Associations of Neuromechanical and Behavioral Factors with Musculoskeletal Injury History

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RESULTS

- 12.3% (2504) of participants reported having sustained a Core/LE sprain or strain
  - Cross-turbation and logistic regression analyses identified a 5-factor model (Table 1)
    - ≥ 2 of 5 factors: OR=16.60 (CLE95 2.56); Sensitivity=54%; Specificity=94%; Relative Risk=6.96
    - ≥ 3 of 5 factors: OR=17.02 (CLE95 2.08); Sensitivity=57%; Specificity=90%; Relative Risk=7.84
  - Distributions of values for PSI, PSQI, and Reactive Outer/Inner Hit Ratio presented in Figures 4-6
- 10% (13/126) of females who participated in high school sports reported having sustained Core/LE sprain or strain
  - Cross-turbation and logistic regression analyses identified a 4-factor model (Table 2)
    - ≥ 3 of 4 factors: OR=17.01 (CLE95 2.56); Sensitivity=63%; Specificity=81%; Risk Ratio=5.31
    - All 4 factors: OR=17.03 (CLE95 2.56); Sensitivity=63%; Specificity=100%; Risk Ratio=17.14
- Table 3 presents a 2-factor model showing associations between sleep quality and psycho-emotional factors
  - 1) Reactive: targets illuminate for 1 s with simultaneous verbal recitation of text scrolling across LED screen
  - 2) Proactive: targets remain illuminated until hit
- 1.6 million to 3.8 million sport-related traumatic brain injuries occur each year in the United States
- Concussion has been defined as a complex pathophysiological process affecting the brain
- Reaction time (RT) appears to be a critical component of athletic performance and may relate to injury risk

CLINICAL RELEVANCE

- Strong associations with recent time-loss Core/LE injury documented for variables measured by screening tests
- Stratified analysis limited to female participants who were high school athletes identified a different set of variables
- Both analyses suggest that perception-action may be an important indicator of injury effect and/or predisposition
- Self-reported persisting effects of recent injury (SFI) and sleep quality (PSQI) may relate to injury risk status

REFERENCES


PARTICIPANT AND PROCEDURES

- 204 participants recruited from college population
  - Females: (n=126) 21.23 ±2.99 years, 166.08 ±6.97 cm; 65.71 ±12.21 kg
  - Males: (n=78) 22.60 ±3.57 years, 178.60 ±7.92 cm; 80.44 ±14.86 kg
- Well-validated survey instruments used to evaluate sleep quality, depression, anxiety, and stress
- Pittsburgh Sleep Quality Index (PSQI) and Depression, Anxiety, and Stress Scale (DASS)
- Sports Fitness Index (SFI) used to quantify persisting effects of injuries sustained over last several years
- Includes inventory of self-reported time-loss injuries sustained during the previous 12-month period
  - Injury defined as a core or lower extremity (Core/LE) sprain or strain
- Visuomotor performance assessed by Dynavision D2(TM) system (Dynavision International, West Chester, OH)
- One 30-s practice trial preceded a single 60-s test trial for two test modes:
  - 1) Proactive: targets remain illuminated until hit
  - 2) Reactive: targets illuminate for 1 s with simultaneous verbal recitation of text scrolling across LED screen
- Unilateral Reactive Hop (URH) RT measured with FITLight Trainer(TM) system (FITLight Corp; Aurora, Ontario)
  - Correct hopping direction determined by specified color pattern displayed by an array of lights (Figure 2)
  - One practice trial and one test trial for both right and left extremities, each consisting of 6 hops
- Analyses performed to assess associations between screening measures and injury history
- Receiver-operating characteristic (ROC) analyses identified cut points for binary classifications of injury status
- Cross-turbation analyses used to assess univariable associations
- Logistic regression analyses used to identify the strongest multivariable set of predictor variables
- Secondary analyses focused on associations between sleep quality and measures of psycho-emotional status