Policy Journal of Social Science Review
ISSN (Online): 3006-4635
ISSN (Print): 3006-4627
https://journalofsocialsciencereview.com/index.php/PJSSR
Vol. 3 No. 3 (2025)

Policy Journal of Social Science Review

Let's Start!

Optimizing Bowling Speed in Young Medium Fast Bowlers Through Targeted Core and Upper Body Circuit Training

Muhammad Hamad[1]
Dr. Izaz Ali[2]
Muhammad Iftikhar Khan[3]

Policy Journal of Social Science Review
ISSN (Online): 3006-4635
ISSN (Print): 3006-4627
https://journalofsocialsciencereview.com/index.php/PJSSR
Vol. 3 No. 3 (2025)

Optimizing Bowling Speed in Young Medium Fast Bowlers Through Targeted Core and Upper Body Circuit Training

Muhammad Hamad	M.S Scholar, Department of Sports Science & Physical Education, SUIT, Peshawar, Pakistan. Email: mhamad1pak@gmail.com
Dr. Izaz Ali	Lecturer IER, Institute of Education and Research, University of Peshawar. Email izazier@uop.edu.pk
Muhammad Iftikhar Khan	Lecturer, Department of Sports Sciences and Physical Education, SUIT Peshawar, KP, Pakistan. Email: Ifti8594352@gmail.com

Abstract

This study investigated the effects of an 8-week core and upper-body circuit training program on bowling speed, core strength, and upper-body endurance among 50 male medium-fast bowlers aged 15 to 19 years from different sports academies. The researcher developed three basic objectives and research questions according to the nature of the study. A pre-experimental design with pre- and post-tests was used to measure improvements. Participants completed circuit training sessions three times per week, focusing on exercises that enhance core stability and upper-body strength relevant to fast-bowling biomechanics. Results indicated significant increases in bowling speed (mean improvement of 5.2 km/h, $p = 0.001$), plank hold time (core endurance) increased by 21.1 seconds ($p = 0.001$), and push-up repetitions (upper-body strength) improved by 8.4 reps ($p = 0.002$). Pearson correlation analysis revealed strong positive relationships between bowling speed and core strength ($r = 0.751$), and between bowling speed and upper-body strength ($r = 0.682$), underscoring the importance of muscular conditioning for performance gains. The findings suggest that integrating structured circuit training focused on the core and upper body enhances bowling speed and physical fitness while potentially reducing injury risk in young medium-fast bowlers. This evidence supports the use of sport-specific strength and endurance training as a key component in youth cricket development programs.

INTRODUCTION

Bowling speed is a key performance factor for medium fast bowlers in cricket, particularly for young medium fast bowlers who require a balance of power, control, and endurance. Bowling speed remains a critical performance indicator in cricket, especially for medium fast bowlers who must balance velocity, control, and endurance to compete at higher levels. In youth cricket, where players are undergoing physical and technical development, the capacity to consistently bowl at high speeds can significantly enhance performance outcomes. Recent studies emphasize that beyond technical proficiency and biomechanics, physical conditioning especially of the core and upper body plays a pivotal role in optimizing bowling performance (Peh et al., 2021).

Policy Journal of Social Science Review
ISSN (Online): 3006-4635
ISSN (Print): 3006-4627
https://journalofsocialsciencereview.com/index.php/PJSSR
Vol. 3 No. 3 (2025)

The bowling action involves a complex biomechanical sequence often described through the kinetic chain concept, which highlights the transmission of force from the lower body through the core and into the upper limbs (Stuelcken et al., 2016). Disruption or weakness in any segment of this chain can impair force generation, reduce bowling speed, and increase susceptibility to injury (Ranson et al., 2019).

Core musculature is central to trunk stabilization and efficient energy transfer during the delivery stride, while the upper body muscles including the deltoids, pectorals, and latissimus dorsi contribute significantly to ball acceleration and release (Dhillon et al., 2020). Therefore, strengthening these muscle groups can lead to improved neuromuscular coordination and explosive force production, both of which are essential for enhancing bowling speed (Chatterjee et al., 2017).

Circuit training, which integrates strength and endurance exercises in a continuous format, has gained popularity as a sport specific conditioning method. Recent evidence supports its effectiveness in improving muscular strength, cardiovascular endurance, and sport specific performance in adolescent athletes (Ahmed et al., 2022). A circuit training regimen focused on the core and upper body, tailored to the movement patterns of fast bowling, may significantly contribute to performance improvements by enhancing functional strength along the kinetic chain (Fernandes et al., 2023).

RESEARCH OBJECTIVES

- To examine the effect of core and upper body circuit training on the bowling speed of young medium fast bowlers.
- To assess the impact of circuit training on the core strength of young bowlers.
- To analyze the relationship between upper body strength and bowling speed.

RESEARCH QUESTIONS

- Does core and upper body circuit training significantly improve bowling speed in young medium fast bowlers?
- What is the impact of circuit training on the core strength of bowlers?
- How does upper body strength influence bowling speed performance?

LITERATURE REVIEW

Recent literature emphasizes the critical role of core and upper body strength training in enhancing bowling speed among young medium fast bowlers. Khatri and Singh (2017) demonstrated that an eight week upper body resistance program using medicine balls significantly increased bowling velocity and arm acceleration in adolescent players. Similarly, Kumar and Sharma (2018) found that core stabilization exercises improved kinetic energy transfer during the bowling action, leading to more consistent and powerful deliveries. Houghton and Dawson (2019) emphasized the importance of neuromuscular coordination, reporting that a combination of core and shoulder training improved both speed and accuracy in elite junior bowlers. In a randomized controlled trial, Patel et al. (2020) observed that a 10 week core and upper limb circuit training regimen enhanced peak bowling speed and reduced fatigue in simulated match conditions.

Policy Journal of Social Science Review
ISSN (Online): 3006-4635
ISSN (Print): 3006-4627
https://journalofsocialsciencereview.com/index.php/PJSSR
Vol. 3 No. 3 (2025)

Anand and Khanna (2021) conducted a study exploring the relationship between core stability and bowling speed, finding a significant positive correlation that highlights the role of core strength in improving performance. Similarly, Zemková and Zapletalová (2022) investigated the neuromuscular control of core stability and its influence on sports performance, concluding that a strong and stable core enhances force transfer and coordination, both essential for fast bowling.

In practical terms, cricket-specific training resources such as those by *Cricket Matters* (2024) and *Khelmart* (2024) underscore the importance of exercises like planks, squats, and push-ups. These exercises improve both static and dynamic strength in the core and upper body, which in turn supports higher bowling velocity. *Cricfit* (2024) adds that structured strength and conditioning programs, including gym-based routines tailored for cricketers, contribute significantly to upper-body endurance and muscular power. These elements are directly linked to increased bowling speed and reduced injury risk.

Further supporting this approach, *Hero Cricket* (2024) promotes sprint and endurance routines that incorporate circuit-based strength training. This method helps bowlers maintain power output over repeated deliveries. Additional evidence from *Cricket Matters* (2024) identifies the essential role of sport-specific strength and power training, including resistance and bodyweight exercises targeting core and upper-body muscle groups crucial for effective bowling mechanics.

Reardon and Williams (2021), in a systematic review of bowling biomechanics, concluded that functional core strength contributes to greater ball speed and fewer technical flaws. Khan and Nawaz (2022) supported these findings in a Pakistani youth cohort, noting that integrated circuit routines not only improved speed but also lowered shoulder and lower back injury incidence. Further, Lee et al. (2023) employed electromyography (EMG) to show enhanced muscle recruitment and stability in bowlers after a six week core activation protocol. Singh and Ahmed (2024) conducted a longitudinal study in under 17 cricket academies and found improvements in athletic indicators such as vertical jump and sprint speed, both of which correlated with faster bowling. Most recently, Ahmed and Waqas (2025) reported that structured circuit training involving resistance tubing, planks, and overhead throws led to a 5–8% increase in average ball velocity over 12 weeks, underlining the importance of targeted strength conditioning in youth cricket development

Bowling speed plays a pivotal role in competitive cricket, especially for medium fast bowlers who rely on variations in pace and movement to disrupt a batter's rhythm. Recent studies have affirmed that higher bowling velocities can significantly reduce the batter's reaction time and increase the likelihood of false shots, thereby enhancing wicket taking potential (Peh et al., 2021). In youth cricket, where physical and technical development are ongoing, bowlers with higher speeds tend to have a performance advantage and are more likely to be selected for advanced training pathways (Dhillon et al., 2020).

Fast bowling involves the efficient transfer of energy along the kinetic chain from the legs through the core to the upper body and finally the arm. Any weakness or inefficiency along this

Policy Journal of Social Science Review
ISSN (Online): 3006-4635
ISSN (Print): 3006-4627
https://journalofsocialsciencereview.com/index.php/PJSSR
Vol. 3 No. 3 (2025)

chain can diminish force output, reduce ball speed, and increase the risk of injury (Fernandes et al., 2023).

BIOMECHANICS AND THE ROLE OF PHYSICAL CONDITIONING

The biomechanics of pace bowling have continued to be a focus of contemporary sports science. Researchers have highlighted the importance of coordinated trunk rotation, optimal ground reaction force, and efficient upper limb action in delivering high speed balls (Peh et al., 2021). However, biomechanical efficiency must be supported by physical readiness, including muscular strength, flexibility, and neuromuscular coordination particularly in the core and upper body (Chatterjee et al., 2017).

Core strength plays a critical role in stabilizing the trunk and generating rotational torque, both of which are essential for explosive bowling actions (Ahmed et al., 2022). The core functions as a conduit for transferring energy from the legs to the arm, while the upper body musculature such as the shoulders, chest, and back contributes directly to ball acceleration and release (Fernandes et al., 2023).

Targeted physical conditioning in these muscle groups has been shown to enhance neuromuscular efficiency and power output, both key determinants of bowling speed (Sharma et al., 2021). Resistance and strength focused training protocols can significantly improve throwing velocity and bowling performance in sports requiring overhead actions like cricket (Kumar et al., 2023).

CIRCUIT TRAINING AS A PERFORMANCE INTERVENTION

Circuit training a form of high intensity interval training involving a sequence of exercises with minimal rest has become increasingly popular among youth athletes due to its ability to develop both strength and endurance simultaneously (Bhatia et al., 2020). When structured to target the core and upper body, circuit training has been shown to enhance neuromuscular coordination, muscular endurance, and postural control all of which are crucial for fast bowling (Ahmed et al., 2022).

Recent studies have demonstrated that cricket specific circuit training programs significantly improve ball release velocity, muscle coordination, and injury resilience (Fernandes et al., 2023; Sharma et al., 2021). Furthermore, circuit training helps avoid early over specialization by developing general physical literacy while reducing injury risks through balanced muscle development (Lloyd et al., 2020).

CORE STRENGTH, NEUROMUSCULAR COORDINATION, AND SPEED GENERATION

The core is the central stabilizing system of the body, enabling efficient energy transfer across the kinetic chain. A strong and stable core enhances rotational power, reduces energy leaks during movement, and maximizes bowling velocity (Kumar et al., 2023). Training that targets neuromuscular coordination improves muscle activation patterns, allowing for smoother, more powerful bowling mechanics (Behm et al., 2020).

Indian studies have shown that youth cricketers who underwent core specific strength training for six to eight weeks reported significant gains in bowling speed and a reduction in injury occurrence (Beri et al., 2016). These outcomes suggest that developing core and upper

Policy Journal of Social Science Review
ISSN (Online): 3006-4635
ISSN (Print): 3006-4627
https://journalofsocialsciencereview.com/index.php/PJSSR
Vol. 3 No. 3 (2025)

body strength through structured, cricket specific circuit routines is both a performance and safety strategy.

YOUTH TRAINING CONSIDERATIONS AND INJURY PREVENTION

Youth athletes are especially vulnerable to training errors, overuse injuries, and movement deficiencies due to ongoing growth and neuromuscular immaturity. Training programs must therefore emphasize progressive overload, adequate recovery, and motor control development (Lloyd et al., 2020). Cricket fast bowlers are prone to lower back and shoulder injuries caused by repetitive high impact movements and spinal torsion. Targeted core and upper body strength training helps mitigate these risks by stabilizing the trunk and improving posture during the delivery stride (Ranson et al., 2019).

Recent guidelines advocate for integrating structured, periodized circuit training into youth cricket development programs, focusing on injury prevention, functional strength, and technical efficiency (Fernandes et al., 2023). As such, circuit based interventions that train the muscle groups most involved in the bowling action represent a scientifically grounded and sustainable approach to improving performance in medium fast bowlers.

METHODOLOGY

The study involved 50 young male medium-fast bowlers, aged 15 to 19 years, selected from various sports academies. A pre-experimental design was employed, in which participants were assessed before (pre-test) and after (post-test) the intervention, without a separate control group. The training program consisted of sessions lasting 40 to 45 minutes, including a 5 to 7-minute warm-up and a 5 to 7-minute cool-down, conducted three times per week (Monday, Wednesday, and Friday). To evaluate the effects of the training, paired sample t-tests were used to compare pre- and post-test results, while correlation analysis was conducted to examine the relationship between bowling speed and physical strength.

TRAINING INTERVENTION:

8 WEEK CIRCUIT TRAINING PROTOCOL FOR MEDIUM FAST BOWLERS

Weeks	Focus	Exercises per Session	Reps/Duration	Notes
1–2	Build Endurance & Form	1. Plank Hold 2. Push Ups 3. Resistance Band Rows	30 sec each × 2 rounds	Focus on form and body control
3–4	Core & Upper Strength	1. Side Plank (each side) 2. Dumbbell Shoulder Press 3. V Ups	10–12 reps each × 2 rounds	Light weights and steady core engagement
5–6	Add Power & Rotation	1. Medicine Ball Chest Pass 2. Russian Twists 3. Elevated Push Ups	10–12 reps or 30 sec × 2 rounds	Explosive power and torso rotation emphasized
7–8	Performance &	1. Plank to Push Up	10 reps each × 3	Match like speed and

Policy Journal of Social Science Review
ISSN (Online): 3006-4635
ISSN (Print): 3006-4627
https://journalofsocialsciencereview.com/index.php/PJSSR
Vol. 3 No. 3 (2025)

Weeks	Focus	Exercises per Session	Reps/Duration	Notes
	Speed	2. Overhead Medicine Ball Throw 3. Dumbbell Chest Press	rounds	upper body strength

RESULTS AND TABLES

TABLE 1: BOWLING SPEED (KM/H) PRE AND POST TEST COMPARISON

Participant Group	Pre Test Mean	Post Test Mean	Mean Difference	p value
(n = 50)	108.5 km/h	114.2 km/h	+5.2km/h	0.001

The table presents the comparison of bowling speeds for a group of 50 young medium fast bowlers before and after undergoing an 8 week circuit training intervention. The average bowling speed prior to the training was 108.5 kilometers per hour. After completing the training program, the average speed increased to 114.2 kilometers per hour, reflecting an improvement of 5.2 kilometers per hour. This increase in bowling speed was statistically significant, with a p value of 0.001, indicating that the improvement is unlikely due to random chance. These results suggest that the targeted circuit training was effective in enhancing the bowling speed of the participants.

TABLE 2: CORE STRENGTH (PLANK HOLD TIME IN SECONDS)

Participant Group	Pre Test Mean	Post Test Mean	Mean Difference	p value
(n = 50)	58.1 sec	79.3sec	+21.1sec	0.001

The table shows the comparison of core strength endurance in 50 young medium fast bowlers before and after the 8 week circuit training program. The average time participants were able to hold a plank position before the training was 58.1 seconds. After the training, this average increased to 79.3 seconds, indicating an improvement of 21.1 seconds. The p value of 0.001 demonstrates that this improvement is statistically significant, meaning it is very unlikely to have occurred by chance. These findings suggest that the circuit training program effectively enhanced the core endurance of the participant

TABLE 3: UPPER BODY STRENGTH (PUSH UPS IN 1 MINUTE)

Participant Group	Pre Test Mean	Post Test Mean	Mean Difference	p value
(n = 50)	27.5 reps	36.01 reps	+8.4reps	0.002

The table presents the comparison of upper body strength in 50 young medium fast bowlers, measured by the number of push ups performed in one minute before and after the 8 week circuit training intervention. Prior to the training, the participants averaged 27.5 push ups. After completing the program, the average number of push ups increased to 36.01, showing an improvement of 8.4 repetitions. The p value of 0.002 indicates that this increase is statistically significant, confirming that the observed improvement in upper body strength is unlikely to be due to chance. This suggests that the circuit training was effective in enhancing the upper body muscular endurance of the bowlers.

Policy Journal of Social Science Review
ISSN (Online): 3006-4635
ISSN (Print): 3006-4627
https://journalofsocialsciencereview.com/index.php/PJSSR
Vol. 3 No. 3 (2025)

PEARSON CORRELATION COEFFICIENT TABLE (SPSS FORMAT)

Variables	Bowling Speed	Core Strength	U Body Strength
Bowling Speed	1	.751	.682
Core Strength	.751	1	.704
U Body Strength	.682	.704	1

The Pearson correlation table displays the relationships among bowling speed, core strength, and upper body strength based on data from 50 participants. Each variable correlates perfectly with itself, shown by the value of 1 along the diagonal. Bowling speed is positively correlated with core strength (r = 0.751) and upper body strength (r = 0.682), indicating that increases in core and upper body strength are associated with increases in bowling speed. Similarly, core strength and upper body strength share a positive correlation of 0.704, suggesting that these two physical qualities tend to improve together. These moderate to strong correlations imply that better muscular strength in the core and upper body relates closely to enhanced bowling speed in young medium fast bowlers.

FINDINGS

- The 8 week core and upper body circuit training program significantly improved the bowling speed of young medium fast bowlers. The average bowling speed increased from 108.5 km/h pre test to 114.2 km/h post test, reflecting a significant mean improvement of 5.2 km/h (p = 0.001).
- Core strength, as measured by plank hold time, showed a statistically significant increase from an average of 58.1 seconds before training to 79.3 seconds after training, with a mean improvement of 21.1 seconds (p = 0.001).
- Upper body muscular endurance, measured by the number of push ups performed in one minute, increased significantly from a pre test average of 27.5 repetitions to 36.01 post test, with a mean gain of 8.4 reps (p = 0.002).
- There is a strong positive correlation between bowling speed and core strength (r = 0.751), as well as between bowling speed and upper body strength (r = 0.682). Core strength and upper body strength are also strongly correlated (r = 0.704). These results indicate that improvements in core and upper body strength are closely associated with increases in bowling speed.

CONCLUSION

The study demonstrates that an 8 week targeted circuit training program focusing on core and upper body muscles effectively enhances bowling speed, core strength, and upper body muscular endurance in young medium fast bowlers. The significant correlations among these variables suggest that core and upper body strength are critical determinants of bowling performance. By improving neuromuscular coordination, functional strength, and endurance through circuit training, young bowlers can achieve higher ball velocities, which is vital for competitive success and injury prevention. Thus, integrating such structured conditioning programs into youth cricket training regimens is supported by strong empirical evidence.

Policy Journal of Social Science Review
ISSN (Online): 3006-4635
ISSN (Print): 3006-4627
https://journalofsocialsciencereview.com/index.php/PJSSR
Vol. 3 No. 3 (2025)

RECOMMENDATIONS

- Coaches and trainers should include core and upper body circuit training as a regular component of youth cricket training to enhance bowling speed and muscular endurance.
- Training programs should progressively increase intensity and complexity while maintaining proper exercise form to optimize neuromuscular adaptations and minimize injury risk.
- Given the strong relationship between core and upper body strength and bowling performance, exercises targeting these areas should be prioritized.
- Regular assessment of bowling speed and muscular endurance is recommended to track improvements and adjust training loads accordingly, ensuring adequate recovery and injury prevention.
- Future studies should evaluate the effectiveness of similar circuit training protocols on female cricketers and other age groups to generalize findings across the broader cricket population.
- Training should include exercises and education aimed at reducing common injuries associated with fast bowling, such as lower back and shoulder injuries, through improved muscular balance and biomechanics.

REFERENCES

Ahmed, H., & Waqas, M. (2025). *Effect of structured circuit training on bowling velocity in under 19 cricket players*. Journal of Sports Science and Youth Development, 9(1), 55–63.

Ahmed, N., Rehman, R., & Zaman, M. (2022). Effectiveness of circuit training on strength and endurance among young athletes. *Journal of Sports Rehabilitation, 31*(4), 367–375. https://doi.org/10.1123/jsr.2021 0147

Ahmed, N., Rehman, R., & Zaman, M. (2022). Effectiveness of circuit training on strength and endurance among young athletes. *Journal of Sports Rehabilitation, 31*(4), 367–375. https://doi.org/10.1123/jsr.2021 0147

Anand, P., & Khanna, G. L. (2021). Relationship of core stability with bowling speed in male cricket medium and medium-fast bowlers. *ResearchGate*. https://www.researchgate.net/publication/357269329

Behm, D. G., & Anderson, K. G. (2020). Neuromuscular contributions to strength and power in youth athletes. *Strength and Conditioning Journal, 42*(1), 21–29. https://doi.org/10.1519/SSC.0000000000000453

Bhatia, N., Malik, S., & Singh, R. (2020). Effects of circuit training on physical fitness parameters among youth athletes. *Indian Journal of Sports and Exercise Science, 10*(1), 45–52.

Chatterjee, S., Banerjee, A., & Ghosh, A. (2017). Impact of strength training on upper body power in adolescent cricketers. *International Journal of Sports Sciences and Fitness, 7*(2), 34–41.

Chatterjee, S., Banerjee, A., & Ghosh, A. (2017). Impact of strength training on upper body power in adolescent cricketers. *International Journal of Sports Sciences and Fitness, 7*(2), 34–41.

Policy Journal of Social Science Review
ISSN (Online): 3006-4635
ISSN (Print): 3006-4627
https://journalofsocialsciencereview.com/index.php/PJSSR
Vol. 3 No. 3 (2025)

Cricfit. (2024). Cricket strength and conditioning: The complete cricket fitness guide. https://www.cricfit.co.uk/post/cricket-strength-and-conditioning-the-complete-cricket-fitness-guide

Cricket Matters. (2024). Core strength tests for cricketers. https://www.cricketmatters.com/core-strength-tests-for-cricketers

Cricket Matters. (2024). Strength and conditioning in cricket. https://www.cricketmatters.com/strength-and-conditioning-in-cricket

Cricket Matters. (2024). Strength and power exercises. https://www.cricketmatters.com/strength-and-power-exercises

Dhillon, H., Singh, A., & Brar, R. (2020). Core strength and its effect on bowling speed in youth cricketers. *Journal of Physical Education and Sports Management, 11*(3), 12–19.

Dhillon, H., Singh, A., & Brar, R. (2020). Core strength and its effect on bowling speed in youth cricketers. *Journal of Physical Education and Sports Management, 11*(3), 12–19.

Fernandes, A., Silva, M., & Costa, R. (2023). Sport specific circuit training and its influence on neuromuscular performance in young cricketers. *European Journal of Sport Science, 23*(1), 50–58. https://doi.org/10.1080/17461391.2022.2076014

Fernandes, A., Silva, M., & Costa, R. (2023). Sport specific circuit training and its influence on neuromuscular performance in young cricketers. *European Journal of Sport Science, 23*(1), 50–58. https://doi.org/10.1080/17461391.2022.2076014

Hero Cricket. (2024). Sprint and endurance running exercise and routine for cricket. https://herocricket.com/blogs/news/sprint-and-endurance-running-exercise-and-routine-for-cricket

Houghton, L., & Dawson, P. (2019). *Neuromuscular coordination training and its impact on junior cricket bowling performance*. International Journal of Sports Physiology and Performance, 14(3), 334–340. https://doi.org/10.1123/ijspp.2018 0250

Khan, A., & Nawaz, S. (2022). *Effects of integrated circuit training on performance and injury prevention in youth cricketers*. Pakistan Journal of Sports Sciences, 16(2), 101–109.

Khatri, S., & Singh, R. (2017). *Upper body resistance training using medicine balls and its influence on bowling speed among adolescent cricketers*. International Journal of Health, Physical Education and Computer Science in Sports, 28(1), 31–36.

Khelmart. (2024). Discover the best exercises for fast cricket bowlers. https://www.khelmart.com/Resource/Discover-the-Best-Exercises-for-Fast-Cricket-Bowlers

Kumar, M., Rao, A., & Sharma, R. (2023). Relationship between upper body strength and bowling speed in university level cricketers. *Journal of Sports Biomechanics and Performance, 4*(2), 89–97.

Kumar, V., & Sharma, P. (2018). *Impact of core stabilization exercises on bowling efficiency in medium fast bowlers*. Journal of Strength and Conditioning Research, 32(4), 890–897. https://doi.org/10.1519/JSC.0000000000002445

Policy Journal of Social Science Review
ISSN (Online): 3006-4635
ISSN (Print): 3006-4627
https://journalofsocialsciencereview.com/index.php/PJSSR
Vol. 3 No. 3 (2025)

Lee, H. S., Choi, Y., & Park, D. (2023). *Electromyographic analysis of core muscle activation in cricket fast bowlers following a core training protocol*. Journal of Biomechanics in Sport, 6(1), 12–21. https://doi.org/10.1016/j.jbs.2023.01.003

Lloyd, R. S., Faigenbaum, A. D., Myer, G. D., & Oliver, J. L. (2020). Strength training for children and adolescents: Benefits and guidelines. *Strength and Conditioning Journal, 42*(3), 60–69. https://doi.org/10.1519/SSC.0000000000000538

Patel, M., Raj, A., & Menon, S. (2020). *Effectiveness of a 10 week core and upper limb strength training program on bowling speed and fatigue in young cricketers: A randomized trial*. Journal of Sports Rehabilitation, 29(6), 745–754. https://doi.org/10.1123/jsr.2019 0072

Peh, S. Y. C., Ong, A. C. H., & Chong, Y. L. (2021). Kinematic predictors of ball release velocity in cricket pace bowling: A systematic review. *Sports Biomechanics, 20*(2), 245–260. https://doi.org/10.1080/14763141.2019.1677014

Peh, S. Y. C., Ong, A. C. H., & Chong, Y. L. (2021). Kinematic predictors of ball release velocity in cricket pace bowling: A systematic review. *Sports Biomechanics, 20*(2), 245–260. https://doi.org/10.1080/14763141.2019.1677014

Ranson, C. A., King, M. A., & Burnett, A. F. (2019). The relationship between bowling workload and injury in elite cricket fast bowlers: A review. *Journal of Science and Medicine in Sport, 22*(11), 1236–1241. https://doi.org/10.1016/j.jsams.2019.06.007

Reardon, J., & Williams, G. (2021). *Biomechanical predictors of fast bowling speed in youth cricketers: A systematic review*. Sports Biomechanics, 20(3), 412–427. https://doi.org/10.1080/14763141.2019.1695305

Sharma, M., Gupta, D., & Singh, V. (2021). Effects of strength based circuit training on performance metrics in cricketers. *Indian Journal of Sports Sciences, 12*(1), 56–64.

Singh, M., & Ahmed, Z. (2024). *Effect of long term physical conditioning on bowling performance in under 17 cricket players*. South Asian Journal of Physical Education, 11(2), 78–85.

Stuelcken, M. C., Pyne, D. B., & Sinclair, P. J. (2016). Anthropometric and strength correlates of bowling speed in elite junior fast bowlers. *International Journal of Sports Physiology and Performance, 11*(1), 69–74. https://doi.org/10.1123/ijspp.2015 0121

Zemková, E., & Zapletalová, L. (2022). Neuromuscular control of postural and core stability in sport performance. *Frontiers in Physiology*. https://www.frontiersin.org/articles/10.3389/fphys.2022.869318/full