Preseason Weight-bearing Dorsiflexion and Ankle Self-Reported Function Asymmetries in NCAA Gymnasts: An Exploratory Case Series

Background: The prevalence of ankle injuries in gymnastics is uncommonly high. Gymnasts often favor a push-off and landing leg, which creates bilateral imbalances in muscle flexibility, strength, and neuromuscular input. Dorsiflexion is vital to proper loading mechanics because it reduces stress on inert tissues such as ligaments and bones, which have slower physiologic responses to ground reaction forces and are more easily damaged at high intensities. This case-series explores asymmetries in ankle dorsiflexion and self-reported ankle function as well as preferred push off and landing legs in gymnasts with and without a history of ankle sprains.

Case Presentation
Patients: In the past two years, our gymnastics team has experienced an ankle injury crisis where only 2 out of 29 athletes were unaffected by ankle injuries. Based on these trends, we decided that it was necessary to uncover underlying factors that may predispose these athletes to ankle injuries so that we could develop effective intervention strategies to treat and prevent them.

Intervention: Prior to the start of the season, all 29 gymnasts (18-20 years old) performed baseline assessments of weight-bearing dorsiflexion and self-reported ankle function as part of their pre-participation physical examination. Specifically, all gymnasts performed the weight-bearing lunge test (WBLT) and completed the Foot and Ankle Ability Measure Sport scale (FAAM-S) for each ankle. Lastly, each gymnast was asked which limb they preferred to take off on and land when performing gymnastics activities.

Comparative Outcome: Twenty-seven out of the 29 gymnasts (93%) reported a history of at least 1 ankle sprain and 21 out of 27 (78%) reported a history of bilateral ankle sprains. The 2 gymnasts without history of ankle sprains demonstrated a WBLT asymmetry of 3 cm and 1.5 cm, respectively. These athletes also reported 95-100% on their FAAM-S with one having a 5% asymmetry (100 vs 95%). For those with a history of bilateral ankle sprains, their WBLT was 10.0±2.5 cm with a 1.5±1 cm asymmetry. Their FAAM-S was 92.6±8.8% with 4.8±7.9% asymmetry. For the 6 with unilateral ankle sprains, their WBLT was 9.5±4.1 cm on the previously injured side and 11.2±2.8 cm for the unaffected side. Their FAAM-S was 86±15% for the previously injured side and 100±0.0% for the unaffected side. Three out of 6 reported at least a 15% reduction in FAAM-S on the injured limb compared to the healthy limb and 4 out of 6 had lower scores on the WBLT on the injured side. Of the 29 athletes, 25 of them had favored one side as both their take-off and landing limb and 13 of 25 (52%) of them had greater dorsiflexion on their favored limb.

Conclusion: Based on this case series, a functional link between dorsiflexion and self-reported function exists. On average, gymnasts with a history of unilateral ankle sprains demonstrated a loss of dorsiflexion and self-reported function on the injured side. The gymnasts with bilateral ankle sprains also had a lower average score on the FAAM-S than gymnasts unaffected by ankle sprains. An important note is that 9 gymnasts with bilateral ankle sprains reported having a “worse” limb by the FAAM-S. Seven of these gymnasts (78%) also had lower WBLT distances on that side. Based on these findings, we have clinical evidence to support that a loss of dorsiflexion might be associated with lower perceived function in those with ankle sprains. Due to the fact that dorsiflexion is a vital aspect of landing mechanics, a crucial component to the sport of gymnastics, using interventions to enhance dorsiflexion in gymnasts with a previous history of ankle sprains may be a viable option for enhancing function and reducing the risk of future injuries.

Word Count: 598