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Research Article

Effectiveness of Calisthenics Exercise Protocol on Upper and Lower Limb Strength in Medical College Students After 6 Weeks -A Pilot Study

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Abstract

Background: Being physically fit overhauls your personality, but between classes, exams and clinical postings, workout can be hard to schedule. Also they have unique time, financial and even space related situation that impact their exercise routines. So there is need to develop a proper training program ,helps them to ensure being physically fit without any financial stress, space related situation and time related problems. Calisthenic is a type of exercise that consist of Varity of movements that are performed without the need of equipment and that uses your body weight and it can performed anywhere. It can designed to increase body strength and flexibility.

Objective: To study the effectiveness of calisthenics exercise protocol on upper and lower limb strength in medical college students.

Methods: Study had begun with the presentation of synopsis to the ethical committee in PES MCOP. An approval was granted from ethical committee various medical college were visited in and around the city. 7 subjects were selected on the basis of their inclusion and exclusion criteria. Pre push up and squat test was done. Pre score was recorded. calisthenics exercise protocol was given for 4 times every week for a 6 weeks. Post push up and squat test was done and score were analyzed. Data entered and analyzed.

Results: there was significant effect on increased in the strength of upper and lower limb. p value <0.0001.

Conclusion: This study concluded that there were increase in upper and lower limb strength in medical college students after 6 weeks of protocol.

Keywords: Calisthenics; Upper Limb; Lower Limb; Strength; Medical College Students

Introduction

During the 20th century, the leading causes of death shifted from infectious to chronic diseases: cardiovascular disease, cancer, and diabetes are now among the most prevalent, costly, and preventable of all health problems. These diseases have been strongly associated with unhealthy lifestyle habits, including inappropriate nutrition, lack of exercise, smoking, alcohol consumption, caffeine overuse, and improper sleeping habits. Although behaviors of students are considered a temporary part of college life, unhealthy habits picked up at this level generally persist in adult life. University and college arenas, therefore, represent an important opportunity for health and nutritional education. College life is also a period during which individuals are for the most part exposed to stress and lack of time, posing a barrier to adoption of healthy practices.

Calisthenics is the form of an exercise training program based around your body weight, using minimal equipment [1]. It is designed to increase body flexibility and strength through movements such as swinging, twisting, jumping, kicking, or bending; uses only body weight for resistance [2]. Due to the activation of various types of muscular groups, it develops coordination and

proprioception in the individual and hence for this particular reason, it is used in both rehabilitation and sports training [1]. Calisthenics exercises are dynamic and aerobic. It is a beneficial form of exercise because of the cadent, low-intensity modification of the large muscle groups used in the upper and the lower extremity [3].

Calisthenics is based on the two physical key components: First is movements; all Calisthenics movements demand a high level of joint mobility and coordinated muscle activation. Which consists of movement preparation, aim here is to remove muscular tension, improve muscular length, enhance mobility and activate the muscles we intend to use in preparing to move. Another one is movement patterning includes teaching the brain and body new movements patterns. The second one is strength consisting of applied strength which is a specific type of strength used in calisthenics eg putting your body in such a position where it requires a high level of muscle force. Here exercises are goal specific. Another is capacity strength; Here the exercises are less specific, global strength exercises that will build up strength, postural stability, and muscular coordination [3-6].

Hence, such types of exercises are specially designed to increase flexibility and strength.

Materials and Methods

Materials

- Consent form
- Mat
- Skipping Rope
- Stopwatch/ Time
- 2 water Bottles

Methods

- **Study Design:** Pilot study (Pre and Post experimental)
- **Sample Size:** 7
- **Sampling Method:** Convenient sampling
- **Study Population:** Medical College students
- **Study Setting:** College In and around Pune
- **Study Duration:** 6 Months
- **Intervention Duration:** 4 days per week for 6 weeks.

Results and Discussion

Result

- Students participated in the study.
- Paired t-test was done to compare the effect of calisthenics exercise protocol on upper limb and lower limb strength.
- It revealed that the mean push up score before the calisthenics exercise protocol was 6.00 ± 2.38 which significantly increased to 22.14 ± 4.10 after effect of calisthenics exercise protocol. ($p < 0.0001$).
- And the mean squat score before the calisthenics exercise protocol was 20.00 ± 2.89 which significantly increased to 50.00 ± 8.66 after the effect of calisthenics exercise protocol. ($p < 0.0001$)

Pre and post experiment value of PUSH UP TEST are significant.

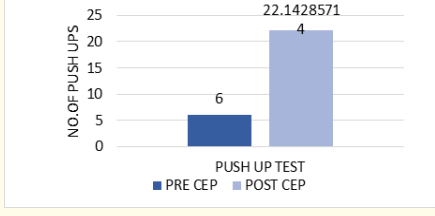

Figure a

	Mean	SD	t-value	p-value	Significance
Pre-cep test	6.0	2.38	15.6203	< 0.0001	Extremely Significant
Post cep test	22.14	4.10			

Table a

Pre and post experimental values of SQUAT TEST are significant.

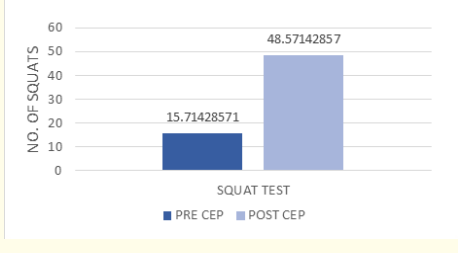

Figure b

	Mean	SD	t-value	p-value	Significance
Pre-cep test	20.00	2.89	8.6948	< 0.0001	Extremely Significant
Post cep test	50.00	8.66			

Table b

Discussion

In this study the effect of calisthenics exercise protocol on upper limb and lower limb strength was checked. And found that there was an increase in the upper and lower limb strength.

The increase in upper limb strength after a calisthenics workout for 6 weeks can be attributed to the following factors.

Firstly, calisthenics exercises use compound exercises such as push-ups, shoulder press, biceps curls, triceps dips, chest press, front raises and triceps extension which often target multiple muscle groups in the upper body, such as arms, shoulder, and chest leading to overall strength gains.

Secondly, consistent training over a 6-week period allows for progressive overload, where we gradually increased the difficulty or intensity of the exercises, challenging their muscles to adapt and grow stronger.

Finally, calisthenics exercises usually require bodyweight movement and utilizing stabilizer muscles, which can further enhance upper limb strength.

Lower limb strength typically increases after implementing a calisthenics workout protocol for 6 weeks due to all factors

- **Progressive Overload:** Calisthenics exercises involve using body weight resistance, and over time, we gradually increased the difficulty of the exercises by adding more repetitions, sets, or progressing to more challenging variations. This progressive overload stimulates muscle adaptation and promotes strength gain in the lower limb.
- **Muscle Activation:** Calisthenics exercises engage multiple muscle groups in the lower limbs simultaneously, leading to improved muscle activation and recruitment. Regularly performing exercises like squats, lunges, and calf raises has strengthened the quadriceps, hamstrings, glutes, and calf muscles, leading to increased lower limb strength.
- **Neuromuscular Adaptations:** By consistently performing calisthenics exercises, the nervous system becomes more efficient at signaling and coordinating muscle contractions. This improved neuromuscular connection enhances their ability to generate and control force, leading to increased lower limb strength.
- **Joint Stability:** Many calisthenics exercises require a good level of stability and balance, especially exercise like walking lunges, jumping lunges, squats jump, squat holds, burpees, sumo squats, burpees. By training these movements, joint stability has been increased, which helps to prevent injuries and allows for greater force production in lower limbs.

Overall, a well-designed calisthenics workout protocol can effectively target and strengthen the lower limbs, resulting in increased lower limb strength after 6 weeks of consistent practice.

Similar results were achieved by Thomas et.al. after "The effect of a calisthenics training intervention on posture, strength and body composition" study. The authors report ,calisthenics training is a feasible and effective training solution to improve strength without the use of any major training equipment in their study, the planche exercise have as a target muscles the upper limb with involvement of the deltoids during the lean phase, the triceps and the forearms during the whole movement and the pectoralis minor, the serratus anterior, the teres major, the teres minor and the trapezius during the protraction and the retraction during the returning phase. These muscles have been seen through electro-miographic assessments to be involved during the pushup exercise. Other muscles are also involved during the stabilizing part of the movement such us the erector spinae and the rectus abdominis [9].

Prapti. S. Solanki., *et al*. done study on "Effectiveness of calisthenics training on lower body strength and endurance among the college students" and concluded that statistically significant increase in the strength and endurance of college students [10].

Daniel.plotkin., *et al*. done study on "Progressive overload without progressing load? Load or repetition progression on muscular adaptation." and concluded that progressing load and repetitions throughout an 8-week training cycle produced a similar increase in muscle size in most muscles and regions of the lower body. This suggests that both are likely sufficient for maximizing hypertrophy [11].

Niharika V Ramanrao Cintre., *et al*. done study on "Effect of calisthenics exercise on the vertical high jump on intermediate female volleyball players." and concluded that body weight calisthenics exercise shows significant effect on vertical high jump of the players due to increase in strength of core as well as the lower limb musculature [1].

Bret contreras., *et al*. done study on the "Biomechanics of the push up: Implication for resistance training program" and concluded that, push ups can be an excellent exercise for improving muscle strength and endurance [12].

kotarsky., *et al*. done study on "Effect of progressive calisthenic push up training on muscle strength and thickness" and concluded that utilization of progressive push up variation increased upper body strength. This is because of the increase in the intensity of the calisthenic exercise by adding repetitions, rather than varying the exercise to keep repetitions low, leading to training intensity that was likely not enough to stimulate strength adaptations [13].

According to Melanie M Adams et.al. even the correct terminology implies that the standard push-up is the norm and that the modified position is inferior. It is important to note that not all published push-up tests require positioning differences for males and females. The Fitness Gram test battery used with children ages 5 to 17 has only the standard push-up as its upper body muscular endurance test. The revised push-up test also uses the standard position for college aged adults, in their "Development of a standard push-up scale for college-aged females" study [14].

Conclusion

There was an increase in the upper and lower limb strength after the 6 weeks of calisthenics exercise protocol.

Limitations

- The sample size of present study was very small.
- It was conducted in only Pune city.
- There were no comparison done.

Future scope of study

- Future study can be conducted on large sample size.
- The study can be conducted on the different population.
- The study can be conducted on any age group.
- Calisthenics exercise protocol can be conducted to see long term effects.

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