STM JOURNALS

Recent Trends in
Sports
https://journals.stmjournals.com/rts

ISSN: 3139-6631
Volume 3, Issue 2, 2026
July–December
DOI (Journal): 10.37591/RTS

Research RTS

A Comparative Study on Calisthenics Exercises and Weight Training for Beginners of 20 – 25 Years Male

Suryansh Nigam[1]*, Anulekha Dey[2]

Abstract

The purpose of this study was to examine and compare the effects of calisthenics training and weight training on beginners. Research suggests that both training methods are used to improve physical fitness, strength, endurance, and overall functional performance, but their impact on beginners varies depending on training structure, progression, and movement demands. The observations were conducted and the ratings in terms of the performance were developed in the form of 5-point scale. Therefore, both of them proved to be rather efficient in case of beginners. The choice of the training methods should be based on personal goals and level of physical condition, because according to the results of the study, the group of calisthenics achieved higher mean rating (4.33/5), while weight training group had lower one (3.33/5), owing to better balance and coordination skills. At the same time, it should be noted that weight training group got a rating for strength (4/5) while calisthenics group got 3/5 rating. A total of 4 subjects were involved in this study however; they were further divided into 2 each for calisthenics training group and weight training group. 3 gym trainers were consulted and finalized the structured training program which consists of calisthenics and weight training was conducted over a period of eleven weeks, with progressive overload, proper recovery, and safety considerations. Various physical components such as muscular strength, endurance, balance, coordination, and body control were developed gradually throughout the training period.

Keywords: Calisthenics, weight training, beginners, muscular strength, muscular endurance, balance, coordination, functional fitness.

INTRODUCTION

Physical fitness affects nearly every part of health and daily function. Regular activity builds strength, endurance, flexibility, and coordination, and it lowers the risk of obesity, type 2 diabetes, cardiovascular disease, and hypertension [1]. According to WHO, lack of exercise is among the top risk factors in deaths globally; thus, having structured workout routines is essential at a beginner level. Figures illustrate the need to pay close attention to beginner's workout methods. Approximately 31% of the global adult population, or about 1.8 billion people, did not engage in sufficient exercises in 2022; the same percentage in South Asia was 45%. Structured fitness activities are especially lacking in India; as of 2024, there were only 12.3 million paid members in fitness facilities in India, accounting for less than 1% of its population. Furthermore, according to time-use data nationally, only 14.8% of men and 3.9% of women exercise on a daily basis in India [2]. These deficiencies are evidence of the necessity of easy-to-use solutions such as calisthenics and strength training exercises [3]. For a person who is just starting to exercise, a certain way of training becomes a very important factor. An effective exercise program will help the

***Author for Correspondence**
Suryansh Nigam
E-mail: suryanshnigam2000@gmail.com

[1]Student, Department of Physical Education and Sports Science, Amity University, Noida, Uttar Pradesh, India

[2]Assistant Professor, Department of Physical Education and Sports Science, Amity University, Noida, Uttar Pradesh, India

Received Date: September 03, 2026
Accepted Date: September 22, 2026
Published Date: September 23, 2026

Citation: Suryansh Nigam, Anulekha Dey. A Comparative Study on Calisthenics Exercises and Weight Training for Beginners of 20 – 25 Years Male. Recent Trends in Sports. 2026; 3(2): 41–50p.

© STM Journals 2026. All Rights Reserved

beginner gradually get used to the exercise routine, master proper biomechanics and prevent injuries [1]. The initial stage establishes the basis for future habits and techniques.

Calisthenics and weight training are some of the most popular types that have found their application in gyms, sport complexes, schools, and rehabilitation centers. However, even nowadays, there is much debate concerning which one is better for beginners [4]. In the case of calisthenics, body weight serves as a resistance tool through various kinds of exercises, including push-ups, squats, lunges, planks, pull-ups, dips, mountain climbers, burpees, and jumping jacks. The fact is that such kinds of exercises involve more than one muscle group, thus developing coordination and neuromuscular efficiency [5]. Being beneficial to the development of balance, flexibility and muscular endurance, calisthenics is appropriate for those who have just started working out as it helps to develop movement competency [4]. Moreover, calisthenic exercise does not require much equipment, thus allowing working out in the house, park, or gym. Studies suggest that there is a relationship between calisthenics and improved core stability, posture, mobility, and functional strength; however, calisthenics places less strain on the joints compared to weight training, which makes calisthenics an ideal starting point for beginners who have poor physical conditioning [4]. Weight training involves the use of external resistance through dumbbells, barbells, machines, and weight plates [6]. The purpose of weight training is to develop strength, muscle mass, and power through the process of progressive overload through which the load is increased progressively to facilitate the recruitment of muscle fibers, development of the muscle cross-sectional area, and neuromuscular adaptation [5]. Exercises are designed to target certain muscles; the bench press targets the pectorals and anterior deltoid, squats target the quadriceps and gluteal muscles, deadlifts target the posterior chain, and the shoulder press targets the deltoids and trapezius muscles. Resistant exercises cause significant improvements in strength and hypertrophy in a short period of time. However, such exercises as deadlifting and squats require proper training and coaching to perform safely [1]. Resistance training and calisthenics have different effects on the body. Resistance training helps people build strength, improve joint stability, coordination, and balance for daily activities [4]. Calisthenics provide a specific and quantifiable way to build strength and muscle mass [7]. In addition, motivational factors are important when choosing between those exercises since beginners have no problems doing calisthenics and get motivated by seeing results in numbers in weight training [3]. This research will compare the benefits and results of calisthenics and weight training during eleven weeks of exercises of beginners [8].

Objectives of the Study

1. To determine and compare the effects of calisthenics training and weight training on muscular strength, muscular endurance, balance, coordination, core stability, and functional fitness among beginners over an eleven-week training period.
2. To provide practical guidance for beginners in selecting an appropriate training method based on the comparative findings of the study.

Delimitation of the Study

- Beginners with little or no prior experience in structured physical training.
- Participants training at Gym37, Sector 37, Noida.
- An eleven-week structured training program.
- Two training modalities: calisthenics and weight training.

Limitation of the Study

- The study relied on weekly performance monitoring and observation rather than laboratory-based testing.
- Dietary habits and psychological factors of participants were not controlled.
- Individual variation in recovery and adaptation among beginners may have influenced results.
- The study duration was limited to eleven weeks.

Methodology and Procedure Research Design

© STM Journals 2026. All Rights Reserved

The present study adopted a comparative, quasi-experimental research design to examine the effects of calisthenics training and weight training on beginners by establishing two parallel groups :- Group A (Calisthenics Training Group) and Group B (Weight Training Group) that followed structured, progressive training schedules over an eleven-week period with different exercise modalities but equal training frequency and progression [9].

Selection of Participants

A total of four beginners with little to no prior experience in structured physical training were selected as participants for the study from Gym37, Sector 37, Noida. The gym permitted students to participate who were medically fit and voluntarily enrolled in the training program. On the basis of their training modality, the selected participants were divided into two equal groups of two participants each in calisthenics group and a weight training group (Table 1).

Criteria Measures

The assessment was conducted through observation evaluated across six fitness components (a) muscular strength, (b) muscular endurance, (c) balance and coordination, (d) core stability, (e) body control and movement quality, (f) functional fitness. Performance in each component was rated through structured weekly observation of exercise execution, endurance capacity, and movement efficiency [10].

The scoring procedure followed a structured observational rubric. During weekly sessions, the internal and external guides jointly observed each participant's exercise execution, technique quality, endurance capacity, and movement control, and rated performance in each of the six fitness components on a 5-point scale (1 = Poor to 5 = Very High/Significant improvement), detailed in Table 1 of the Results section. Ratings recorded in the final two weeks of training (Week 10 to Week 11) were compared with baseline ratings in Week 1 to calculate the overall improvement rating achieved by each group (Table-2).

Test Tools Used

Along with the observation rubric, four general bodyweight exercises were performed on a weekly basis to assist in determining the performance ratings. Every exercise was focused on a particular aspect of physical fitness.

Training Program Design

The training sessions took place five days a week, and consisted of a warm up, training process and a cool down. The intensity and difficulty level of the exercises were gradually increased every week in order for the body to have enough time for proper adaptation and to reduce the possibility of getting an injury (Table 3).

Each exercise was conducted five days a week for around 45 minutes and was composed of three sections namely; warming up, workout activity and cooling down. (Table-4) Exercises conducted within each section for both classes, as well as the physical component that each section addresses, is outlined in the table below (Table-5).

Rest periods of 60 to 90 seconds were allowed between sets during the training phase for both groups. The ten-week program is presented below.

Table 1. Participant details.

Participant Code	Group
C1	Calisthenics Training Group
C2	Calisthenics Training Group

© STM Journals 2026. All Rights Reserved

W1	Weight Training Group
W2	Weight Training Group

Administration of the Data Collection

The research process involved three stages:

1. *Phase – Baseline Measurement*: Participants were briefed about the exercise program, and their strength, endurance, flexibility, and body compositions were measured in Week 1.
2. *Phase – Exercise Training Program*: Calisthenics and weight training groups started their respective training programs for ten weeks starting from Week 2 to Week 10.
3. *Phase – Final Measurements*: In Week 11, participants did conditioning exercises for their whole body, and final measurements were made.

Analytical Technique

Since the results were achieved through structured weekly fitness monitoring and not from tests using an instrument, the data collected was analyzed using descriptive method. The improvement in each component of fitness for both groups was evaluated as being moderate, high, very high or significant, and then comparison was made [11].

Results

The findings of this research study were drawn out of continuous observation and analysis of the performance of the subjects in 11 weeks of training program.(Table-6) Both the control and experimental group underwent a well-defined training program, which led to improvement in different elements of physical fitness.(Table-7) Instead of laboratory-based test, the measurement of the performance improvement was done based on performance evaluation, exercise technique, endurance capacity, and efficiency of movement during training classes [12]. In order to report the improvements in a standardized format, each element of physical fitness was translated into a five point Performance Rating Scale, which is equivalent to the descriptive rating of each group in each week of the training program (Table-8).

The key findings of the study, drawn from the participant-wise and group-wise data presented below, are summarised as follows:

Both participants in each group showed a substantial improvement in push-up, pull-up, squat, and plank performance between the pre-training and post-training assessments [13]. To convert these raw scores into the 1–5 rating scale used, standard beginner fitness benchmarks were applied to the push-up, squat, and plank tests. Push-up and squat scores were averaged to derive the Muscular Endurance rating, and plank duration was used to derive the Core Stability rating (Table 9).

The pull-up performance reflects bodyweight-movement skill more than absolute load-bearing strength, this component, along with Balance & Coordination, Body Control & Movement Quality, and Functional Fitness, continued to be rated observationally by the guides, consistent with the scoring procedure described earlier (Table 10).

Table 2. Fitness test used in the study.

Test Used	Definition	Relation to This Study
Push-Up Test	Maximum number of correct-form push-ups performed continuously until technical failure.	Used to track upper-body strength/endurance gains and inform the Muscular Endurance rating for both groups
Pull-Up Test	Maximum number of correct-form pull-ups (assisted or unassisted) performed.	Recorded as supporting evidence of upper-body pulling strength, bodyweight-movement, body control
Squat Test	Maximum number of correct-form bodyweight/loaded squats performed to technical	Used to track lower-body strength/endurance gains and inform the Muscular Endurance rating for both

© STM Journals 2026. All Rights Reserved

	failure.	groups
Plank Test	Maximum duration for which a correct plank position could be held.	Used directly to derive the Core Stability rating for both groups

Table 3. Weekly aim / focus of structured training program.

Week	Focus of Training
1	Orientation, familiarisation with technique and safety guidelines, and baseline observation.
2	Structured beginner-level upper-body, lower-body, and core exercises; focus on neuromuscular adaptation and technique.
3	Controlled progressive overload through additional sets and repetitions; focus on muscular endurance and core stability.
4	Split training approach separating upper-body, lower-body, and core sessions; focus on strength endurance and recovery.
5	Slightly advanced exercise variations; increased resistance/bodyweight difficulty; focus on posture and coordination.
6	Moderately advanced exercises for balance, motor control, and functional strength; increased training intensity.
7	Compound and skill-oriented movements introduced; greater emphasis on functional strength and body awareness.
8	Intermediate-level movements focusing on pushing-pulling balance, unilateral strength, and core stability.
9	Increased training volume; focus on movement efficiency, unilateral control, and core endurance.
10	Advanced beginner-level progressions; explosive strength, dynamic stability, agility drills, and circuit training.
11	Consolidation and integration of learned skills through full-body conditioning and final observation.

Session Structure and Exercise Components

Table 4. Session structure of calisthenics training group.

Session Part	Duration	Fitness Component Targeted	Exercises Included
Warm-up	8–10 min	Cardiovascular activation, joint mobility, injury prevention	Light jogging on the spot, arm circles, dynamic leg swings, jumping jacks, joint mobility drills
Main Training	25–30 min	Muscular strength, muscular endurance, balance and coordination, core stability, functional fitness	Push-ups, bodyweight squats, lunges, planks, assisted/full pull-ups, dips, mountain climbers, burpees
Cool-down	5–7 min	Flexibility, recovery, reduction of muscle soreness	Static stretching (hamstrings, shoulders, quadriceps), deep breathing, light mobility work

Table 5. Session structure of weight training group.

Session Part	Duration	Exercises Included	Fitness Component Targeted
Warm-up	8–10 min	Light cardio (treadmill/cycling), dynamic stretching, light-resistance activation sets	Cardiovascular activation, joint readiness, neuromuscular activation
Main Training	25–30 min	Bench press, barbell squats, deadlifts, shoulder press, lat pull-downs, bicep curls, leg press	Muscular strength, hypertrophy, muscular endurance
Cool-down	5–7 min	Static stretching, foam rolling, breathing exercises	Flexibility, recovery, reduction of muscle soreness

Table 6. Performance rating scale.

Score	Performance Level	Description
5	Very High / Significant	Marked, clearly visible improvement in the component
4	High	Strong, consistent improvement in the component

© STM Journals 2026. All Rights Reserved

3	Moderate	Noticeable but average improvement in the component
2	Below Average	Slight improvement in the component
1	Poor	Little to no observable improvement in the component

The calisthenics group achieved a higher overall post-training mean rating (4.42 out of 5) than the weight training group (3.83 out of 5). The calisthenics group showed greater improvement in Balance & Coordination (5) and Core Stability (5) compared to the weight training group (3 and 4.5 respectively). Within the calisthenics group, C1 improved from a pre-training mean of 1.83 to a post-training mean of 4.33, while C2 improved from 2.00 to 4.50, with C2 showing marginally stronger gains in muscular endurance and core stability (Table-11).

The weight training group recorded a higher rating in Muscular Strength (4) compared to the calisthenics group (3). Within the weight training group, W1 improved from 2.00 to 3.75 and W2 from 2.00 to 3.92, with both participants showing comparable progress across components (Table-12).

In both groups, the two participants followed a similar pattern of improvement, with the small differences between them mainly reflecting their individual push-up, squat, and plank scores rather than any systematic difference in training response (Figure 1).

Mean rating score before and after training for each group was derived by taking the average of the six component-based rating scores. For the calisthenics group, the mean rating improved from 1.92 before training to 4.42 after training, which demonstrates a high improvement in muscle endurance and core stability as well as rated improvement in balance, body control, and functional fitness. For the weight training group, the mean rating improved from 2.00 before training to 3.83 after training, with muscle endurance and core stability showing a similar degree of improvement to that of the calisthenics group (Table-13).

The calisthenics group demonstrated improvement in the areas of balance, coordination, core stability, and body control by scoring highest (5) in these areas. Due to the fact that the training technique requires individuals to exercise against their body weight, better awareness of movement and posture was achieved [14]. The weight training group made more progress in terms of muscle strength than the calisthenics group by scoring high (4) in this area, whereas the calisthenics group scored lower (3). Progressive overload is possible in this case due to the presence of external resistance. Both techniques turned out to be effective for beginners and were systematically performed as it can be seen from mean ratings (4.33 and 3.33). Nevertheless, the character of the improvement differed from the training technique used [15].

Table 7. Participant wise Raw Test Scores for Calisthenics Training Group.

Test (Raw Score)	C1 Pre	C1 Post	C2 Pre	C2 Post
Push-up (reps)	13	52	20	84
Pull-up (reps)	3	9	4	11
Squat (reps)	34	122	42	147
Plank (sec)	53	152	62	184

Table 8. Participant wise Raw Test Scores for Weight Training Group.

Test (Raw Score)	W1 Pre	W1 Post	W2 Pre	W2 Post
Push-up (reps)	15	62	16	75

© STM Journals 2026. All Rights Reserved

Pull-up (reps)	2	6	3	9
Squat (reps)	35	144	37	132
Plank (sec)	57	148	54	164

Table 9. Rubrics of each criteria measure.

Test	Poor (1)	Fair (2)	Moderate (3)	Good (4)	Excellent (5)
Push-up (reps)	< 10	10–20	21–40	41–70	> 70
Squat (reps)	< 30	30–60	61–100	101–140	> 140
Plank (sec)	< 30	30–60	61–90	91–150	> 150
Pull-up (reps)	0–2	3–5	6–8	9–12	> 12

Table 10. Participant wise pre and post training ratings for both fitness component and calisthenics training group.

Fitness Component	C1			C2		
	Pre	*Post*	*Difference / Improvement*	*Pre*	*Post*	*Difference / Improvement*
Muscular Strength	1	3	2	1	3	2
Muscular Endurance	2	4	2	2	5	3
Balance & Coordination	2	5	3	2	5	3
Core Stability	2	5	3	3	5	2
Body Control & Movement Quality	2	4	2	2	4	2
Functional Fitness	2	5	3	2	5	3
Mean Score	1.83	4.33	2.50	2.00	4.50	2.50

Table 11. participant-wise pre and post training ratings by fitness component for weight training group.

Fitness Component	W1			W2		
	Pre	*Post*	*Difference / Improvement*	*Pre*	*Post*	*Difference / Improvement*
Muscular Strength	2	4	2	2	4	2
Muscular Endurance	2	4.5	2.5	2	4.5	2.5
Balance & Coordination	2	3	1	2	3	1
Core Stability	2	4	2	2	5	3
Body Control & Movement Quality	2	3	1	2	3	1
Functional Fitness	2	4	2	2	4	2
Mean Score	2.00	3.75	1.75	2.00	3.92	1.92

Table 12. Comparative performance rating between calisthenics and weight training groups.

Fitness Component	Calisthenics Group		Weight Training Group	
	C 1	C 2	W 1	W 2
Muscular Strength	2	2	2	2
Muscular Endurance	2	3	2.5	2.5
Balance & Coordination	3	3	1	1
Core Stability	3	2	2	3
Body Control & Movement Quality	2	2	1	1

© STM Journals 2026. All Rights Reserved

Functional Fitness	3	3	2	2
Mean	2.50	2.50	1.75	1.92
Average mean of each group	2.50		1.84	

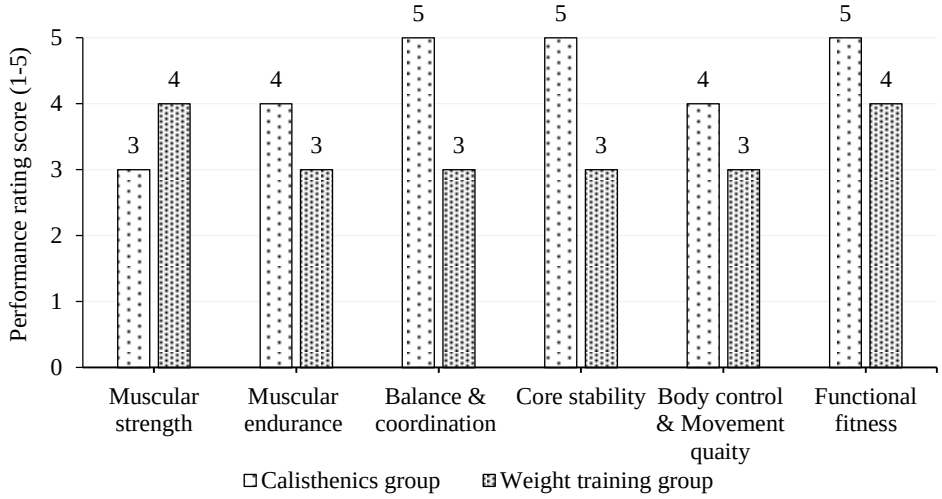


Figure 1. Comparative performance rating of calisthenics and weight training groups.

Table 13. Group mean rating score.

Group	Pre-Training Mean (out of 5)	Post-Training Mean (out of 5)
Calisthenics Group	1.92	4.42
Weight Training Group	2.00	3.83

DISCUSSION

The results from the current experiment show that calisthenics and weight training led to a significant enhancement in all of the measured fitness dimensions throughout the eleven-week duration, with the calisthenics group achieving a significantly higher mean post-training score (4.42) compared to that of the weight training group (3.83), although there were differences in terms of how the two groups improved. Higher scores for balance/coordination (5 vs. 3) and core stability (5 vs. 4.5) in the calisthenics group may be attributed to the type of exercises performed, which are bodyweight and require postural stability and coordination of multiple joints in their execution [4]. Bodyweight exercises require recruitment of several muscle groups simultaneously along with managing one's body weight, thereby putting relatively more demands on neuromuscular coordination and proprioception than external resistance exercises that occur in one plane only [16].

The superior rating for muscular strength (4) in the weight training group is in line with the principle of progressive overload; wherein external loads can be incrementally increased as a means of developing strength [7]. The loading of the specific muscles through exercises like the bench press, barbell squat, and deadlift might be the reason why the improvements in strength were better than the improvements in all the other assessed components for the weight training group [6]. In support of this finding, the data from the tests indicate that the weight training group showed an increase from a group average of 15.5 push-ups to 68.5, which is equivalent to the increase in the calisthenics group from 16.5 to 68 push-ups.

The gains in functional fitness were demonstrated by both groups, with the calisthenics group having a slightly higher rating (5 vs. 4), which indicates that whole-body movements based on bodyweight adapt well to functional abilities at the beginner level [4]. This supports the existing research stating that calisthenics training increases core stability, proper alignment, and

© STM Journals 2026. All Rights Reserved

functional strength while putting less stress on joints, making this type of exercises a good starting point for beginners [4]. Thus, the study findings confirm the opinion that calisthenics and weight training are complementary rather than competitive exercises, and the choice should be determined by what the beginner needs – functional movement or muscle strength [3].

- The mean rating for the calisthenics group was significantly higher than that of the weight training group with 4.42 versus 3.83, on a scale of 5.
- The mean rating in Muscular Strength was higher in the weight training group (4) as opposed to the calisthenics group (3).
- The calisthenics group performed much better in Balance & Coordination (5) and Core Stability (5), with the weight training group having a mean rating of 3 and 4.5 respectively.
- Muscular Endurance was found to be strongly enhanced in both groups, as evidenced by the mean test scores of 4.5 in both calisthenics and weight training groups.
- The mean ratings in Functional Fitness were quite high in both calisthenics and weight training with 5 and 4 respectively, proving that both training programs contributed to the overall functional fitness.
- The individual participant data (C1, C2 for calisthenics; W1, W2 for weight training) revealed that there was a consistent pattern of improvement in both groups.

CONCLUSION

The current research was aimed at comparing the impact of calisthenics exercises and weight training on beginners using a systematic training course over eleven weeks. Results show that both types of training were found effective for beginners in a systematic and progressive way. The participants who engaged in calisthenics exercises showed more progress in such parameters as balance, coordination, core stability, and body control. The participants who participated in weight training showed more progress in absolute muscular strength due to measurable load-based adaptations.

During the entire training period, members from both groups were observed to become more confident, improve their posture, perform exercises more efficiently, and increase their endurance. In summary, both calisthenics and weight training are appropriate training approaches for beginners, and which approach to choose should be determined by individual objectives. While calisthenics would help to achieve functional fitness, body balance and control, weight training is likely to be more effective in building muscle strength. The use of both training methods together in accordance with the recommendations for beginner periodisation and development of training program is also recommended for beginners.

Recommendation

More studies can be done on the following topics:

- Pilates vs. Zumba
- HIIT (High-Intensity Interval Training) vs. Steady-State Cardio
- Yoga vs. Functional Mobility Training
- Resistance Bands vs. Free Weights

REFERENCES

1. Wagner DR. ACSM's resource manual for guidelines for exercise testing and prescription. Medicine & Science in Sports & Exercise. 2005 Nov;37(11):2018.
2. Sands WA, Wurth JJ, Hewit JK. Basics of strength and conditioning manual. Colorado Springs, CO: National Strength and Conditioning Association. 2012;1:100-4.
3. Afonso J, Nikolaidis PT, Sousa P, Mesquita I. Is empirical research on periodization trustworthy? A comprehensive review of conceptual and methodological issues. Journal of sports science & medicine. 2017 Mar 1;16(1):27.
4. Boyle M. New functional training for sports. Human Kinetics; 2016 May 18.

© STM Journals 2026. All Rights Reserved

DOI:10.5040/9781718225718
5. Lally P, Gardner B. Promoting habit formation. Health psychology review. 2013 May 1;7(sup1):S137-58.
6. Tsourlou T, Gerodimos V, Kellis E, Stavropoulos N, Kellis S. The effects of a calisthenics and a light strength training program on lower limb muscle strength and body composition in mature women. Journal of strength and conditioning research. 2003 Aug;17(3):590-8.
7. Igor R, Vladimir I. Modalities of training parameter alternation in nowadays strength training practice. Citius Altius Fortius. 2010 Dec 1;29(4):41.
8. Nemoto N. A Constructional Analysis of Bodily Motion Expressions. English Linguistics. 2007;24(2):389-420.
9. Guy JA, Micheli LJ. Strength training for children and adolescents. Journal of the American Academy of Orthopaedic Surgeons. 2001 Jan;9(1):29-36.
10. Herzog W. Skeletal muscle mechanics: questions, problems and possible solutions. Journal of neuroengineering and rehabilitation. 2017 Sep 16;14(1):98.
11. Cook CJ, Kilduff LP, Jones MR, Joyce D, Lewindon D. Recovering effectively in high-performance sports. High-performance training for sports. 2014 Jul 15:319-30.
12. Gabriel BM, Zierath JR. The limits of exercise physiology: from performance to health. Cell metabolism. 2017 May 2;25(5):1000-11.
13. Neumann DA. Kinesiology of the hip: a focus on muscular actions. Journal of Orthopaedic & Sports Physical Therapy. 2010 Feb;40(2):82-94.
14. Greer J. Training: The foundation for success in combat. Heritage Foundation. 2018 Oct;4:37-45.
15. Renson R. Kinesiologists: raiders of the lost paradigm?. Kinesiology. 2002 Dec 18;34(2.):210-21.
16. DiNubile NA. Strength training. Clinics in sports medicine. 1991 Jan 1;10(1):33-62.

© STM Journals 2026. All Rights Reserved