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Effect of 8-Week MESO cycle training on flexibility

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Abstract
The purpose of the study was to ascertain the effect of 8-week flexibility training on the development of flexibility of 20 sports persons who were selected as subjects adopting convenient sampling. The subjects were regularly training at Dronacharya Gym situated in Subhash Nagar, New Delhi. The age of the subjects ranged from 25 to 35 years. The flexibility of the subjects was assessed using the sit and reach test. Thereafter the subjects followed a progressive training programme for a duration of eight weeks and after the conclusion of the training programme the flexibility was again tested. The data was analyzed using the mean difference method (t-ratio) and the level of significance was set at 0.05. The t-ratio obtained was – which revealed that the training program was effective in enhancing the flexibility of the subjects.

Keywords: Meso-cycle, flexibility.

Introduction
Flexibility is the ability to move muscles and joints through their full range of motion. In the literature, the terms to do degree of "normal" motion in contrast to the stretching refers to the process of elongating connective tissue, muscles and other tissue.

Physical fitness has many components such as muscular strength, endurance power, speed, coordination and flexibility. Physical fitness depends on a vast number of intertwined mechanisms each playing an important role in improving the performance of the sportsperson and these factors are developed through systematic and regular practice. Many people do not understand the role of flexibility for enhancing performance and preventing injuries. Though each and every component is equally important for the improvement of sports performance but only one component i.e. flexibility is the main area of concern of the present research work.

Flexibility can be defined as the ability to perform movement with greater range of motion or large amplitude. It is controlled partly by the energy liberation process of the body and partly by the coordinative process of central nervous system. In common usage flexibility is often equated with stretching ability, elasticity, suppleness, mobility etc. but in scientific terms flexibility means much more than what is conveyed by any of these terms.

Poor flexibility creates many problems and can be damaging to all structures within the body. Stiff and tight muscle limit your range of motion and contribute to back, neck, and pelvis pain

Some of the immediate benefits of flexibility are:

- Reduction of muscle tension
- Decrease in muscle pain
- Improved circulation
- Increased range of motion
- Improved coordination
- Development of body awareness.
- Reduction in injuries.
- Increased comfort.

Bandy and Irion (1994) conducted a study to examine the length of time the hamstring muscles should be placed in a sustained stretched position to maximally increase ROM. Fifty-seven subjects (40 men, 17 women), ranging in age from 21 to 37 years and with limited hamstring muscle flexibility were randomly assigned to one of four groups. Three groups stretched 5 days per week for 15, 30, and 60 seconds, respectively. The fourth group, which served as a

Control group, did not stretch. Data were analyzed with a 4×2 analysis of variance for repeated measures on one variable. The data analysis revealed a significant interaction, indicating that the change in flexibility was dependent on the duration of stretching. Further post hoc analysis revealed that 30 and 60 seconds of stretching were more effective at increasing flexibility of the hamstring muscles (as determined by increased ROM of knee extension) than stretching for 15 seconds or no stretching.

Bandy *et al*. compared the effects of Dynamic Range of Motion (DROM) with static stretch on hamstring flexibility. Fifty-eight subjects, ranging in age from 21 to 41 years and with limited hamstring flexibility were randomly assigned to one of three groups. One group performed DROM 5 days a week by lying supine with the hip held in 90° of flexion. The subject then actively moved the leg into knee extension (5 seconds), held the leg in end range knee extension for 5 seconds, and then slowly lowered the leg to the initial position (5 seconds). These movements were performed six times per session (30 seconds of total actual stretching time). The second group performed one 30-second static stretch, 5 days per week. The third group served as a control group and did not stretch. The analysis of data using two-way analysis of variance (ANOVA) followed by post hoc analysis revealed that a 30-second static stretch increased ROM more than two times that of DROM, the use of DROM to increase flexibility of muscle must be questioned.

Methodology

Twenty males, whose ages ranged between 25 to 35 years, were selected as subjects adopting convenient sampling procedure. The subjects were regularly training at the Dronacharya Gym situated in Subhash Nagar, New Delhi. Sit & reach test was administered to the subjects for the assessment of flexibility before and after the conclusion of 8-week flexibility training.

The data was analyzed adopting the following statistical measures:

1. Means and standard deviations
2. Standard error of difference between the means
3. The t-ratio was computed in order to ascertain the effect of 8-week flexibility training programme.

The level of significance chosen was 0.05.

Analysis of Data

The means, standard deviations and the t-value are presented in the table 1.

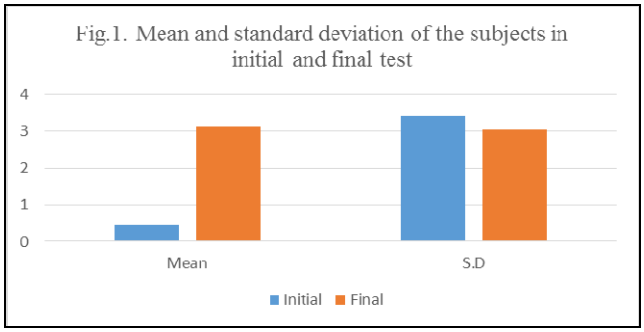
Table 1: Significance of difference in the means as a result of 8-week flexibility training.

Mean		Mean diff.	Standard deviation		Standard error	t-ratio
Initial	Final	2.65	Initial	final	0.196	13.54*
0.45	3.10		3.41	3.04		

*Significant at 0.05 level $t_{0.05}$ (19) = 2.09

The statistical analysis of data in the above table clearly reveals that a difference of 2.65 in the initial and final means is statistically significant at 0.05 level of confidence. The t-value of 13.54 is higher than the table value of 2.09 with 19 degrees of freedom.

The initial and final means and standard deviation of the subjects are graphically presented in fig. 1.



Discussion of Findings

The results of the study clearly indicate that 8-week training program for developing flexibility as suggested in the study has proved to be effective in enhancing the flexibility of the subjects. The increase in flexibility may be as a result of implementing training program prepared by the scholar might have put adequate load on the muscle as a result of which the range of movement of the muscle increased thereby increasing the flexibility of the subjects**.**

Flexibility is defined as the static maximum range of motion (ROM) available about a joint. The largest limiting factor of static ROM is the structure of the joint itself. Thus, even after endless stretching exercise, there will be a limit as to how much movement is available. In addition, joint structures can vary between individuals, and this must be recognized when assessing flexibility standards in athletes. Most of the variability in static ROM is due to the elastic properties of the muscle and tendons attached across the joints. 'Stiff' muscles and tendons reduce the ROM while 'compliant' muscles and tendons increase ROM. It is these elastic properties that are altered after stretching exercises. When a muscle is held for some time under tension in a static stretch, the passive tension in the muscle declines, i.e. the muscle 'gives' a little. This is called a 'viscoelastic stretch relaxation response'. This could be the possible reason for improvement of flexibility among subjects

Regular stretching possibly brings about permanent increase in static ROM, which is associated with a decrease in passive tension. Experimentally, this was shown by Toft *et al*. (1989), who found a 36% decrease in passive tension of the plantar flexors after three weeks of regular calf stretches. The relationship between static ROM and passive tension has been further supported by McHugh *et al*. (1998). These researchers demonstrated that maximum static hip flexion ROM was inversely correlated with the passive tension of the hamstrings during the mid-range of hip flexion. This suggests that the ease with which the muscle can be stretched through the mid-ROM is increased if the maximum static ROM is improved.

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