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Purpose

- To examine trial-to-trial consistency of a novel upper body reactive strength index (UB-RSI)

Methods

- Subjects: 11 males (age: 23.7 ± 2.5 years, mass: 91.0 ± 9.4 kg, height: 1.83 ± 0.05 m) and 8 females (age: 22.5 ± 1.2 years, mass: 71.7 ± 14.4 kg, height: 1.65 ± 0.10 m)
- Subjects completed 5 plyometric pushups on a force plate that recorded ground reaction force data at 600 Hz (45 second rest period between trials)
- For each trial, subjects started in a pushup position with hands shoulder-width apart, then performed an upper body countermovement to their preferred depth and executed a pushup so that their hands left the force plate surface (Figure 1)
- The UB-RSI metric was generated for each trial by dividing pushup height (based on flight time) by the time-to-takeoff, which is the time from initiation of the countermovement until takeoff (UB-RSI = pushup height [cm] / time-to-takeoff [s]) (Figure 2)
- To examine trial-to-trial consistency of the UB-RSI an intraclass correlation coefficient was calculated (ICC [2,1]), along with its 95% confidence interval (95% CI)
- The following guidelines were used to interpret the ICC value: <0.50 = poor consistency, $0.50-0.75$ = moderate consistency, $0.75-0.90$ = good consistency, >0.90 = excellent consistency
- An independent t-test was also conducted to compare the UB-RSI values between males and females (alpha level = 0.05)



Figure 1. Example of subject performing plyometric pushup

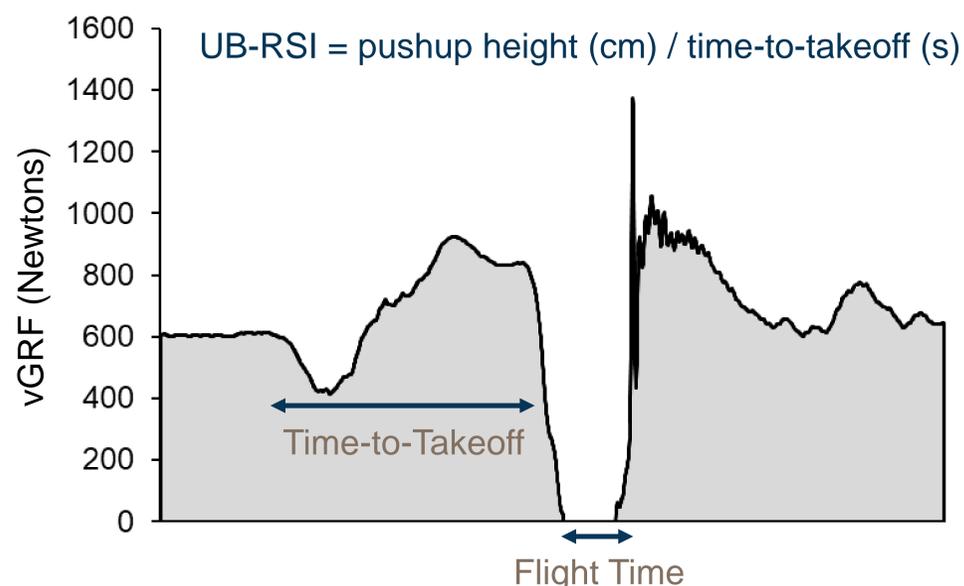


Figure 2. Example vertical ground reaction force (vGRF) time series during performance of a plyometric pushup

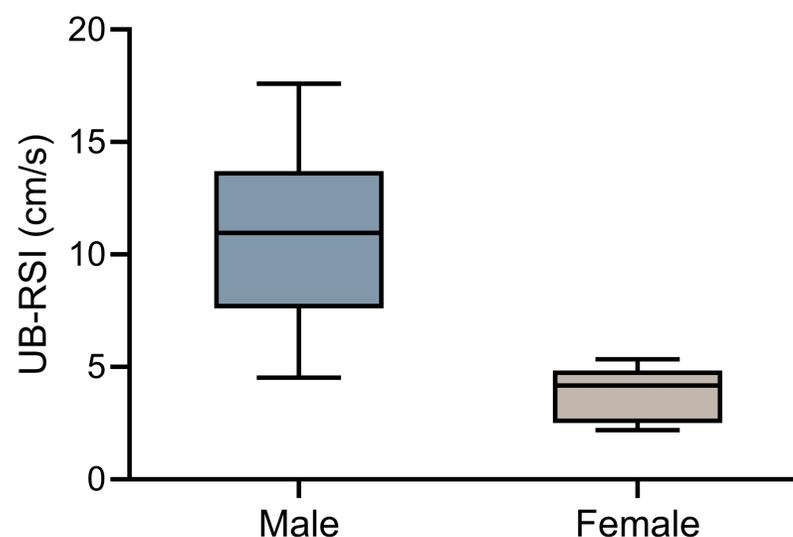


Figure 3. Box plots - UB-RSI metric for males and females

Results

- The ICC value for the UB-RSI was 0.94 (CI 95% = [0.89, 0.97]), which reflects excellent trial-to-trial consistency
- Males produced higher UB-RSI values compared to females ($p < 0.001$; 10.4 ± 4.1 cm/s vs. 3.8 ± 1.2 cm/s), indicating that males had greater upper body reactive strength (Figure 3)

Conclusions

- The UB-RSI exhibited excellent trial-to-trial consistency and detected sex differences in upper body reactive strength

Practical Applications

- The modified reactive strength index (mRSI), which is calculated by dividing jump height by the time from countermovement initiation until takeoff, is commonly used to assess lower body reactive strength during a countermovement jump
- The UB-RSI is an analogous metric to assess upper body reactive strength
- The UB-RSI could be used to assess upper body reactive strength among athletes who participate in sports that require “explosive” upper body movements, such as football linemen who need to hand strike opponents
- It could also be a useful metric for monitoring upper body reactive strength for athletes recovering from upper body injury

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