

NEUROMUSCULAR FATIGUE AND SELF-REPORTED WELLNESS MEASURES IN COLLEGIATE BASEBALL ATHLETES

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INTRODUCTION

- Neuromuscular coordination and activation are essential to baseball pitchers. Evidence supports the use of discrete characteristics of the countermovement jump (CMJ) to monitor neuromuscular performance.
- Changes in CMJ metrics and self-reported wellness measures (SRWM) during a training block and the relationship between them have not been examined in baseball pitchers.
- PURPOSE:** Investigate CMJ performance and SRWM during off-season training in collegiate baseball pitchers.

METHODS

- National Collegiate Athletic Association Division I baseball pitchers (n=13, age: 20.5 ± 1.5 years, body mass: 87.6 ± 6.8 kg, height: 184.9 ± 5.9 cm, body fat percentage: 18.2 ± 1.6%) participated.
- Six CMJ testing sessions were conducted at the same time of day over a three-week off-season period. Athletes performed the same standardized dynamic warm-up and completed SRWM of perceived recovery status (PRSS) and overall fatigue status (OFS) prior to CMJ testing.
- SRWM, completed before CMJ, consisted of PRSS (0-10, Exhausted to Energetic) and OFS (0-10, No Fatigue to Maximal Fatigue)
- During CMJ testing five maximal trials were performed on bilateral force plates.
- Metrics included: JH (jump height, cm), JH relative to body mass (JHBM, cm/kg), RSI_{mod} (reactive strength index modified, AU), braking mean force relative to body mass (BMF, N/kg), and propulsive mean force relative to body mass (PMF, N/kg).
- Repeated measures analysis of variance (RMANOVA) 1 (jump metric) x 6 (testing session) were used to evaluate changes over time (p<0.05). Pearson correlation coefficients examined strength of relationship between PRSS and OFS (p<0.05).

KEY FINDING

Despite increasing states of fatigue and decreased perception of recovery status, neuromuscular performance remained unchanged.

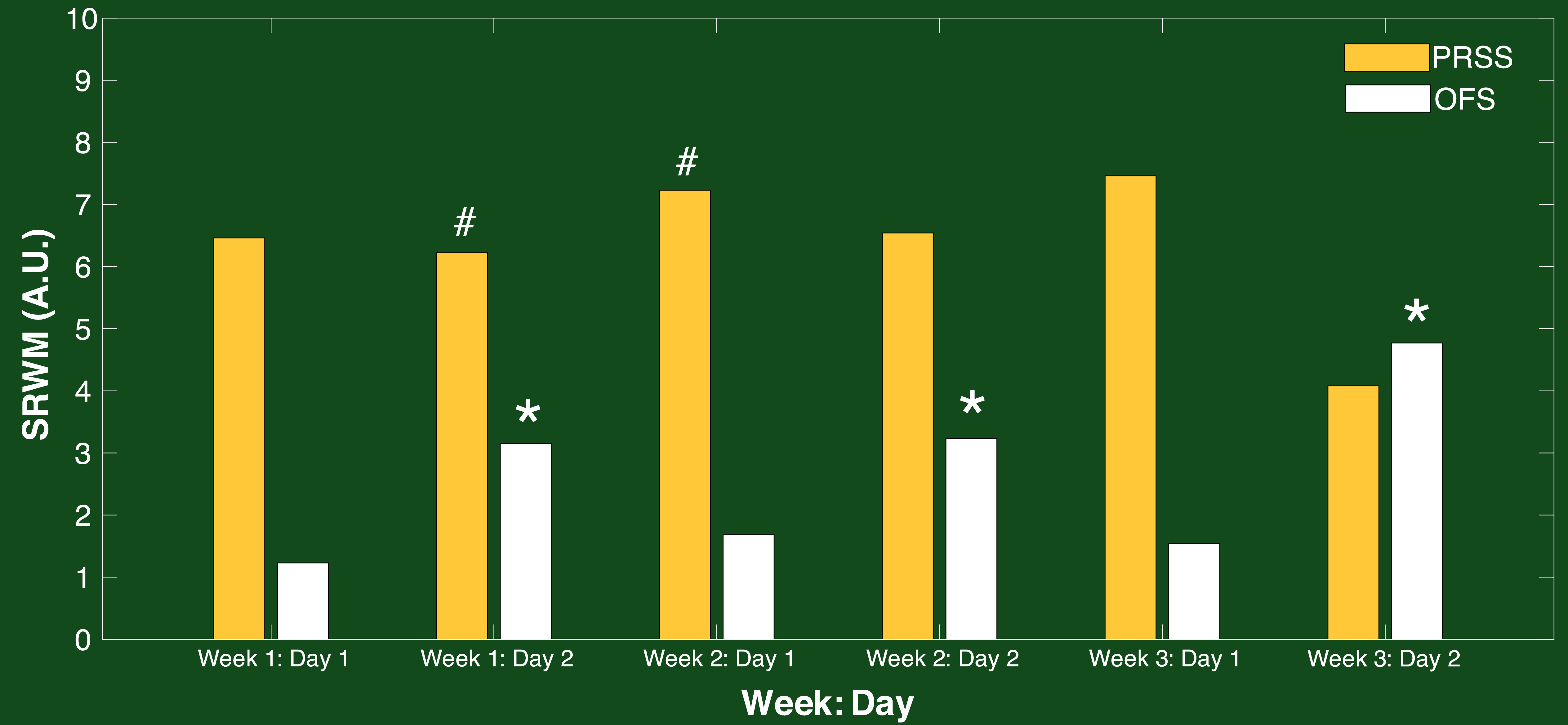
Table 1. Countermovement Jump Performance Testing Metrics

CMJ Metrics	Week 1: Day 1	Week 1: Day 2	Week 2: Day 1	Week 2: Day 2	Week 3 Day 1	Week 13 Day 2
JH (cm)	41.27±3.93	40.74±4.23	41.67±4.97	41.03±4.20	41.09±4.33	40.83±4.28
JH _{BM} (cm/kg)	0.47±0.06	0.46±0.05	0.48±0.07	0.47±0.06	0.46±0.07	0.47±0.06
RSI _{mod} (AU)	0.49±0.13	0.57±0.09	0.49±0.18	0.58±0.15	0.55±0.09	0.54±0.13
BMF (N/kg)	25.22±3.42	26.03±2.96	25.90±2.85	26.52±3.51	25.87±2.89	24.53±2.95
PMF (N/kg)	21.76±1.31	21.61±1.47	21.41±1.72	22.03±1.43	21.55±1.76	21.07±1.40

Values represented as mean ± standard deviation (n=13)

CMJ: Countermovement Jump; W#_D#: Week and Day; JH (cm): jump height; JHBM (cm/kg): JH relative to body mass; RSI_{mod} (AU): reactive strength index modified; BMF (N/kg): braking mean force relative to body mass; PMF (N/kg): propulsive mean force relative to body mass

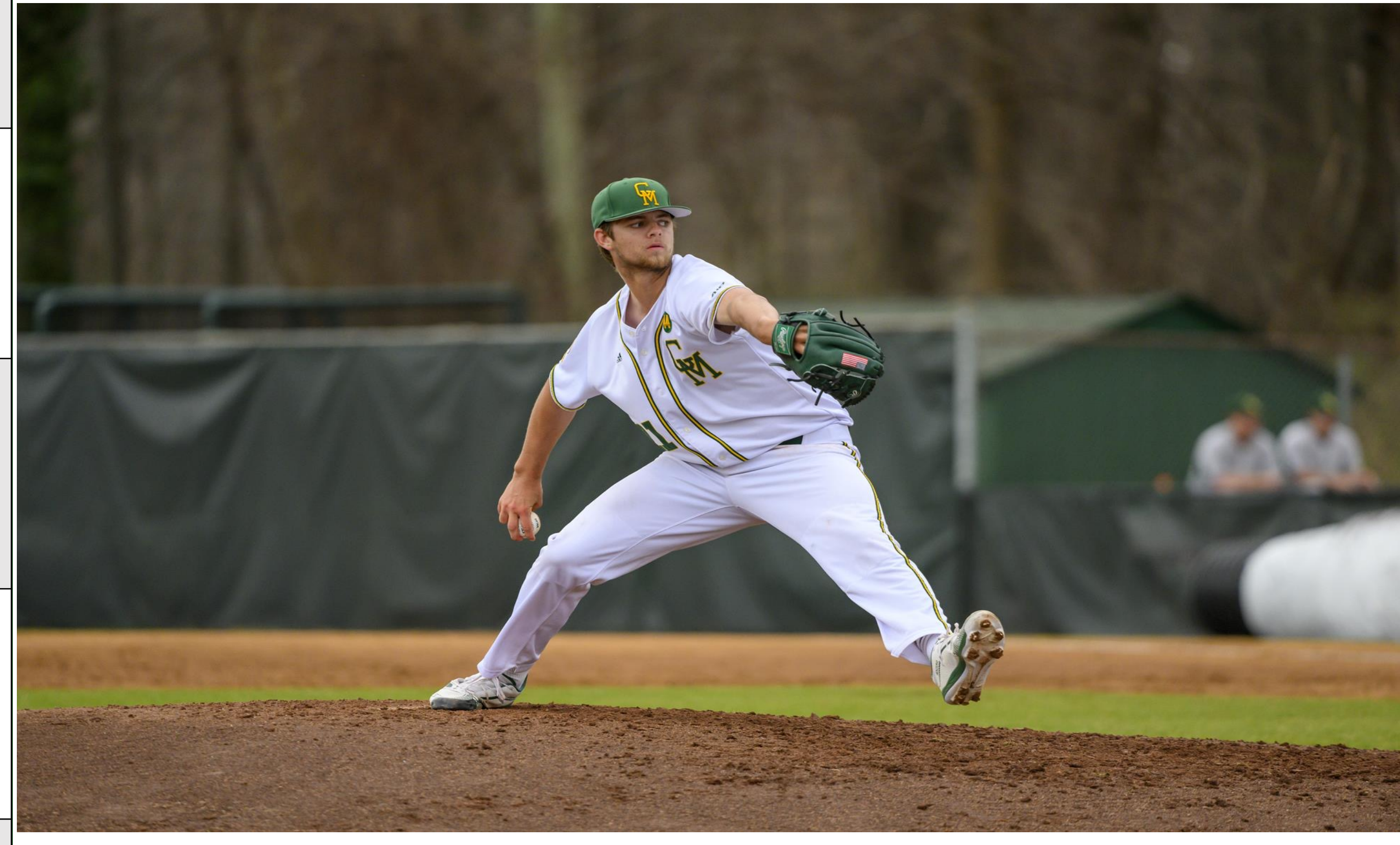
Figure 1. Self-Reported Wellness Measures for Recovery and Fatigue



W#_D#: Week and Day; SRWM: Self-Reported Wellness Measures, PRSS: Perceived Recovery Status, OFS: Overall Fatigue Status
 p<0.05, # Indicates significant difference compared to W3_D2 PRSS
 p<0.05, * Indicates significant difference compared to W1_D1 OFS

RESULTS

- Athlete CMJ performance are included in Table 1 (Mean ± SD) . (Table 1)
- JH, JHBM, RSI_{mod}, BMF, and PMF did not change across testing sessions.
- A significant main effect (p<0.001) existed for PRSS and OFS. (Figure 1)
- Post-hoc analysis showed higher PRSS for the 2nd and 3rd testing sessions compared to the 6th session. Additionally, athletes reported significantly higher OFS values during the 2nd, 4th, and 6th sessions compared to the 1st session (Figure 1)
- A strong negative correlation existed between PRSS and OFS (r = -0.69; p<0.001).



CONCLUSIONS & PRACTICAL APPLICATIONS

- Although CMJ performance may not change during biweekly CMJ testing, negative perception of fatigue and recovery may occur.
- Longer monitoring periods are warranted to examine if negative trends in SRWM precede subject declines in neuromuscular performance.
- Strength and conditioning professionals are recommended to incorporate wellness measures to optimize pitcher performance and mitigate the risk of overtraining.

