History of Ankle Sprain as a Risk Factor of Future Lateral Ankle Sprain in Athletes

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Clinical Scenario

Despite the attention and focus lateral ankle sprains receive in athletic training practice and research, they remain the most common injury in many sports. Whereas the functional limitations and time loss from lateral ankle sprains are apparent, consistently reducing their incidence is less certain. One important step in preventing lateral ankle sprains is identifying their risk factors. Although previous literature summaries suggest that specific risk factors are inconclusive in predicting lateral ankle sprains, recent literature investigating the predictors of ankle sprains should be included as evidence. Determining the primary risk factors for lateral ankle sprains may lead to good prevention programs, which in turn may decrease time lost because of injury.

Focused Clinical Question

Are athletes with a history of an ankle sprain at greater risk for future lateral ankle sprains than athletes with no previous ankle sprain?

Summary of Search, “Best Evidence” Appraised, and Key Findings

- We searched the literature for epidemiological and cohort studies that investigated the predictors or risk factors associated with lateral ankle-sprain injuries in sport.
- We incorporated 1 literature review from 2002,1 which included cohort studies through 2001, to allow for comparisons with more current research from 2001 to the present.
- We included 2 high-quality long-term cohort studies2,3 and 1 descriptive epidemiologic study.4
- Different risk factors were reported in each study, with 1 common predictor always present: history of ankle sprain.

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Clinical Bottom Line

Although the current epidemiological research identifying multiple potential lateral ankle-sprain risk factors still seems divergent, the current evidence identifies previous ankle sprain as a consistent risk factor that should be addressed in prevention programs.

Strength of Recommendation: The level B evidence presented supports the premise that a history of ankle sprain consistently predicts future occurrence of lateral ankle sprains.

Search Strategy

Terms Used to Guide Search Strategy

- **Patient/Client group:** athlete or athletic population or athletic sample
- **Intervention/Assessment:** history of ankle sprain
- **Comparison:** none
- **Outcomes:** ankle sprain or recurrent ankle sprain or lateral ankle sprain

Sources of Evidence Searched

- Cochrane Library
- PubMed
- CINAHL
- SPORTDiscus
- Previous literature reviews

Inclusion and Exclusion Criteria

Inclusion Criteria

- Studies investigating lateral ankle sprains in sport settings and their risk factors or predictors
- Systematic reviews, cohort studies, or descriptive epidemiological studies
- Limited to English language
- Limited to humans
- Limited to last 8 years (2002–2009)

Exclusion Criteria

- Studies investigating high-ankle or syndesmotic sprains
- Studies investigating functional instability of the ankle
- Studies not investigating history of ankle sprain as a risk factor
Results of Search

Three relevant studies\(^2\text{–}^4\) were retrieved, analyzed, and categorized based on the study design (Table 1). Two studies represented a cohort design\(^2\text{,}^3\) and 1 was identified as a descriptive epidemiological design.\(^4\) One additional study\(^1\) was included as a point of reference to summarize lateral ankle-sprain risk-factor research through the year 2001.

Best Evidence

The studies listed in Table 2 were identified as the best evidence for this CAT and were selected to be reviewed because they fit the inclusion criteria.

Implications for Practice, Education, and Future Research

The Beynnon et al\(^1\) review, published in 2002, included research published through 2001 and identified a consensus on 3 potential predictive factors for lateral ankle sprains: Gender is not a risk factor, foot type and joint laxity are not risk factors, and bracing or other support is a factor and can decrease injury risk. However, a consensus was not reached on the other 8 potential factors. Specific to ankle-sprain history as a risk factor, Beynnon et al\(^1\) stated that the literature was “divided.” Although the current CAT did not reveal evidence that would refute most of the conclusions regarding those other risk factors,\(^1\) it did provide conflicting evidence regarding history of an ankle sprain. Whereas Beynnon et al\(^1\) reported that the evidence was divided, our current evidence suggests that previous ankle sprain is a risk factor for future ankle sprains.

McHugh et al\(^3\) and Kofotolis et al\(^4\) found there to be a higher injury rate with a history of an ankle sprain, and Kofotolis et al\(^4\) reported a significant increase of grade II and grade III lateral ankle sprains in athletes who had a prior ankle injury. Hiller et al\(^2\) reported a significant increased risk of lateral ankle sprains for the ankle contralateral to the previously sprained ankle. Furthermore, both Kofotolis et al\(^4\) and Hiller et al\(^2\) report narrow confidence intervals that do not embrace a risk of ankle injury. This further strengthens our confidence that the estimate of the true effect of previous ankle sprains on predicting future ankle sprains is precise.

One of the first steps in developing an injury-prevention plan is to identify susceptible individuals. It would seem appropriate then to suggest that clinicians

### Table 1 Summary of Study Designs of Articles Retrieved

<table>
<thead>
<tr>
<th>Level of evidence</th>
<th>Study design</th>
<th>Number located</th>
<th>Reference</th>
</tr>
</thead>
</table>
| 2b                | Cohort                        | 2              | Hiller et al\(^2\)  
 McHugh et al\(^3\) |
<p>| 2c                | Descriptive, epidemiological  | 1              | Kofotolis et al(^4) |</p>
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Hiller et al\textsuperscript{2}</th>
<th>McHugh et al\textsuperscript{3}</th>
<th>Kofotolis et al\textsuperscript{4}</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Participants</strong></td>
<td>115 adolescent dancers: 94 girls, 21 boys (12–16 y old). One ankle of each dancer was randomly assigned to test group (n = 114) and the other to a validation group (n = 112). No exclusion criteria, 13-month period, 98.9% follow-up rate.</td>
<td>169 high school athletes (14–18 y old): 101 male, 68 female. Athletes were eligible if they participated in football, basketball, soccer, or gymnastics. 2-year period; 1st year, 100% follow-up; 2nd year, 52% follow-up. Decrease resulted from loss of graduating and non-sport-participating athletes.</td>
<td>336 male amateur soccer athletes (20–29 y old). All positions were included: goalkeeper, defender, midfielder, and forward. 2-year period; 64,038 total h of exposure, 46,227 practice h exposure, 17,811 game h exposure; 92.9% follow-up rate.</td>
</tr>
<tr>
<td><strong>Intervention investigated</strong></td>
<td>Not applicable</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td><strong>Outcomes (risk factors) examined</strong></td>
<td>History of ankle sprain, y dancing, h/wk dancing, flexibility, balance, external hip rotation, foot and 1st metatarsal phalanges ROM, ankle instability, age, inversion recovery</td>
<td>Previous ankle injury, hip strength, balance ability, brace/tape v no support, sex, body-mass index</td>
<td>Previous ankle injury, contact v noncontact, game v practice, time of sport season, time during competition, player position, age, body mass, height</td>
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<td><strong>Main findings</strong></td>
<td>0.21 lateral ankle sprains per 1000 h of dancing exposure. Significantly greater risk of sprain in dancers who had previous sprain of contralateral ankle (hazard ratio = 3.90, CI 1.49–10.22). Higher (not statistically significant) risk of sprain seen in younger dancers, greater inversion ROM, and inability to balance on demi-pointe.</td>
<td>1.13 sprains per 1000 exposures. A higher incidence rate was seen in athletes with previous injury (95% CI 0.9–3.1). Significant findings (p &lt; .05) of grade II and grade III sprains in athletes with previous injury (95% CI 0.5–2.3). Combination of a male being overweight with a history of previous sprain makes him 9.6 times more likely to experience a sprain than athletes with no previous ankle sprain and of normal weight (95% CI 0.1–1.7, p &lt; .01).</td>
<td>2.16 ankle sprains per 1000 h of sport exposure. Previous ankle sprain was significant predictor (odds ratio = 1.83, CI 1.46–2.29, p &lt; .05). Most injuries occurred through contact rather than noncontact (p &lt; .05). First 2 mo of season saw significantly more ankle sprains than the rest of the season (p &lt; .05). Neither age, body mass, nor height was a risk factor for ankle sprains (p &gt; .05).</td>
</tr>
<tr>
<td><strong>Level of evidence</strong></td>
<td>2b</td>
<td>2b</td>
<td>2c</td>
</tr>
<tr>
<td><strong>Conclusion</strong></td>
<td>Having a history of a lateral ankle sprain is associated with an increased risk of ankle sprain.</td>
<td>Previous ankle injury increases the risk of a sprain, and being an overweight male was significant in this study but needs further examination. Hip strength and balance are not significant risk factors for ankle sprains.</td>
<td>Athletes are at a higher risk of ankle sprain if they have a history of ankle injury; also, a higher risk is present during the first 2 mo of the season.</td>
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ROM, range of motion.
use ankle-sprain history when developing an ankle-sprain-prevention program. This is advantageous because injury history can be collected efficiently, without the implementation of specific tests and equipment. Efforts should then concentrate on protecting those who have already experienced at least 1 lateral ankle sprain. This could incorporate other supported interventions such as balance training⁵ and supportive devices.⁶ Furthermore, evidence suggests that prevention efforts should not only address the ankle with the sprain history but also incorporate a bilateral prevention program.²

Future research on lateral ankle-sprain risk factors should include well-designed, long-term, prospective studies that incorporate a large sample size, equally representative of gender and sport types, under an established system to classify and measure the risk factors. Furthermore, research should focus on the impact of preventive interventions on the ankle-sprain incidence of those with a history of lateral ankle sprain. Studies should also look at risk factors that may not be thoroughly addressed in previous research (eg, anatomical ankle/foot issues, prior knee or hip injuries, etc). With new and higher quality cohort studies on this particular issue, it may be possible to examine the research and find consensus on the risk factors of lateral ankle sprains. This in turn may lead to the creation of a better injury-prevention program for those participating in sport. This CAT should be reviewed in 2 years to determine whether additional best evidence has been published that may change the clinical bottom line for this specific clinical question.

References