

The effectiveness of calisthenics on physical fitness components in cricket players

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Abstract

Introduction. Calisthenics is a type of exercise that primarily uses a person's own body weight and a range of motions performed without the use of any gear or equipment and is a type of resistance training. Calisthenics is an excellent way to enhance general fitness, strength, flexibility, agility, balance, coordination, aerobic conditioning, cardiovascular and muscular endurance, all of which may prove beneficial in cricket. **Aim of Study.** The aim of this research is to evaluate the impact of a 6-week calisthenics regimen on the physical fitness components of cricket players. **Material and Methods.** A total of 60 male cricket players (18-28 years) were divided randomly into two groups. Group A (experimental group) performed calisthenics for four days in a week for six weeks with their regular cricket training. Group B (control group) was instructed to continue their regular play throughout the study duration. The outcome measures included the Y-balance test, the hand-eye coordination test, the standing broad jump test, the 50-yard dash test, the sit-and-reach test, and the curl-up test. **Results.** Linear mixed-effects analysis revealed significant Group $\times$ Time interactions for all outcome variables ($p \leq 0.01$), indicating greater improvements in the experimental group at Week 3 and 6 compared with the control group. Significant time effects were observed for balance, coordination, power, speed, flexibility, and abdominal strength and endurance. Improvements in flexibility were significant only at Week 6. Effect sizes ranged from moderate to large, demonstrating meaningful training effects. **Conclusions.** Calisthenics combined with cricket training delivers added benefits by enhancing significant physical attributes in cricket players, including balance, coordination, power, speed, flexibility and abdominal strength and endurance. These findings should be interpreted with caution because the sample included only young male cricket players and the participants could not be blinded due to the exercise-based intervention.

KEYWORDS: physical fitness, calisthenics, cricket players.

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Introduction

Cricket is a two-team, eleven-player sport played on an oval pitch that requires a high level of technical expertise. The biggest difficulty with cricket is that it incorporates four core activities—batting, bowling, fielding, and wicket keeping—each needing a unique set of abilities [1]. In the past, cricket was thought to be a sport that only required a limited amount of physical preparation and fitness [2]. However, changes in formats and increasing physical demands of different roles have led to higher fitness requirements in modern cricket [2-4].

Physical fitness has a significant impact on a cricket player's performance. With the game becoming more competitive, players are now required to undertake structured physical conditioning to meet the demands of modern cricket. In reality, many talented players may be unable to compete at the highest level because of inadequate physical conditioning. Physical fitness is one of the most important traits of a successful cricketer and is associated with a positive mindset [5].

A physically fit athlete is more likely to perform effectively during the game and experience fewer injuries [6].

The term calisthenics comes from Greek words *kàlos* (beauty) and *sthénos* (strength). In some regions, such as Australia, the term has also been used in the context of women's competitive sports combining gymnastics and dance technique [7]. Calisthenics exercises are performed using only body weight as resistance and are generally vigorous and aerobic in nature. They involve large muscle groups of both the upper and lower limbs in a rhythmic and controlled manner, making them a beneficial and efficient form of training [3]. Calisthenics has grown in popularity due to its simplicity, minimal equipment requirements, low cost, and easy implementation in outdoor settings such as parks [7]. Calisthenics activities are a sequence of rapid musculature contractions that promote body strength and flexibility by using only the person's body weight. They involve movements such as twisting, running, swinging, bending, striking and many other actions that engage the trunk, upper and lower limbs, neck, and back, effectively utilizing all major muscle groups [8]. Calisthenics exercises are commonly employed in both sports training and recovery. By increasing total muscular groups during calisthenics exercises, proprioception and coordination can be developed [3]. Resistance training in the form of calisthenics, often referred to as bodyweight training, has gained popularity over the past few years. Traditional free-weight and dumbbell exercises, such as the squat and bench press, are well studied and commonly used to build muscle strength, largely because external resistance can be precisely manipulated [9]. Calisthenics training has the potential to improve physical attributes and sports specific abilities. It has been shown to enhance muscular strength, agility, balance, endurance, and flexibility in athletes from sports such as tennis, kabaddi, soccer, swimming, and volleyball [3, 10-12].

However, there is limited evidence examining the effect of calisthenics specifically in cricket players. Given the physical and skill demands of cricket, it is important to investigate whether a structured calisthenics program can improve key fitness components in this population.

Aim of Study

The aim of the present investigation is to evaluate the effect of a 6-week calisthenics regimen on the physical fitness components of cricket players.

Material and Methods

Study design

This research followed a randomized controlled trial design. Due to the nature of the exercise-based intervention, participant blinding was not feasible. However, allocation concealment was ensured during group assignment. As the researcher was also the assessor, assessor blinding was not feasible. Allocation concealment was maintained using a lottery method with sealed, opaque envelopes prepared and drawn by an independent individual. Ethical clearance was granted by the Institutional Ethical Committee, Department of Physiotherapy, Guru Jambheshwar University of Science and Technology, Hisar, via letter number PTY/2023/174 dated 11.04.2023. Additionally, the study was registered with Clinical Trial Registry-India (CTRI) under the registration number REF/2023/09/073162. Informed consent from each player was obtained prior to participation in this research.

Participants

A total of 60 male cricket players were recruited from various sports academies and Guru Jambheshwar University of Science and Technology, Hisar. The inclusion criteria required participants to be 18-28 years old, to be practicing cricket regularly, and to have at least two years of playing experience. The exclusion criteria consisted of players with history of any recent injury or surgery; any musculoskeletal, neurological, or cardiopulmonary disorders; or any other significant diseases; involvement in drug or alcohol consumption; irregular cricket practice; or participation in other sports alongside cricket.

The sample size was estimated using G*Power 3.1 software, considering the effect size [level of significance (α) = 0.05, power ($1 - \beta$) = 95% and effect size = 1.817], and the calculation indicated a requirement of 14 participants ($n = 7$ for each group). To accommodate an anticipated 15% dropout rate, 60 players were ultimately recruited and randomly assigned to two groups of 30.

Procedure

The study's inclusion and exclusion criteria were used to screen a total of 72 participants. Only 60 of the 72 screened participants satisfied the inclusion requirements (Figure 1). The players were allocated using simple randomization (lottery method) into two groups: Group A (experimental group) and Group B (control group), each with 30 players. To maintain allocation concealment, the randomization slips were

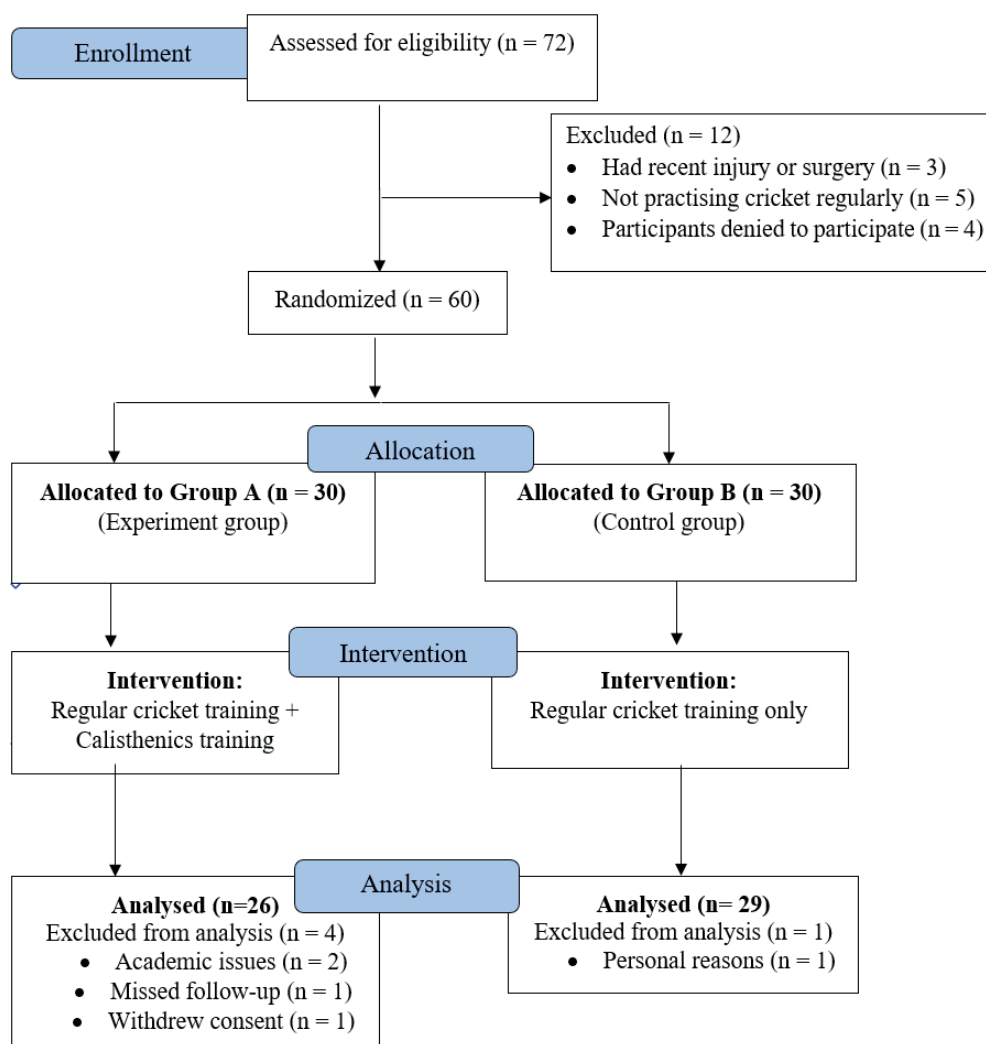


Figure 1. Consort flow diagram

placed in sealed, opaque envelopes and drawn by an independent individual not involved in evaluation or training.

Participant flow and retention are presented in the CONSORT diagram (Figure 1). Of the 60 allocated players, 4 participants from Group A and 1 participant from Group B did not complete post-intervention testing due to academic or personal reasons. Therefore, final analysis was conducted on 26 participants in Group A and 29 participants in Group B.

Intervention

The players in Group A performed calisthenics four days per week for six weeks with regular cricket training. Participants in the control group continued routine cricket training, including skill-based drills and conditioning sessions conducted as per team schedules.

Each of the 10-minute warm-up and cool-down activities was completed by every participant. The workout plan includes stretching the biceps, triceps, hamstrings, quadriceps, and calves, as well as running or jogging for five minutes as part of the 10-minute warm-up. Five repetitions of each stretching exercise were performed, with a 10-second hold between each repeat as shown in Table 1.

Table 1. Calisthenics exercise group

Warm-up	10 minutes
Calisthenics exercise training	25 minutes
Cool-down	10 minutes
Total time	45 minutes

Warm-up exercises

Before each session, athletes were instructed to walk briskly or jog for five minutes and then perform warm-up activities outlined in Table 2.

Table 2. Warm-up exercises

No.	Exercise	Equipment	Repetition/Time	Intensity
1.	Running/ jogging	No equipment	5 minutes	
2.	Stretching (biceps, triceps, hamstrings quadriceps and calves)	No equipment	5 repetitions (with 10-second hold)	40-50%

Calisthenics exercises

A variety of movements, including basic push-ups, lower abdominal plank, prone superman, V-up, and mountain climber were part of the calisthenics program. The calisthenics program was conducted for six weeks. Each exercise was performed for two sets of ten repetitions during the first week, after which the exercises were progressively intensified from Week I to Week VI. A recovery period of 90 seconds was allowed between the exercise sets [3, 7, 13], as shown in Table 3. Each training session lasted approximately 45 minutes, including the warm-up and cool-down. A fixed recovery interval of 90 seconds was maintained between all exercise sets throughout the 6-week program. All training sessions were supervised, and attendance was recorded to ensure adherence. Total weekly training load was approximately 180 minutes (45 minutes $\times$ 4 sessions/week).

Outcome measures

Primary outcomes: The primary outcomes included balance, coordination, power, speed, flexibility, and abdominal strength and endurance. No secondary outcomes were predefined.

In this study, the physical fitness components examined were balance, coordination, power, speed, flexibility, abdominal strength and endurance. The outcome measures were the Y-balance test, the hand-eye coordination test, the standing broad jump test, the 50-yard dash test, the sit-and-reach test, the curl-up test. Balance was measured by the Y-balance test [14], while coordination, power, speed, and flexibility were measured using standardized field tests described by Kansal [15]. Abdominal strength and endurance were assessed using the curl-up test [16]. The curl-up test was scored using a categorical method with a maximum possible score of 5.

The reliability of the Y-balance test, hand-eye coordination test, standing broad jump test, 50-yard dash test, sit-and-reach test, curl-up test has been reported to be good to excellent (ICC = 0.85-0.91, 0.875, 0.96-0.99, 0.89-0.99, 0.92, 0.995) [14, 16-19].

Before each test, the participants were instructed not to consume caffeine and to avoid heavy exercises for 24 hours prior to their participation in the study. Each player performed three trials for every test, and the best score among the three was used for analysis. Measurements of all outcome variables (Y-balance test, hand-eye coordination test, 50-yard dash, sit-and-reach test, and curl-up test) were taken at baseline, at Week 3 and at Week 6.

Data analysis

The data were analyzed using SPSS version 21.0. Normality was assessed using the Kolmogorov–Smirnov test, which indicated a mixed distribution pattern across variables. Owing to the mixed normality of the data and the repeated-measures study design, linear mixed-effects models were used as the primary analytical approach, as they appropriately handle repeated measurements, missing data, and non-normal distributions. Participants were treated as random effects, whereas Group, Time, and Group $\times$ Time interaction were included as fixed

Table 3. Exercise protocol for a 6-week calisthenics training

Exercise	Week I (sets $\times$ repetitions)	Week II (sets $\times$ repetitions)	Week III (sets $\times$ repetitions)	Week IV (sets $\times$ repetitions)	Week V (sets $\times$ repetitions)	Week VI (sets $\times$ repetitions)
1) Push-up	2 $\times$ 10	2 $\times$ 10	2 $\times$ 15	2 $\times$ 15	3 $\times$ 10	3 $\times$ 15
2) Lower abdominal plank	2 $\times$ 10	2 $\times$ 10	2 $\times$ 15	2 $\times$ 15	3 $\times$ 10	3 $\times$ 15
3) Prone Superman	Not started	2 $\times$ 10	2 $\times$ 15	2 $\times$ 15	3 $\times$ 10	3 $\times$ 15
4) V-up	Not started	Not started	2 $\times$ 15	2 $\times$ 15	3 $\times$ 10	3 $\times$ 15
5) Mountain climber	Not started	Not started	Not started	Not started	3 $\times$ 10	3 $\times$ 15

effects. Repeated-measures ANOVA (RM-ANOVA) was used as a supportive analysis due to its robustness to moderate violations of normality. Bonferroni correction was applied for post-hoc comparisons, and effect sizes (partial η^2 and Cohen's d) were reported. The level of significance was set at $p \leq 0.05$.

Results

The demographic profile of the participants, including age, height, weight, and BMI, is presented in Table 4. The data were analyzed using the Kolmogorov-Smirnov test and showed that the 50-yard dash test and curl-up test variables were not normally distributed, whereas the Y-balance test, hand-eye coordination test, standing broad jump test, sit-and-reach test variables showed normal distribution.

Linear mixed-effects modelling demonstrated significant Group $\times$ Time interactions for all outcome variables ($p \leq 0.01$), indicating greater improvement in the experimental group at Week 3 and Week 6 compared to the control group. Descriptive changes across time-points are presented in Table 5, and RM-ANOVA with interaction terms is presented in Table 6.

For balance outcomes, the experimental group demonstrated large improvements in Y-balance right-leg performance [$F(2,50) = 340.68$, $p < 0.001$, partial $\eta^2 = 0.93$] and Y-balance left-leg performance [$F(2,50) = 326.06$, $p < 0.001$, partial $\eta^2 = 0.93$]. Hand-eye coordination also improved significantly with a large effect size [$F(2,50) = 170.97$, $p < 0.001$, partial $\eta^2 = 0.87$]. Standing broad jump performance showed significant improvement over time [$F(2,50) = 68.22$,

Table 4. Mean age, height, weight, and BMI of the study participants

	Group		t-value	p-value
	Experimental	Conventional		
	Mean $\pm$ Standard deviation	Mean $\pm$ Standard deviation		
Age	22.31 $\pm$ 1.76	21.83 $\pm$ 2.02	0.935	0.354
Height (in cm)	180.15 $\pm$ 5.44	177.45 $\pm$ 7.27	1.548	0.128
Weight (in kg)	72.75 $\pm$ 6.16	72.40 $\pm$ 5.55	0.222	0.825
BMI	22.51 $\pm$ 1.67	22.98 $\pm$ 0.71	1.388	0.171

Table 5. Descriptive statistics (Mean $\pm$ SD)

Outcome	Group	Baseline	Week 3	Week 6
Y-balance right	Group A	86.26 $\pm$ 3.56	95.53 $\pm$ 4.23	102.78 $\pm$ 3.73
Y-balance right	Group B	86.94 $\pm$ 3.34	88.69 $\pm$ 3.13	91.09 $\pm$ 3.16
Y-balance left	Group A	81.32 $\pm$ 6.24	98.00 $\pm$ 5.23	101.00 $\pm$ 5.87
Y-balance left	Group B	88.08 $\pm$ 8.96	88.08 $\pm$ 8.82	91.80 $\pm$ 7.76
Hand-eye coordination	Group A	15.00 $\pm$ 3.32	21.00 $\pm$ 4.44	32.00 $\pm$ 6.56
Hand-eye coordination	Group B	20.00 $\pm$ 4.07	21.00 $\pm$ 3.94	33.00 $\pm$ 4.50
Standing broad jump	Group A	293.63 $\pm$ 18.79	307.04 $\pm$ 16.66	323.88 $\pm$ 15.90
Standing broad jump	Group B	282.97 $\pm$ 12.63	285.34 $\pm$ 12.89	287.90 $\pm$ 13.12
50-yard dash	Group A	5.70 $\pm$ 0.45	5.10 $\pm$ 0.48	4.70 $\pm$ 0.45
50-yard dash	Group B	5.80 $\pm$ 0.50	5.60 $\pm$ 0.49	5.40 $\pm$ 0.42
Sit-and-reach	Group A	28.00 $\pm$ 3.12	19.00 $\pm$ 3.10	28.00 $\pm$ 4.12
Sit-and-reach	Group B	19.00 $\pm$ 3.30	19.00 $\pm$ 2.80	22.00 $\pm$ 3.15
Curl-up	Group A	5.00 $\pm$ 0.00	5.00 $\pm$ 0.00	5.00 $\pm$ 0.00
Curl-up	Group B	5.00 $\pm$ 0.00	4.00 $\pm$ 0.00	5.00 $\pm$ 0.00

Table 6. RM-ANOVA and mixed-model analysis results

Variable	F (experimental)	<i>p</i> -value	Partial η^2	Group $\times$ Time (LMM <i>p</i>)
Y-balance right	340.68	<0.001	0.93	<0.001
Y-balance left	326.06	<0.001	0.93	<0.001
Hand–eye coordination	170.97	<0.001	0.87	<0.001
Standing broad jump	68.22	<0.001	0.73	0.0026
50-yard dash	48.23	<0.001	0.66	<0.001
Sit-and-reach	44.99	<0.001	0.64	<0.001
Curl-ups	44.83	<0.001	0.64	0.0026

$p < 0.001$, partial $\eta^2 = 0.73$], indicating enhanced lower-limb power in the experimental group.

Speed, assessed using the 50-yard dash, demonstrated a significant reduction in time across the intervention period [$F(2,50) = 48.23$, $p < 0.001$, partial $\eta^2 = 0.66$]. Flexibility, measured by the sit-and-reach test, improved significantly over time, with meaningful improvement observed at Week 6 [$F(2,50) = 44.99$, $p < 0.001$, partial $\eta^2 = 0.64$]. A transient decline was observed at Week 3, followed by improvement at Week 6. Core endurance, assessed using the curl-up test, showed a significant time effect [$F(2,50) = 44.83$, $p < 0.001$, partial $\eta^2 = 0.64$]. The absence of variability across time points reflects a ceiling effect rather than lack of intervention responsiveness.

Within-group changes across time were significant for all variables in both experimental and control groups ($p < 0.001$); however, the magnitude of improvement was consistently greater in the experimental group, as reflected by the larger effect sizes.

The significant improvements observed in the control group are likely attributable to natural practice effects and repeated exposure to the testing procedures. This interpretation is supported by the mixed-effects analysis, which demonstrated significant time effects but smaller effect sizes in the control group compared to the experimental group.

Discussion

The present study examined the effects of a 6-week calisthenics training program on physical fitness components in male cricket players. The primary findings demonstrated significant Group $\times$ Time interactions for all outcome variables, indicating that calisthenics training produced greater improvements than conventional training across the intervention period.

These findings are supported by large effect sizes (partial $\eta^2 = 0.64$ – 0.93) and significant Group $\times$ Time interactions identified through mixed-effects modelling and RM-ANOVA.

The improvement observed in both groups may also be influenced by repeated exposure to testing, resulting in familiarity and motor learning. Similar test-related learning effects and performance gains through familiarization alone have also been documented in previous research [20]. This interpretation is supported by the significant main effect of time observed across all variables, despite smaller effect sizes in the control group. Further, since players continued regular cricket training throughout the study, ongoing practice itself may have contributed to faster familiarization and skill-related improvement, particularly in speed and coordination.

A possible reason for the significant improvement observed in the experimental group as compared to control group can be that the calisthenics exercises utilize the weight of the body for exercising and require engagement of nearly all muscle groups through complete joint movement, which may have contributed to improvements across all outcome variables. Similar findings were documented in a previous study, which also reported statistical significance in running speed, agility skills, explosive strength, hamstring extensibility in soccer players following an 8-week calisthenics program [10]. Comparable findings were also observed in another study, which showed that calisthenics training improved flexibility, agility, strength, and speed in swimmers [12]. A similar impact on physical performance was seen in kabaddi players, including improvements in agility, flexibility, strength, and endurance [11]. These outcomes are directly relevant to cricket performance, as sprinting between wickets, acceleration during bowling run-ups, postural stability during batting, and multidirectional agility during

fielding rely heavily on balance, coordination, lower-limb power, and core endurance.

As the primary goal of calisthenics exercises is to develop body strength and flexibility through movements performed using one's own body weight as resistance, such training may also enhance neuromuscular and movement-related qualities, including balance, coordination, and range of motion [21].

The activation of multiple muscle groups during calisthenics helps develop proprioception and coordination, which improves the control and balance of the body [3]. This could be the reason to explain statistically significant improvement of balance in our study.

Calisthenics exercises are weight-bearing in nature and require coordinated use of both the upper and lower limbs, which might have contributed to improvement in coordinated movements [8]. These changes in physical components may be due to targeted neural adaptations, enhanced motor unit activation, and better coordination among the involved muscle groups [9, 22]. The large effect sizes observed for balance, coordination, and power outcomes suggest that these neuromuscular adaptations were substantial and exceeded improvements expected from familiarization alone. This may be the possible explanation for improvement in coordination observed in our study.

Calisthenics exercises cause rapid force production and are therefore efficient for enhancing power, which helps explain the improvements in power observed in the present study. Similar reasons for improvement was suggested by the use of calisthenics in kabaddi players [11].

The use of calisthenics training induces neuromuscular adaptations within the stretch-shortening cycle, which contribute to enhanced speed [8]. This could be the reason to explain statistically significant improvement in speed in our study.

During calisthenics, the joints move through repeated stretches and bends using the body's own strength and weight. These movements not only build joint stability but are also believed to boost blood flow to the surrounding soft tissues. This increased circulation helps in healing, keeps the joints moving freely, and may even support better flexibility in muscles like the hamstrings [8]. This can be the suggested reason for improved flexibility in our study. This non-linear pattern may reflect early-phase neuromuscular fatigue or muscle stiffness, followed by adaptive recovery.

In addition, the calisthenics exercises performed in an open kinetic chain primarily targeted the core muscles

of the abdominal region – often referred to as the body's powerhouse – which may have contributed to the improvements in abdominal strength and endurance observed in the present study.

Limitations

Participant blinding could not be performed due to the nature of exercise-based intervention. The sample involved only young male cricket players, which limits the generalizability of the findings. Continued routine cricket training may have contributed to improvements in both groups, as reflected by the significant time effects; however, the significant Group $\times$ Time interactions and larger effect sizes confirm the additional benefit of calisthenics training. Additionally, the curl-up test demonstrated a ceiling effect due to its categorical scoring method, which may have limited sensitivity to detect further improvements. Therefore, adding a calisthenics training routine to regular cricket practice may help boost players' overall performance by enhancing their balance, coordination, power, speed, and flexibility and abdominal strength and endurance.

Conclusions

It can be concluded that implementing calisthenics exercises four times a week over six weeks, alongside regular cricket training, offers added benefits by enhancing key physical attributes such as balance, coordination, power, speed, flexibility and abdominal strength and endurance in cricket players. Future studies should include cricket-specific outcome measures such as bowling speed, running between wickets and batting reaction time.

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Conflict of Interest

The authors declare no conflict of interest.

References

1. Webster Z, Travill A. A comparison of the physical demands of a one-day cricket game and the training sessions of provincial cricket players using global positioning system tracking software. *S Afr J Sports Med.* 2018;30(1):1-6. <https://doi.org/10.17159/2078-516X/2018/v30i1a5053>
2. Christie CJ, Todd AI, King GA. Selected physiological responses during batting in a simulated cricket work bout: a pilot study. *J Sci Med Sport.* 2008;11(6):581-4. <https://doi.org/10.1016/j.jsams.2007.08.001>

3. Genç H. Effect of the calisthenics exercises on static and dynamic balance in tennis players. *Int J Appl Exerc Physiol.* 2020;9(3):140-8.
4. Noakes T, Durandt J. Physiological requirements of cricket. *J Sports Sci.* 2000;18(12):919-29. <https://doi.org/10.1080/026404100446739>
5. Ferdinands R, Deshpande Y. Kinetics of the front-arm technique in cricket fast bowling. *Int J Sports Sci Coach.* 2022;17(6):1516-25. <https://doi.org/10.1177/17479541221124073>
6. Phomsoupha M, Laffaye G. Injuries in badminton: a review. *Sci Sports.* 2020;35(4):189-99. <https://doi.org/10.1016/j.scispo.2020.01.002>
7. Thomas E, Bianco A, Mancuso E, Patti A, Tabacchi G, Paoli A, et al. The effects of a calisthenics training intervention on posture, strength and body composition. *Isokinet Exerc Sci.* 2017;25(1):1-8. <https://doi.org/10.3233/IES-170001>
8. Kaya DO, Duzgun I, Baltaci G, Karacan S, Colakoglu F. Effects of calisthenics and Pilates exercises on coordination and proprioception in adult women: a randomized controlled trial. *J Sport Rehabil.* 2012;21(3):235-43. <https://doi.org/10.1123/jsr.21.3.235>
9. Kotarsky CJ, Christensen BK, Miller JS, Hackney KJ. Effect of progressive calisthenic push-up training on muscle strength and thickness. *J Strength Cond Res.* 2018;32(3):651-9. <https://doi.org/10.1519/JSC.00000000000002345>
10. Panihar U, Rani D. The effect of calisthenics training on physical fitness parameters and sports specific skills of soccer players: a randomized controlled trial. *Adv Rehabil.* 2022;36(2):23-31. <https://doi.org/10.5114/areh.2022.116181>
11. Marwat NM, Aslam H, Hussain A, Hassan H, Ejaz D, Zafar A, et al. Calisthenics training: effects on physical fitness (coordination, flexibility and endurance) of Kabaddi players. *PalArch J Archaeol Egypt Egyptol.* 2021;18(1):5212-20.
12. Bayrakdar A, Demirhan B, Zorba E. The effect of calisthenics exercises performed on stable and unstable ground on body fat percentage and performance in swimmers. *Manas J Soc Stud.* 2019;8(3):2979-92.
13. Cigerci AE, Genç H. The effect of calisthenics exercises on body composition in soccer players. *Prog Nutr.* 2020;22(1-S):94-102. <https://doi.org/10.23751/pn.v22i1-S.9797>
14. Plisky P, Schwartkopf-Phifer K, Huebner B, Garner MB, Bullock G. Systematic review and meta-analysis of the Y-Balance Test lower quarter: reliability, discriminant validity, and predictive validity. *Int J Sports Phys Ther.* 2021;16(5):1190-209.
15. Kansal DK. Textbook of applied measurement, evaluation & sports selection. New Delhi: Sports and Spiritual Science Publications; 2008.
16. Ahearn EL, Greene A, Lasner A. Some effects of supplemental Pilates training on the posture, strength, and flexibility of dancers 17 to 22 years of age. *J Dance Med Sci.* 2018;22(4):192-7. <https://doi.org/10.12678/1089-313X.22.4.192>
17. Rahman ZA. Reliability, validity, and norm references of standing broad jump. *Rev Gest Inov Tecnol.* 2021; 11(3):1340-54. <https://doi.org/10.47059/revistageintec.v11i3.2014>
18. Altmann S, Ringhof S, Neumann R, Woll A, Rumpf MC. Validity and reliability of speed tests used in soccer: a systematic review. *PLoS One.* 2019;14(8):e0220982. <https://doi.org/10.1371/journal.pone.0220982>
19. Ayala F, Sainz de Baranda P, De Ste Croix M, Santonja F. Absolute reliability of five clinical tests for assessing hamstring flexibility in professional futsal players. *J Sci Med Sport.* 2012;15(2):142-7. <https://doi.org/10.1016/j.jsams.2011.10.002>
20. Clark RA, Pua YH, Bryant AL, Hunt MA. Validity and reliability of the Wii Balance Board for assessment of standing balance. *Gait Posture.* 2010;31(3):307-310.
21. Behm DG, Blazevich AJ, Kay AD, McHugh M. Acute effects of muscle stretching on physical performance, range of motion, and injury incidence in healthy active individuals. *Appl Physiol Nutr Metab.* 2016;41(1):1-11. <https://doi.org/10.1139/apnm-2015-0235>
22. Magill RA, Anderson D. Motor learning and control: concepts and applications. 11th ed. McGraw-Hill; 2017.