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Effect of passive, active and combined warm up on the lower limb of healthy individuals

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ABSTRACT

Aim of the study is to determine the effect of passive, active and combined warmup on lower limb of healthy individuals. The methodology of the study is 30 individuals based on inclusion and exclusion criteria. Detailed procedure will be explained in patient words, and informed consent will be obtained from all participants. Effect of active, passive and combined warm-up will be evaluated in the subjects. The post-test value will be taken after four weeks. The results we determined from the static analysis has been revealed that there is a significant improvement in physical fitness of combined warm-up group than the active and passive warm-up separately. In the vertical jump test for passive warm-up group, the pre-test mean is 37.71, with the standard deviation being 6.53 and the post-test mean being 38.24 with a standard deviation of 6.60. And for the active warm-up group, the pre-test mean is 38.69, with the standard deviation being 6.606 and the post-test mean being 39.4 with a standard deviation 6.65. And for the combined warm-up group, the pre-test mean is 38.94, with the standard deviation being 7.12 and the post-test mean being 40.57 with a standard deviation of 6.88. Hence, we conclude that it has been proved statistically that although improvements have been observed in three groups, the improvement is much more significant in the combined warm-up group.



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INTRODUCTION

Physical activity is the movement which is produced by the skeletal muscles that need energy expenditure. Physical inactivity, it is a broad term used to identify the people who do not get the recommended level of regular physical activity. It is the fourth leading risk factor for global mortality. The WHO (World Health Organisation) reported

that around 3.2 million deaths each year are attributable due to the physical inactivity. The leading global risk for mortality in the world nowadays are high blood pressure (13%), tobacco use (9%), high blood glucose (6%), physical inactivity (6%), and overweight and obesity (5%) (Nelson *et al.*, 2007).

Warm up is usually an integral part which helps the body and mind for a workout. Any activity that increases the body temperature for a few degrees Celsius is called a warm-up (Andrade *et al.*, 2015). Warm up can be classified into active warm up and passive warm-up (Mc Gowan C *et al.*, 2015). The effect of heating on the contractile properties of skeletal muscle has been studied. It is clear that increasing muscle temperature increases the speed of muscle contraction, and decreases both times to peak tension and half relaxation time (Susan grey *et al.*, 2001).

Active warm-up is a dynamic stretching that activates muscles we use during the workout (Gray SC

et al., 2002). Passive warm-up involves raising muscular or core temperature by some external means without depleting energy substrates (kedargogte *et al.*, 2017). Active warm up significantly increases the concentration of the muscle acetyl-carnitine before the onset of exercise. The accumulation of large pre-exercise store of muscle acetyl-carnitine provides an extra substrate for oxidative ATP production at the onset of exercise (Greenhaff, P. L., *et al.*, 1998).

The active warm-up incorporates within itself a whole series of physical activities by riding an unloaded lower extremity bicycle ergometer set up at a speed of 60 minutes/second for 15 minutes. The passive warm-up was given by infrared light to lower limb muscle for 15 minutes. Combined warm-up includes both.

An active warm-up helps in increase in blood flow, increase in oxygen consumption and leads to breaking of actin and myosin bonds which improves flexibility (marshallpw *et al.*, 2015). Passive warm-up helps in improving athletic performance by increasing flexibility, increase in metabolism of energy system, increase in oxygen releasing tissues, increase in nerve conduction velocity, reduction in peak tension time in muscle, it increases the temperature strain on the body and can help in increasing performance (Ross *et al.*, 2001). Combined warm-up provides both.

So the warm-up is widely used by trainers and physical therapist before a range of exercises and athletic performance (emilianoCe *et al.*, 2008). There was also a hypothesis that the warm-up may involve some psychological effects such as increased preparedness (bishop D *et al.*, 2003).

These conflicts result as a lack of studies, as far as we know, evaluating the effect of active warm-up + passive warm up on the muscular performance prompted the study. Our final aim is to provide practical suggestions to trainers, coaches, and sports medicine physicians on the use of active warm-up combined with passive warm up to increase muscular performance.

METHODOLOGY

The study is designed as Comparative Study Design; study setting is done at Saveetha College of Physiotherapy, thandalam. The sample size was 30 healthy students. The inclusion criteria were both the gender were taken between the age group of 19-23 years without any significant musculoskeletal issues, and risk for cardiovascular complications during exercise and absence of any other medical condition which could preclude from exercise were included. The exclusion criteria are those who have contraindications to infrared radiations,

musculoskeletal disorders affecting lower extremities that will prevent the subject from using bicycle ergometer, a cardiovascular disorder such as angina, valvular disease, arrhythmias. The materials required are bicycle ergometer set at a speed of 60meters/second for 15 minutes, infrared lamp, stopwatch, inch tape. The procedure, a total of 30 samples were selected according to the inclusion and exclusion criteria. The safety and simplicity of the entirety of the procedure will be explained before handed. All of 30 samples will be randomly selected using convenient sampling techniques. The participants were randomly divided into three groups. Active warm-up group, n=10 participants, passive warm-up group, n=10 participants, and combined warm-up group, n=10 participants. All 30 of the samples were undergoing a vertical jump test. In the vertical jump test, the person stands side on to a wall keeping the feet flat on the ground and reaches up, the point of the fingertip is marked. This is called standing height. The person then stands away from the wall and leaps vertically as high as possible. The difference in distance between the standing reach height and jump height is the score. The best of three attempts is recorded.

RESULT

From the statistical analysis, it has been revealed that there is a significant improvement in physical fitness of combined warm up than the active and passive warm-up separately. In the vertical jump test for the passive warm up, the pre-test mean is 37.71, with the standard deviation being 6.538 and the post-test mean being 38.24, with a standard deviation of 6.60, and for the active warm up, the pre-test mean is 38.69, with the standard deviation being 6.66 and the post-test mean being 39.4, with a standard deviation of 6.65, and for the combined warm up, the pre-test mean is 38.94, with the standard deviation being 7.12 and the post-test mean being 40.57, with a standard deviation of 7.25.

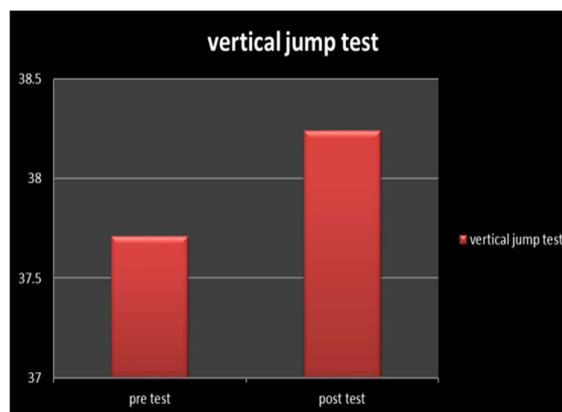


Figure 1: vertical jump test for passive warm-up group

DISCUSSION

The present study aimed to investigate the effect of 4 weeks of active warm-up and active warm up in healthy individuals on physical activity. This study was detailed on 30 healthy individuals. The results of the present study demonstrate that, after a combined warm up, there is an increased effect of which combined warm-up of active and passive comparatively better among the other two groups comprising of 10 participants each, group A received active warm-up and group B received passive warm up. Measurements were assessed using vertical jump test (Sargent, D.A.1921).

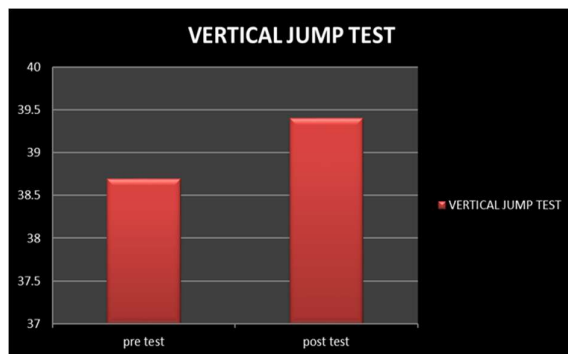


Figure 2: vertical jump test for active warm-up group

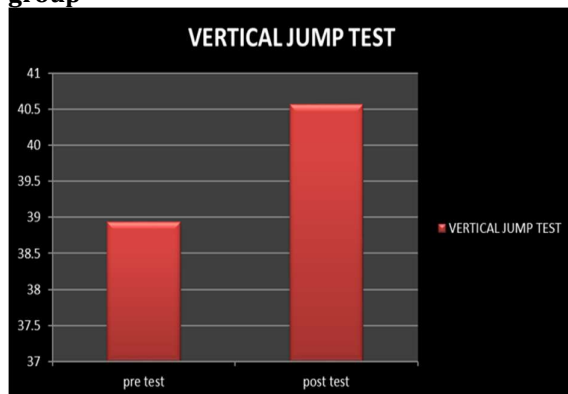


Figure 3: Vertical jump test for combined warm-up group

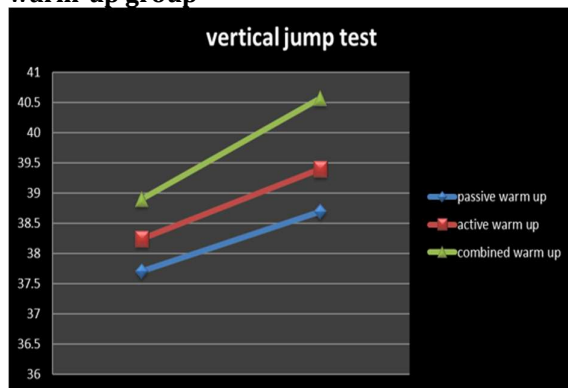


Figure 4: Comparison of passive, active and combined warm up

In this test, the subject stands in the position with the arm extended above the head as high as he

could by keeping his soles of the feet in a plain surface without elbows and knees, next to the graduated surface. The participant was asked to mark with his fingers the highest position he could reach. To facilitate reading the fingers of each individual were marked with colour powder. The jumping was performed by freely flexed lower limbs as well as move the upper limbs for the excursion of the jump to provide the greatest possible thrust. Each participant performs three jumps, and the greatest value is considered (Bosco, C *et al.*, 1983). The data that presented normally were expressed as mean and standard deviation. Figure 1, figure 2, figure 3 presents the correlation between the pre-test and post-test values of passive warm-up group, active warm-up group and combined warm-up group respectively. It shows that combined warm-up has a significant improvement in comparing with passive warm-up group and an active warm-up group.

Table 1: passive warm-up group

Vertical jump test	Mean	Standard deviation	P- Value
Pre-test	37.71	6.53	P<0.001
Post-test	38.24	6.60	

The data from the above table shows the pre-test and post-test values of Vertical jump test for passive warm-up group. The pre-test mean value of this test is 37.71 (SD is 6.53) and the post-test mean value is 38.24 (SD is 6.60) with p-value (<0.001) statistically significant.

Table 2: active warm-up group

Vertical jump test	Mean	Standard deviation	P-Value
Pre-test	38.69	6.66	P<0.001
Post-test	39.4	6.65	

The data from the above table shows the pre-test and post-test value of Vertical jump test for active warm-up group. The pre-test value is 38.69 (SD is 6.66), and the post-test mean value is 39.4 (SD is 6.65) with p-value (<0.001) statistically significant.

Table 3: Combined warm-up group

Vertical jump test	Mean	Standard deviation	P-Value
Pre-test	38.94	7.12	P<0.001
Post-test	40.57	6.88	

The data from the above table shows the pre-test and posttest values of Vertical jump test for combined warm-up group. The pre-test means the value is 38.94 (SD is 7.12) and the post-test mean value is 40.57 (SD is 6.88) with a p-value (<0.001) statistically significant.

The limitations of my study were the small sample size of 30. Only the younger age group were included. The study can also be conducted for a

longer duration like 6 weeks for obtaining further information if any.

Future recommendations are, a future study can be done with a larger population and in a longer duration. Older age people might be included.

CONCLUSION

From the results, it has been proved statistically that although improvements have been observed in three groups, the improvement is much more significant in the combined warm-up group than it is in the passive warm-up and active warm-up separately.

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