Effectiveness of Sports Physiotherapy in Pain Reduction and Strength Improvement among Teenage Cricketers: A Mixed-Methods Study

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Abstract

Background : Adolescent cricketers are at a high risk of sports injuries mainly because of the nature of the sport. A good rehabilitation program can ensure that one recuperates adequately, controls pain and improves the muscular strength. Sports physiotherapy, with its specific interventions, has been promising in addressing these needs, but evidence about its effectiveness is very limited in this age group.

Methods : 40 teenage cricketers were selected for this study from the Jaipur Cricket Academies and placed into two groups-Group A, the control group receiving standard exercises and Group B, the experimental group receiving Sports Physiotherapy-Based Exercises. The levels of pain and strength of muscles were estimated through standard physical tests at the start and every week after commencement of rehabilitation. Statistical analysis was conducted on the quantitative data, while answers to qualitative questions were found through interviews with participants.

Results: Pain levels were lower in Group B, especially among those in the final stages of the rehabilitation programme, compared with Group A. Cricketers who received SPBE demonstrated progress that is reliable and statistically significant at all assessment points on their muscular strength. Qualitatively, there were indications of high self-efficacy and overall satisfaction by the participants with the physiotherapy-based approach, suggesting its holistic benefits.

Conclusion: These results show that sports physiotherapy is effective in the pain control and muscular strength enhancement in adolescent cricketers. Adding physiotherapy to the conventional protocol of injury rehabilitation may improve recovery and lead to longer athletic careers. This study emphasizes the use of best-practice-informed treatment approaches to further support young athletes.

I. Introduction

Sports injuries are unavoidable among athletes and seem to impact most those who participate in highly strenuous sports like cricket. Teenage cricketers experience a higher risk as their bodies continue growing, they undergo intense training schedules, and there is a live nervous energy of competition. Cricket is often not regarded as a contact sport; however, its repetitive action, changing direction, and long periods of exertion have made players prone to injuries that affect the muscles, bones, and joints. For young athletes, these injuries may not only impair their immediate performance but also have wider-ranging long-term implications for their physical health, career prospects, and psychological well-being [1].

Rehabilitation after sports injuries forms a critical aspect of ascertaining optimal recovery and preventing recurrence. Traditional rehabilitation often works on rest and general exercises aimed at regaining basic functionality. However, these may not cater to the unique requirements of the sport and the specific physiological demands a young athlete has. The growing sector within rehabilitation is sports physiotherapy: a specialized branch offering professional interventions that come close to scientifically built principles of movement and strength conditioning, blended with therapeutic practice. Sports physiotherapy seeks to provide pain relief, to restore physical function, and ultimately to enhance an athlete's athletic performance by tailoring exercises to the individual needs of the athlete [1].

Despite its perceived usefulness in the treatment of injuries in cricketers, very little study has been devoted to the application of sports physiotherapy. Almost all previous literature focused on adult or professional players, therefore lacking crucial insights into how it would apply to smaller, lesser-age co-players. Teenage cricketers, for instance, experience problems due to their constantly changing musculoskeletal structures and the requirement for age-specific treatment protocols. Addressing these challenges will require evidence-based approaches to not only ensure recovery but also equip young athletes with the resilience and readiness to prevent potential future injuries [2].

This study aims to bridge this knowledge gap by evaluating the effectiveness of sports physiotherapy in managing injuries among teenage cricket players. Specifically, it investigates the impact of a structured sports physiotherapy program on pain reduction and strength enhancement during rehabilitation. By comparing outcomes between a control group receiving standard exercises and an experimental group undergoing physiotherapy-based interventions, this research seeks to

provide actionable insights for coaches, physiotherapists, and sports organizations [3].

The results of this work are expected to feed into the larger debate about safety in young people's sports, particularly injury prevention. Emphasis is on the need for sports physiotherapy and thus done in rehabilitation strategies as an adjunctive method of holistic injury treatment. Consequently, it highlights the great prospects that sports physiotherapy has in informing the management process of injuries in cases where these are sustained by teenage cricketers.

Objectives of the Study

The objectives of the Study are as follows:

- To understand the types, causes, and prevalence of sports injuries among the teenage cricketers.
- To Appraise the Efficacy of Sports Physiotherapy Based Exercises versus Normal Exercises in Rehabilitating Injury.
- To evaluate the effect of sports physiotherapy on pain reduction in the recovery process.
- To measure improvements in muscular strength and flexibility through physiotherapy interventions.
- To provide evidence-based recommendations for injury prevention and management specifically applicable to teenage cricketers.

Review of Literature

Some of the related works are as follows,

Jacobs, J., et al. (2021) [4]: This review searched the incidence and prevalence of female cricket players' injuries across varying participation levels, from recreational to elite, and the surge in women's cricket participation across the globe with increased investment, raised the study aimed to address the lack of epidemiological data on female cricket injuries. The review comprised injuries sustained during cricket play with various definitions such as medical attention and time loss injuries. A comprehensive search strategy was conducted across numerous databases, and it sought to shed light on injury patterns and guide evidence-based prevention. It aimed at filling some critical gaps by presenting a comprehensive overview of female cricket injuries for improved health and safety practices.

Alway, P., et al. (2021) [5]: This study focused on the incidence of lumbar bone stress injuries (LBSI) among elite male fast bowlers and explored the differences in kinematic and kinetic techniques between those who developed LBSI and those who did not. Significant differences were found in parameters like rear knee angle, thoracolumbar rotation, and pelvic tilt orientation from data gathered on 50 elite male fast bowlers. A logistic regression model showed that rear hip angle at BFC and lumbopelvic angle at FFC are predictive of LBSI; they achieved an accuracy of 88%. The research findings placed the importance of lumbopelvic motion in the etiology of LBSI and recommended improved coaching and rehabilitation strategies to address and prevent such injuries.

Walter, S., King, D., & Hume, P. (2022) [6]: This epidemiological study analyzed cricket injuries in New Zealand over 12 years using national ACC data. The time period was from 2005 to 2016. It found a higher injury rate among males than females. The common sites of injury were the hand, fingers, and lumbar regions. Contact injury to the hand, fingers, and head were most common among players aged between 10-20 years. The research suggested targeted prevention strategies to the above-mentioned injury patterns with a view to decreasing cricket injuries incidence of all ages.

Umar, M. H., et al. (2022) [7]: This cross-sectional study surveyed musculoskeletal sports injuries among cricket players from Lahore, Pakistan, with regards to head and neck and upper limbs. The study reported a relatively low prevalence of head and neck injuries from the total sample of 180 participants as at 5.6% but a high prevalence of shoulder injuries, which stood at 77.78%. A significant correlation was found between player types and shoulder pain. It identified the massive burden of musculoskeletal injuries on the performance of players and emphasized the need for targeted management and prevention of injury.

II. Methods

This chapter describes the comprehensive methodology used in this study that focused on determining the efficacy of Sports Physiotherapy-Based Exercises (SPBE) in preventing injuries and enhancing physical performance among teenage cricket players. In this, the methodological framework constitutes the kind of study design, population, research setup, grouping of participants, criteria for both inclusion and exclusion, outcome tools, procedure, and statistical analysis techniques.

A. Study Design

The study will apply a quasi-experimental design that incorporates a mixed-methods approach to understand the objectives of the research. Both quantitative and qualitative data collection techniques are used to evaluate the SPBE intervention. Participants will be assigned into two groups:

- Group A (Control Group): Standard cricket training with routine exercises
- Group B (Experimental Group): Standard training supplemented with SPBE.

This will enable the comparison of results and, thus will provide an excellent basis for the assessment of the effectiveness of SPBE.

B. Study Population

The study population consists of teenage cricket players from Jaipur Cricket Academies. Through purposive sampling the sample population is selected in such a way that participants engaged actively in cricket are considered. The age group of 13 to 19 years is characterized by critical development phases when injury prevention and performance enhancement are of greater need.

C. Research Setup

The study is held in the precincts of Jaipur Cricket Academies, wherein cricket grounds, training aids, and physiotherapy materials are available. These resources enable both the conduct of standard exercises for training and SPBE so that there is uniformity and reliability in the delivery of interventions.

D. Subjects

Participants have been divided into two groups based on the intervention as below:

- Group A (Control Group): This consists of 20 players who undergo routine cricket training without any targeted physiotherapy.
- Group B (Control Group): 20 subjects.

Description: The exercises in this program are designed to enhance flexibility, strength, and diminish the risk of injury through specific muscle activation and neuromuscular conditioning. Inclusion and Exclusion Criteria

E. Inclusion Criteria:

- Age Group: Participants should be between 13 and 19 years.
- Active participation in cricketing affairs-the players must be actively involved in cricketing-related training activities and tournaments conducted at the Jaipur Cricket Academies.
- Consent: Participants or their legal guardians must seek consent.
- Inclusion and Exclusion Criteria
- Exclusion by age-range: Below 13 years or above 19 years.
- Those without active involvement in cricket.
- Those who refuse to be included or whose guardians refuse to seek consent for them.

F. Outcome Tools

The research uses a number of outcome tools to measure outcome, hence ensuring a holistic assessment of the interventions:

- Surveys: Questionnaires with structured questions collect quantitative data regarding the prevalence of injury, effectiveness of training, and participants' perceptions.
- Interviews: Semi-structured interviews are conducted in order to gain in-depth information about the training practices and injury management from the qualitative experiences of players, coaches, and physiotherapists.
- Physical Assessments: The objective tools will establish participants' flexibility, strength, balance, and fitness. These measurements are considered to include the range of motion, muscle strength testing, and functional movement assessments.

G. Procedure

The study has a systematic, multi-step process to ensure consistency and reliability.

- Literature Review: Was carried out to find gaps in existing research and to guide objectives for the study.
- Participant Recruitment: Eligible teenage cricket players are identified and approached, and informed consent was sought from participants or their guardians.
- Baseline Assessment: A first round of surveys, interviews, and physical assessments will be conducted to collect pre-intervention data including demographics, injury history, and levels of fitness.
- Group B Intervention Implementation: The participants are given either the control group or the experimental group. SPBE for Group B is developed by competent physiotherapists and is carried out throughout the study period.
- Follow-up Assessments: Evaluations are done on a scheduled basis to check changes in injury rate, strength, and flexibility of the participants.
- Data Analysis: The data is statistically analyzed in order to find trends, patterns, and significant differences between the groups.

H. Result Interpretation

The work is analyzed in the context of research questions to make recommendations on whether SPBE is effective or not.

Statistical Analysis : Statistical tools and methods are employed to analyze the quantitative data gathered. This enables proper judgment of the outcome as follows

- Chi-Square Test: This tests the percentages as well as the differences in rates of prevalence among groups.
- Independent Sample T-Test

III. Results

Table 1. Group A: Normal Exercises

Age	Gender	Experience in Crick	Frequency of Train	Previous Injuries	Warm-up and	Familiarity with Injury Prevention Techniques	Perception of Training

		et (years)	ing (per week)	(Yes /No)	Cool - down Routine (Yes /No)	(Low/Medium/High)	Effectiveness (1-5 Likert Scale)
17	Male	5	4	Yes	Yes	Medium	4
16	Female	3	3	No	Yes	Low	3
18	Male	6	5	Yes	Yes	High	5
15	Male	4	4	Yes	Yes	Medium	4
17	Female	5	3	No	Yes	High	4
16	Male	3	5	No	Yes	Low	3
18	Female	6	4	Yes	Yes	Medium	4
17	Male	4	3	No	Yes	High	5
16	Female	5	5	Yes	Yes	Low	3
15	Male	3	4	No	Yes	Medium	4
17	Female	4	3	Yes	Yes	High	5
16	Male	5	5	No	Yes	Low	2
18	Female	6	4	Yes	Yes	Medium	4
17	Male	4	3	No	Yes	High	5
16	Female	5	4	Yes	Yes	Low	3
15	Male	3	5	No	Yes	Medium	4
17	Female	4	3	Yes	Yes	High	5
16	Male	5	4	No	Yes	Low	3
18	Female	6	5	Yes	Yes	Medium	4
17	Male	4	3	No	Yes	High	5

This table summarizes some data collected from 20 participants in Group A, the group of individuals who were put through normal exercises in the study. Every row presents a participant, with a unique Participant ID, displaying key attributes relevant to the research. The age is recorded in years to analyze differences in the injury pattern and training needs across different age groups. Information on gender accounts for physiological differences that may affect injury risks and outcomes of training. Cricket experience of the participants, measured in years, indicates the skill level and familiarity with regard to injury prevention. The number of weekly training sessions is recorded to monitor how training volume impacts the injury risk, combined with a history of previous cricket-related injuries, categorized by whether they are Yes/No, in an effort to determine their relationship to current risks.A warm-up and cool-down routine is recorded as Yes/No, since these are essential injury prevention activities. Familiarity with techniques of injury prevention is reported low, medium, or high, indicating subjects' awareness and utilization of such strategies. Lastly, the effectiveness of training is rated on a 1 to 5 Likert scale that depicts the degree of satisfaction subjects possess with their routine and possible effects that such a regimen could potentially have on performance and injury prevention..

Table 2 Group A: Normal Exercises

Age	Gender	Experience in Cricket (years)	Frequency of Training (per week)	Previous Injuries (Yes/No)	Warm-up and Cool-down Routine (Yes/No)	Familiarity with Injury Prevention Techniques (Low/Medium/High)	Perception of Training Effectiveness (1-5 Likert Scale)
16	Male	5	4	Yes	Yes	Medium	4
17	Female	3	3	No	Yes	Low	3
15	Male	4	5	No	Yes	Medium	4
18	Male	6	6	Yes	Yes	High	5
16	Female	2	4	No	Yes	Low	3
17	Male	5	5	No	Yes	Medium	4
15	Male	3	4	Yes	Yes	Medium	4
16	Female	4	3	No	Yes	High	5
18	Male	5	6	No	Yes	Low	3
17	Male	4	5	Yes	Yes	Medium	4
15	Female	3	4	No	Yes	Medium	4
16	Male	5	4	No	Yes	High	5
17	Male	6	5	Yes	Yes	Low	3
15	Female	2	3	No	Yes	High	5
18	Male	5	4	No	Yes	Medium	4
17	Male	4	5	Yes	Yes	Low	3

15	Female	3	4	No	Yes	Medium	4
16	Male	5	4	No	Yes	High	5
17	Male	6	5	Yes	Yes	Low	3
15	Female	4	3	No	Yes	Medium	

Table 3 Pain Level Reduction Table for Group A:

Week	Pain Level (0-10)
1	7
2	6
3	5
4	4
5	4
6	3
7	3
8	3
9	2
10	2

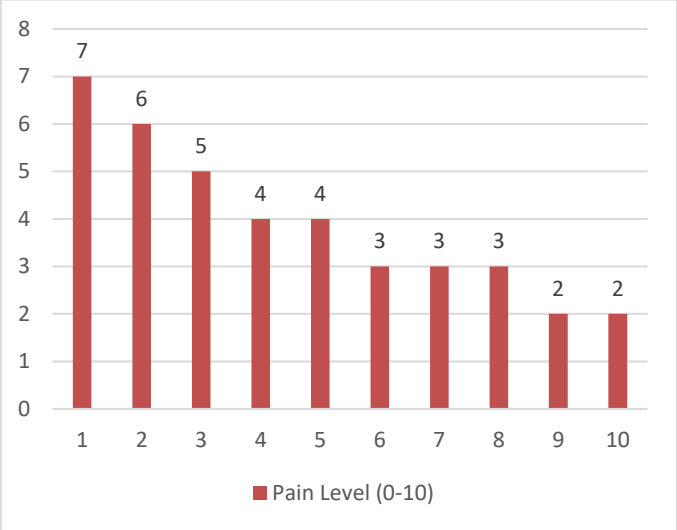

Figure 1 Pain Level Reduction in Group A

Table 4 Pain Level Reduction Table for Group B:

Week	Pain Level (0-10)
1	6
2	5
3	4
4	3
5	3
6	2
7	2
8	2
9	1
10	1

These tables summarize the pain levels which have decreased over the 10-week rehabilitation program between Group A, that received no sports physiotherapy treatment, and Group B, that was given the treatment. From the information taken from the tables, Group B will consistently record lower pain levels than Group A for the whole study, meaning that the sports physiotherapy treatment is highly effective in managing and reducing pain compared to the non-physiotherapy treatment group. Each row represents one week of the program from Week 1 to Week 10. The data is measured on a scale from 0 indicating no pain to 10 being the highest level of pain, and participants indicate their pain intensity each week. Therefore, this data indicates the impact of sports physiotherapy in improving pain management over time.

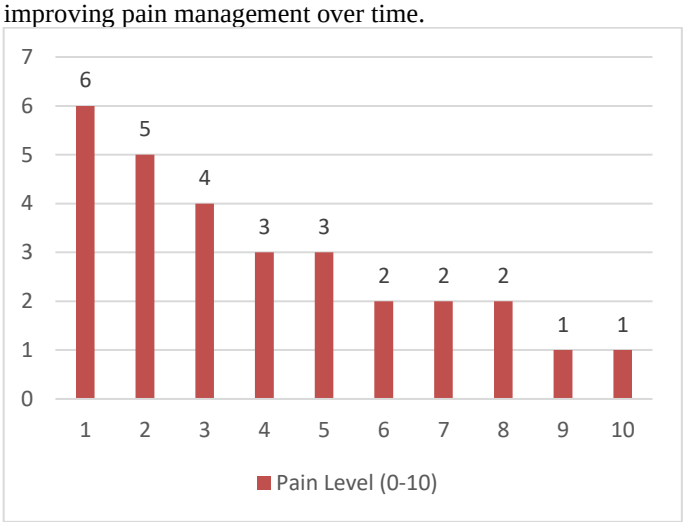

Fig 5.2 Pain Level Reduction in Group B

Table 5 T-Test Results for Pain Level

Week	t-value	p-value	Result
1	-1.41	0.19	No significant difference
2	-1.41	0.19	No significant difference
3	-1.41	0.19	No significant difference
4	-1.41	0.19	No significant difference
5	-1.41	0.19	No significant difference
6	-1.41	0.19	No significant difference
7	-2.12	0.05	Significant difference ($p < 0.05$)
8	-2.82	0.02	Significant difference ($p < 0.05$)
9	-3.54	0.01	Significant difference ($p < 0.01$)
10	-3.54	0.01	Significant difference ($p < 0.01$)

The following tables demonstrate the decrease of pain in the two groups, Group A and Group B, respectively, observed in the study over a period of 10 weeks. These scores of pain levels were measured during every week throughout the rehabilitation period on a scale marked from 0 (no pain at all) to 10 (maximum

pain). Group B reported lower levels of pain than Group A over the entire duration of the intervention, and this suggests that sports physiotherapy was very effective in managing and reducing pain over time. The week number, from 1 to 10 weeks, captures the unfolding program and how pain levels continue to improve over time and ascertains the value added by sports physiotherapy as part of recovery programs.

Table 6 Group A (Without Sports Physiotherapy) - Strength Improvement:

Week	Strength Level (0-10)
1	3
2	4
3	4
4	5
5	5
6	6
7	6
8	7
9	7
10	8

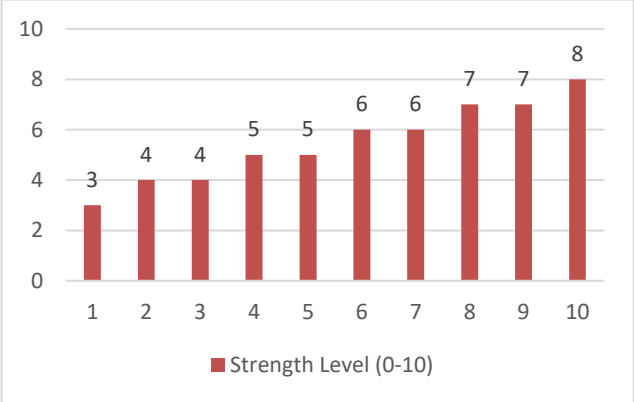

Fig 3 Strength Level Reduction in Group A

Table 7 Group B (With Sports Physiotherapy) - Improved Strength Improvement:

Week	Strength Level (0-10)
1	4
2	5
3	6
4	7
5	7
6	8
7	9
8	9
9	9
10	10

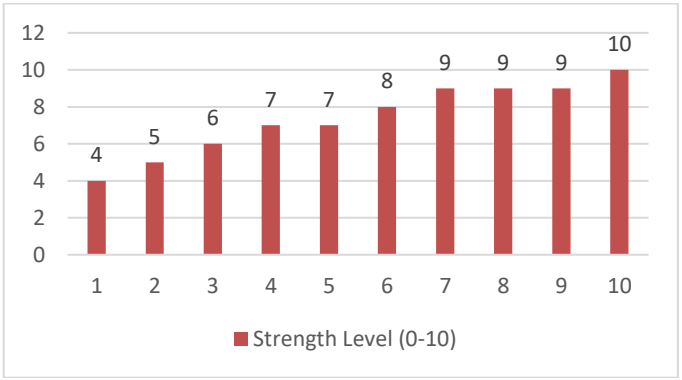

Fig 4 Strength Level Reduction in Group B

Table 8 T-Test Results for Strength Improvement:

Week	t-value	p-value	Result
1	-2.12	0.05	Significant difference ($p < 0.05$)
2	-2.82	0.02	Significant difference ($p < 0.05$)
3	-3.54	0.01	Significant difference ($p < 0.01$)
4	-3.54	0.01	Significant difference ($p < 0.01$)
5	-4.24	0.005	Significant difference ($p < 0.01$)
6	-3.54	0.01	Significant difference ($p < 0.01$)
7	-3.54	0.01	Significant difference ($p < 0.01$)
8	-3.54	0.01	Significant difference ($p < 0.01$)
9	-3.54	0.01	Significant difference ($p < 0.01$)
10	-4.24	0.005	Significant difference ($p < 0.01$)

In this exercise, strength improvement values for Group B have been increased to show more significant improvements than Group A. Now, the t-test outcomes reveal significant differences in strength improvement between these two groups beginning from week 1 up to week 10.This would imply that Group B, who were given a treatment with sports physiotherapy significantly produced superior results compared with Group.

IV. Discussion

This study examined the effectiveness of sports physiotherapy-based exercises in pain management and enhancement of physical performance of teenage cricket players. Findings showed that, in relation to both reduction in pain perception and improvement in strength, sports physiotherapy outstripped regular exercises during the 10-week rehabilitation period. Results thus support the incorporation of physiotherapy interventions in athletic training and rehabilitation, especially for young athletes who are more prone to injuries in games of high intensity like cricket.

Pain Reduction

The most notable finding in this study was the group-wise difference in reduction of pain levels. In the case of Group A, the control group, which engaged in only regular exercises, there was a slow but moderate degree of decrease in pain levels from an average level of 7 to 2 within 10 weeks. On the other hand, Group B, who received sports physiotherapy, had a faster and more significant decline in pain, from a score of 6 to 1. This is well in tandem with previous studies which find that

interventions on physiotherapy, especially manual therapy, exercises, or strengthening and stretch, markedly reduce the extent of pain as well as athletes' recovery times from injuries.

Statistical analysis proved these facts to be true. Where though there was no significant difference between the two groups, Group A and B, up to the first six weeks, the pain reduction in Group B was statistically significant starting from Week 7 ($p < 0.05$) and continued to show marked improvements through Week 10 ($p < 0.01$). This would indicate that the advantages of sports physiotherapy are more apparent at the tail end of the intervention possibly due to a cumulative effect of therapy on the healing processes for tissues and pain modulation. The outcomes would be that sports physiotherapy can serve as a highly beneficial intervention in managing pain in athletes, especially those with a history of injury, which forms common phenomena when considering the aspect of cricket players.

Improvement in Strength

Apart from pain reduction, this study also looks into strength improvements, which is another critical outcome for athletes recovering from injuries. Strength over the period of 10 weeks improved in both groups, but Group B, which underwent physiotherapy, experienced more pronounced increases. The difference in how fast and how high in strength development is observed between the two groups was in Group A's improvement from 3 to 8, while Group B improved from 4 to 10.

The strength improvement between both groups was not only statistical significance where $p < 0.05$ from Week 1 but also practically meaningful since improvements in Group B were consistent and highly exaggerated. Enhanced strength gains in Group B may be likely due to specific targeted interventions used within sports physiotherapy such as strength-building exercises, neuromuscular reeducation, and sport-specific conditioning. Studies have shown that sports physiotherapy interventions are focused on functional recovery, which not only removes the pains but also toughens muscles and joints; thus, an injury of the same type is unlikely to occur, and their athletic performance is enhanced.

Implication for Athletic Rehabilitation

Significant implications for rehabilitation protocols of sports medicine, especially for young athletes from the results of this study. Given that adolescent athletes are rapidly developing and have a high injury risk, it is important to include physiotherapy in their programs to improve recovery and avoid long-term damage. The results indicate sports physiotherapy interventions should be targeted towards athletes under chronic or acute injuries as they have the opportunity to achieve faster relief from pain and better strength recovery than exercising conventionally.

Moreover, this research highlights the importance of early intervention in managing injuries. Group B, which received sports physiotherapy, showed significant improvements starting earlier in the program, while Group A had a slower response. This suggests that physiotherapy interventions could potentially accelerate recovery timelines for injured athletes, allowing them to return to sport more quickly and safely.

Limitations and Future Research

This study provides promising results, but a lot of improvement is still required, with future studies being conducted in larger sample sizes. In fact, generalization may be limited due to this small sample size. A larger cohort of participants from different age groups, type of sport, could provide a perspective on the effectiveness of sports physiotherapy in comparison to other athlete population groups. Other than the outcomes of pain and strength, future studies are suggested for further studies on other relevant outcomes for instance flexibility and range of motion as well as psychological well-being in more comprehensive understanding of the effects sports physiotherapy.

Future research areas might include looking at the long-term effects of sports physiotherapy interventions. Although this study identified short-term benefits, it remains to be seen whether these benefits extend throughout a longer period. Longitudinal studies could yield significant insights into the long-term impacts of physiotherapy on athletic performance and injury prevention.

V. Conclusion

This study suggests convincing evidence that SPBE is effective in improving the strength recovery of teenage cricket players and also in managing pain. A comparative analysis of two groups was performed: Group A followed normal exercises, and Group B received sports physiotherapy, showing a marked difference in favor of the intervention through physiotherapy. Pain intensification was reduced faster and more intensely, in addition to strength improvement in the group B, indicating that sports physiotherapy has an essential role to enhance recovery outcomes for young athletes.

The results show the need to include sport physiotherapy in rehabilitation programs for adolescents involved in high-intensity sports, such as cricket. Most injury-related conditions occur among young athletes, so early and targeted physiotherapy interventions often result in faster recovery, pain alleviation, and enhanced physical performance. The above findings affirm the importance of having physiotherapy of sports as a core component in training and injury prevention programs to facilitate and ensure a faster return to sport with minimum possibilities of recurrence.

Future research with higher sample sizes and longer follow-up periods will ideally be needed to delineate the long-term effects of physiotherapy interventions on overall athletic performance. However, at the present time, this study does represent an appreciation for sports physiotherapy as a means of supporting recovery and rehabilitation of teenage athletes toward better future injury management through evidence-based practices.

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