Influence of Chronic Ankle Instability on Physical Activity: A Critically Appraised Topic

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Lateral ankle sprains are the most common injury sustained by physically active individuals. The overwhelming majority of people who sprain their ankle go on to develop chronic ankle instability (CAI). CAI may cause affected individuals to limit their physical activity, leading to health issues such as obesity and cardiovascular disease. The growing body of literature suggests that functional limitations reported by individuals with CAI may lead to a decrease in physical activity. This critically appraised topic sought to determine if adolescent and college-aged individuals with CAI have lower physical activity levels than their healthy peers. A literature search was conducted in August 2021–February 2022 using the terms “chronic ankle instability” and “physical activity.” Studies were included if the participants were adolescent or college-aged and had CAI. Three studies meeting the inclusion criteria were identified. The first study reported that college students with CAI walk fewer steps per week than their healthy peers, while the second study observed higher physical activity levels among adolescents with CAI. The third study incorporated details on how there is a high prevalence of ankle injury in adolescents, so methods to prevent the injury should be followed to avoid injury earlier on. Despite the conflicting evidence on how CAI impacts physical activity levels, physical activity remains important for long-term health. Thus, it is necessary to emphasize that individuals with CAI should seek treatment to mitigate recurrent ankle sprains in order to safely continue with physical activity.

Keywords: CAI, walking, adolescents

Key Points

- Adolescents with chronic ankle instability (CAI) have similar physical activity levels to their healthy peers.
- College-aged individuals with CAI walk less than their healthy counterparts.
- Because lifelong physical activity is beneficial, prioritizing maintenance or improvement of physical activity is imperative with CAI.

Clinical Scenario

Approximately 2 million acute lateral ankle sprains (LASs) occur annually in the United States, with 40% of individuals who sustain a LAS developing a condition known as chronic ankle instability (CAI).¹² CAI has been described as a condition in which individuals experience recurrent bouts of instability, repetitive LASs, and/or prolonged pain >12 months after the index ankle injury.³ Decades of research have identified numerous pathomechanical, sensory-perceptual, and motor-behavioral impairments associated with the condition.³ Although each individual impairment likely contributes to the development and/or characteristics of CAI, the reduction in physical activity, a behavioral adaptation previously reported among young adults (i.e., college-aged individuals),⁴ may have the greatest long-term consequences.

The reported decrease in physical activity among young adults with CAI⁴ is likely attributed to the frequent bouts of instability and chronic pain associated with the condition. At the same time, continuing physical activity and not taking action to seek further treatment could lead to more frequent instability; thus, leading to future changes in type and quantity of physical activity.⁵ Furthermore, individuals with CAI report greater fear of ankle sprains than copers (persons with a history of ankle sprain who do not experience repeated bouts of instability in the injured ankle) and healthy controls,⁶ which could lead to a reduction in physical activity to avoid future injuries. However, the association between fear-avoidance and physical activity in individuals with CAI has not been established. Lower physical activity may contribute to the development of other chronic conditions such as cardiovascular disease, type 2 diabetes, and dementia.⁷ As such, effective rehabilitation for both individuals with acute LAS and CAI is critical to removing barriers to lifelong physical activity⁸ and maintaining quality of life long term.

Despite evidence suggesting young adults with CAI have lower physical activity,⁴ it remains unclear as to how physical activity is impacted across different populations with CAI (i.e., adolescents [high school aged] and young adults). A better understanding of physical activity among adolescents and young adults with CAI may elucidate a timeframe in which the presence of CAI and the associated characteristics are perceived severe enough to cause a modification in behavior (i.e., alter physical activity). Therefore, the purpose of this critically appraised topic is to synthesize results from previously conducted research that measured physical activity levels among adolescent and young adult (college-aged) individuals with CAI.

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Focused Clinical Question

Do adolescents and college-aged individuals with CAI have lower physical activity levels than their peers without CAI?

Search Strategy

A database search of PubMed and Google Scholar was conducted between August 2021 and February 2022 using the following terms:

- Patient/client group: Adolescents and college-aged individuals
- Exposure: CAI
- Comparison: Healthy adolescents or college-aged individuals
- Outcome: Self-reported levels of physical activity or step count

The study inclusion criteria were studies that:

- Enrolled adolescent/college-aged participants with self-reported CAI
- Used an objective or subjective form of assessing physical activity levels as a primary outcome variable
- Were published between 2011 and 2022

The study exclusion criteria were studies:

- With participants who recently sustained an ankle injury (<3 months prior to enrollment)
- With participants whose medial side of the affected ankle was also affected
- Written in a language other than English

Evidence Quality Assessment

Studies included were assessed using the Strengthening the Report of Observational studies in Epidemiology checklists and grade of recommendation was determined via the Strength of Recommendation Taxonomy guidelines.

Results of Search

The initial search resulted in six possible studies for inclusion (Figure 1). After review, three studies met the inclusion criteria (Figure 1). All included studies quantified physical activity in individuals with CAI (Table 1). Overall, each study reported different findings related to physical activity among individuals with CAI when compared with healthy individuals. Specifically, one study found an increase in physical activity, another study found a decrease in physical activity, and the third study found no changes to physical activity. Although not part of our inclusion criteria or focused clinical question, each study was unique regarding population (i.e., age, setting) and the method in which physical activity was quantified. As such, the results stratified by these unique characteristics are presented below.

One study enrolled rural adolescents with CAI and asked them to report their perceived level of physical activity using the International Physical Activity Questionnaire short-form. Another study objectively measured physical activity via pedometer of young adults with CAI. Results were conflicting between the two studies; rural adolescents with CAI reported higher levels of physical activity compared with healthy participants while the study on young adults reported that individuals with CAI took fewer steps than their healthy counterparts. Furthermore, rural adolescents with CAI reported similar Foot and Ankle Ability Measure (FAAM) and FAAM-Sport scores compared with healthy respondents while young adults with CAI reported lower FAAM and FAAM-Sport scores than healthy participants. A third study with adolescents did not show a difference in physical activity levels as measured using the Hospital for Special Surgery Pediatric Functional Activity Brief Scale between participants with and without CAI despite significantly worse ankle function.

Results of Evidence Quality Assessment

Using the Strengthening the Report of Observational studies in Epidemiology Checklists (Table 1), all studies were rated as high quality. Strength of Recommendation Taxonomy appraisal for the included studies resulted in a score of two for each study, collectively resulting in an evidence grade of B. Two studies did not report details on funding, while one did not provide information on bias.

Clinical Bottom Line

There is insufficient evidence to suggest physical activity levels are different in individuals with CAI compared with healthy controls. Adolescents with CAI have similar or greater levels of physical activity compared with healthy individuals, whereas young adults with CAI have lower levels of physical activity.

Implications for Practice, Education, and Future Research

CAI brings about a giving away sensation, which can limit the injured individual’s ability or willingness to perform physical activity. Overall, the studies suggest that adolescents with CAI have greater or similar levels of physical activity, while the young adults with CAI have lower physical activity compared with persons without CAI. Further investigation should be conducted to assess why adolescents may participate in physical activity more, regardless of the instability associated with CAI. Failure to adequately address the sensation of giving away may lead to further instability later, which can lead to subsequent musculoskeletal injury. The results with young adults suggest that they avoid the
associated pain and instability associated with CAI by limiting physical activity (Pearson product–moment correlation between laxity and step count; \( r = -0.84, p = 0.02 \)). We feel it is important to speculate that a bout of instability is likely perceived differently between adolescents and young adults and may be another explanatory factor in why there are differences in activity levels in these populations with CAI. Due to comorbidities, chronic health conditions that can develop with lack of physical activity, it is of great importance for individuals with CAI to seek appropriate treatment to ensure physical activity can be safely performed. Continuing to tease out perception of an injury across various populations may enhance our educational and clinical efforts.

An important factor contributing to the inconsistent impact of CAI on physical activity is the measurement technique for quantifying physical activity. The use of self-reported questionnaires specific to a narrow range of age groups, and activity trackers can contribute to variations in results. For example, pedometers may become less accurate and underreport steps when individuals walk below 2 mph. In addition, questionnaires are a form of qualitative data collection, which can allow a person to respond as truthfully as they wish. Self-reported physical activity participation surveys are known to be inconsistent with the current recommendations of physical activity. It opens up opportunities for overestimation of physical activity level and bias.

Although each physical activity assessment technique has limitations, each appraised study included a comparison group participating in organized sports. Researchers should consider both the accuracy and feasibility of the

<table>
<thead>
<tr>
<th>Study design</th>
<th>Hubbard-Turner and Turner(^4)</th>
<th>Holland et al.(^5)</th>
<th>Donovan et al.(^9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participants</td>
<td>20 participants with unilateral CAI (n = 11 female; age = 21.2 ± 1.9 years, height = 174.3 ± 6.9 cm, mass = 71.9 ± 11.7 kg)</td>
<td>Adolescents ages 14–18; out of 1,365 students, 201 surveys were used</td>
<td>Healthy (able to fully participate) adolescent athletes participating in organized sports</td>
</tr>
<tr>
<td>Inclusion/ exclusion criteria</td>
<td>Unilateral ankle sprain</td>
<td>The participants were categorized as:</td>
<td></td>
</tr>
<tr>
<td>Outcome measures</td>
<td>FAAM, IPAQ, Step counts (7 days of pedometer wear)</td>
<td>Uninjured (completely healthy)</td>
<td></td>
</tr>
<tr>
<td>Results</td>
<td>CAI group scored lower on FAAM (88.5 ± 4.3% vs. 100.0 ± 0.0%, ( p = 0.01 )) and FAAM Sport (76.3 ± 10.6% vs. 98.7 ± 0.1%, ( p = 0.01 ))</td>
<td>Unstable (injury &gt; 1 year ago + IdFAI &gt; 10)</td>
<td></td>
</tr>
<tr>
<td>Evidence quality score (STROBE)</td>
<td>20/22</td>
<td>Healthy (able to fully participate) adolescent athletes participating in organized sports</td>
<td></td>
</tr>
<tr>
<td>SORT</td>
<td>2</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

Note. CAI = chronic ankle instability; IdFAI = Identification of Foot and Ankle Instability; FAAM = Foot and Ankle Ability Measure; IPAQ = International Physical Activity Questionnaire; HRQoL = health-related quality of life; PedsQL = Pediatric Quality of Life 4; HSS Pedi-FABS = Hospital for Special Surgery Pediatric Functional Activity Brief Scale; MET = metabolic equivalent; STROBE = Strengthening the Report of Observational studies in Epidemiology; SORT = Strength of Recommendation Taxonomy.
instrumentation and determine whether the research question can still be answered in light of the potential limitations. Studies that aim to capture a general approximation of physical activity among groups may find questionnaires and pedometers appropriate; whereas, studies that aim to refine training programs of elite athletes may need a more accurate measure (i.e., research-grade triaxial accelerometers) of physical activity.

Demographic differences, including age, sport participation and setting, may additionally account for the inconsistent findings of the included studies. For example, activity may naturally decrease as people transition from adolescence to adulthood. A natural decrease in activity levels among young adults compared with adolescents may be expected and possibly attributed to a transition to harder course loads causing greater time demands, lack of participation in recreational sports, and absence of physical activity courses in their curriculum.

Furthermore, being affiliated with an organized sport may set an inherent level of physical activity that is directly aligned with the sport’s practice and event schedule and often is associated with access to fitness equipment. Of the three studies, one study included both sporting and nonsporting adolescent participants, one study included nonsporting participants from a University community, and the third study included only adolescent participants on a sport team that were currently cleared for sport participation. The results of each study are somewhat aligned with regard to their sport participation status. For example, the study by Donovan et al. found no differences in physical activity between sport participants with and without CAI. This finding was not unexpected considering that all participants were actively participating in their sport; thus, likely following similar exercise schedules. On the contrary, the study by Holland et al. that included both sporting and nonsporting adolescent participants, found increased physical activity among participants with CAI. When further examining the data, the authors noted that individuals who participated in high impact activities were more likely to report CAI. As such, the observed increase in activity is possibly due to the same high-impact activities inherently demanding greater physical activity. Finally, participants in the study on college-aged individuals were not affiliated with organized sport; therefore, these individuals likely needed to seek physical activity on their own volition.

In addition, there are differences in physical activity between urban and rural adults. As of 2008, the ability to meet physical activity guidelines increased from 19.4% to 25.3% in urban residents and 13.3% to 19.6% in rural adult populations. The consistent percent increase reinforces how urban residents are more likely to meet the physical activity guidelines. However, it is concerning that young adults with CAI who attended an urban university had lower levels of activity compared with their peers. For future research, the differences in physical activity levels in general between adolescents and young adults along with rural- and urban-dwelling individuals should be considered.

Young adults with CAI scored lower on the FAAM test and FAAM-Sport. The lower scores are associated with functional limitations, which may explain why those individuals were not as physically active. Despite similar functional limitations, adolescents with CAI remain highly active. It seems that in adolescence, the benefits gained by sport participation may outweigh the physical limitations of CAI and risk of subsequent injury. Thus, adolescents continue participating in sports despite CAI. A key benefit to sport participation is increased health-related quality of life. However, like function, adolescent individuals with CAI report lower health-related quality of life when compared with adolescents without CAI, but not to the extent of adolescents who do not participate in sport. This observation supports the importance of identifying methods that permit physical activity while simultaneously protecting the ankle joint from additional trauma. Unfortunately, when individuals with CAI get to college, they may self-select out of physical activity due to the functional limitations associated with CAI rather than treat their ankle instability. As a result, this practice further promotes negative consequences on their health-related quality of life that is no longer being offset by physical activity. Longitudinal studies tracking physical activity from adolescence through adulthood in individuals with CAI are necessary to confirm this speculation.

Despite the inconsistent findings between the studies included in this critically appraised topic, several key concerns must be raised. Impairment of physical activity following injury is not a CAI-specific problem. In fact, reductions in physical activity are associated with other common lower-extremity musculoskeletal injuries including patellofemoral pain and anterior cruciate ligament reconstruction. This suggests that we may not be adequately educating individuals on the importance of lifelong physical activity and/or providing them with the physical function to participate in physical activity following the cessation of readily available recreational activities in high school. Similarly, return to activity criteria and how clinicians determine readiness for resumption of physical activity may need to be examined across musculoskeletal injuries. Specific to the LAs that contribute to CAI, nearly 75% of individuals participating in high school athletics return to sport within 3 days after injury while 44% of college athletes return to sport within 24 hr. Many of these athletes are still experiencing injury-related impairments during these abbreviated periods of rest following injury. Only recently has a consensus been published establishing criteria to assess in individuals following LAS to determine readiness to return to sport. This consensus is an important step in the process of ensuring that individuals are ready to return to sport and have the functional foundation upon which to build a lifetime of physical activity.

Future investigations should work toward understanding how CAI: (a) affects specific forms of physical activity or exercise; (b) impedes activities of daily living to demonstrate the need for treatment to maintain or improve health-related quality of life; and (c) impacts specific forms of physical activity, including aerobic or strength-related exercises. Finally, it is necessary to study physical activity during the transition from adolescence to adulthood to determine how changes in perceptions of instability and physical limitations may be contributing to an individual’s desire to continue exercising.

**CAT Kill Date: January 2026**

CATs have limited life and should be revisited approximately 2 years after publication (see https://doi.org/10.1123/ijatt.2018-0093).

### References


