before the treatment to Experimental group (.616 > 0.05).

#### Pre-Test and Post-Test Comparison of Bilirubin level of Each Group

**Table 5: Pre-Test and Post-Test Means and Standard Deviation of Bilirubin Level of Experimental Group and Control Group**

Groups	Statistical Sources	Pre-test	Post-test
Experimental group (Vigorous Intensity Exercise)	Mean	.526	.880
	Std. Deviation	.103	.23664
	N	15	15
Control group (No treatment)	Mean	.546	.5333
	Std. Deviation	.112	.11127
	N	15	15

The table shows there is difference between pre-test score and post-test score in Bilirubin level of experimental group (.526 < .880, Improvement= 0.354). On the other hand, the control group shows little difference between pre-test and post-test in mean score of Bilirubin level (.546 > .533, decrease= 0.013). The descriptive results show that there is positive effect of Vigorous Intensity Exercises on Bilirubin level of subjects having age 18-22 years.

**Table 6: Difference between Pretest and Posttest of Experimental group and Control Group in Bilirubin Level**

Groups	Pretest Bilirubin	Posttest Bilirubin	T	Sig.
	Mean $\pm$ SD	Mean $\pm$ SD		
Experimental group	.526 $\pm$ 1.03	.880 $\pm$ .236	-5.734	.000
Control Group	.546 $\pm$ .112	.533 $\pm$ .111	.619	.546

In Table 6, a paired sample t-Test has been applied to measure the significant difference in Bilirubin level between pre-test and post-test of Experimental group and control group. The table shows that there is Statistically significant difference (0.000 < 0.05) between the pre-test and post-test in Bilirubin score of experimental group. On the other hand, there is no statistically significant difference (.546 > 0.05) in pre-test and post-test in Bilirubin score of control group.

**Table 7. Post-Treatment Difference between Experimental Group and Control Group in Bilirubin Level**

variable	Experimental Group n=15	Control Group n=15	T	Sig.
	Mean $\pm$ SD	Mean $\pm$ SD		
Bilirubin Level	.880 $\pm$ .236	.533 $\pm$ .111	5.134	.000

In Table 7, an independent sample t-Test has been applied to test the hypothesis about the mean difference of experimental group and control group in Bilirubin in post-test. The table shows that there is statistically significant difference between experimental group and control group in Bilirubin level after the vigorous intensity exercises treatment to experimental group (.000 < 0.05) which indicates that vigorous intensity exercises protocol is effective on Bilirubin level.

#### Discussion

The study was conducted to find out the effects of vigorous intensity exercises on Bilirubin level of liver among the university students of 18 to 22 years of age. The present investigation was experimental in nature, taking the form of pre-test and post-test. The Liver Function Test (LFT) was used to measure the dependent variable (bilirubin) in both



groups of participants before the treatment to experimental group. The data was tabulated and analyzed keeping in view the objective of the study.

The data results of the present study confirmed that vigorous intensity exercises were the effective mode of exercises to improve the Bilirubin level among the adults having age 18-22 years. The experimental group showed significantly enhancement in the mean Bilirubin score compared to control group. Since, the participants of the study showed their zeal and interest to participate in the study. The results of the present study are consistent with other studies which were conducted to confirm the effect of vigorous intensity exercises on Bilirubin level. The study of Žiberna, Jenko-Pražnikar, *et al.*, (2021) found that aerobic exercise play a dramatic role in increasing the level of serum Bilirubin level among subjects. Morelliet *al.*, (2020) concluded that there is significant positive Impact of vigorous-intensity physical activity on body composition parameters, lipid profile markers, and Bilirubin levels in adults. In the same way, Smits, Jasper *et al.* (2012) reached at the facts that vigorous-intensity exercise prove be significant for Bilirubin sensitivity. Similarly, Devries *et al.*, (2008) found that there is significant positive effect of endurance exercise on hepatic lipid content, enzymes, and adiposity in men and women.

### Findings of the Study

1. There was no statistically significant difference in bilirubin levels between the experimental group and the control group before treatment to the experimental group ( $P > 0.05$ ).
2. There was a significant difference in bilirubin levels after treatment between the Experimental group and the control group ( $P < 0.05$ ). The bilirubin levels in the experimental group were much enhanced than those in the control group.
3. The levels of bilirubin in the experimental group were found to be significantly different before and after the test ( $P < 0.05$ ). Participants in the experimental group saw their bilirubin level enhanced as a result of their treatment.
4. There was no significant change in bilirubin levels among the subjects between the pre- and post-test of the control group since they did not receive any treatment ( $P > 0.05$ ).

### Recommendations

The following recommendations are given on the basis of the findings and the conclusions drawn from them:

1. The results showed that bilirubin levels in the subjects of experimental group were elevated after participating in vigorous intensity exercises. In light of this finding, the students may easily integrate this program into their daily routine. In order to help university students to normal/control their bilirubin levels, it has been suggested that the government may design a curriculum that incorporates specific vigorous intensity exercises.
2. Since high-intensity workouts do not necessitate any specialized equipment, they may be easily included into the workdays of public and private companies to boost bilirubin levels that will pave the way to a healthier lifestyle for their employees.
3. The vigorous intensity exercises are form of exercises that may be recommended for the masses in order to ameliorate their bilirubin level.
4. A nation's most precious resource is its healthy population, which is in a better position to advance the country as a whole. The health of the population as a whole can benefit from the government's provision of indoor and outdoor spaces for exercise and recreation.

### Conclusion

The present study was initiated to investigate the effect of vigorous intensity exercises on the bilirubin level (liver function). Bilirubin has antioxidant properties against chronic respiratory diseases. However, previous studies are limited by acquisition of serum bilirubin level at one time point and its analysis with clinical parameters. The researcher evaluated the association of serum bilirubin levels with various clinical outcomes of girls having age 18-22 with the treatment of vigorous intensity exercises. The researchers concluded that higher serum bilirubin levels were associated with a vigorous intensity exercise in age group 18-22 years of female. The researchers also concluded that Vigorous intensity exercises are highly associated with the improvement of serum bilirubin level than control group. Bilirubin possesses potential antioxidant and anti-inflammatory effects. However, vigorous intensity exercises may be used with medications to treat and maintain the bilirubin related health consequences to reduce the side effects. Because exercise is a natural antibiotic with no any harmful side effects.

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