Effect of Moderate Intensity Exercise on Lungs Functions (IRV & ERV) in Young Athletes

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Authors’ contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

This research study was primarily conducted for the purpose to examine the effect of moderate intensity exercise on lungs functions (IRV & ERV) in young athletes. The participant of the study was randomly selected from the Department of Sports Sciences & Physical Education, Gomal University, KP Pakistan. A written informed consent was taken from all the subjects. A self-made, 08 weeks exercise protocols was applied on the selected subjects. Pretest and posttest data were
collected by using spirometer and other helping devices. The collected data were tabulated and were analyzed by using various statistical tools. On the basis of data analysis and findings the researcher concluded there is significant effect of 0.8 weeks moderate intensity exercise on lungs functions (IRV & ERV).

Keywords: Moderate intensity exercise; young athletes; lungs functions.

1. INTRODUCTION

1.1 Background of the Study

Lungs are principle organs which carry out gases exchange (O2 and CO2) that provide O2 and remove CO2 from the body [1,2]. The blood comes from heart to lungs via pulmonary artery (which is deoxygenated blood) lungs have a sac-like structure which known as alveoli which is surrounded by blood capillaries thus from alveoli the oxygen is transported to blood thus this blood comes toward the heart then heart pump the oxygenated blood through ventricle to all part of the body [3,4,5].

Thus oxygenated blood reached to heart through pulmonary vein, there is a special molecule for the transporting of oxygen in blood called hemoglobin (a protein). Thus heart pumps the oxygenated blood to all parts of the body which give us energy [6,7]. Due to production of energy a waste materials is produce such as carbon dioxide which remove from the body through circulatory system which bring the carbon dioxide to lungs thus its remove through this way and the other waste materials excrete through the kidney [8,9,10].

Moderate intensity exercise refers to all those exercise, in which a person moving fast enough to used up 6 times more energy than in rest condition (Riding a bike, brisk waking (4 to 6km /hour), dancing, hiking, double tennis and pushing a lawn mower [18,19].

Exercise helps in reducing chances of cardiovascular disease, in those which have already heart problems, improve diastolic blood pressure, control blood sugar level, build of strong and healthy muscles and thus improve quality of life [20,21].

Physical activities has been set up as an important change in behavior for vital physiological, physical and psychological health results but without physical activities are still spreading and creating problems worldwide [22,23]. Various factors effect in the engagement in physical activities thus influence in the human wellbeing [24,25,26]. Research found that physical activity decreases various health problems, according to the American college of sports medicine (ACSM) moderate intensity exercise increase heart rate and breathing [27,28].

As a result of all the above research evidence, now it is clear to say that exercise promote the functional capacity of all body organs. Lungs which is more important organ helps body to get oxygen from the air that we breathe. Likewise the functions of other organs, exercise also promote the lungs capacity and volumes. How much exercise promote lungs volume and capacity? What kind of exercise promote lungs volume and capacity? To discover the fact, the researcher intend to carry on a research study under the title “effect of moderate intensity exercise on lungs functions among young athletes”.

2. MATERIALS AND METHODS

To reach at certain finding and conclusion, the researcher was adopt the following procedure.
2.1 Participants of the Study

The participant of the study was randomly selected from the Department of Sports Sciences & Physical Education, Gomal University, KP Pakistan. The lungs functions and anthropometric characteristics of the subjects were measured by using; weight machine, Spirometer, and measuring tape. The participants were divided as Experimental Group (EG)-5 and Control Group (CG)-5. The subject were included in the study by adopting the criteria that; subject having age not less than 22 and not more than 25 years, subject having no health problem and Subject using no medicine.

2.2 Data Analysis

The collected data was tabulated and was analyzed by different statistical tools. One sample t-test was used to compare the collected data of subjects with the international level normal ranges, the independent sample t-test was used to compare the CG and EG before and after the treatment. The researcher was also use paired sampled t-test to compare the test results of same group before and after the treatment. The descriptive statistics was also be use describe the collected data through mean, and standard deviation of the sample subjects.

3. PRESENTATION AND ANALYSIS OF DATA

Table.1 shows the descriptive measurement of EG (Pre-test) in term of anthropometric characteristics. The mean in term of age was 21.4 years, mean in term of weight was 67.2, mean in term of height was 170.18 cm, mean in term of BMI was 23.2, mean in term of IRV was 6.6 and mean in term of ERV was 2.4.

Table.2 shows the descriptive measurement of EG (Post-test) in term of anthropometric characteristics. The mean in term of age was 21.4 years, mean in term of weight was 64.4, mean in term of height was 170.18 cm, mean in term of BMI was 22.2, mean in term of IRV was 31.2 and mean in term of ERV was 3.4.

Table.3 shows the descriptive measurement of CG (Pre-test) in term of anthropometric characteristics. The mean in term of age was 23 years, mean in term of weight was 80., mean in term of height was 175.8 cm, mean in term of BMI was 23.2, mean in term of IRV was 6.6 and mean in term of ERV was 2.4.

Table.4 shows the descriptive measurement of CG (Post-test) in term of anthropometric characteristics. The mean in term of age was 23 years, mean in term of weight was 80.2, mean in term of height was 175.8 cm, mean in term of BMI was 27.4, mean in term of IRV was 5.4 and mean in term of ERV was 2.

Table 5 indicates the mean difference in both CG and EG. The data were express through means and standard deviation. Significant difference in EG during the pretest and posttest score in term of BMI, \( t_4 = 4.662, \) \( \text{Sig.} = .010 < \alpha = .05 \). Significant difference during the pre-test and posttest score in term of IRV of EG \( t_4 = -3.361, \) \( \text{Sig.} = .028 < \alpha = .05 \). The data also indicates that there is significant difference during the pre-test and posttest score in ERV of EG \( t_4 = -3.162, \) \( \text{Sig.} = .034 < \alpha = .05 \). Hence it is observed that there is significant difference in BMI, IRV and ERV during pre-test and posttest score of EG.

Table 6 indicates the mean difference in both CG and EG. The data were express through means and standard deviation. No significant difference was found during pretest and posttest score in term of BMI of CG, \( t_4 = -2.00, \) \( \text{Sig.} = .851 > \alpha = .05 \). No significant was found during pretest and posttest score in term of IRV of CG, \( t_4 = 2.058, \) \( \text{Sig.} = .109 > \alpha = .05 \). No significant was found during pretest and posttest score in term of ERV of CG, \( t_4 = 1.633, \) \( \text{Sig.} = .178 > \alpha = .05 \). Hence it is observed that there is significant difference in BMI, IRV and ERV during pre-test and posttest score of EG.

Table.1 showing the descriptive statistics of pretest measurements of EG

| S.No | Name | BMI   | Height (cm) | Weight (kg) | Age (year) | IRV (sec:) | ERV (sec:) |
|------|------|-------|-------------|-------------|------------|------------|------------|
| 1    | A1   | 21.79 | 172.72      | 65          | 22         | 6          | 2          |
| 2    | A2   | 28.31 | 170.18      | 82          | 21         | 6          | 3          |
| 3    | A3   | 24.91 | 167.64      | 70          | 22         | 6          | 2          |
| 4    | A4   | 20.72 | 170.18      | 60          | 21         | 6          | 2          |
| 5    | A5   | 20.37 | 170.18      | 59          | 21         | 8          | 3          |
| Average |     | 23.2  | 170.18      | 67.2        | 21.4       | 6.4        | 2.4        |
Table 2 showing the descriptive statistics of posttest measurements of EG

| S.No | Name | BMI  | Height (cm) | Weight (kg) | Age (year) | IRV (sec:) | ERV (sec:) |
|------|------|------|-------------|-------------|------------|------------|------------|
| 1    | A1   | 21.12| 172.72      | 63          | 22         | 53         | 3          |
| 2    | A2   | 26.93| 170.18      | 78          | 21         | 15         | 4          |
| 3    | A3   | 23.13| 167.64      | 65          | 22         | 18         | 3          |
| 4    | A4   | 20.03| 170.18      | 58          | 21         | 25         | 4          |
| 5    | A5   | 20.03| 170.18      | 58          | 21         | 45         | 3          |
|      |      | **Average** | 22.2 | **170.18** | **64.4** | **21.4** | **31.2** |

Table 3 showing the descriptive statistics of pretest measurements of CG

| S.No | Name | BMI  | Height (cm) | Weight (kg) | Age (year) | IRV (sec:) | ERV (sec:) |
|------|------|------|-------------|-------------|------------|------------|------------|
| 1    | B1   | 26.76| 185.42      | 92          | 24         | 4          | 2          |
| 2    | B2   | 24.74| 175.26      | 78          | 23         | 8          | 2          |
| 3    | B3   | 31.08| 170.18      | 90          | 22         | 9          | 2          |
| 4    | B4   | 27.50| 185.88      | 75          | 23         | 8          | 3          |
| 5    | B5   | 24.22| 162.56      | 65          | 23         | 4          | 3          |
|      |      | **Average** | 26.9 | **175.8** | **80** | **23** | **6.6** |

Table 4 showing the descriptive statistics of posttest measurements of CG

| S.No | Name | BMI  | Height (cm) | Weight (kg) | Age (year) | IRV (sec:) | ERV (sec:) |
|------|------|------|-------------|-------------|------------|------------|------------|
| 1    | B1   | 26.76| 185.42      | 92          | 24         | 4          | 2          |
| 2    | B2   | 25.39| 175.26      | 78          | 23         | 6          | 2          |
| 3    | B3   | 31.08| 170.18      | 90          | 22         | 9          | 2          |
| 4    | B4   | 27.50| 185.88      | 75          | 23         | 5          | 2          |
| 5    | B5   | 24.22| 162.56      | 66          | 23         | 3          | 2          |
|      |      | **Average** | 27 | **175.8** | **80.2** | **23** | **5.4** |

Table 5 Paired sample t-test showing the mean difference between pre-test and posttest score in term of BMI, IRV and ERV of EG

| Testing variables | Mean (BMI Pre) | N | Std. deviation (T) | Sig. |
|-------------------|----------------|---|---------------------|------|
| Pair 1 BMI Pre    | 23.2860        | 5 | 3.28947             | .010 |
| Pair 1 BMI post   | 22.2200        | 5 | 2.90637             |      |
| Pair 2 IRV (sec) pre | 6.4000      | 5 | .89443       | -3.361 | .028 |
| Pair 2 IRV (sec) post | 31.2000  | 5 | 16.88787 |      |
| Pair 3 ERV (sec) pre | 2.4000    | 5 | .54772       | -3.162 | .034 |
| Pair 3 ERV (sec) post | 3.4000    | 5 | .54772       |      |

Table 6 Paired sample t-test showing the mean difference between pre-test and posttest score in term of BMI, IRV and ERV of CG

| Testing variables | Mean (BMI Pre) | N | Std. deviation (T) | Sig. |
|-------------------|----------------|---|---------------------|------|
| Pair 1 BMI Pre    | 25.9000        | 5 | 3.43029             | -.200 | .851 |
| Pair 1 BMI post   | 25.9760        | 5 | 3.34019             |      |
| Pair 2 IRV (sec) pre | 6.6000    | 5 | 2.40832       | 2.058 | .109 |
| Pair 2 IRV (sec) post | 5.4000    | 5 | 2.30217       |      |
| Pair 3 ERV (sec) pre | 2.4000    | 5 | .54772       | 1.633 | .178 |
| Pair 3 ERV (sec) post | 2.0000    | 5 | .00000       |      |
Table 7 indicates the mean difference in both CG and EG. The data were expressed through means and standard deviation. No significant difference in both groups CG and EG in term of BMI was observed during pretest (EG (M = 23.28±3.28) CG (M = 25.90±3.43) t= 1.230, Sig. = .254 > α= .05. No significant difference was found in both groups EG ad CG in term of IRV during pretest (EG= 5.40±2.30), CG (M = 6.40±2.40), t= -1.897, Sig. = .094> α= .05.

No significant difference was found in both groups EG ad CG in term of BMI during posttest (EG = 25.90±3.43) CG = 23.28±3.28) t= -1.897, Sig. = .094> α= .05. No significant difference was found in both groups EG ad CG in term of IRV during pretest (EG= 3.40±.54), CG = 2.40±.54) t= -.174, Sig. = .866 > α= .05. Similarly, data shows significance difference in both groups CG and EG in term of BMI during posttest (CG= 25.90±3.43), EG=31.20±16.88) and control group (M= 5.40±2.30) t= 3.385, Sig. = .026 < α= .05. (The experimental group produced better results than control group in IRV after the treatment).

Data shows no significant difference in both CG and EG in term of ERV during pretest (EG= 2.40±.54), CG= 2.40±.54) t= .000, Sig. = 1.000 > α= .05. On the other hand, data also indicates that there is significant difference in both CG and EG in term of ERV during posttest (EG= 3.40±.54), CG = 2.00±.000) , t= 5.715, Sig. = .00 < α= .05. (EG produced better results than CG in IRV during posttest). The EG produced better results than CG in ERV during posttest.

4. RESULTS AND DISCUSSION

No significant difference in both groups CG and EG in term of BMI was observed during pretest (EG (M = 23.28±3.28) CG (M = 25.90±3.43) t= -1.230, Sig. = .254 > α= .05. No significant difference in both groups CG and EG in term of BMI during posttest (EG = 22.22±2.90), CG= 25.97±3.34) , t= -1.897, Sig. = .094> α= .05. In line of this finding, the study conducted by Kesavachandran, C., V. Bihari, and N. Mathur (2009) concluded that physical alone cannot helps in maintaining BMI and body fats. In addition the researchers also concluded that physical activities as well exercise helps in controlling body weight and fats.

No significant difference was found in both groups EG ad CG in term of IRV during pre-test (EG= 6.40±.89), CG = 6.60±2.40) , t= -.174, Sig. = .866 > α= .05. Similarly, the researcher concluded that there is significant difference between experimental group produced better results than control group in IRV after the treatment). No significant difference in both groups CG and EG in term of ERV during pretest (CG= 5.40±2.30), EG=21.20±16.88) and control group (M= 5.40±2.30) t= 3.385, Sig. = .026 < α= .05. On the other hand, data also indicates that there is significant difference in both CG and EG in term of ERV during posttest (EG= 3.40±.54), CG = 2.00±.000) , t= 5.715, Sig. = .00 < α= .05. (The experimental group produced better results than control group in ERV during posttest).

The EG produced better results than CG in ERV during posttest. Such emerging study is supported by Seo, KyoChul, and MiSuk Cho (2017) by finding that exercise improve the functional capacity of lungs and other body functions.

5. CONCLUSION

On the basis of analysis and findings of the study the researcher concluded that there is no significant difference between experimental group and control group in BMI before the treatment. Similarly, the researcher reached at the fact there is no significant difference between experimental group and control group in BMI.
after the treatment. The researcher also concluded that there is no significant difference between experimental group and control group in inspiratory and expiratory reserve volume before the treatment. Similarly, the researcher concluded that there is no significant difference between experimental group and control group in an inspiratory and expiratory reserve volume after the treatment. The researcher concluded that inferentially there is no significant effect of moderate intensity exercise on BMI and inspiratory and expiratory reserve volume of the subjects but descriptively the experimental group shows better results in BMI and inspiratory and expiratory reserve volume of the subjects but descriptively the experimental group shows better results in BMI and inspiratory and expiratory reserve volume after the treatment score which support the descriptive results on the other hand control group was found same in pretest and posttest BMI and inspiratory and expiratory reserve volume tests.

6. RECOMMENDATIONS

On the basis of findings of the study following recommendations hereby made by the researcher.

1. The present study was conducted on limited number of respondents due to time, financial and academic limitation therefore in future the future researcher should conduct the study on large number of sample to full fill the spaces of present study.

2. The present study was conducted on the male students. Therefore for better results, it would be considered important to conduct a research study on female subjects.

3. The present study was conducted the researcher on the basis of 45 minutes' moderate intensity exercise each time 10 minutes for warm up, 30 exercise and five minutes for cooling down. It should be necessary for future researcher to change the activity time from 30 minutes to 40 or 50 minutes.

CONSENT

A written informed consent was taken from all the subjects before the application of prescribed exercise protocols.

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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