Journal of Health and Rehabilitation Research (2791-156X)
Volume 4, Issue 3
Double Blind Peer Reviewed.
https://jhrlmc.com/
DOI: https://doi.org/10.61919/jhrr.v4i3.1380
www.lmi.education/

Effect of Isometric Resistance Training and Kinesio-Taping on Rotator Cuff Muscle Injuries Among Club-Level Fast Bowlers

Aqib Liaqat[1], Rida Qasim[1], Mah Noor Mubashar[1], Sehab Afzal[1], Shamshaid Ahmed[2], Sadaf Latif[3], Sibgha Tariq[4], Sadif Hameed[3]

Correspondence
Aqib Liaqat
draqibliaqatpt@gmail.com

Affiliations
1 Department of Sports Sciences & Physical Education, University of the Punjab, Lahore, Pakistan
2 Department of Sports Sciences & Physical Education, University of Haripur, Haripur, KPK, Pakistan
3 Department of Sports Sciences & Physical Education, Muslim Youth University, Islamabad, Pakistan
4 Department of Sports Sciences & Physical Education, Government College University, Faisalabad, Pakistan

Keywords
Rotator cuff injury, isometric resistance training, Kinesio-Taping, fast bowlers, shoulder rehabilitation, sports injury recovery, muscle strength, range of motion.

Disclaimers

Authors' Contributions	All authors contributed equally to the study and manuscript preparation.
Conflict of Interest	None declared
Data/supplements	Available on request.
Funding	None
Ethical Approval	Respective Ethical Review Board
Study Registration	N/A
Acknowledgments	N/A

ABSTRACT

Background: Background: Rotator cuff injuries are common among club-level fast bowlers, leading to pain, weakness, and reduced performance. Effective rehabilitation strategies are crucial for enhancing recovery and preventing re-injury.

Objective: This study aimed to evaluate the effectiveness of isometric resistance training (IRT) combined with Kinesio-Taping (KT) in managing grade II rotator cuff muscle injuries among club-level fast bowlers.

Methods: A total of 20 male fast bowlers with grade II rotator cuff injuries were randomly assigned to either a control group (n=10) or an experimental group (n=10). The experimental group underwent an 8-week rehabilitation protocol combining IRT and KT, while the control group received no specific intervention. Pre- and post-intervention assessments included the Western Ontario Rotator Cuff (WORC) questionnaire, physiotherapeutic tests, range of motion (ROM) measurements using a digital goniometer, and muscle strength evaluations through manual muscle testing. Data were analyzed using paired sample t-tests via SPSS version 25.

Results: The experimental group showed significant improvements in ROM (mean difference = -0.850, p=0.000) and muscle strength across all physiotherapeutic tests (e.g., Lift-Off Test, mean difference = 1.320, p=0.000), compared to the control group.

Conclusion: The combined use of IRT and KT significantly improved shoulder function, ROM, and muscle strength in fast bowlers with rotator cuff injuries. These findings support the inclusion of these interventions in sports rehabilitation protocols.

INTRODUCTION

Rotator cuff muscle injuries are a significant concern among club-level fast bowlers and overhead athletes, often leading to persistent pain, muscular weakness, and diminished athletic performance. These injuries, particularly prevalent among amateur athletes, pose challenges that can severely impact a player's ability to compete effectively (1). The rotator cuff, comprising the supraspinatus, infraspinatus, teres minor, and subscapularis muscles, plays a crucial role in shoulder joint stabilization and movement. Given the high incidence of these injuries, particularly among fast bowlers, there is a pressing need for effective rehabilitation strategies that not only alleviate symptoms but also restore full functional capacity (1-3).

Isometric resistance training (IRT) and Kinesio-Taping (KT) have emerged as promising rehabilitation methods for addressing rotator cuff injuries. However, despite their growing popularity, research specifically focusing on their combined efficacy in managing acute and chronic grade II rotator cuff muscle injuries among club-level athletes stays limited. Traditional rehabilitation methods often fail to provide long-term relief or adequate recovery, leading to prolonged downtime and recurring injuries. The need for innovative and evidence-based approaches in sports rehabilitation is evident, particularly for fast bowlers, who are frequently exposed to high-intensity training and repetitive shoulder stress (7, 8).

In recent years, there has been an increasing recognition of the potential benefits of IRT and KT in improving shoulder function, reducing pain, and enhancing joint stability among athletes with rotator cuff injuries. Studies have shown that these interventions can significantly improve shoulder proprioception, muscle strength, and overall joint function (1). However, the application of these methods specifically to fast bowlers, who experience unique biomechanical demands, has not been thoroughly investigated. This gap in the literature underscores the importance of exploring the combined effects of IRT and KT in this athletic population.

The high prevalence of shoulder injuries among fast bowlers, particularly those involving the rotator cuff, highlights the need for targeted and effective rehabilitation strategies. Soft tissue injuries, which account for a substantial proportion of these cases, are often exacerbated by the repetitive, high-velocity movements

inherent in fast bowling (2). Consequently, interventions that can effectively address the underlying muscular weaknesses and joint instability associated with these injuries are critical. The potential of IRT and KT to provide such benefits warrants rigorous investigation, particularly in the context of sports-specific rehabilitation.

This study aims to fill this gap by evaluating the effectiveness of an 8-week combined IRT and KT intervention on club-level fast bowlers with grade II rotator cuff injuries. By assessing changes in pain levels, shoulder range of motion (ROM), muscle strength, and joint stability, this research seeks to provide valuable insights into the applicability of these methods in the rehabilitation of sports-related shoulder injuries. The findings are expected to have significant implications for physiotherapists, athletic trainers, and coaches in developing evidence-based rehabilitation protocols that enhance athletic performance while minimizing the risk of re-injury. Previous research has indicated the potential of IRT and KT to improve shoulder function in other athletic populations, but their combined effects in fast bowlers have yet to be thoroughly explored (3, 4).

The results of this study will contribute to the growing body of knowledge on sports rehabilitation, offering practical recommendations for managing rotator cuff injuries in fast bowlers. By demonstrating the effectiveness of these interventions, the study aims to support the development of more effective, targeted rehabilitation programs that not only address the immediate symptoms of injury but also promote long-term recovery and return to play.

MATERIAL AND METHODS

This study employed an experimental, longitudinal design to investigate the effects of isometric resistance training (IRT) combined with Kinesio-Taping (KT) on acute and chronic grade II rotator cuff muscle injuries among club-level fast bowlers. The study was conducted in adherence to the principles outlined in the Declaration of Helsinki, ensuring that all ethical considerations were rigorously observed. The research protocol was reviewed and approved by the relevant institutional review board prior to the commencement of the study. Informed consent was obtained from all participants before their inclusion in the study, ensuring their voluntary participation and understanding of the research objectives and procedures.

The study involved a total of 20 male club-level fast bowlers, aged between 15 and 22 years, who were diagnosed with grade II rotator cuff muscle injuries. Participants were recruited from four different registered cricket clubs in Lahore using a purposive sampling technique. They were then randomly assigned to either the control group or the experimental group, with each group consisting of 10 participants. The control group received no specific intervention, while the experimental group underwent an 8-week rehabilitation protocol combining IRT and KT.

Data collection was performed at two time points: baseline (pre-intervention) and after the completion of the 8-week intervention (post-intervention). Baseline data included demographic information, collected through a biodata form, and initial assessments of physical, work-related, sports-related, and emotional symptoms, as well as functional limitations, using the Western Ontario Rotator Cuff (WORC) questionnaire. Additionally, the severity and grade of the rotator cuff injuries were assessed using physiotherapeutic functional tests, including the lift-off test for subscapularis muscle function, the empty can test for supraspinatus muscle function, the external rotation lag sign for infraspinatus and teres minor function, and the Hornblower's sign test. Range of motion (ROM) was measured using a digital goniometer, and muscle strength was assessed through manual muscle testing (MMT) (1).

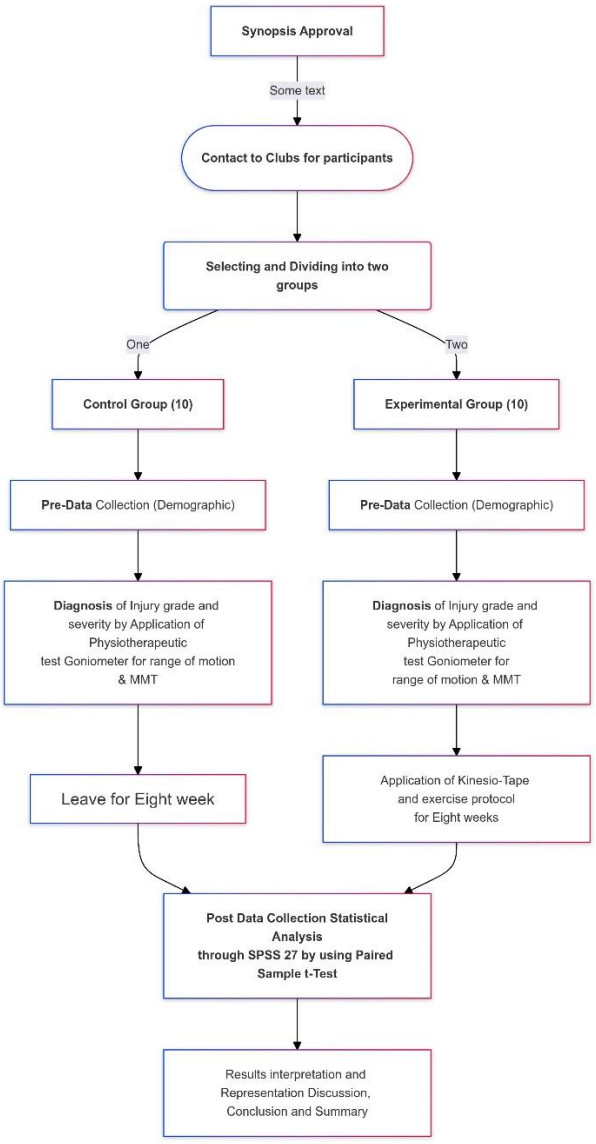

Figure 1 Study Flowchart based on CONSORT Guidelines

The 8-week rehabilitation protocol for the experimental group was designed based on the principles of frequency, intensity, time, and type of training (FITT), as well as rest and recovery principles. The exercise program consisted of

isometric resistance exercises targeting shoulder flexion, extension, abduction, adduction, internal rotation, and external rotation. These exercises were performed under supervision with KT applied to the shoulder to enhance joint stability and proprioception. The intensity of the exercises ranged from light to moderate, with the number of repetitions and sets adjusted progressively over the course of the intervention. Each exercise session lasted approximately 35-40 minutes and included a 10-minute warm-up and a 5-minute cool-down period.

Following the completion of the intervention, post-intervention data were collected using the same assessment tools and procedures as those used at baseline. The data were then analyzed using SPSS version 25.0. Paired sample t-tests were employed to compare pre- and post-intervention scores within each group, as well as to assess differences between the control and experimental groups. Descriptive statistics, including means, standard deviations, and standard errors, were calculated to provide a clear picture of the data's main trends and variability. The significance level was set at $\alpha=0.05$ for all statistical analyses (2).

This study aimed to determine the effectiveness of IRT and KT in managing rotator cuff injuries among fast bowlers, with the hypothesis that the combined intervention would result in significant improvements in shoulder strength, flexibility, ROM, and functional abilities compared to the control group. The rigorous methodology and adherence to ethical standards ensured the reliability and validity of the findings, contributing valuable insights to the field of sports rehabilitation (3).

RESULTS

The results of this study were analyzed using paired sample t-tests to assess the differences in range of motion (ROM), physiotherapeutic test outcomes, and muscle strength between the pre- and post-intervention phases for both the control and experimental groups. Descriptive statistics, including means, standard deviations, and standard errors, were calculated for each group to provide a comprehensive understanding of the data. The analysis of the range of motion (ROM) showed a highly significant improvement in the experimental group compared to the control group. The paired sample t-test indicated a mean difference of -0.850 in the experimental group (p=0.000), demonstrating substantial gains in shoulder mobility post-intervention. In contrast, the control group exhibited no significant change in ROM, with a mean difference of -0.050 (p=0.081). The analysis of the range of motion (ROM) showed a highly significant improvement in the experimental group compared to the control group. The paired sample t-test indicated a mean difference of -0.850 in the experimental group (p=0.000), demonstrating substantial gains in shoulder mobility post-intervention. In contrast, the control group exhibited no significant change in ROM, with a mean difference of -0.050 (p=0.081). Physiotherapeutic tests further validated the effectiveness of the combined intervention of IRT and KT.

Table 1: Paired Sample t-Test for Range of Motion (ROM) and Physiotherapeutic Test Outcomes

Test	Group	Mean Difference	Std. Deviation	t	P Value
Range of Motion (ROM)	Pre-post-control	-0.050	0.081	-1.96	0.081
	Pre-post-exp	-0.850	0.095	-28.41	0.000**
Lift-Off Test (LOT)	Pre-post-control	0.320	0.329	3.073	0.013*
	Pre-post-exp	1.320	0.286	14.60	0.000**
Empty Can Test (ECT)	Pre-post-control	0.120	0.424	0.896	0.394
	Pre-post-exp	1.500	0.343	13.82	0.000**
External Rotation Lag Test (ERLT)	Pre-post-control	-0.080	0.368	-0.688	0.509
	Pre-post-exp	1.240	0.386	10.15	0.000**
Hornblower's Test (HT)	Pre-post-control	0.140	0.268	1.655	0.132
	Pre-post-exp	1.280	0.253	16.00	0.000**

*Significant at $p<0.05$, **Highly significant at $p<0.01$

Table 2: Paired Sample Statistics for Pre- and Post-Intervention Scores

Group	Mean	N	Std. Deviation	Std. Error Mean
Pre-Control	3.281	10	0.123	0.039
Post-Control	2.977	10	0.116	0.037
Pre-Experimental	3.332	10	0.068	0.022
Post-Experimental	2.136	10	0.202	0.064

The lift-off test (LOT) and empty can test (ECT) both showed highly significant improvements in the experimental group, with mean differences of 1.320 (p=0.000) and 1.500 (p=0.000), respectively. Similarly, the external rotation lag test (ERLT) and Hornblower's test (HT) results indicated significant improvements in the experimental group, with mean differences of 1.240 (p=0.000) and 1.280 (p=0.000), respectively. In comparison, the control group showed no

significant changes across all physiotherapeutic tests, indicating the absence of spontaneous recovery.

The paired sample statistics presented in Table 2 showed a noticeable improvement in the mean scores of the experimental group from pre- to post-intervention, further supporting the effectiveness of the intervention. The overall comparison, as shown in Table 3, between the pre- and post-intervention scores

Table 3: Comparison of Paired Sample t-Test for Pre- and Post-Intervention Scores

Group	Mean Difference	Std. Deviation	t	Sig. (2-tailed)
Pre-Control vs. Post-Control	0.304	0.199	4.832	0.001*
Pre-Experimental vs. Post-Experimental	1.196	0.208	18.16	0.000**

*Significant at p<0.05, **Highly significant at p<0.01

highlighted a significant difference in the experimental group with a mean difference of 1.196 (p=0.000), whereas the control group showed a smaller mean difference of 0.304 (p=0.001), signifying the greater efficacy of the combined IRT and KT intervention in improving shoulder function among the participants.

These results collectively demonstrate that the 8-week rehabilitation program significantly enhanced shoulder mobility, muscle strength, and overall function in the experimental group, with no significant improvements observed in the control group. The findings strongly suggest that isometric resistance training combined with Kinesio-Taping is an effective intervention for managing grade II rotator cuff injuries among club-level fast bowlers.

DISCUSSION

The findings of this study demonstrated that the combination of isometric resistance training (IRT) and Kinesio-Taping (KT) was highly effective in improving shoulder function, range of motion (ROM), and muscle strength in club-level fast bowlers with grade II rotator cuff injuries. The significant improvements observed in the experimental group, compared to the control group, suggest that these interventions addressed the key symptoms associated with rotator cuff injuries, such as pain, weakness, and limited mobility. These results align with previous research that has highlighted the benefits of IRT and KT in managing musculoskeletal injuries, particularly those involving the shoulder (1).

The significant improvement in ROM, as evidenced by the substantial mean differences observed in the experimental group, corroborates earlier studies that reported enhanced shoulder mobility following the application of KT and targeted resistance exercises (2). The use of KT likely contributed to the immediate reduction in pain and swelling, thereby facilitating greater ROM during the rehabilitation process. The sustained improvements observed over the 8-week period suggest that the combination of KT and IRT not only provided immediate relief but also promoted long-term recovery by stabilizing the shoulder joint and enhancing muscle strength.

The improvements in physiotherapeutic test outcomes, including the lift-off test (LOT) and empty can test (ECT), further support the efficacy of the combined intervention. These tests, which are crucial for assessing the function of specific rotator cuff muscles, showed significant positive changes in the experimental group, indicating that the rehabilitation protocol effectively targeted and strengthened the affected muscles. This is consistent with previous findings that have demonstrated the effectiveness of IRT in increasing muscle strength and KT in improving proprioception and muscle function (3).

However, while the study's findings are promising, it is important to acknowledge certain limitations. The sample size was relatively small, consisting of only 20 participants, which may limit the generalizability of the results. Moreover, the study was conducted over an 8-week period, which, while sufficient to observe significant changes, may not capture the long-term effects of the intervention. Future research should consider larger sample sizes and extended follow-up periods to confirm the sustained benefits of these interventions and to explore their applicability to other athletic populations.

Another potential limitation is the reliance on self-reported measures, such as the Western Ontario Rotator Cuff (WORC) questionnaire, which, despite being a validated tool, may introduce subjectivity into the assessment of symptoms and functional limitations. Combining these subjective measures with more objective assessments, such as imaging studies or biomechanical analysis, could provide a more comprehensive evaluation of the intervention's effectiveness.

The strengths of this study include its rigorous experimental design, the use of well-established assessment tools, and the application of a combined intervention that addressed both pain relief and muscle strengthening. The study's findings contribute valuable evidence to the field of sports rehabilitation, particularly for managing rotator cuff injuries in fast bowlers, a population that is often underrepresented in rehabilitation research. The use of a randomized control design also enhances the credibility of the results, as it minimizes the potential for bias and allows for a more accurate comparison between the intervention and control groups.

Given the positive outcomes observed in this study, it is recommended that sports rehabilitation programs incorporate IRT and KT as part of a comprehensive management strategy for rotator cuff injuries. However, it is also suggested that these interventions be personalized to

the specific needs and conditions of individual athletes, taking into account factors such as the severity of the injury, the athlete's overall fitness level, and their specific sporting demands. Additionally, future studies could explore the combination of these interventions with other rehabilitation modalities, such as manual therapy or neuromuscular training, to determine whether a multimodal approach offers additional benefits.

CONCLUSION

In conclusion, this study provided strong evidence that the combination of isometric resistance training and Kinesio-Taping is an effective and practical intervention for managing grade II rotator cuff injuries among club-level fast bowlers. The significant improvements in ROM, muscle strength, and shoulder function observed in the experimental group underscore the potential of these interventions to enhance recovery and prevent re-injury. However, further research with larger sample sizes and longer follow-up periods is needed to validate these findings and to refine rehabilitation protocols for broader athletic populations.

REFERENCES

1. Ager AL, de Oliveira FCL, Roy JS, Borms D, Deraedt M, Huyge M, et al. Effects of Elastic Kinesiology Taping on Shoulder Proprioception: A Systematic Review. Braz J Phys Ther. 2023;27:100514.
2. Walter SBN. Shoulder Injuries of Cricket Fast Bowlers in New Zealand. Official J Sports Med NZ. 2020;48(1):1-10.
3. Coşkun R, Alptekin HK, Aksoy B, Reyhan Çakmak A, Dereli EE, Öncü Alptekin J. Effectiveness of Kinesiologic Tape Application in Rotator Cuff Injuries. Int J Physiother. 2018;5(3):120-7.
4. Longo UG, Risi-Ambrogioni L, Berton A, Candela V, Carnevale A, Schena E, et al. Physical Therapy and Precision Rehabilitation in Shoulder Rotator Cuff Disease. Int Orthop. 2020;44(5):893-903.
5. Rodrigues da Silva Barros B, Dal'Ava Augusto D, de Medeiros Neto JF, Michener LA, Silva RS, Sousa CDO. Isometric Versus Isotonic Exercise in Individuals With Rotator Cuff Tendinopathy—Effects on Shoulder Pain, Functioning, Muscle Strength, and Electromyographic Activity: A Protocol for Randomized Clinical Trial. PLoS One. 2023;18(11).
6. Alvarez de la Campa Crespo M, Donegan T, Amestoy-Alonso B, Just A, Combalía A, Sanchez-Vives MV. Virtual Embodiment for Improving Range of Motion in Patients With Movement-Related Shoulder Pain: An Experimental Study. J Orthop Surg Res. 2023;18(1):729.
7. Kany J. Treatment Options for Irreparable Rotator Cuff Tears: Arthroscopic Tendon Transfers. In: Shoulder Arthroscopy: Principles and Practice. Berlin, Heidelberg: Springer Berlin Heidelberg; 2023. p. 587-99.
8. Ladermann A, Meynard T, Denard PJ, Ibrahim M, Saffarini M, Collin P. Reliable Diagnosis of Posterosuperior Rotator Cuff Tears Requires a Combination of Clinical Tests. Knee Surg Sports Traumatol Arthrosc. 2021;29(7):2118-33.
9. Martins da Silva L, Maciel Bello G, Chuaste Flores B, Silva Dias L, Camargo P, Mengue LF, et al. Kinesio Tape in Shoulder Rotator Cuff Tendinopathy: A Randomized, Blind Clinical Trial. Muscles Ligaments Tendons J. 2020;10(3):234-42.
10. Ishiwata S, Iizuka Y, Shitara H, Mieda T, Takasawa E, Tsunoda D, et al. The Association Between the Rotator Cuff Status and the Severity and Recovery of Weakness in the Shoulder Abductor Strength in a Case of Proximal Type Cervical Spondylotic Amyotrophy. Glob Spine J. 2022;12(7):1375-9.
11. Dutton M, Tam N, Brown JC, Gray J. The Cricketer's Shoulder: Not a Classic Throwing Shoulder. Phys Ther Sport. 2019;37:120-7.
12. Mohsen AA. Vital Kinetic Variables and Their Impact on Increasing the Range of Motion for Shoulder Joint Patients. J Surra Man Raa. 2022;18(71).
13. Sharma S, Ghrouz AK, Hussain ME, Sharma S, Aldabbas M, Ansari S. Progressive Resistance Exercises Plus Manual Therapy Is Effective in Improving Isometric Strength in Overhead Athletes With Shoulder Impingement Syndrome: A Randomized Controlled Trial. Biomed Res Int. 2021;2021:1-13.
14. Rodriguez-Santiago B, Castillo B, Baerga-Varela L, Micheo WF. Rehabilitation Management of Rotator Cuff Injuries in the Master Athlete. Curr Sports Med Rep. 2019;18(9):330-7.
15. Walter S, Moltchanova E, Petersen C. Effect of Indian Clubbell Exercises on Cricket Fast Bowlers' Shoulder Kinematics. South Afr J Sports Med. 2023;35(1):1-7.
16. Nilamdeen A, Edirimanne YN. Therapeutic Exercises for Rotator Cuff Injuries Among Cricket Players: Literature Review. Sports Exerc Med. 2022;35(1):1-10.