



## A COMPARATIVE STUDY BETWEEN CALISTHENICS EXERCISES AND YOGA IN YOUNG ADULTS TO BUILD UPPER LIMB MUSCLE STRENGTH

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### ABSTRACT

**Background:** Health promotion encourages healthier lifestyles for optimal well-being, encompassing physical, mental, and social health. Regular physical activity, including resistance training and calisthenics, boosts overall health, muscular strength, and flexibility. Yoga unites body and mind, promoting physical and spiritual growth. Strength and coordination of the upper limb are vital for daily tasks, enhanced by consistent exercise. **Objectives:** The objective of this study is to compare the effects of calisthenics exercises and yoga on building upper limb muscle strength in young adults. **Methods:** Thirty participants were divided into two groups: Calisthenics and Yoga. Hand-grip strength was measured using a dynamometer before and after 3 weeks of daily 40-minute training. Each participant performed three trials, with the highest score used for analysis. Weekly strength assessments were conducted for both groups. **Result:** The results showed no statistically significant difference in grip strength between the Calisthenics and Yoga groups at any time point. Both groups demonstrated a substantial increase in upper limb muscle strength, with significant improvement observed in both, but no significant difference between the two training methods. **Conclusion:** This study highlights the significant role of Calisthenics and Yoga in physical training, promoting muscle strength and flexibility. It is recommended for fitness trainers and clinical practitioners to integrate both exercises into training programs for optimal results and overall fitness. Additionally, athletes can benefit from these practices to enhance muscle strength and performance.

**KEYWORDS :** Yoga, Calisthenics, hand strength, muscle strength, resistance training

### INTRODUCTION

Health promotion is the science and art of helping people implement healthier lifestyles to achieve optimal health. Health is defined as complete physical, mental, and social well-being, not just the absence of disease. Physical education nurtures fitness, alertness, balance, and adaptability, benefiting individuals physically, mentally, emotionally, and socially, thereby encouraging overall health.<sup>1</sup>

Physical activity is crucial for health and well-being. Daily exercise helps maintain a strong body and mind, supporting muscle, bone, heart, and lung health. Whether for professional athletes or general fitness, gauging exercise effects is crucial for understanding fitness levels.<sup>2</sup>

Muscular strength refers to your capability to lift and move objects, measured by the force you can exert and the weight you can lift for a short time. It improves overall health and enhances athletic performance.<sup>3</sup>

Resistance training has grown in admiration over the past decade, with calisthenics being a well-known form of strength training. These exercises use body weight without equipment, making them cost-effective and accessible to everyone.<sup>4</sup>

Calisthenics has a long history, with the term originating from the Greek words 'kallos' (beauty) and 'sthenos' (strength). It comprises using body weight and inertia to develop physical strength and physique.<sup>5</sup>

Calisthenics is a type of physical training that encompasses rhythmic exercises to improve strength and flexibility, typically without equipment.<sup>6</sup> It is also referred to as street workout.<sup>7</sup>

Yoga, meaning "to join," unites body and mind for balance. Originating from ancient Indian philosophy, it promotes physical, mental, and spiritual well-being. Yoga asana, developed over 5,000 years ago, focuses on physical poses (Asanas) that boost flexibility and support spiritual growth.<sup>8</sup>

The upper limb consists of muscles organized into compartments that control movements in the hand, arm, and shoulder, safeguarding stability and fluid motion. The hand performs skilled "prehension activities" in daily life, requiring adequate shoulder stability for a strong grip.<sup>9</sup> Many tasks depend on the strength and coordination of the

upper extremity.<sup>10</sup>

A key aspect of calisthenics is that the hands are involved in nearly every movement, including pushing, pulling, and core exercises. Since calisthenics emphasizes full body control and strength, aids like straps and hooks are not used.<sup>3</sup>

### Methodology

**Sample Size:** 30

**Source Of Subjects:** Subjects working at Ujala Cygnus SH Multi-speciality Hospital, Sitarganj

**Study Design:** comparative study

**Sampling Method:** sample of convenience

### Inclusion Criteria:

- Age more than 18 or equal to 25 years of age.
- Both Male & Female.
- Muscle strength with Grade 4 and Grade 5.
- BMI 15.0 to 25.0.
- Good physical and mental health.
- Physically active.

### Exclusion Criteria:

- Person taking any muscle builder supplements.
- Any chronic metabolic bone disease.
- Person with physical and mental disability.
- Vertigo patients.
- Patients with ongoing unstable angina.
- Acute pulmonary embolism, pulmonary infraction or deep vein thrombosis
- Person with spinal injuries and recent head injuries.
- Person with epilepsy.
- Any recent fractures.
- Recent hospitalization.
- Person with sedentary or inactive lifestyle.

### Outcome Measures:

- Hand grip dynamometer
- The Oxford scale<sup>12</sup>

### Procedure

Thirty participants were divided into two groups: a Calisthenics group and a Yoga group, following inclusion and exclusion criteria. After obtaining consent, hand-grip strength was measured using a digital

dynamometer on both dominant and non-dominant arms. Each participant performed three trials with rest in between. The highest score was used for analysis. Both groups underwent a 40-minute daily training program for 3 weeks, with weekly hand-grip strength measurements. The highest score from each test was used for statistical comparison.

**Table1: Training protocol for Group A**

| Schedule (40 min)  | Exercise                                                                                                                                              | Repetition                                                                 | Duration                                                                              |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Warm up (10 min)   | Running like jogging<br>Dynamic stretching                                                                                                            | Continue<br>Continue                                                       | 5 min<br>5 min                                                                        |
| Activity (20 min)  | Push-ups<br>Dips<br>Chin up<br>Bodyweight rows<br>Biceps rows<br>Triceps extension<br>Plank up down<br>Plank<br>Downward dog to plank<br>Static holds | 40<br>30<br>30<br>40<br>40<br>40<br>Continue<br>Continue<br>Continue<br>40 | 3 min<br>2 min<br>3 min<br>2 min<br>3 min<br>3 min<br>1 min<br>1 min<br>1min<br>1 min |
| Cool down (10 min) | Static stretching<br>Child pose                                                                                                                       | Continue<br>continue                                                       | 5 min<br>5 min                                                                        |

**Table 2: Training protocol for Group B**

| Schedule (40 min)  | Exercise                                                                                                                                                              | Repetition                                                                                                           | Duration                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| Warm up (10 min)   | Running like jogging<br>Alternate up & down hand movements<br>Neck rotation<br>Shoulder socket rotation                                                               | Continue<br>Continue<br>Continue<br>Continue                                                                         | 3 min<br>2 min<br>2 min<br>3 min                                                       |
| Activity (20 min)  | Purvotanasana<br>Dhanurasana<br>Makarasana<br>Adho-mukha svanasana<br>Bhujangasana<br>Urdhvamukha svanasana<br>Plank pose<br>Vashistasana<br>Salabhasana<br>Crow pose | Continue<br>Continue<br>Continue<br>Continue<br>Continue<br>Continue<br>Continue<br>Continue<br>Continue<br>Continue | 2 min<br>2 min<br>2 min<br>2 min<br>2 min<br>2 min<br>2 min<br>2 min<br>2 min<br>2 min |
| Cool down (10 min) | Child pose<br>sanasana                                                                                                                                                | Continue<br>Continue                                                                                                 | 5 min<br>5 min                                                                         |

#### Statistical Analysis:

The data collected in the study was processed in IBM SPSS Statistics 23. The data was analyzed for descriptive statistics. Paired t-test was used to compare the data for difference in grip strength within the group. Meanwhile, independent sample t-test was applied to compare the data of grip strength between the groups. The statistical significance was set at <0.05 with confidence level at 95%.

#### RESULT

The data were analyzed using the statistical software SPSS 15 version. The recorded data for grip strength at pre-intervention was compared with the data collected at the interval of 1 week, 2 week and 3 week using paired sample t-test.

**Group A (Calisthenics Group):** The comparison of the data of grip strength within the group revealed statistically significant difference in the scores of grip strength at 1 week ( $p < 0.01$ ), 2 week ( $p < 0.01$ ) and 3 weeks ( $p < 0.01$ ).

**Table 3: Descriptive analysis of grip strength**

| Grip Strength              | Group A (Calisthenics) |               | Group B (Yoga) |               |
|----------------------------|------------------------|---------------|----------------|---------------|
|                            | Left                   | Right         | Left           | Right         |
| Pre-Intervention           | 33.93 ± 14.89          | 37.89 ± 13.46 | 39.06 ± 16.21  | 44.6 ± 17.52  |
| Post-intervention (1 week) | 36.73 ± 15.88          | 40.2 ± 14.77  | 39.46 ± 16.24  | 44.86 ± 17.76 |
| Post-intervention (2 week) | 39 ± 15.94             | 43.06 ± 15.5  | 40.46 ± 15.97  | 46.26 ± 17.19 |
| Post-intervention (3 week) | 40.8 ± 16.21           | 46.46 ± 16.56 | 41.46 ± 16.01  | 47.06 ± 16.64 |

**Table 4: Comparison of grip strength within the (Calisthenics) group**

|                                                              | Left     |              | Right    |              |
|--------------------------------------------------------------|----------|--------------|----------|--------------|
|                                                              | t- value | Significance | t- value | Significance |
| Pre-Intervention v/s Post-Intervention at 1 week             | -4.221   | <0.01 *      | -4.004   | <0.01 *      |
| Pre-Intervention v/s Post-Intervention at 2 week             | -6.141   | <0.01 *      | -5.842   | <0.01 *      |
| Pre-Intervention v/s Post-Intervention at 3 week             | -8.132   | <0.01 *      | -8.225   | <0.01 *      |
| Post-Intervention at 1-week v/s Post-Intervention at 2 week  | -6.107   | <0.01 *      | -5.375   | <0.01 *      |
| Post-Intervention at 1-week v/s Post-Intervention at 3 week  | -9.445   | <0.01 *      | -7.761   | <0.01 *      |
| Post-Intervention at 2-week v/s Post-Intervention at 3 weeks | -6.081   | <0.01 *      | -5.743   | <0.01 *      |

**Group B (Yoga Group):** The comparison of the data of grip strength within the group revealed statistically significant difference in the scores of grip strength at 2 week ( $p < 0.01$ ) and 3 weeks ( $p < 0.01$ ) for both left and right hand. But there was no observed statistically significant difference in comparison of the grip strength scores of pre-interventions with scores at 1 week for either left ( $p = 0.32$ ) or right ( $p = 0.262$ ) hand.

**Between Group Analysis:** The scores of grip strength were compared between the groups using independent sample t-test. The results revealed absence of any statistically significant difference in the scores of grip strength between the groups at any point of time. Thus, suggesting that both the groups had equal substantial increase in their grip strengths.

**Table 5: Comparison of grip strength within the (Yoga) group**

|                                                             | Left     |              | Right    |              |
|-------------------------------------------------------------|----------|--------------|----------|--------------|
|                                                             | t- value | Significance | t- value | Significance |
| Pre-Intervention v/s Post-Intervention at 1 week            | -1.031   | 0.32         | -1.169   | 0.262        |
| Pre-Intervention v/s Post-Intervention at 2 week            | -2.941   | <0.01 *      | -3.669   | <0.01 *      |
| Pre-Intervention v/s Post-Intervention at 3 week            | -4.361   | <0.01 *      | -4.281   | <0.01 *      |
| Post-Intervention at 1 week v/s Post-Intervention at 2 week | -4.183   | <0.01 *      | -3.224   | <0.01 *      |
| Post-Intervention at 1 week v/s Post-Intervention at 3 week | -6.179   | <0.01 *      | -3.8     | <0.01 *      |
| Post-Intervention at 2 week v/s Post-Intervention at 3 week | -4.183   | <0.01 *      | -2.863   | <0.01 *      |

**Table 6: Comparison of scores between the groups (Calisthenics v/s Yoga)**

|                               | Left    |              | Right   |              |
|-------------------------------|---------|--------------|---------|--------------|
|                               | t-value | Significance | t-value | Significance |
| Pre-Intervention              | -0.903  | 0.374        | -1.180  | 0.248        |
| Post-Intervention (At 1 Week) | -0.466  | 0.645        | -0.782  | 0.441        |
| Post-Intervention (At 2 Week) | -0.252  | 0.803        | -0.535  | 0.597        |
| Post-Intervention (At 3 Week) | -0.113  | 0.911        | -0.099  | 0.922        |

#### DISCUSSION

Calisthenics is an exercises programme having a difference of gross motor activities like running, standing, grasping, pushing, etc. In several studies calisthenics' exercises compared with different types of exercises like Isometrics exercises, Pilates, Combined Exercises and Yoga also.

The present study analysis suggests that both the groups had equal substantial increase in their grip strengths. After one week both the groups hand grip strength shows little hike but after 2<sup>nd</sup> and 3<sup>rd</sup> week calisthenics group shows minor increase in hand grip strength within the group compare to yoga group, however dominant hand grip strength is greater than non-dominant grip strength in both groups.

The comparison of the data of grip strength within the calisthenics group revealed statistically significant difference in the scores of grip strength at 1 week ( $p < 0.01$ ), 2 week ( $p < 0.01$ ) and 3 weeks ( $p < 0.01$ ). Such improvement can be explained by muscle targeted exercises and weight bearing exercises like body weight row, biceps

row and triceps extension. This difference can be attributed to the nature of calisthenics exercises.

Calisthenics include continuous movement of the limbs which require more muscle work which in turn increases the need of O<sub>2</sub> demand leading to increase in muscle strength. In calisthenics all upper limb muscles like deltoid, rotator cuff muscles, biceps brachii, triceps, brachioradialis as well as latissimus dorsi, serratus anterior are involved in almost every single exercise compare to yoga, thus muscle strength is better in calisthenics group participants. Yoga group also shows some improvement in strength. But there was no significant difference in comparison of the grip strength scores of pre-interventions with scores at 1 week for either left ( $p=0.32$ ) or right ( $p=0.262$ ) hand.

A study indicated that calisthenic training was able to improve upper body muscular strength. The purpose of this study was to determine whether progressive calisthenics push-up is comparable with traditional bench press training as a technique for increasing muscle strength and thickness. healthy moderately trained men completed the study for 4 weeks. This study is the first to demonstrate that calisthenics, using different progressive variations to maintain strength training programming variables, can improve upper body muscle strength.<sup>13</sup>

Calisthenics are more dynamic type of exercises which included the movements of all limbs whereas, yoga is more of static posture and breathing control exercises which help in improving flexibility of the body. The weight of each participant being a limiting factor in the execution of the exercises. Although all the participants were doing exercise comfortably.

In another study, calisthenics training has been shown to successfully improve fitness components such as flexibility in various ages and populations. It was found that 8-week calisthenics training improved flexibility among swimming athletes. Also, that 8-week of calisthenics training was significantly increased the level of flexibility among junior high school boys. Similar to the effectiveness of calisthenics training in increasing flexibility among athletes as well as the general population, calisthenics and aerobic calisthenic training have also been shown in this study to be effective in increasing flexibility among obese peoples.<sup>14</sup>

Dhanurasana, Crow-pose, Bhujangasana, Purvotthanasana was used to assess strength of triceps, deltoids, pectoralis major and pectoralis minor or hand muscles. It was found that sun salutation a form of yoga improves upper body muscle strength in 24-week training. The purpose of this study was to evaluate effects of regular practice of sun salutation on muscle strength. 49 male and 30 female subjects performed 24 cycles of sun salutation, 6 days a week for 24 weeks. Results of this study indicate that sun salutation has the potential to improve the muscle strength, and this is an easier and less time-consuming alternative to improve strength and endurance.<sup>15</sup>

In the present study we also see that yoga and calisthenics are two entirely different practices. With their own methods and principles. In calisthenics, we increase resistance by decreasing mechanical advantage (i.e. pushups progressing to one-arm pushups). It requires a different path of progression. In yoga, the asanas great for improving your flexibility. But the movement sequences are awesome for increasing neuromuscular coordination and functional stability.

The biggest difference is that calisthenics is much more of a strength and conditioning workout, with the main goal to increase the difficulty and/or number of repetitions you can perform of movements like pull ups or push-ups and Yoga comes in many different styles—some build strength, others focus on mobility and flexibility, and others still are primarily focused on breath work and meditation.

In India, physical inactivity, unhealthy lifestyles, and mental health issues are impacting the fitness of the younger generation, affecting national growth. Calisthenics training plays a crucial role in enhancing both physical and mental fitness, while yoga also contributes to overall well-being. This study is significant for sports, as performance is closely linked to motor fitness and physiological parameters, which showed notable improvements after calisthenics training.

The data analysis exposed no significant difference in grip strength between the Calisthenics and Yoga groups, indicating both had equal improvements. The study showed significant improvement in upper limb muscle strength after both yogic practice and calisthenics, with no difference between the groups. The null hypothesis was accepted, and the study's objectives were not supported by the results. It is concluded that combining calisthenics with yoga is more effective than calisthenics alone for increasing muscular strength and endurance in young adults. Both calisthenics and yoga are valuable in physical training, improving muscle strength and flexibility, and are recommended for fitness trainers, clinical practitioners, and athletes.

### Limitations And Future Scopes

The present study has a small sample size and is of short duration. Some participants faced difficulties performing yoga and calisthenics exercises, and variations in weight affected their performance. Future studies could explore the combined effects of yoga and calisthenics on muscle strength in different age groups, or focus on specific gender groups (adult females or males). Additionally, studies with a larger sample size and longer duration could provide more comprehensive results. Further research could also investigate other physiological and physical fitness variables.

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### CONCLUSION