JHWCR JOURNAL OF HEALTH, WELLNESS AND COMMUNITY RESEARCH 3007-0570

https://doi.org/10.61919/9vtm9652

Original Article

Prevalence and Impact of Chronic Ankle Instability Among Recreational Athletes During Amateur Sports Programs in Collegiate

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"Cite this Article" Received: 01 March 2026; **Accepted**: 02 April 2026; **Published**: 16 May 2026

Author Contributions: Concept: SK; Design: ZN, MB; Data Collection: MAA, AF, AA, AZ, MK, AB, RK; Analysis: ZN, MB, MAA; Drafting: AF, AA, AZ, MK, AB, RK.. **Ethical Approval**: Jinnah Sindh Medical University, Karachi, Pakistan. **Informed Consent**: Written informed consent was obtained from all participants; **Conflict of Interest**: The authors declare no conflict of interest. **Funding**: No external funding; **Data Availability**: Available from the corresponding author on reasonable request; **Acknowledgments**: N/A.

ABSTRACT

Background: Chronic ankle instability is a recurrent and functionally limiting condition that may follow ankle sprain, particularly in young athletes exposed to jumping, landing, pivoting, and rapid directional changes during sports participation. Objective: To determine the prevalence of chronic ankle instability and assess its relationship with ankle functional status among collegiate recreational athletes participating in amateur sports programs. Methods: This cross-sectional observational study included 100 collegiate recreational athletes aged 18–24 years from multiple universities and colleges in Karachi. Participants were involved in amateur sports including volleyball, football, basketball, cricket, and other athletics. Chronic ankle instability was assessed using the Cumberland Ankle Instability Tool, while ankle dorsiflexion range of motion was measured with a smartphone-based goniometer. Mechanical ankle instability was further evaluated using the Talar Tilt Test. Data were analyzed using descriptive statistics and Pearson correlation analysis. Results: Chronic ankle instability was identified in 19% of participants, including 12% with moderate instability and 7% with mild instability. Most participants were classified as stable by Cumberland score. Mean dorsiflexion was 21.62° for the right ankle and 21.44° for the left ankle. The correlation between dorsiflexion and Cumberland score was weak and not statistically significant ($r = 0.079$, $p = 0.434$). Positive Talar Tilt findings were observed in 3% of right ankles and 1% of left ankles. Conclusion: Chronic ankle instability was present in nearly one-fifth of collegiate recreational athletes and was more commonly reflected as functional instability than mechanical laxity. Early screening, preventive education, proprioceptive training, strengthening, and structured rehabilitation may reduce recurrent ankle sprain risk and improve safe sports participation.
Keywords: Chronic ankle instability, Cumberland Ankle Instability Tool, dorsiflexion, recreational athletes, ankle sprain, Talar Tilt Test.

INTRODUCTION

Chronic ankle instability is a persistent and clinically important consequence of ankle sprain, particularly among physically active young individuals. Lateral ankle sprain is one of the most frequently reported musculoskeletal injuries in athletic populations, and although it is often perceived as a minor injury, inadequate rehabilitation or premature return to sport can result in recurrent sprain, repeated episodes of "giving way," pain, functional limitation, and long-term joint dysfunction (1). Among young athletes, the burden of chronic ankle instability is especially relevant because sports participation commonly requires rapid acceleration, deceleration, jumping, landing, cutting, and sudden changes in direction, all of which place substantial mechanical and neuromuscular demand on the ankle joint (2). When ankle sprains are not managed appropriately, residual symptoms may persist and

contribute to impaired balance, reduced proprioception, altered range of motion, decreased confidence during sports participation, and increased susceptibility to future injury (3).

The epidemiology of chronic ankle instability varies across athletic groups, sports, age categories, and definitions used for diagnosis. Previous studies have reported that chronic ankle instability is common among adolescent and collegiate athletes, with prevalence estimates influenced by injury history, sport type, sex, level of competition, and the assessment criteria applied (4). Basketball, football, volleyball, cricket, and other field or court-based sports are particularly relevant because these activities expose athletes to repeated landing, pivoting, and inversion-stress mechanisms, which are strongly associated with lateral ankle sprain and subsequent instability (5). Systematic evidence further suggests that perceived ankle instability is not limited to elite athletes but also affects recreational and collegiate athletes, who may have less access to structured conditioning, supervised rehabilitation, injury-prevention programs, and on-site medical support (6). This makes recreational athletes an important population for investigation, especially in university settings where sports participation is common but formal injury surveillance is often limited.

The development of chronic ankle instability is multifactorial. Mechanical factors may include ligamentous laxity, altered talocrural or subtalar joint motion, and residual structural compromise after ankle sprain, whereas functional factors may include neuromuscular deficits, impaired proprioception, delayed muscle activation, postural-control deficits, and reduced dynamic balance (7). These impairments may not only affect athletic performance but may also influence activities of daily living, physical activity levels, and long-term joint health. Recurrent ankle instability has been associated with reduced participation, persistent discomfort, repeated injury episodes, and an increased risk of chronic ankle-related disability if not identified and addressed early (8). Therefore, early recognition of instability in young recreational athletes is clinically important for guiding preventive strategies, rehabilitation planning, and education regarding safe return to sport.

Despite the growing literature on ankle sprain and chronic ankle instability, important gaps remain in the evidence concerning recreational collegiate athletes, particularly in local university populations. Much of the existing research has focused on elite athletes, adolescent athletes, or sport-specific cohorts, while recreational athletes participating in amateur collegiate sports remain comparatively underrepresented. This distinction is important because recreational athletes may differ from professional or elite athletes in training load, access to coaching, conditioning practices, footwear choices, injury awareness, and rehabilitation adherence. In addition, local data from collegiate settings are needed to understand the burden of chronic ankle instability in young athletes who participate in sports primarily for fitness, recreation, competition, or institutional activities rather than professional performance.

Assessment of chronic ankle instability requires both subjective and objective evaluation. Self-reported tools such as the Cumberland Ankle Instability Tool are useful for identifying perceived functional instability and differentiating stable from unstable ankles, while clinical and functional measures such as ankle dorsiflexion range of motion and ligamentous stability tests provide additional information about physical impairment and possible mechanical instability (9). Dorsiflexion is particularly relevant because adequate ankle mobility is required for squatting, landing, running, stair descent, and multidirectional sports movement. Reduced dorsiflexion may alter lower-limb mechanics and increase compensatory movement patterns, whereas excessive motion in selected cases may suggest ligamentous laxity or mechanical instability. Combining self-reported instability with range-of-motion assessment and clinical testing may therefore provide a more complete understanding of both the prevalence and functional impact of chronic ankle instability in recreational athletes.

Given these considerations, the present study was designed to determine the prevalence of chronic ankle instability and evaluate its impact on ankle function among collegiate recreational athletes participating in amateur sports programs. The population of interest included young male and female recreational

athletes aged 18–24 years engaged in sports such as volleyball, football, basketball, cricket, and other athletic activities. The exposure of clinical interest was a history of ankle sprain or ankle-related symptoms, while the primary outcome was chronic ankle instability assessed through the Cumberland Ankle Instability Tool, with ankle dorsiflexion range of motion and Talar Tilt Test findings used to further characterize functional and mechanical ankle status. This study therefore seeks to answer the following research question: what is the prevalence of chronic ankle instability among collegiate recreational athletes participating in amateur sports programs, and how is it associated with ankle functional status, particularly dorsiflexion range of motion?

MATERIALS AND METHODS

A cross-sectional observational study was conducted to determine the prevalence of chronic ankle instability and assess its association with ankle functional status among collegiate recreational athletes participating in amateur sports programs in Karachi, Pakistan. The study was carried out across multiple university and college settings, including Bahria University, DHA Suffa University, and affiliated colleges of Jinnah Sindh Medical University. Data collection was completed over a period of 4–6 months after approval of the study synopsis. This design was selected because it allowed estimation of the proportion of athletes with chronic ankle instability at a defined point in time and enabled assessment of its relationship with ankle dorsiflexion range of motion and clinical signs of mechanical instability.

The study population consisted of male and female recreational athletes aged 18–24 years who were actively involved in amateur collegiate sports, including volleyball, football, basketball, cricket, and other athletic activities. Recreational athletes were defined as individuals participating in sports for fitness, recreation, institutional activity, or non-professional competition without formal professional athletic training. Participants were eligible if they were involved in regular sports activity and had experienced ankle injury or ankle sprain within the preceding months. Athletes were excluded if they had a recent or previous history of ankle fracture, pes planus, pes cavus, osteoarthritis, osteoporosis, systemic disease such as hypertension or diabetes mellitus, or any condition likely to affect ankle stability or range of motion independently of sports-related ankle injury.

Participants were selected through a purposive sampling technique from the participating institutions. Athletes present during data collection visits were screened according to the eligibility criteria, and those meeting the criteria were invited to participate. A total of 115 athletes were approached, of whom 100 provided complete and analyzable responses. Before participation, the purpose and procedures of the study were explained, and informed consent was obtained. Participants were informed that participation was voluntary, that they could withdraw at any stage, and that their responses would remain confidential and be used only for research purposes.

Data were collected using a structured questionnaire, the Cumberland Ankle Instability Tool, smartphone-based goniometric assessment of ankle dorsiflexion, and the Talar Tilt Test. The structured questionnaire recorded demographic and sports-related information, including age, gender, institution, sport type, history of ankle injury, frequency of ankle injury, severity and duration of ankle-related symptoms, previous treatment, functional limitations, preventive practices, and perceived effects of ankle symptoms on sports participation and daily activity. Chronic ankle instability was assessed using the Cumberland Ankle Instability Tool, a nine-item self-reported instrument scored from 0 to 30, where higher scores indicate better ankle stability and lower scores indicate greater functional instability. A score of 28 or above was considered stable, while a score of 27 or below was considered suggestive of chronic ankle instability. Scores of 25–27 were categorized as mild instability, 21–24 as moderate instability, and 20 or below as severe instability. The tool was used to identify perceived instability, recurrent giving-way episodes, pain, and difficulty during functional or sports-related movements (10).

Ankle dorsiflexion range of motion was measured using a smartphone-based goniometer application. The application used was RateFast Goniometer version 1.4 installed on an Apple iPhone XS Max with

iOS version 17.1.2. Measurements were taken with the participant in a sitting position with the knee flexed. The smartphone was positioned along anatomical landmarks at the ankle, using the lateral malleolus, the bisection of the fibula, and the fifth metatarsal as reference points. Dorsiflexion was measured separately for the right and left ankle and recorded in degrees. The smartphone goniometer was used because smartphone-based goniometric applications have demonstrated acceptable reliability for measuring ankle joint range of motion, including ankle dorsiflexion and plantarflexion (11).

Mechanical ankle instability was assessed using the Talar Tilt Test in participants identified as having chronic ankle instability or abnormal dorsiflexion findings suggestive of possible ligamentous laxity. During the test, the participant was positioned in sitting with the knee extended. The examiner stabilized the distal leg with one hand and grasped the heel with the other hand, maintaining the ankle in a neutral position before applying inversion stress toward the tibia. A positive test was recorded when pain was produced over the lateral ligament region, excessive laxity was felt, or a clunk sensation was noted. The test was used to assess the integrity of the lateral ankle ligaments, particularly the anterior talofibular and calcaneofibular ligaments, and to identify possible mechanical contributors to chronic ankle instability.

The primary outcome variable was the presence of chronic ankle instability based on the Cumberland Ankle Instability Tool score. Secondary outcome variables included severity category of instability, right and left ankle dorsiflexion range of motion, right and left ankle range-of-motion classification, and right and left Talar Tilt Test findings. Demographic and clinical variables included age, gender, sport type, institution, previous ankle injury, recurrent ankle sprain, giving-way sensation, previous treatment, preventive exercise practices, and self-reported functional effect on sports or daily activity. Functional ankle instability was operationally defined as self-reported recurrent giving-way, perceived instability, or repeated ankle sprain associated with a Cumberland Ankle Instability Tool score of 27 or below. Mechanical ankle instability was operationally defined as excessive ankle motion or positive laxity response on clinical testing beyond expected physiological limits.

To reduce measurement bias, the same standardized questionnaire and assessment sequence were used for all participants. Eligibility criteria were applied before enrollment to minimize confounding from non-sport-related musculoskeletal or systemic conditions that could independently affect ankle stability. The use of both self-reported and objective clinical measures allowed triangulation of perceived instability, ankle mobility, and ligamentous laxity. Participants with incomplete or irrelevant responses were excluded from final analysis, resulting in 100 complete datasets. Data were checked for completeness before entry into the statistical software, and variables were coded consistently before analysis.

The sample size was estimated using OpenEpi software with a 95% confidence level. The required sample size was calculated as 100 participants, including both male and female recreational athletes within the eligible age range. Statistical analysis was performed using IBM SPSS Statistics version 27. Descriptive statistics were used to summarize demographic characteristics, CAIT scores, instability categories, dorsiflexion values, and Talar Tilt Test findings. Categorical variables were reported as frequencies and percentages, while continuous variables were reported as mean and standard deviation. The prevalence of chronic ankle instability was calculated as the proportion of participants with CAIT scores of 27 or below among the total analyzed sample. Pearson correlation analysis was used to assess the strength and direction of the linear association between Cumberland Ankle Instability Tool scores and ankle dorsiflexion range of motion. A p-value of less than 0.05 was considered statistically significant.

Ethical approval was obtained before data collection from the relevant institutional review process. Written informed consent was obtained from all participants before enrollment. Confidentiality was maintained throughout the study by using collected data only for research purposes and avoiding disclosure of identifiable participant information in the analysis or reporting. Data integrity was supported by standardized data collection procedures, consistent operational definitions, uniform

scoring of CAIT responses, direct recording of goniometric readings, and statistical analysis using predefined procedures.

RESULTS

A total of 115 collegiate recreational athletes were invited to participate, and 100 participants provided complete and analyzable data. Participants were aged 18–24 years and were actively involved in amateur sports programs including volleyball, football, basketball, cricket, and other athletics. The main study outcome was chronic ankle instability assessed using the Cumberland Ankle Instability Tool, with ankle dorsiflexion range of motion and Talar Tilt Test findings used to describe functional and mechanical ankle status.

Table 1. Participant Recruitment and Core Study Profile

Variable	Value
Athletes invited	115
Complete valid responses analyzed	100
Response completion rate	87.0%
Age eligibility range	18–24 years
Study setting	Bahria University, DHA Suffa University, and affiliated colleges of Jinnah Sindh Medical University
Sports represented	Volleyball, football, basketball, cricket, and other athletics
Primary assessment tool	Cumberland Ankle Instability Tool
Objective ankle mobility assessment	Smartphone-based goniometer
Mechanical instability assessment	Talar Tilt Test
Statistical software	SPSS version 27.0

Among the 115 athletes approached, 100 were included in the final analysis, giving an analyzable response proportion of 87.0%. The study population represented young collegiate recreational athletes from multiple Karachi-based academic institutions, and the assessment combined a subjective instability instrument with objective ankle range-of-motion testing and clinical ligamentous stability assessment.

Table 2. Prevalence and Severity of Chronic Ankle Instability Based on Cumberland Ankle Instability Tool

CAIT Category	CAIT Score Range	Frequency, n	Percentage, %	Cumulative Percentage, %
Moderate instability	21–24	12	12.0	12.0
Mild instability	25–27	7	7.0	19.0
Stable ankle	≥28	81	81.0	100.0
Total	—	100	100.0	—

The mean Cumberland score was 27.71 with a standard deviation of 2.36, indicating that most participants had scores within the stable range. Chronic ankle instability, defined as a CAIT score of 27 or below, was identified in 19 of 100 participants, giving an observed prevalence of 19.0%. Within the unstable group, moderate instability was more frequent than mild instability, affecting 12.0% and 7.0% of the total sample, respectively. No participant was reported in the severe instability category.

Table 3. Right and Left Ankle Range-of-Motion Classification

ROM Classification	Right Ankle, n (%)	Left Ankle, n (%)
Moderate instability	5 (5.0)	3 (3.0)
Mild instability	1 (1.0)	4 (4.0)
Stable joint	91 (91.0)	92 (92.0)
Mechanical instability	3 (3.0)	1 (1.0)
Total	100 (100.0)	100 (100.0)

Range-of-motion classification showed that most participants had stable ankle findings on both sides. Stable joint classification was observed in 91.0% of right ankles and 92.0% of left ankles. Mechanical instability was more frequently recorded on the right side, affecting 3.0% of right ankles compared with 1.0% of left ankles. Moderate instability was also more frequent on the right side, while mild instability was more frequent on the left side.

The mean dorsiflexion was similar between sides, with the right ankle showing a mean of 21.62° and the left ankle showing a mean of 21.44°. The right ankle had a wider observed range, extending from 16.00° to 29.00°, while the left ankle ranged from 16.00° to 27.00°. The overall dorsiflexion value used for

association analysis had a mean of 21.53˚ with a standard deviation of 1.53˚, indicating relatively low dispersion around the mean.

Table 4. Descriptive Statistics for Ankle Dorsiflexion and Cumberland Score

Variable	N	Minimum	Maximum	Mean	Standard Deviation
Dorsiflexion of right ankle, degrees	100	16.00	29.00	21.62	1.99
Dorsiflexion of left ankle, degrees	100	16.00	27.00	21.44	1.71
Overall dorsiflexion value analyzed, degrees	100	—	—	21.53	1.53
Cumberland score	100	—	—	27.71	2.36

Table 5. Association Between Dorsiflexion, Cumberland Score, and Talar Tilt Test Findings

Analysis / Clinical Test	Result	N	Inferential Statistic	p-value
Pearson correlation dorsiflexion vs Cumberland score	Weak positive correlation	100	r = 0.079	0.434
Talar Tilt Test, right ankle negative	97 (97.0%)	100		
Talar Tilt Test, right ankle positive	3 (3.0%)	100		
Talar Tilt Test, left ankle negative	99 (99.0%)	100		
Talar Tilt Test, left ankle positive	1 (1.0%)	100		

Pearson correlation analysis showed a weak positive relationship between dorsiflexion and Cumberland score, but this association was not statistically significant, r = 0.079, p = 0.434. This indicates that dorsiflexion did not show a meaningful linear association with CAIT score in the analyzed sample. The Talar Tilt Test was negative in 97.0% of right ankles and 99.0% of left ankles. Positive findings were recorded in 3.0% of right ankles and 1.0% of left ankles, indicating that clinical signs of mechanical laxity were present in a small minority of participants.

Overall, chronic ankle instability was identified in 19.0% of the analyzed collegiate recreational athletes using the Cumberland Ankle Instability Tool. Most participants were classified as stable by CAIT and by ankle range-of-motion categories. Mean dorsiflexion values were closely comparable between right and left ankles, and the weak non-significant correlation between dorsiflexion and Cumberland score suggests that ankle dorsiflexion alone did not explain the variation in perceived ankle instability within this sample. Mechanical instability on Talar Tilt testing was uncommon, with positive findings limited to 3.0% on the right and 1.0% on the left.

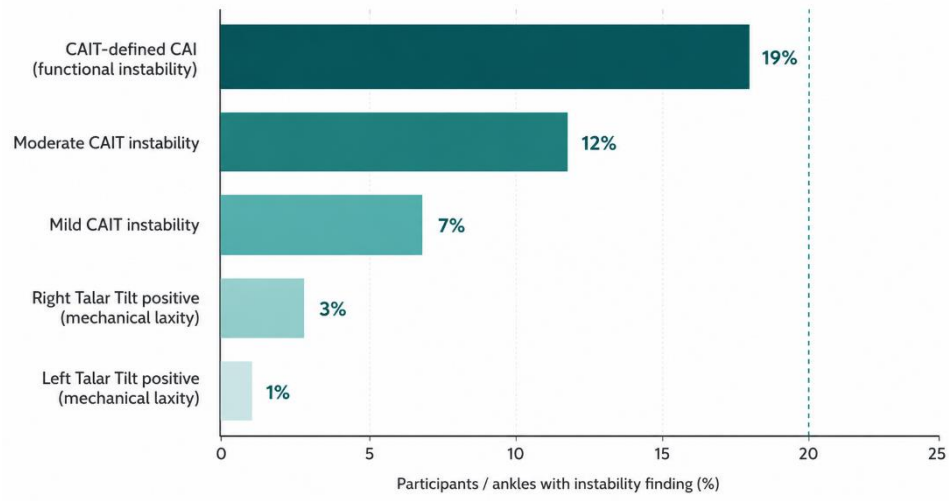

Figure 1. Functional–Mechanical Instability Gradient in Collegiate Recreational Athletes

The figure demonstrates a clear gradient between self-reported functional instability and clinically detected mechanical laxity. CAIT-defined chronic ankle instability was present in 19% of participants, comprising 12% with moderate instability and 7% with mild instability, whereas positive Talar Tilt findings were substantially less frequent, occurring in 3% of right ankles and 1% of left ankles. This pattern indicates that perceived or functional ankle instability was more common than mechanically detectable ligamentous laxity, suggesting that most instability symptoms in this cohort may reflect functional deficits rather than overt mechanical instability.

DISCUSSION

The present cross-sectional study assessed the prevalence of chronic ankle instability among collegiate recreational athletes and examined its relationship with ankle functional status, particularly dorsiflexion range of motion and clinical evidence of mechanical laxity. Chronic ankle instability was identified in 19% of the analyzed participants using the Cumberland Ankle Instability Tool, with 12% classified as having moderate instability and 7% as having mild instability. Most participants were classified as stable, and no severe instability category was reported. This finding suggests that approximately one in five recreational athletes in this collegiate sample experienced clinically relevant symptoms of functional ankle instability, supporting the view that ankle sprain-related sequelae remain an important concern even among non-professional athletes who participate in sports primarily at amateur or institutional levels. The observed prevalence is close to previous work among adolescent and collegiate athletic populations, where chronic ankle instability has commonly been reported in the range of approximately 20% to 23%, although higher estimates have been reported in sport-specific samples such as basketball athletes, where repeated jumping, landing, cutting, and pivoting movements may increase cumulative ankle stress (12–14).

The prevalence observed in this study should be interpreted in the context of the recruited population and the method used to define instability. The CAIT identifies perceived functional instability, including pain, recurrent giving way, difficulty during sport, and symptoms during daily or dynamic activities. Therefore, the 19% prevalence primarily reflects self-reported functional ankle instability rather than purely structural ligament insufficiency. This distinction is clinically important because chronic ankle instability is not a single-mechanism disorder; it may arise from mechanical laxity, neuromuscular impairment, proprioceptive deficit, reduced postural control, altered movement strategy, or a combination of these factors. In recreational athletes, functional symptoms may persist even when overt mechanical laxity is absent, particularly if athletes return to sport without adequate rehabilitation, balance training, strengthening, or education regarding injury prevention (15). The present findings support this concept because the proportion of athletes with CAIT-defined instability was higher than the proportion with positive Talar Tilt findings.

The relationship between CAIT score and ankle dorsiflexion was weak and statistically non-significant, with Pearson correlation analysis showing $r = 0.079$ and $p = 0.434$. Although dorsiflexion is biomechanically important for running, squatting, landing, stair descent, and multidirectional sports movement, the current data indicate that dorsiflexion alone did not meaningfully explain variation in perceived ankle instability within this sample. Mean dorsiflexion values were similar between the right and left ankles, with right ankle dorsiflexion averaging 21.62° and left ankle dorsiflexion averaging 21.44°. The overall dorsiflexion value used in the association analysis was 21.53°, with relatively low variability. These findings suggest that while some individuals with instability may demonstrate altered ankle motion, dorsiflexion range of motion was not a strong standalone marker of CAIT-defined instability in this cohort. This differs from studies reporting reduced dorsiflexion among individuals with chronic ankle instability, but such differences may be explained by variations in study design, population characteristics, instability severity, measurement procedures, and whether comparisons were made against healthy controls or across instability subgroups (16).

The range-of-motion classifications showed that most participants had stable ankle findings on both sides, with 91% of right ankles and 92% of left ankles categorized as stable. Mechanical instability based on range-of-motion classification was uncommon, affecting 3% of right ankles and 1% of left ankles. Similarly, Talar Tilt Test findings showed that 97% of right ankles and 99% of left ankles were negative, while positive findings were recorded in only 3% and 1%, respectively. This pattern indicates that clinically detectable ligamentous laxity was present in a small minority of participants. The difference between the 19% CAIT-defined instability prevalence and the lower rate of positive Talar Tilt findings suggests that functional ankle instability was more frequent than mechanical instability in this sample.

Clinically, this supports the need to evaluate both perceived instability and physical signs of ligamentous laxity rather than relying on one assessment method alone. A participant may report instability because of impaired neuromuscular control, fear of re-injury, pain, reduced confidence, or poor balance even in the absence of a clearly positive mechanical stress test.

The predominance of functional symptoms over mechanical laxity has practical implications for prevention and rehabilitation. Athletes with CAIT-defined instability may benefit from interventions targeting proprioception, balance, peroneal muscle strength, landing control, sport-specific movement retraining, and gradual return-to-play conditioning. Preventive strategies such as structured warm-up routines, ankle-strengthening exercises, neuromuscular training, appropriate footwear, and external support through bracing or taping may also be useful for athletes with previous ankle sprain or recurrent giving-way episodes. Because recreational athletes may not receive the same level of medical supervision as elite athletes, early identification through simple screening tools such as CAIT, supported by range-of-motion and clinical stability assessment, may help reduce recurrent sprain risk and long-term functional limitation (17).

The findings also highlight the importance of considering sports context. The study included athletes from volleyball, football, basketball, cricket, and other athletic activities, all of which may expose the ankle joint to repeated load, rapid direction change, uneven landing, or inversion stress. Court and field sports may differ in injury mechanism, surface, footwear, movement demand, and exposure frequency, which can influence the risk of ankle sprain and chronic instability. Although the present analysis did not provide sport-specific prevalence estimates, the inclusion of multiple amateur sports reflects the real-world collegiate environment, where athletes often participate with variable training backgrounds and inconsistent access to rehabilitation resources. This reinforces the need for institutional injury-prevention programs that are practical, low-cost, and applicable across different recreational sports settings.

Gender distribution is another relevant consideration. The sample included more male than female athletes, limiting interpretation of sex-related differences in chronic ankle instability. Previous studies have reported higher CAI prevalence among female athletes in some contexts, potentially due to differences in lower-limb biomechanics, ligamentous laxity, neuromuscular control, landing mechanics, and hormonal or anatomical factors (18). In the present sample, the small number of female participants restricts meaningful comparison between male and female athletes. Future analyses with more balanced recruitment would allow clearer evaluation of whether sex modifies the relationship between previous ankle injury, CAIT score, dorsiflexion, and mechanical laxity.

The study has several strengths. It focused on recreational collegiate athletes, a population that is clinically relevant but less frequently studied than elite or professional athletes. It also combined a validated self-reported instability tool with objective dorsiflexion measurement and clinical ligamentous testing, allowing the assessment of both functional and mechanical components of ankle instability. The use of multiple universities and colleges improved the contextual relevance of the findings for collegiate amateur sports programs. Additionally, the analysis provided a clear estimate of CAIT-defined instability and described the distribution of mild and moderate instability, which may help clinicians and sports educators identify athletes who would benefit from early preventive or rehabilitative attention.

Several limitations should be considered when interpreting the findings. The purposive sampling approach and the focus on athletes with previous ankle injury or ankle-related history may limit generalizability to all collegiate recreational athletes. The cross-sectional design also prevents conclusions about causality, progression, or recovery over time. Self-reported injury history may be affected by recall bias, particularly for previous sprains, treatment history, or perceived instability episodes. The study did not include a separate healthy control group, which limits the ability to quantify the magnitude of dorsiflexion impairment among athletes with CAI compared with athletes without previous ankle injury. In addition, the small number of positive Talar Tilt findings limits deeper analysis

of mechanical instability patterns. Despite these limitations, the findings provide useful local evidence that functional ankle instability is present in a notable proportion of collegiate recreational athletes and that mechanical laxity appears less frequent than self-reported instability symptoms.

Overall, the results suggest that chronic ankle instability among collegiate recreational athletes is primarily expressed as functional instability rather than overt mechanical laxity in most affected participants. The weak, non-significant association between dorsiflexion and CAIT score indicates that ankle dorsiflexion should not be interpreted as a standalone indicator of chronic ankle instability in this population. A combined assessment strategy using self-reported instability, ankle mobility testing, and clinical ligamentous examination provides a more complete understanding of ankle status. These findings support the integration of early screening, education, proprioceptive training, strengthening, and sport-specific rehabilitation strategies within collegiate amateur sports programs to reduce recurrent ankle injury and support safer athletic participation.

CONCLUSION

Chronic ankle instability was identified in a notable proportion of collegiate recreational athletes participating in amateur sports programs, with 19% of participants classified as having CAIT-defined instability, including 12% with moderate instability and 7% with mild instability. Most athletes demonstrated stable ankle status, and clinically detectable mechanical laxity on Talar Tilt testing was uncommon, occurring in 3% of right ankles and 1% of left ankles. Mean dorsiflexion values were comparable between the right and left ankles, and the weak non-significant correlation between dorsiflexion and Cumberland score indicated that dorsiflexion range of motion alone did not meaningfully explain perceived ankle instability in this sample. These findings suggest that chronic ankle instability in collegiate recreational athletes is more commonly reflected as functional or perceived instability than as overt mechanical laxity. Early screening using validated tools, combined with range-of-motion assessment, clinical stability testing, preventive education, proprioceptive training, strengthening, and structured rehabilitation, may help reduce recurrent ankle sprains, improve ankle function, and support safer participation in collegiate amateur sports.

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