THE IMPACT OF UNILATERAL VS BILATERAL ANKLE BRACING ON RATE OF FORCE DEVELOPMMENT AND REACTIVE STRENGTH INDEX MODIFIED DURING JUMPING

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INTRODUCTION

- Volleyball is characterized by repeated vertical jumps and rapid changes in direction (Gross & Liu, 2008) but the incidence of ankle injury in the sport is high (Fong et al., 2007).
- Ankle bracing has been shown to be an effective means of preventing ankle injuries (Verhagen et al., 2000). Volleyball players will wear braces either unilaterally or bilaterally, however, the current research has not considered the comparison of unilateral and bilateral bracing on the force-time characteristics seen during jumping.
- During the countermovement jump, eccentric rate of force production (RFD_{ECC}) can be considered a determinant of jump performance (Laffaye & Wagner, 2013).
- The Reactive Strength Index Modified (RSI_{MOD}) assesses the ability to generate maximal vertical impulse in a minimal amount of time during jumping and represents the level of "explosiveness" of an athlete (Kipp et al., 2016).
- PURPOSE: To examine the impact of wearing ankle braces both unilaterally and bilaterally on RFD_{ECC} and RSI_{MOD} during the countermovement jump in volleyball players.

METHODS

- Twenty university volleyball players were recruited, both males (n = 13) and females (n = 7) (males: age = 21.5 ± 2.2 years; mass = 77.5 ± 7.0 kg; height = 183.9 ± 5.8 cm; females: age = 19.9 ± 1.2 years; mass = 65.1 ± 7.0 kg; height = 174.9 ± 5.6 cm).
- After completing a standardized warm-up, participants performed three maximal effort vertical jump trials on an AMTI force platform while wearing an ASO ankle brace under the following conditions: unilaterally on the dominant ankle, bilaterally, or with no ankle brace worn.

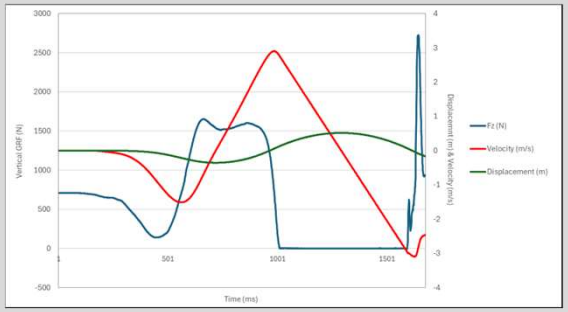
- The three test conditions were performed in random order across participants, and the data for the three jumps were averaged to determine a mean value for each participant under each condition which was included in the analysis.

- RFD_{ECC} ($N \cdot s^{-1}$) was calculated as the average slope during the braking phase on the force-time curve.
- RSI_{MOD} was calculated as jump height (m) determined from the ground reaction force data divided by the time from movement initiation to take-off.
- A one-way repeated measures ANOVA was used to examine the differences among the three bracing conditions for each dependent variable, with Bonferroni post-hoc analysis performed for pairwise comparisons. All analyses were performed with an alpha level set a priori at $p \leq 0.05$.

RESULTS AND DISCUSSION

- The mean ± SD RFD_{ECC} across the three bracing conditions were: unilateral = 4546 ± 1469 $N \cdot s^{-1}$; bilateral = 4621 ± 1879 $N \cdot s^{-1}$; no bracing = 4494 ± 1691 $N \cdot s^{-1}$.
- The mean ± SD RSI_{MOD} were: unilateral = 0.44 ± 0.14; bilateral = 0.45 ± 0.15; no bracing = 0.46 ± 0.15.
- No significant differences were found in RFD_{ECC} ($p > 0.05$) or in RSI_{MOD} ($p > 0.05$) across the three bracing conditions.

Figure 1. Vertical GRF (N), velocity (m/s), and displacement (m) during the countermovement jump.



- Previous research examining the effects of ankle bracing on vertical jump height has been inconclusive, with some studies reporting decreases in jump height while wearing the ASO brace (Henderson et al., 2019) and others reporting no differences (Morikawa et al., 2022; You et al., 2020).
- In the current study, a decreased jump height was seen for the no brace condition compared to the unilateral bracing and bilateral bracing ($p < 0.05$).
- Morikawa et al. (2022) examined RFD during a squat jump while bilaterally braced and also found no differences in jump height compared to a no brace condition.
- During the countermovement jump, high RSI_{MOD} scores are associated with higher force, power, impulse, and velocity which are seen during both the eccentric and concentric phases (McMahon et al., 2017).

PRACTICAL APPLICATIONS

- The results suggest that wearing ankle braces, whether unilaterally or bilaterally, has no impact on RFD_{ECC} and RSI_{MOD} during the countermovement jump.
- Ankle braces reduce the motion at the ankle in the frontal and sagittal planes to minimize the risk of ankle injury, most notably lateral ankle sprains (DiStefano et al., 2008). Despite this functional design characteristic, the results of this study suggest that neither unilateral nor bilateral ankle bracing will affect the rate of force production or level of explosiveness seen during jumping.
- This information can help athletes, coaches, and training staff to better understand the impact of wearing ankle braces to minimize the occurrence or recurrence of ankle injury on athlete performance.

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