Short Communication

Effect of Physical Exercise on Physiological Changes and Performances of First Year Students at Haramaya University

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Abstract Physical exercise is important for maintaining physical fitness and contributes positively to maintaining a healthy weight, promoting physiological well-being, and strengthening the immune system. It is a fact that many life threatening conditions can be prevented by regular exercise. This research attempted to investigate the effects of intensified physical training on physiological changes and performance efficiencies on Haramaya University first year sport science students. An informal design (i.e. before and after without control) was applied. Twenty participants were selected from first year sport science department. Ten male and ten female students participated in different physical training programs of varying intensities for 3 consecutive months, i.e. 3 days per week and 60 minutes duration per day. Pre and post training performances and laboratory tests were conducted and analyzed for performance efficiency levels and major physiological changes. Findings of this study revealed a significant effect of physical exercise on cardio vascular endurance, muscular endurance, muscular strength, flexibility and body composition as well as some physiological changes. Based on the findings, it was concluded that intensified physical training had a positive effect on performance and physiological changes of the subjects.

Key words*:* Intensified physical training; Performance efficiency; Physiological changes

1. Introduction

Physical education programs are designed and intended to promote general health and overall fitness. The exact regime of education may vary among programs, but physical education remains critical in achieving an overall healthy society. The main purpose of physical education is the process of becoming physically active for the rest of our lives (Watson, 1983).

Physical exercise is important for maintaining physical fitness and can contribute positively to maintaining a healthy weight, building and maintaining healthy bone density, muscle strength, and joint mobility, promoting physiological well-being, reducing surgical risks, and strengthening the immune system. Exercise reduces levels of cholesterol, which causes many health problems, both physical and mental (Cornil *et al*., 1965). Frequent and regular aerobic exercise has been shown to help prevent or treat serious and life-threatening chronic conditions such as high blood pressure, obesity, heart disease, Type 2 diabetes, insomnia, and depression (Menoutis, 2008).

The beneficial effect of exercise on the cardiovascular system is well documented. There is a direct relation between physical inactivity and cardio vascular endurance, and physical inactivity is an independent risk factor for the development of coronary artery disease. Most beneficial effects of physical activity on cardiovascular disease mortality can be attained through moderate- intensity activity (40% to 60% of maximal oxygen uptake, depending on age) (Stampfer *et al*., 2000).

Intensified physical training on the other hand is a person's ability to perform a specific activity by making more intense, stronger or more marked and by increasing in extent (Brandon, 2009). Exercises are performed with a high level of effort, or intensity, where it is thought that it will stimulate the body to produce an increase in muscular strength and size (Philbin, 2004). It seems clear that physical training is not designed for achieving muscle failure and it should be done in proper sets with repetitions. This training exercise involves a combination of weight and repetitions, which helps in the maximum development of the muscles.

The reason for selecting first year students of sport science department was that: They are considered as beginners. Participating in this research will be a base for them in their future activities in the department. They are going to do a lot of activities related to physical exercise in their ongoing under graduate program in the department. This research lays the foundation of their performance and will help identify their initial level.

The effect of exercise on physiological changes and performance is more visible and noticeable on beginners. This study was designed to examine the effects of twelve week program of strength, endurance

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and flexibility exercises using 3 days per week and 60 minute sessions per day.

The end result of this study may have possible effects on physiological changes and performance efficiency of beginners, the exercise trainers, fitness center users, instructors, participants of the study, and physical education institutions in the country. It may also have great significance in improving student's participation in physical activity and achievement in high performance and quality of lives. The objective of this study is to investigate the effects of intensified physical training on physiological changes and performance efficiency on Haramaya University first year sport science students.

2. Materials and Methods

2.1. Experimental Design

Experimental Design which is a kind of informal design (i.e. before- and- after without control) was used to conduct this research. The participants of this study were the selected students of first year sport science department.

2.2. Data Collection Instruments

The data collection was more quantitative, including a questionnaire/check list, laboratory and performance test results. The use of these principal data collection instruments was intended to explore a range of quantitative information. The Physical activity Readiness questionnaire (from now onwards PAR-Q) was prepared based on reviewing the available literatures on similar studies, journals and other sources. The main purpose of the questionnaire was to select the appropriate subjects who would provide authentic, valid and reliable data to answer the general and specific objectives of this research.

2.3. Procedures of Data Collection

Based on the objectives of the research, the physical activity readiness questionnaire (PARQ) was distributed for 39 volunteer students in the class. But, the researcher selected 20 students (10 male and 10 female students) from the total population (first year sport science students) by considering the PARQ as an inclusion and exclusion criteria. Purposive sampling method was used specifically in the selection process. All selected subjects were at the age of 18 – 25 and they were active participants in different performance and health related exercise training programs. This resulted in physiological change and performance efficiency for three months (12 weeks) of total training, 3 days per week and 60 minutes per session (including warm up, cool down and stretching exercises). The intensity was progressively increased as the subjects adapted themselves to the training.

2.4. Methods of Data Analysis

The data that were collected through field and laboratory tests, before and after intervention, were analyzed and interpreted. The analyses were carried out by the Descriptive Statistical Analysis Code and by using SPSS version 16.0 software to summarize fitness and performance status as well as physiological changes. Calculating measures of central tendency like mean and calculating measures of dispersion like standard deviation were also carried out.

2.5. Ethical Consideration

The study protocol was approved by the Department Graduate Committee, School of Graduate Studies and then by Ethical Review Committee of Haramaya University College of Health Sciences. Information on the study was given to the participants, including purposes and procedures, potential risks and benefits. It was explained that participation was voluntarily and private information was protected. Verbal informed consent form for focus group was obtained.

3. Results and Discussion

An improvement was seen in the participants' health that was related to their physical fitness components (cardio vascular endurance, muscular strength and endurance, flexibility rate and body composition). Because of the physical appearance and conditions of the majority of the participants, the selected exercise types that were designed for the program of intensified physical training were more related with weight gain and strength and relatively endurance activities like aerobic exercises.

Table 1 shows that the mean score of selected subjects step test performance before intensified training is higher than that of after intensified training. This result implies that physical training has a positive effect on the improvement of cardio vascular endurance. The above table indicates that the mean score of push up test of the subjects before training (9.75) is lower than after training (36.05). Slowly increasing the amount of weight and number of repetitions performed gives even more benefits, irrespective of age (Campos *et al.*, 2002).

Table 1 also indicates that the mean score value for sit up test before training (5.35) is much lower than the value after training (37.35). This test measures the strength and endurance of the abdominals and hip-flexor muscles. As the test was repeatedly carried out the muscles became stronger. The effectiveness of an abdominal exercise is dependent upon how well it recruits your stomach muscles. Sit ups on a decline bench and on an exercise ball target your abdominal muscles; however, because of the slight differences in technique, one is more effective than the other (Mikesh, 2012).

Table 1. The Mean change of performance tests before and after intensified physical training (*For N=20).*

Pair	Variables	Values
Pair 1	Step test before training	144.60 ± 17.45
	Step test after training	107.05 ± 12.25
Pair 2	Push up test before training	9.75 ± 6.22
	Push up test after training	36.05 ± 12.79
Pair 3	Sit up test before training	5.35 ± 6.06
	Sit up test after training	37.35 ± 9.12
Pair 4	Sit and reach test before training	6.05 ± 3.83
	Sit and reach test after training	17.75 ± 4.22
Pair 5	Shoulder flexion test before training	4.64 ± 2.33
	Shoulder flexion test after training	9.91 ± 3.83
Pair 6	Body mass index before training	19.89 ± 2.33
	Body mass index after training	20.55 ± 2.36
Pair 7	Waist to hip ratio before training	0.77 ± 0.06
	Waist to hip ratio after training	0.79 ± 0.06

Similarly the mean value for sit and reach flexibility test is higher in the test after (17.75) intensified training than before (6.05). This test only measures the flexibility of the lower back and hamstrings. Rate of this test is highly increased with regular physical training. As table 1, the mean value of shoulder flexion shoulder stretch test before intensified training (4.64) is much lower than the mean value of the test after training (9.91). The improvement of the rate of this test as shown on the data is one indicator of the improvement of the participants' range of motion in joints (flexibility).

Mean value of body mass index also increases after the training (20.55) than before (19.89). One of the major benefits of physical training is that it reduces the risk of obesity. As it is shown in the above table, body mass index is highly affected by physical training. But it depends on the type, duration and intensity of exercise. In case of this research, the designed exercises were more of weight gain which was done by free weight materials. That is why the level of body mass index shows an improvement.

The mean value of white blood cell (WBC) increased in the after intensified training (7.25) than before training (5.73). When there is regular exercise, these cells increase their numbers and circulate more quickly through the whole body. If exercise becomes too much or too heavy, increased activity by the white blood cells can improve the ability to fight off viral and bacterial infections (Mikesh, 2012).

The mean value of red blood cell (RBC) count before training was also lower than the mean value after training. The above table also shows that the mean value of hemoglobin (HGB) count in the test before the training (14.42) is lower than the count which was held in the test after the training (16.14). Exercise training can increase total HGB and red cell mass, which enhances oxygen-carrying capacity. The possible underlying mechanisms are proposed to come mainly from bone marrow, including stimulated erythropoiesis with hyperplasia of the hematopoietic bone marrow, improvement of the hematopoietic micro environment induced by exercise training, and hormone- and cytokine-accelerated erythropoiesis (Hu and Lin, 2012).

The bellow table 2 shows that the mean value of hematocrit before training (45.91) is lower than the value of it after the intensified training (48.17). The increase of the number of hematocrit is because of the increasing of red blood cells.

The mean value of platelet before the training is also lower than the mean value after the training. In single sessions of resistance exercise, such as weight-lifting, increase circulating platelet levels immediately after exercise. However, such changes are not lasting, with a 21-week resistance training program having no effect on baseline platelet levels (Bobeuf *et al*., 2009).

Table 2. Paired Samples Statistics for Laboratory Test Results *(For N=20).*

Pair	Tests	Value
Pair 1	Pre training WBC (mg/dl)	5.73 ± 1.51
	Post training WBC (mg/dl)	7.25 ± 2.23
Pair 2	Pre training RBC(mg/dl)	4.80 ± 0.41
	Post training RBC (mg/dl)	5.55 ± 1.09
Pair 3	Pre training Hgb test (g/dl)	14.42 ± 1.72
	Post training Hgb test (g/dl)	16.14 ± 3.16
Pair 4	Pre training Hct test (mg/dl)	45.91 ± 4.44
	Post training Hct test (mg/dl)	48.17 ± 7.92
Pair 5	Pre training PLT (mg/dl)	315.95 ± 99.50
	Post training PLT (mg/dl)	357.65 ± 66.22
Pair 6	Pre training creatinine test	0.80 ± 0.30
	Post training creatinine test	1.22 ± 0.19
Pair 7	Pre training albumin test	47.96 ± 7.20
	Post training albumin test	46.43 ± 6.80
Pair 8	Pre training triglyceride test	80.59 ± 20.91
	Post training triglyceride test	77.59 ± 20.92
Pair 9	Pre training uric acid test	5.61 ± 1.60
	Post training uric acid test	3.51 ± 1.14

As table 2 indicates, the mean value of creatinine before training is slightly decreased in the test after training. The mean value of albumin is increased in the test after the training than the test before the training. These results indicate that increased albumin synthesis after intense upright exercise contributes to the maintenance of greater plasma albumin content. Moreover, the impact of exercise on the control of albumin synthesis is modulated by posture (Haskell *et al*., 1997).

In case of triglyceride, increase in mean value also shows in the test after training than the test before. Triglycerides are fats in the blood. It can reduce the levels by physical exercise because burning fat stored in the body cuts the fat levels in the blood. But in case of this research, the reason behind the increase of the mean value of triglyceride in the test after training is that the exercises that were designed were more of weight gain activities for training (Banach *et al*., 2005).

The above table also shows that the mean value of uric acid before the intensified training is higher than the value after training. It shows that the proper nutrition and exercise will lower uric acid levels to help prevent gout.

4. Conclusions and Recommendations

Based on the major findings of the study, intensified training has a significant effect on the improvement of health related physical fitness components. Most of the increase in muscle size form training is the result of an increase in the size of the muscle fibers, and not an increase in their number. The changes of amount of RBC, WBC, HGB, HCT, PLT, creatinine, albumin, triglyceride and uric acid is an indicator for the physiological changes as a result of intensified physical training.

Considering the major findings, it was recommended that, the exercise training program needs to be long term and the nutritional status of participants should be emphasized for more beneficial from intensified training in all dimensions (physiological, psychological and sociological). In addition, long term effect of intensified physical training for health related and performance skills, more physiological system change needs to be adopted.

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