Revista de Ensino de Ciências e Matemática
ACTA SCIENTIAE
ONLINE ISSN 2178-7727
ULBRA

EFFECTS OF SIX WEEKS CALISTHENICS TRAINING PROGRAMME ON MUSCULAR STRENGTH ENDURANCE OF HOCKEY PLAYERS

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Received: 10th July, 2025
Revised &Accepted: 15th November, 2025
Published: 25th December, 2025
DOI: https://doie.org/10.65985/AS.2026439166

Abstract:

The primary aim of the study was to determine the effects of six weeks Body Weight Calisthenics Training Programme on muscular strength endurance of hockey player. For the purpose of the study 14 female hockey players were selected from Pratapgarh District in Uttar Pradesh with age ranged 12.5 ± 2.5 years. The following fitness variables were measured: abdominal muscular strength, arms and shoulder strength endurance, strength endurance of lower back muscles and strength endurance of leg muscles. Pre-test data were collected at the start of the six weeks training Programme and also Post-test data were collected after the completion of the six weeks training Programme through the administration of the standardized test i.e. Plank and Side Plank, Push-up, Back Extension and Squat and Squat Hold test. Descriptive statistics and Independent t-test were in 0.05 levels of significance. The Result of the study revealed that the six weeks body weight training had significantly improved in the abdominal muscular strength, arms and shoulder strength endurance, strength endurance of lower back muscles and strength endurance of leg muscles of hockey players. The results of the study revealed that the seven weeks Body Weight calisthenics training had significantly improved on physical fitness components of hockey Player.

Key Words: Plank and Side Plank, Push-up, Back Extension, Squat.

ISSN:1517-4492 | **E-ISSN**:2178-7727

1. Introduction

Hockey is a globally recognized sport and is considered one of the oldest and most dynamic ball games, played by both men and women at levels ranging from junior to professional competition. The game requires continuous movements such as walking, running, stepping, and jumping, which place considerable demands on players' endurance and dynamic balance. Therefore, muscular strength, endurance, and balance are essential physical components for successful hockey performance (Reza et al., 2024). These physical fitness attributes influence not only a player's ability to sustain activity throughout the match but also their capacity to perform explosive actions and maintain coordination under conditions of fatigue.

Calisthenics, a bodyweight-based training method that requires minimal equipment, has gained recognition as an effective approach for developing the physical attributes essential for hockey players. This form of training engages large muscle groups in both the upper and lower body, thereby enhancing muscular endurance and overall functional capacity (Fenta & Wase Mola, 2023; Mola & Bayısa, 2020). Through repetitive strength-oriented exercises such as pull-ups and dips, performed with or without additional resistance, calisthenics promotes the development of strength endurance while maintaining movement efficiency (Mola & Adane, 2020). In addition, its versatility allows athletes to improve flexibility, coordination, and body control through dynamic movements such as swinging, twisting, jumping, kicking, and bending—actions that closely resemble the physical demands encountered during hockey play.

Typically organized in sets of high-intensity exercises interspersed with brief recovery intervals, calisthenics training encourages athletes to perform bodyweight drills such as burpees and jumping jacks at maximal effort. This training structure stimulates neuromuscular adaptations and contributes to improvements in overall fitness levels (Singh et al., 2024a; Singh et al., 2024b). Previous research across various sports disciplines indicates that calisthenics and related training interventions can significantly enhance physical fitness, motor abilities, and sport-specific performance (Fenta & Wase Mola, 2023; Singh et al., 2025; Mola et al., 2025; Tyagi et al., 2025). Furthermore, studies highlight that integrating calisthenics into athletic training programs not only improves physical capacities but also supports psychological readiness and overall athletic development (Taye et al., 2024, 2025; Mola & Shaw, 2024a, 2024b, 2024c).

Pilates exercise training program is a health course therapy conditioning both thephysical and mental mechanism or an individual. It was a method of exercise that consists of low-impactflexibility and muscular strength and endurance movements. It was developed by Joseph Pilates in the early20th century. A Pilates routine generally includes exercises that promote core strength and endurance, including exercises that stress proper posture and movement patterns and balanced flexibility and strength (Singh L.S. et al., 2021).

2. Methodology

Subjects:

The purpose of the study was to assess the effect of body weight calisthenics training on physical fitness of Hockey players. Thus, 14 female players with the age group between 10 to 15 years randomly selected from the Pratapgarh District in Uttar Pradesh. The subjects had experience of at least one year in Hockey game and represented their respective team. All the subjects were informed about the nature

ISSN:1517-4492 | **E-ISSN**:2178-7727

of the study and their consistence was obtained to cooperate till the end of the experiment and testing period.

Selection of Variables:

Table 1: Selected Variables and Test

S.NO.	VARIABLES	TEST	CRITERION
1.	Abdominal Muscles	Plank	Seconds
2.	Arm and Shoulder Strength	Push Up	Repetition
3.	Leg Muscles	Squat	Repetition
4.	Leg Muscles	Squat Hold	Seconds

Research Design:

The study was formulated as a true random group design; consisting a pre-test and post-test. The subjects (N=14) were randomly collected. Pre-test was conducted for all the subjects on selected physical fitness variables such as abdominal muscular strength endurance, arms and shoulder strength endurance, strength endurance of lower back muscles and strength endurance of leg muscles on first day of the training and Post-test was collected after six weeks of training.

The training Programme lasted for six weeks; every day in the morning from 7:00 am to 7:30 am (for 30 minutes a day) and 5 (five) days a week, Monday to Friday. Saturday and Sunday were observed as rest Day

Training Protocol:

The training schedule was design for five days a week from Monday to Friday from 7.00 am to 7.30 am and Saturday and Sunday were observed as rest Day. The session last for 30 minutes. Prior and after of every session player had 10 minutes of warm-up and 10 minutes of cool-down exercise involving jogging, stretching exercises.

There are five exercises in each session with 30 seconds of work and 20 seconds of rest. Total number of sets is 3 and the rest in between the sets are 60 seconds.

The training program is mentioned below:

Table 2: Training Program Schedule

DAYS	SESSION I	SESSION II	SESSION III	SESSION IV	SESSION V
MONDAY	Burpees	Squats	Superman Squeeze	Russian Twist	Plank

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TUESDAY	Skater Hops	Triceps Dips	Side Lunge	Sit-ups	Plank Jack
WEDNESDAY	Lunge	Sumo Squats	Dolphin plank	Heel Touch	Inchworm
THURESDAY	Mountain Climber	Curtsy Lunge	Reverse Crunch	Leg Raise	Push-ups
FRIDAY	Plank Hop	Side Lunge	Flutter Kick	V Tucks	Squats

Collection of Data:

Standardized test and training were administered for collecting the data on the subjects personally by the investigator. To achieve the purpose of the study two tests are conducted for the subjects. First test is recoded before training programme started (Pre-test) and another test data is recorded after the training programme had completed (Post-test).

Statistical Analysis

The present study pays attention mainly on testing the means of pre and post treatment of the group, secondly deals with the increase of means in the group form baseline to post treatment at various measures. The group means gains recorded by the subjects during the experimental period of 6 weeks to the criterion measures were tested for significance by applying depended descriptive statistics. Independent t-test was applied was applied to determine whether the training produced significantly different improvement in selected variable after 6 weeks of training.

3. RESULTS

TABLE 3: DESCRIPTIVE STATISTICS OF PHYSICAL FITNNESS OF HOCKEY PLAYERS

VARIABLES	TEST	GROUPS	N	MEAN	S.D.	S.E.M.
Abdominal Muscles	Plank	Pre Test	14	43.07	7.74	2.07
		Post Test	14	53.79	9.68	2.59
Arm and Shoulder Strength	Push Up	Pre Test	14	15.86	4.67	1.25
		Post Test	14	20.64	5.32	1.42
Leg Muscles	Squat	Pre Test	14	28.86	4.22	1.13
		Post Test	14	38.29	4.89	1.31
Leg Muscles	Squat Hold	Pre Test	14	34.50	5.49	1.47

ISSN:1517-4492 | **E-ISSN**:2178-7727
Vol. 8, No. 1 (2025)

Post Test	14	45.00	7.34	1.96

Table 3 shows that the mean score and standard deviation among Hockey players on of abdominal muscular strength endurance, arms and shoulder strength endurance, strength endurance of lower back muscles and strength endurance of leg muscles in pre-test and post-test was (43.07 ± 7.74 and 53.79 ± 9.68), (15.86 ± 4.67 and 20.64 ± 5.32), (28.86 ± 4.22 and 38.29 ± 4.89) and (34.50 ± 5.49 and 45.00 ± 7.34).

From the above means and standard deviations, it was indicated that there was a changes among the subjects on all the variables.

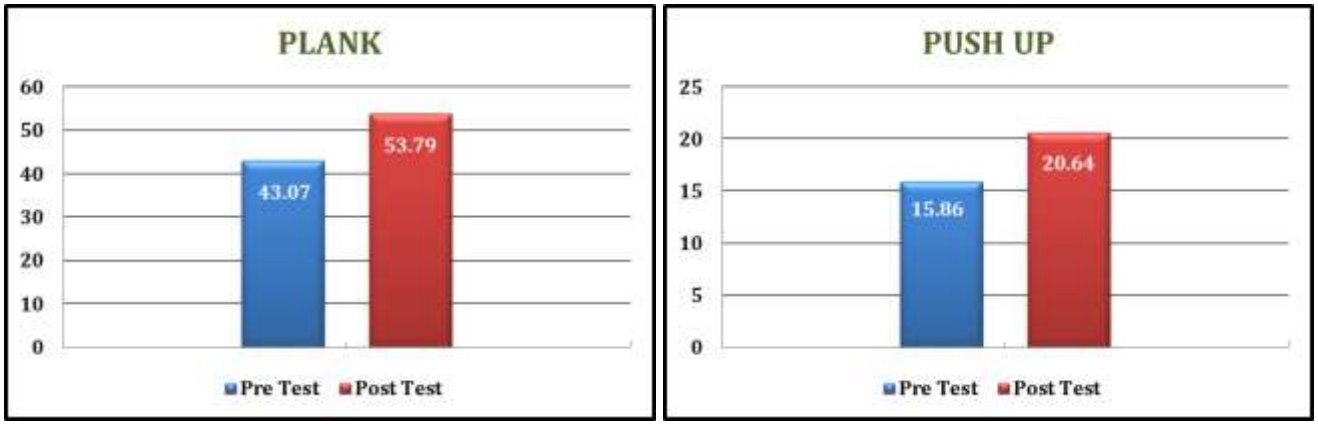

Figure I & II: Mean Comparison of Plank and Push Up between Pre-Test and Post-Test Score

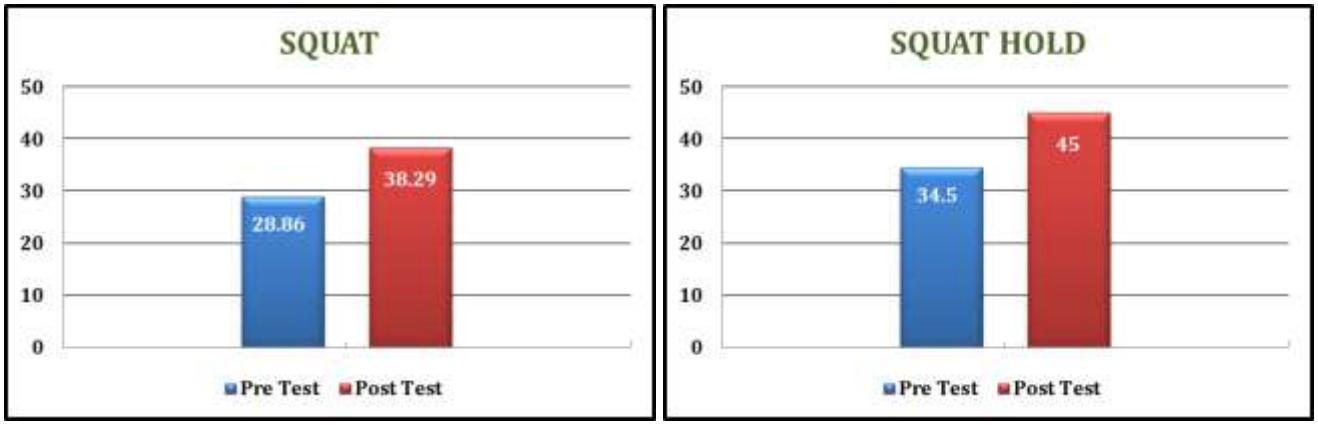

Figure III & IV: Mean Comparison of Squat & Squat Hold between Pre-Test and Post-Test

ISSN:1517-4492 | **E-ISSN**:2178-7727

TABLE 4: INDEPENDENT T-TEST OF PHYSICAL FITNNESS COMPONENTS OF HOCKEY PLAYERS

VARIABLES	TEST	GROUPS	MEAN	S.D.	df	t-value	p-value
Abdominal Muscles	Plank	Pre Test	43.07	7.74	26	**3.23***	**.003**
		Post Test	53.79	9.68			
Arm and Shoulder Strength	Push Up	Pre Test	15.86	4.67	26	**2.53***	**.018**
		Post Test	20.64	5.32			
Leg Muscles	Squat	Pre Test	28.86	4.22	26	**5.46***	**.000**
		Post Test	38.29	4.89			
Leg Muscles	Squat Hold	Pre Test	34.50	5.49	26	**4.29***	**.000**
		Post Test	45.00	7.34			

*0.05 level of significance df (26) = 1.706

Table-4 reveals that the calculated t-value of the variables i.e. abdominal muscular strength endurance, arms and shoulder strength endurance, strength endurance of lower back muscles and strength endurance of leg are **3.23*, 2.53*, 5.46*** and **4.29*** respectively. From the table it is reveals that there is a significant differences found in the variables since calculated t-value is more than the tabulated t-value (critical value = **1.706**) on level of significant at 0.05 for the degree of freedom 26. Hence from the above analysis it is known that there is significant difference between the Pre Test score and Post Test score of hockey Players on physical fitness.

4. DISCUSSION

The present study aimed to investigate the effect of bodyweight calisthenics training on selected physical fitness variables of hockey players. The findings showed significant improvements in abdominal muscular strength endurance, arm and shoulder strength endurance, lower back strength endurance, and leg strength endurance after six weeks of training. These results highlight the effectiveness of structured calisthenics programs in enhancing muscular endurance and core stability, which are crucial for hockey performance.

The results are consistent with previous research emphasizing the role of bodyweight training in sports performance. For example, Fenta and Wase Mola (2023) reported significant improvements in physical fitness qualities and skill performance among handball players after eight weeks of calisthenics training. Similarly, Mola and Bayısa (2020) demonstrated that circuit training improved health-related physical fitness components among sport science students, while Mola and Adane (2020) showed that explosive power, flexibility, and speed training significantly enhanced long jump performance. These findings confirm that structured exercise programs can optimize sport-specific fitness outcomes.

ISSN:1517-4492 | **E-ISSN**:2178-7727

The outcomes of this study also align with Harry and Wehr's earlier findings, where a 10-week calisthenics program improved strength, flexibility, and other components of fitness among undergraduates. Comparable results have also been reported in recent sports science literature. For instance, Singh et al. (2025) found interval training significantly improved motor abilities in youth football players, while Singh et al. (2024a) highlighted that neuromuscular training optimized the speed and explosive power of football players. Likewise, Singh et al. (2024b) demonstrated the positive physiological impact of plyometric training, further reinforcing the role of functional and bodyweight-based exercise in athlete development.

Beyond physical strength, structured exercise has also been linked to better motor coordination and injury resilience. Husain et al. (2024a, 2024b) studied backpack loads and walking gait, showing how external stressors affect physical performance, underscoring the need for controlled training such as calisthenics to balance strength and posture. Reza et al. (2024) similarly evaluated motor fitness metrics across sports, confirming that consistent physical conditioning is essential for athletic performance. Singh L.S., et al., (2024) the efficacy of interval training in enhancing both cardiorespiratory endurance and muscular endurance, essential facets for sustaining peak performance in the dynamic sport of football. By meticulously examining the effects of this training program. Therefore, the objective of the study is to find the effect of interval training on cardiorespiratory endurance and muscular endurance football players.

Furthermore, the importance of training environments and talent identification cannot be overlooked. Studies by Mola and Shaw (2024a, 2024b, 2024c) emphasized the reliability and validity of talent identification practices and highlighted the role of managerial skills in developing athletes. These findings suggest that beyond physical interventions, structured training programs such as calisthenics must be integrated into a supportive developmental environment.

The present findings also support evidence from longitudinal training interventions. For example, Mola et al. (2025) demonstrated that a 12-week training program improved both fitness and long jump performance, while Tyagi et al. (2025) identified position-based physical distinctions in male Kho-Kho players, reinforcing the role of sport-specific conditioning. Additionally, Taye et al. (2025) highlighted the influence of coaches, parents, and stakeholders on youth football development, emphasizing that both social and physical environments are crucial for athletic progress. Nutritional aspects are equally vital, as shown by Taye et al. (2024), who analyzed dietary practices and performance among Ethiopian U-17 football players. In line with these studies, the present findings confirm that calisthenics is not only effective in enhancing muscular endurance but also beneficial for psychological readiness. Properly executed calisthenics improves body-mind coordination, reduces anxiety, and enhances focus, ultimately supporting optimal performance.

5. CONCLUSION

Sport is a vital component of physical education and a global phenomenon that contributes significantly to modern society. This study examined the effect of calisthenics training on selected fitness variables of hockey players in Pratapgarh, Uttar Pradesh, by randomly selecting 14 participants aged 12.5 ± 2.5 years and subjecting them to a six-week training program. Using descriptive statistics and an independent t-test, the results revealed significant improvements in abdominal muscular strength endurance, arm and shoulder endurance, lower back strength endurance, and leg strength endurance. These findings confirm that calisthenics is an effective, functional, and accessible training method that

ISSN:1517-4492 | **E-ISSN**:2178-7727

enhances muscular endurance in young athletes, supporting its use as a valuable component of hockey players' physical preparation and broader youth athletic development.

REFERENCES

Ali Erdem Cigerci, Harun Genc. Effect of calisthenics exercises on body composition of soccer players. Progress in Nutrition 2020;22(Supplement 1):94-102

Anders E, Myers S. Field Hockey: Steps to success, 2nd ed., Leeds: Human Kinetics; 2008.

B Don Franks A, George C, Moore B. Effect of calisthenics and volleyball on the AAHPER fitness test and volleyball skill. American journal of health, physical education, and Recreation. 2013; 40(2):288-292.

Chaves LMS, Santos GV, Teixeira CLS, Grigoletto MES. Calisthenics and bodyweight exercises: different concepts or scientific synonyms? Rev Bras Fisiol Exercise 2020;19(1):13-15. DOI: http://doi.org/10.33233/ rbfe. v19i1.3985C

Cole, William L. "A Comparison of The Effect of Isometric and Callisthenic Exercises as the Physical Performance of Selected Eleventh Grade Boys in Lake Washington Senior High School Districts " (Unpublished Master Thesis, University of Washington, 1965 cited in Completed Research In Health, Physical Education And Recreation 6 (S.N0. -496) (1966):116.

Harry Campney K, Richard Wehr W. Effects of Calisthenics on Selected Components of Physical Fitness, Research Quarterly. American Association for Health, Physical Education and Recreation. 1965; 36(4):393-402.

Hrysomallis C, McLaughlin P, Goodman C. Relationship between static and dynamic balance tests among elite Australian footballers. J SciMedSport. 2006; 9(4):288-291. DOI: 10.1016/j.jsams.2006.05.021

Paul Coach Wade. Explosive calisthenics;2015

Tadino, Dominick A. "Effect of Daily Fitness Minutes Period of Calisthenics upon the Physical Fitness of Fifth Grade Boys and Girls", Research Quarterly, 37 :2 (1966) : 276-281

Fenta, B. G., & wase Mola, D. (2023). Effect of eight-week callisthenics exercise on selected physical fitness quality and skill performance in handball. Jurnal SPORTIF: Jurnal Penelitian Pembelajaran, 9(3), 550-566.

Husain, R., Mola, D. W., & Shaw, D. (2024). Effect of selected backpack loads carried for selected durations on temporal pattern of peak forces of walking gait of school-going boys. International Journal of Kinesiology and Sports Science, 12(4), 48-56.

Husain, R., Mola, D. W., & Shaw, D. (2024). Understanding the Effects of Selected Backpack Loads Carried for Certain Durations on Peak Forces of Walking Gait in School-Going Boys. Journal of Learning Theory and Methodology, 5(3), 144-152.

ISSN:1517-4492 | **E-ISSN**:2178-7727

Mola, D. W., & Adane, A. K. (2020). The effect of explosive power, flexibility and speed training on long jump performance: The case of burayu town athletics Club. IJPEFS, 36(1), 71-80.

Mola, D. W., & Bayısa, G. T. (2020). Effect of circuit training on selected health-related physical fitness components: the case of sport science students. Turkish Journal of Kinesiology, 6(4), 142-148.

Mola, D. W., & Shaw, D. (2024). Analyzing the reliability and validity of talent identification practices for athletes: An adaptation study. Educational Administration: Theory and Practice, 30(5), 12277-12284.

Mola, D. W., & Shaw, D. (2024). Assessing the reliability of the talent development environmental questionnaire: A pilot study. International Journal of Research-Granthaalayah, 12(3), 117-122.

Mola, D. W., & Shaw, D. (2024). Significance of managerial skills for talent development in ethiopian athletes. International Journal of Kinesiology and Sports Science, 12(2), 21-29.

Mola, D. W., Rahman, M. H., Uvinha, R. R., Adane, A. K., Tyagi, S., Adili, D., & Islam, M. S. (2025). Effect of 12-week Training Program on the Fitness and Performance of Long Jumpers. International Journal of Kinesiology and Sports Science, 13(1), 45-53.

Reza, M. N., Rahman, M. H., Islam, M. S., Mola, D. W., & Andrabi, S. M. H. (2024). Assessment of motor fitness metrics among athletes in different sports: An original research. Physical Education Theory and Methodology, 24(1), 47-55.

Singh L.S., RK, S, Singh S, H. Martin, B. Bojan (2021) Effect of Pilates Exercises on Fundamental Skills Performance of Archers: Education India Journal: A Quarterly Refereed Journal of Dialogues on Education, A UGCCARE List Journal, ISSN 2278-2435, Vol. 10, Issue-4 November-2021.DOI: 10.13140/RG.2.2.10057.26726

Singh, A. J., Singh, L. S., & Mola, D. W. (2025). Effect of Interval Training on Selected Motor Abilities of Youth Football Players. Slobozhanskyi Herald of Science and Sport, 29(2), 167-175.

Singh, L. S., Singh, N. R., Singh, W. J., Singh, O. R., & Mola, D. W. (2024). Optimizing the Speed and Explosive Power Performance of Football Players: The Effect of a Six-Week Neuromuscular Training. Physical Education Theory and Methodology, 24(5), 697-703.

Singh, L. S., Singh, W. J., Azeem, K., Meitei, N. M., & Mola, D. W. (2024). Concept of plyometric training and its effect on physiological parameters of football players. Physical Education Theory and Methodology, 24(4), 609-618.

Singh, L. S., Farooque, S., Singh, W. J., & Zelenovic, M. (2024). Enhancing cardiorespiratory and muscular endurance in football players: The impact of a six-week interval training program. *Journal Sport Area*, *9*(1), 88-97. https://doi.org/10.25299/sportarea.2024.vol9(1).14869

Taye, A. G., Bouchh, H., Rahman, M. H., Uvinha, R. R., Legesse, A. K., Adili, D., & Mola, D. W. (2025). Determining the Influence of Coaches, Parents, and Stakeholders on the Development of Youth Football: A Comprehensive Analysis. Physical Education Theory and Methodology, 25(3), 556-565.

ISSN:1517-4492 | **E-ISSN**:2178-7727

Taye, A. G., Mola, D. W., & Rahman, M. H. (2024). Analyzing the nutritional awareness, dietary practices, attitudes, and performance of U-17 football players in Ethiopia. Physical Education Theory and Methodology, 24(1), 110-117.

Tyagi, S., Vanaik, A. K., Wasuja, M., & Mola, D. W. (2025). Comparing Physical Attribute Distinctions in Male Kho-Kho Positions. Physical Education Theory and Methodology, 25(1), 66-71.

ISSN:1517-4492 | **E-ISSN**:2178-7727
Vol. 8, No. 1 (2025)