Visuomotor Training for Injury Risk Reduction among College Football Players
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BACKGROUND AND PURPOSE
A total of 18 injuries were sustained by 17 of the 49 players (1 player sustained 2 injuries; Tables 1-4)

• Football players sustain ~ 1.2 million injuries per year, most of which are musculoskeletal sprains and strains

• Visuomotor reaction time (VMRT) is an important component of neuromuscular responsiveness and injury risk

• Slow VMRT has predicted musculoskeletal sprains and strains sustained by college football players

• VMRT training has been reported to reduce risk for concussion occurrence among college football players

• Imposition of a postural stability challenge during VMRT testing may have value for injury risk assessment

• Recent reports have documented that concussion history is also a risk factor for sustaining any type of injury

The purpose of this study was to assess the possible benefits of a pre-season training program that presented various types of visuomotor and postural balance challenges.

PARTICIPANT CHARACTERISTICS AND PROCEDURES
49 NCAA Division I Football Championship Subdivision players assessed prior to first pre-season practice session

• No VMRT Training (n=36): 19.9 ± 1.1 years; 101.33 ± 21.18 kg; 185.14 ± 5.62 cm

• VMRT Training (n=13): 20.1 ± 1.4 years; 105.84 ± 19.57 kg; 188.16 ± 4.69 cm

• Dynavision D2™ system (Dynavision International, West Chester, OH) used for 60-s testing/training trials

• Test 1: Proactive mode – target button illuminated until hit, followed by illumination of next target button

• Test 2: Reactive mode –½ ms hit to target button while reading scrolling text on LCD screen

• Test 3: Reactive mode – simultaneous maintenance of bilateral postural balance on ‘BOSU’ device

• VMRT training participants completed a total of 9 training sessions over a 3-week period

• Week 1: 3 Proactive mode training sessions (two 60-s trials per session)

• Week 2: 3 Reactive mode training sessions (two 60-s trials per session)

• Week 3: 3 Reactive mode – BOSU training sessions (two 60-s trials per session)

• Post-training VMRT testing/training trials completed at end of 3-week training period using same procedures

• Electronic documentation system used for injury surveillance throughout pre-season practices and 12 games

• Injury defined as any sprain, strain, or concussion requiring evaluation and treatment (arthroscopy excluded)

• Proactive performance represented by average response time (ms) and Reactive performance by total hits

• Analyses also performed to assess performance changes for each of 5 target button concentric rings

• Average elapsed time (ms) potentially confounded by failure to hit outer ring buttons in Reactive mode

• Number of hits for 60-s test mode was used as an indicator of Reactive mode performance capability compared to VMRT

• Data analysis procedures:

• Cross-tabulation analysis performed to assess association between risk classification and injury occurrence

• Receiver operating characteristic analysis used to establish cut-points for VMRT performance values

• Paired t-tests used to analyze differences between pre- and post-training performance values

RESULTS
• A total of 18 injuries were sustained by 17 of the 49 players (1 player sustained 2 injuries; Tables 1-4)

• No difference in injury incidence between players who were starters (41%) and those who were non-starters (42%)

• 2.7X more injuries sustained by untrained players (42%) compared to players who completed VMRT training (15%)

• Significant performance improvements evident for both Proactive mode VMRT and Reactive mode hits (Tables 5 & 6)

• Reactive mode R 4.38 ± 3.38 6.38 ± 3.89 .115

• Proactive mode R 8.08 ± 2.47 8.38 ± 3.18 .122

• Baseline values for untrained players combined with post-training values for trained players used for analysis

• ± 5 hits: X2(1)=29.24; p=.001; Sensitivity = 53%; Specificity = 63%; OR=4.80 (90% CI: 1.03, 20.82)

• ≤ 11 hits: X2(1)=3.60; p=.059; Sensitivity = 88%; Specificity = 63%; OR=4.60 (90% CI: 1.13, 17.82)

• Reactive-BOSU performance improved by training, but association with injury weaker than standing on firm surface

• Baseline hits for players who did not perform VMRT training: Mean = 35.5 (Range 11-41); Mean = 36.67 ±11.50

• Pre-training hits for players who completed VMRT training: Mean = 41 (Range 21-67); Mean = 41.85 ±11.58

• Post-training hits for players who completed VMRT training: Mean = 53 (Range 37-75); Mean = 54.92 ±12.15

• Recent reports have documented that concussion history is also a risk factor for sustaining any type of injury

• Previous reports have associated Proactive mode VMRT ≤ 85 hits (2.705 ms) with injury in college football (OR=2.36)

• 94% of our untrained players (34/36) had ≤ 85 hits at baseline testing and 41% (14/34) sustained injury

• All 4 concussions were sustained by players who did not complete the VMRT training

• 89% of our trained players (11/13) had ≤ 85 hits at baseline testing and 54% (7/13) had ≤ 85 hits after training

• Only 17% of our trained players (1/6) who had > 85 hits were injured

• Reactive VMRT training improved performance and appeared to lower injury incidence, which may be explained by improved/ peripheral perception of environmental stimuli at a viewing angle of approximately 45 degrees (Figure 5)

• More research is needed to refine VMRT training methods, for integration of central-peripheral visual input and to better understand the potential value of a simultaneous postural balance challenge for injury risk reduction

REFERENCES


