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Prevalence of functional ankle instability in recreational pickleball players: A cross-sectional study

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Abstract
Introduction: Pickleball is a fast-growing paddle sport in which lateral movements, lunging and pivoting place considerable demands on the ankle. Functional Ankle Instability (FAI) can impair balance and sports participation, but its occurrence in recreational pickleball players, particularly in India, is unknown.
Aim: To estimate the prevalence of FAI among recreational pickleball players using the Cumberland Ankle Instability Tool (CAIT), and to describe its distribution by sex, age and side.
Materials and Methods: This cross-sectional study was conducted at pickleball clubs. A total of 105 recreational players aged 18-40 years, playing at least three sessions per week for at least three months, were selected by convenience sampling. Participants completed the CAIT for each ankle through a Google Form; a score ≤24 defined FAI. Prevalence was reported with a 95% Wilson Confidence Interval (CI), and differences by sex and age group were tested with the Chi-square test.
Results: The mean age was 25.44±4.77 years; 73 (69.5%) participants were male. FAI was present in 31 participants (29.5%; 95% CI 21.6-38.8%): 21 (20.0%) unilateral and 10 (9.5%) bilateral. Prevalence was higher in females (15/32; 46.9%) than in males (16/73; 21.9%) (χ^2=6.66, p=0.010; odds ratio 3.14, 95% CI 1.29-7.64), but did not differ significantly by age group (p=0.23).
Conclusion: Nearly three in ten recreational pickleball players had CAIT-defined FAI, more often unilateral than bilateral and more often in females. Screening and preventive physiotherapy merit consideration in recreational pickleball.

Keywords: Ankle injuries, joint instability, prevalence, racquet sports, sprains and strains

Introduction

Lateral ankle sprains are among the most common musculoskeletal injuries in people who take part in sport and recreational physical activity. [1]. An estimated 10-30% of individuals with recurrent sprains go on to develop chronic ankle instability, characterised by repeated giving way, pain and functional limitation [2]. Persistent instability reflects both mechanical insufficiency of the lateral ligament complex and sensorimotor deficits [3]. The Anterior Talofibular Ligament (ATFL) is the weakest of the lateral ligaments, with the lowest load to failure in a cadaveric study, and is the structure most often injured in inversion sprains [4].

The CAIT is a nine-item, 30-point self-report questionnaire designed to quantify the severity of functional ankle instability [5]. It is one of the instability-specific questionnaires recommended by the International Ankle Consortium (IAC) for identifying self-reported ankle instability [6].

Pickleball, a paddle sport combining features of tennis, badminton and table tennis, has grown rapidly in popularity and is attractive because it is social, enjoyable and moderately demanding [7, 9]. Play nonetheless involves lateral shuffling, lunging and sudden changes of direction [8]. Inversion ankle sprains, which are very common in tennis, are likely to occur by a similar mechanism in pickleball [10], and foot and ankle injuries related to the sport have risen sharply in recent years [11]. Most available literature, however, concerns injury mechanisms, rehabilitation or general health benefits, and originates mainly from Western populations. To our knowledge, no published Indian study has estimated the prevalence of FAI among recreational pickleball players using the CAIT.

The present study therefore aimed to determine the prevalence of FAI among recreational pickleball players using the CAIT, and to describe its distribution by sex, age, side, and unilateral versus bilateral involvement.

Materials and Methods

This cross-sectional observational study was conducted at pickleball clubs and community coaching centres in Surat city, from February 2026 to August 2026. Permission was obtained from the management of each venue. Written informed consent was obtained from all participants before they completed the questionnaires, and responses were anonymised with a unique participant code.

Participants: Recreational pickleball players were approached during casual practice, drop-in play and non-competitive training sessions across several venues, and selected by non-probability convenience sampling.

Inclusion criteria: Age 18-40 years (either sex); recreational player playing at least three sessions per week for at least three months; willing to give informed consent; able to read, understand and complete the self-administered questionnaire.

Exclusion criteria: Ankle fracture or surgery within the previous six months; current ankle rehabilitation or physiotherapy; neurological conditions affecting lower-limb sensation or motor control; systemic conditions affecting

joint stability (for example, connective tissue disorders); professional or competitive pickleball players; low vision or cognitive difficulty; regular participation in other sports.

Data collection tools: Data were collected through a self-administered Google Form comprising two parts, completed in the presence of a researcher who could clarify items without influencing responses.

a. **Supplementary data sheet:** Age, sex, duration of pickleball participation, weekly playing frequency, history of ankle sprain, use of ankle support or brace, and warm-up practice.

b. **Cumberland Ankle Instability Tool (CAIT):** A validated nine-item questionnaire whose items cover pain, perceived instability during sport and daily activity, sharp turns, stairs, single-leg standing, hopping, uneven surfaces and the ability to stop an ankle roll. The total score ranges from 0 (severe instability) to 30 (stable ankle). The original validation reported a test-retest reliability (intraclass correlation coefficient) of 0.96 [5]; the Dutch version confirmed high validity and reliability [12]. The CAIT was completed separately for the right and left ankle, giving two scores per participant, and took about five minutes.

Operational definitions: FAI was defined as a CAIT score ≤24. This is the cut-off endorsed by the IAC [6]; the original validation had proposed ≤27 [5]. A participant was classified as having FAI if either ankle met this criterion; as unilateral FAI if only one ankle did, and as bilateral FAI if both did.

Outcome and variables: The primary outcome was the prevalence of FAI. Descriptive variables were age, sex, duration of participation and weekly playing frequency.

Results

All 105 recreational pickleball players who met the eligibility criteria were included in the analysis. The mean age was 25.44±4.77 years, and nearly half the participants (48.6%) were aged 18-23 years. Most participants played three to four days a week (68.6%), and 41.9% had played for more than one year [Table 1].

Table 1: Characteristics of the participants (N=105).

Characteristic	n (%)
Sex	
Male	73 (69.5)
Female	32 (30.5)
Age (years), mean±SD	25.44±4.77
Age group (years)	
18-23	51 (48.6)
24-29	33 (31.4)
≥30	21 (20.0)
Weekly playing frequency	
3-4 days	72 (68.6)
5-6 days	20 (19.0)
Daily	13 (12.4)
Duration of pickleball participation	
3-6 months	32 (30.5)
>6 months to 1 year	29 (27.6)
>1 year	44 (41.9)

SD: Standard deviation

FAI was present in at least one ankle in 31 of 105 participants (29.5%; 95% CI 21.6-38.8%). Twenty-one participants (20.0%) had unilateral and 10 (9.5%) had bilateral FAI, while 74 (70.5%) had no FAI. Side-wise, FAI was present in 22 right ankles (21.0%) and 19 left ankles (18.1%) [Table 2].

Table 2: Prevalence of Functional Ankle Instability (FAI) (N=105).

Category	n	Prevalence (%)
FAI in at least one ankle	31	29.5
Unilateral FAI	21	20.0
Bilateral FAI	10	9.5
No FAI	74	70.5
FAI in right ankle	22	21.0
FAI in left ankle	19	18.1

FAI: CAIT score ≤24. Side-wise counts total 41 ankles (21 unilateral + 2×10 bilateral).

FAI was more prevalent in females (15/32; 46.9%) than in males (16/73; 21.9%), a statistically significant difference (χ^2=6.66, df=1, p=0.010; odds ratio 3.14, 95% CI 1.29-7.64). Prevalence was 33.3% in players aged 18-23 years, 33.3% in those aged 24-29 years and 14.3% in those aged 30 years or above; this difference was not statistically significant (χ^2=2.93, df=2, p=0.23). The highest sex- and age-specific prevalence was among females aged 18-23 years (12/21; 57.1%); 20 of the 32 female participants were aged 21-23 years [Table 3, fig 1].

Table 3: Prevalence of FAI by sex and age group, n/N (%).

Age group (years)	Male	Female	Total
18-23	5/30 (16.7)	12/21 (57.1)	17/51 (33.3)
24-29	9/28 (32.1)	2/5 (40.0)	11/33 (33.3)
≥30	2/15 (13.3)	1/6 (16.7)	3/21 (14.3)
Total	16/73 (21.9)	15/32 (46.9)	31/105 (29.5)

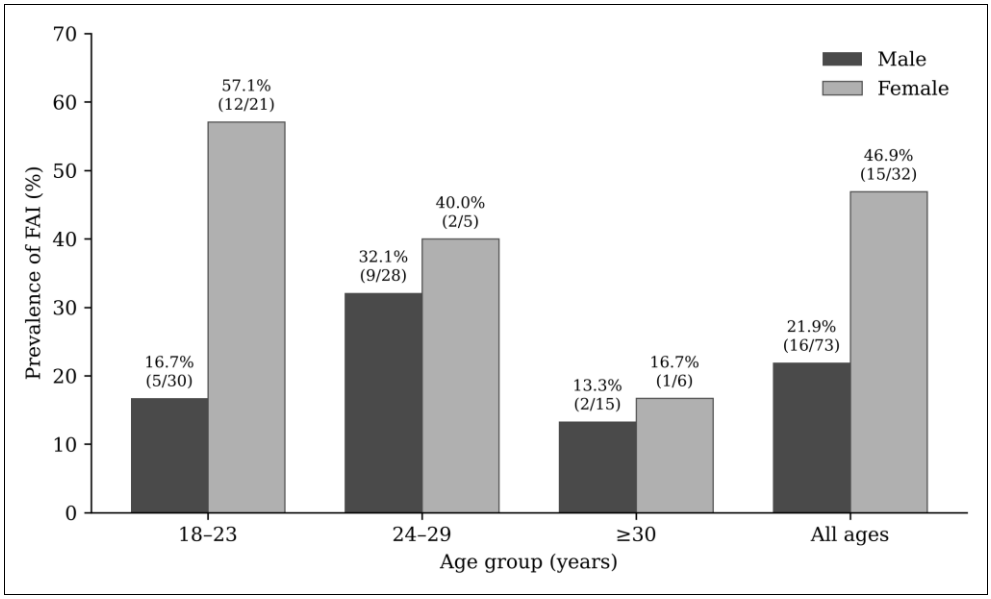

Fig 1: Prevalence of FAI (%) by sex and age group. Labels show n/N.

Discussion

In this cross-sectional study of 105 recreational pickleball players, 29.5% (95% CI 21.6-38.8%) had CAIT-defined FAI in at least one ankle, and unilateral involvement (20.0%) was twice as common as bilateral involvement (9.5%). The finding is consistent with the physical demands of the sport. Running, lunging, lateral movement, sudden stopping and pivoting require good ankle stability, balance and neuromuscular control, and sudden direction changes with ankle inversion are recognised injury mechanisms in pickleball [8, 10]. The estimate is comparable with those from other athletic populations. A systematic review of studies using IAC-based criteria reported an overall chronic ankle instability prevalence of 25% (range 7-53%) [13], and a survey of high school and collegiate athletes found chronic ankle instability in 23.4% [14]. Direct comparison is limited, because those studies applied the IAC criteria, which also require a history of sprain and episodes of giving way, whereas FAI here was classified on the CAIT score alone.

FAI was found in 22 right and 19 left ankles, a small difference suggesting that instability was not confined to one side. Limb dominance, previous injury and playing style were not assessed in detail, so no explanation for any side difference can be offered.

FAI was more frequent in female (46.9%) than in male players (21.9%), with approximately three-fold higher odds. This should be interpreted cautiously. Females formed only 30.5% of the sample, 20 of the 32 were aged 21-23 years, and the analysis was not adjusted for previous sprains, playing frequency, footwear or brace use. Possible explanations, such as differences in ligament laxity, neuromuscular control or footwear, were not measured and remain hypotheses. A higher prevalence in females is consistent with surveys of high school and collegiate athletes [14] and of Taiwanese basketball players [15], in which women were affected more often than men. Those samples were larger and came from school, collegiate or semi-professional teams rather than recreational play, and the wide confidence interval here reflects the small female subgroup.

Prevalence was similar in the 18-23 and 24-29-year groups (33.3% each) and lower in players aged 30 years or above (14.3%), although this difference was not statistically significant and only 21 players were in the oldest group. The age pattern may simply reflect the young sample (mean age 25 years) and should not be taken as evidence that younger players are at greater risk. It also contrasts with a recent epidemiological report in which pickleball-related foot and ankle injuries occurred more often in players older than 50 years, although that study examined injuries rather than functional instability [11].

Lateral ankle sprains have a high recurrence rate, and a proportion of those affected develop chronic instability [1, 2]. Previous sprain history was not included in the present analysis, so no conclusion about its association with FAI can be drawn. Impaired proprioception and neuromuscular control contribute to recurrent sprains, and rehabilitation that includes balance and proprioceptive training has been advocated [3, 16]. Players with low CAIT scores may therefore benefit from further assessment of ankle strength, balance, proprioception, range of motion and functional performance, and from ankle strengthening, balance, proprioceptive and sport-specific neuromuscular training. The CAIT takes about five minutes and could serve as a simple screening tool in clubs and coaching settings.

Limitation

The sample was modest and recruited by convenience sampling from selected venues in one city, which limits generalisability, and only recreational players were

included. Instability was identified by self-report alone, without objective measurement of strength, balance, proprioception or joint laxity. Footwear, playing surface, intensity of play and details of previous injury were not analysed. FAI was defined by the CAIT alone, without the sprain-history and giving-way criteria of the IAC, so the prevalence may be overestimated relative to IAC-defined chronic ankle instability. The female subgroup was small, and older age groups were sparsely represented.

Conclusion

About three in ten recreational pickleball players in this sample had functional ankle instability according to the CAIT; unilateral involvement was more common than bilateral, and prevalence was higher in females. Screening and preventive physiotherapy should be considered for recreational players. Larger multicentre studies with objective clinical measures, analysis of sprain history and longitudinal designs are recommended to identify risk factors and to test preventive programmes.

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