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An Observational Study on the Effect of Running Activity Pain in College Students with Medial Tibial Stress Syndrome

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ABSTRACT

Background: Medial Tibial Stress Syndrome (MTSS) is a prevalent overuse injury affecting 13.2–17.3% of runners annually, characterised by repetitive mechanical loading along the posteromedial tibia. College students engaged in running represent a highly susceptible population, yet the impact of continued running on pain severity in this cohort remains largely underexplored.

Objective: To observe and assess the effect of running activity on pain intensity in college students diagnosed with Medial Tibial Stress Syndrome using the Shin Pain Scoring System (SPSS).

Methods: An observational cross-sectional study was conducted at Career Point University, Kota, Rajasthan, from February 2026 to April 2026. A total of 52 college students aged 17–25 years involved in regular running activity (minimum twice per week) were enrolled using convenience sampling. Participants were assessed using the Shin Pain Scoring System (SPSS) and clinical tests including the loaded dorsiflexion test, fulcrum test, tap test, tuning fork test, and single leg hop test. Data were analysed using descriptive statistics, paired t-test, and Pearson correlation analysis.

Results: Mean shin pain scores were 12.29 ± 3.47 (right leg) and 12.19 ± 3.39 (left leg), both in the moderate range. Severity distribution showed 73.1% moderate and 26.9% mild pain; no severe cases were identified. Paired t-test revealed no significant difference between legs ($t = 1.399$, $p = 0.168$). Pearson correlation showed a very strong bilateral relationship ($r = 0.990$, $p < 0.001$).

Conclusion: Running in college students with MTSS often causes bilateral, moderate shin pain, showing a strong systemic biomechanical link. Early physiotherapy and careful load management are key to preventing progression into stress fractures.

Keywords: Shin pain, MTSS, Running Injury, Overuse Injury, Bilateral Pain

INTRODUCTION:

Medial Tibial Stress Syndrome (MTSS) is a frequent lower limb injury that commonly develops from weight-bearing activities such as running or jumping. It is characterised by pain localised along the posteromedial aspect of the tibia, representing one of the most common overuse injuries among runners and athletes, affecting approximately 35% of the athletic population. Overuse injuries such as MTSS can occur in up to 70% of runners annually, with sports involving frequent running and jumping showing a high prevalence [1,2.]

Running is one of the most popular physical activities worldwide, with increasing participation in recreational and competitive events. Despite its well-documented health benefits, recreational runners frequently experience running-related injuries. Among affected body regions, the lower leg ranks among the most frequently injured areas, with MTSS occurring in approximately 13.2% to 17.3% of runners [3]. The syndrome's multifactorial aetiology encompasses repetitive mechanical tibial loading, deficits in muscular strength and endurance, and excessive eccentric contraction of lower leg musculature generating periosteal traction forces [4].

Tibial anatomy is central to understanding MTSS Patho mechanics. The tibia, the larger of the two lower leg bones, bears the majority of weight-bearing load and provides attachment for numerous muscles including the tibialis anterior. Contributing risk factors include high-impact overuse training, inadequate footwear, hard training surfaces, poor running mechanics, muscle imbalances, structural foot abnormalities (high arches or flat feet), and insufficient warm-up routines [5,6,7].

Systemic factors, including nutritional deficiencies affecting bone mineral density and hormonal fluctuations during menstruation, may further modulate susceptibility to tibial stress [8,9]. The clinical differential includes stress fractures, characterized by localized sharp pain and structural bone damage, which must be distinguished from the diffuse medial tibial tenderness of MTSS to guide appropriate management [10,11].

Clinical assessment of MTSS encompasses several validated tests. Loaded dorsiflexion evaluates ankle mobility asymmetry, while the fulcrum test applies bending stress to the tibia to elicit and localize pain [12,13]. The tap test identifies tenderness along the tibial and fibular shafts, the tuning fork test differentiates periosteal irritation from focal stress fracture pain, and the single leg hop test assesses functional performance and pain response during impact loading [14,15,16].

MATERIALS AND METHODS

Design and setting: An observational cross-sectional study was conducted at Career Point University, Kota, Rajasthan, India, from February 2026 to April 2026. Ethical approval was obtained in accordance with the principles of the Declaration of Helsinki, and written informed consent was secured from all participants before enrolment.

Participants

A total of 52 college students were enrolled using convenience sampling. Inclusion criteria required participants to be: (1) enrolled university students aged 17–25 years; (2) engaged in regular running activity at minimum twice per week; and (3) able to self-report or respond to the questionnaire with or without assistance. Exclusion criteria comprised: inability to provide informed consent; systemic diseases affecting bone health or muscle function; recent lower limb surgery (within 6 months); history of lower limb fractures or bone pathology other than MTSS; neurological disorders affecting lower limb function or balance; and chronic opioid use

Sample Size: A convenience sample of 52 eligible students was enrolled. Demographic information, including age, gender, weekly running duration, and academic year, was collected via a Google Form incorporating a consent statement and demographic questionnaire.

Outcome Measures: The primary outcome measure was the Shin Pain Scoring System (SPSS), a validated tool with a maximum score of 29 that classifies pain severity as mild (0–9), moderate (10–19), or severe (20–29) [21]. The Visual Analogue Scale (VAS), a 100 mm horizontal scale, was used as a supplementary pain intensity measure. Clinical assessment included five standardised tests performed bilaterally:

Loaded Dorsiflexion Test: Assessment of ankle dorsiflexion range with the patient facing a wall; asymmetry between legs scored as one point.
Fulcrum Test: A bending force applied perpendicular to the lower leg to provoke tibial stress pain, repeated 2–3 times along the tibia.
Tap Test: Two-finger percussion along the entire length of the tibia and fibula; a positive result elicits increased bone tenderness.
Tuning Fork Test: A vibrating tuning fork applied over several tibial areas; positive result indicates increased pain, used primarily for stress fracture differentiation.
Single Leg Hop Test: Patient hops on one leg 10 times; difficulty, increased landing time, decreased jump height, and flat-footed hopping noted as positive findings.
Statistical Analysis: Data were coded and entered into Microsoft Excel. Descriptive statistics included mean, median, and standard deviation for continuous variables; frequency and percentage distributions were computed for categorical severity classifications. A paired t-test was used to compare dependent right and left leg SPSS scores within the same subjects. Pearson correlation analysis assessed the strength and direction of the linear relationship between bilateral pain scores. Statistical significance was set at $p < 0.05$.

3. RESULTS

1. Descriptive Statistics

A total of 52 college students participated in this observational study on Medial Tibial Stress Syndrome (MTSS). The age of the participants ranged from 18 to 25 years, with a mean age of 20.69 ± 1.78 years. The mean shin pain score (Right Leg) was 12.29 ± 3.47, and the mean shin pain score (Left Leg) was 12.19 ± 3.39. The pain scores indicate that, on average, participants experienced moderate levels of pain bilaterally, with no clinically significant difference between right and left legs.

Table:1 Descriptive Statistics of Study Variables

Variable	N	Mean	Std. Deviation
Age (years)	52	20.69	1.78
Shin Pain Score – Right Leg	52	12.29	3.47
Shin Pain Score – Left Leg	52	12.19	3.39

2. Severity Distribution

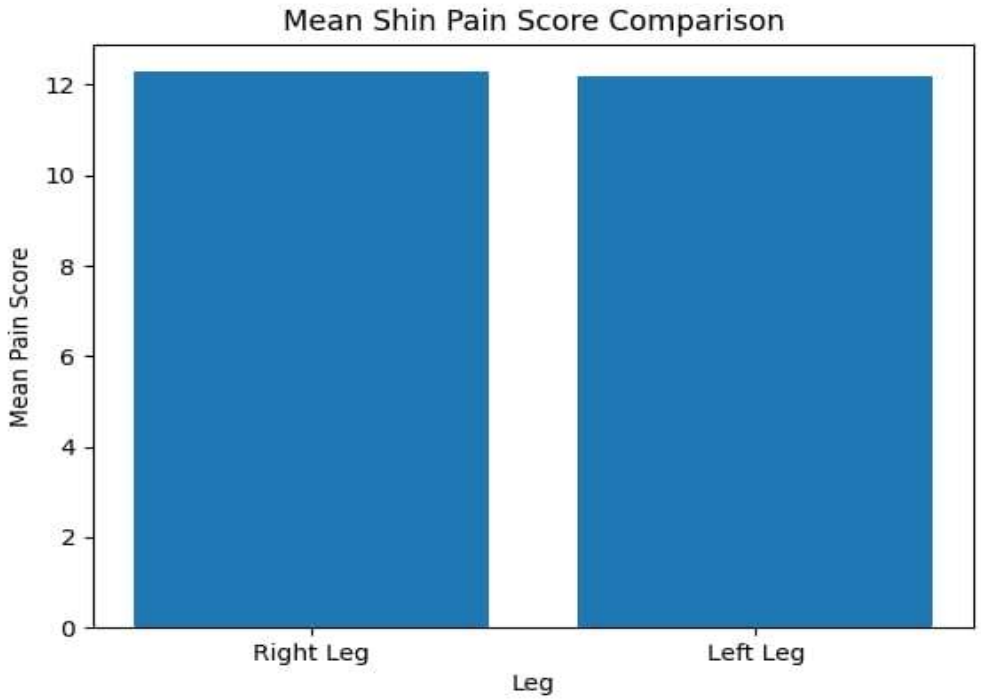
Based on the Shin Pain Scoring Scale, participants were categorised into two severity groups. Moderate pain (score 10–19) was observed in 38 participants (73.1%), while mild pain (score 0–9) was observed in 14 participants (26.9%). No participants were classified under the severe pain category (score 20–29). This indicates that running activity is associated predominantly with moderate pain intensity in students with medial tibial stress syndrome.

Table No.2: Severity Distribution of Shin Pain (N = 52)

Pain Category	**Number of Students**	**Percentage (%)**
Mild (0–9)	14	26.9%
Moderate (10–19)	38	73.1%
Severe (20–29)	0	0.0%

Total	**52**	**100%**

Figure 1: Mean Shin Pain Score Comparison (Right Leg vs Left Leg)



The bar graph above demonstrates almost equal mean pain levels in both legs (Right: 12.29; Left: 12.19), suggesting bilateral involvement as a characteristic feature of medial tibial stress syndrome among running students.

Figure 2: Severity Distribution of Pain Among Participants

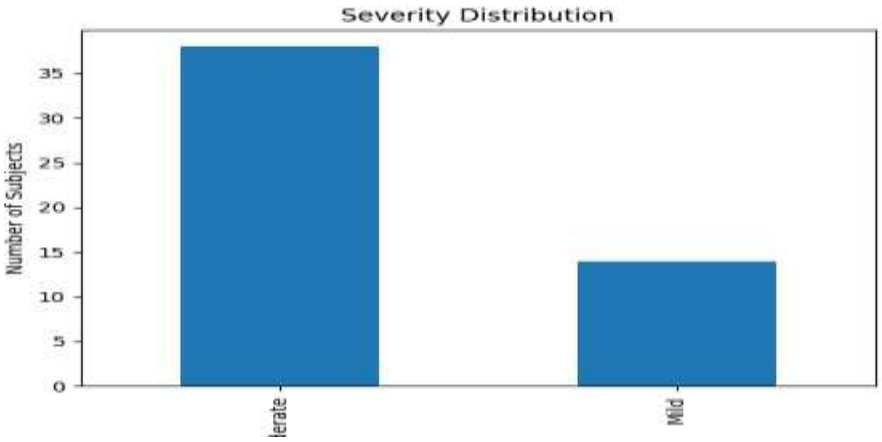


Figure illustrates the severity distribution. A clear majority (73.1%) of participants presented with moderate pain, while 26.9% exhibited mild symptoms. The absence of severe cases may reflect the self-selected nature of the sample, as students with severe MTSS may have already discontinued running activity.

3. Inferential Statistics

A paired t-test was performed to compare the mean SPSS scores of the right leg versus the left leg across all 52 participants. The results are presented in Table.

Table No.3: Inferential Statistics – Paired t-Test and Pearson Correlation

Test	Statistic Value	p-value
Paired t-test (Right vs Left)	t = 1.399	p = 0.168 (NS)
Pearson Correlation (r)	r = 0.990	p < 0.001 (S)

NS = Not Significant; S = Significant (p < 0.001)

The paired t-test revealed no statistically significant difference between the right leg SPSS score (mean = 12.29) and the left leg SPSS score (mean = 12.19), with t (51) = 1.399 and p = 0.168 (p > 0.05). This indicates that the severity of shin pain was bilaterally symmetric, i.e., both legs were equally affected by MTSS. The Pearson correlation coefficient between right and left leg scores was r = 0.990 (p < 0.001), indicating a near-perfect positive correlation. Students who experienced higher pain in one leg demonstrated proportionally higher pain in the other leg, confirming a highly consistent bilateral pain pattern across participants.

4. DISCUSSION

The present observational study evaluated pain intensity associated with running activity in college students with MTSS. Mean SPSS scores of 12.29 ± 3.47 (right) and 12.19 ± 3.39 (left) indicate moderate bilateral shin pain, consistent with earlier reports documenting moderate-grade MTSS as the predominant clinical presentation in physically active populations. Kanase et al. (2025) and Bhusari et al. (2023) similarly identified repetitive running and inadequate recovery as major contributors to moderate shin pain among athletes [18,19].

The absence of a statistically significant difference between bilateral SPSS scores (t = 1.399, p = 0.168) supports the understanding that MTSS is driven by systemic biomechanical factors—repetitive tibial loading, muscle imbalances, altered running mechanics, and foot pronation—rather than isolated unilateral pathology. This finding aligns with Ohmi et al. (2023), who demonstrated persistent bilateral biomechanical abnormalities in long-distance runners with a history of MTSS [20].

The near-perfect bilateral correlation (r = 0.990, p < 0.001) indicates a highly consistent symmetrical pain pattern, corroborating Winkelmann et al. (2016), who identified BMI, navicular drop, and range of motion parameters as bilateral biomechanical risk factors affecting both lower extremities simultaneously [25.] This symmetry implies that therapeutic strategies must address generalized rather than unilateral biomechanical dysfunction.

The predominance of moderate pain (73.1%) with an absence of severe cases likely reflects the self-selected nature of the sample; students with severe MTSS may have already self-restricted running activity. This observation underscores the importance of early identification before symptom escalation toward stress fractures. The use of the SPSS as a validated clinical screening instrument strengthens the reliability and reproducibility of these findings [21].

From a clinical management perspective, the bilateral and systemic nature of pain suggests that physiotherapy should target underlying biomechanical dysfunctions in both limbs. Evidence-based interventions include gait retraining, footwear modification, progressive load management, and

strengthening and stabilization exercises. Emerging modalities such as low-load blood flow restriction (BFR) training offer a means to maintain conditioning while minimizing tibial mechanical stress, as demonstrated by Brekke et al. (2025) [17]. Shockwave therapy has also demonstrated efficacy in pain reduction among military cadets with MTSS, supporting its consideration in refractory cases [24].

Limitations: This study was limited by its cross-sectional design and convenience sampling method, which preclude causal inference and limit generalizability. The absence of objective biomechanical assessments (e.g., gait analysis, force plate data) and the reliance on self-reported questionnaires represent additional constraints. Future longitudinal studies with larger, more representative samples and objective biomechanical outcome measures are recommended to further elucidate the relationship between running load and MTSS progression.

5. CONCLUSION

Running activity in college students with MTSS is significantly associated with moderate-grade bilateral shin pain. The mean SPSS scores for both right (12.29 ± 3.47) and left (12.19 ± 3.39) legs fell within the moderate pain range, with 73.1% of participants classified as moderate and 26.9% as mild. The absence of a significant bilateral difference and the very strong positive correlation ($r = 0.990$, $p < 0.001$) confirm a symmetrical bilateral pain pattern characteristic of MTSS. These findings support the alternative hypothesis that running activity contributes to increased pain intensity in students with MTSS, and highlight the critical importance of early screening, biomechanical assessment, training modifications, appropriate footwear selection, and targeted physiotherapy to prevent symptom progression and optimize outcomes in this population.

Declarations

Ethics Statement: This study was performed in accordance with the principles of the Declaration of Helsinki. Written informed consent was obtained from all subjects.
Conflict of Interest: None Declared.
Funding: None Declared.

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