Potential for Improvement of Visuomotor Reaction Time among Collegiate Athletes
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BACKGROUND AND PURPOSE

• Over 2 million injuries occur in NCAA sports each year1
• Reaction Time (RT) appears to be an important component of neuromuscular control and injury susceptibility
• Slow RT has been associated with non-contact ACL injuries1 and core and lower extremity sprains and strains2
• There is a lack of research evidence to support the effectiveness of visuomotor training for improvement of RT
• The purpose of this study was to evaluate the extent to which a visuomotor training program could improve the RT of collegiate football players using the Dynavision D2 system

PARTICIPANT CHARACTERISTICS AND PROCEDURES

• 62 NCAA Division I-FCS football athletes: Age 20.6 ±1.2 years, Mass 104.1 ±19.4 kg, Height 186.7 ±5.3 cm
• Visuomotor training conducted using Dynavision D2 system (Dynavision International, West Chester, OH)
  - Board height adjusted to position tachistoscope (T-scope) at eye level (Figures 1 and 2)
  - Participant instructed to maintain visual focus on T-scope and to hit targets when illuminated
  - Assessment and training trials conducted at differing levels of task complexity
  - Level 1 (Proactive) – Targets illuminated (red) until hit; T-scope inactive
  - Level 2 (Reactive) – Targets illuminated (green or red) for 750 ms; T-scope inactive; goal to hit green only
  - Level 3 (Reactive) – Targets illuminated (red) for 750 ms; recitation of 5-digit numbers displayed on T-scope
  - Level 4 (Proactive) – Targets illuminated (red) until hit; verbal response to simple T-scope arithmetic problems
  - Level 5 (Proactive) – Targets illuminated (red) until hit; recitation of sentences displayed on T-scope
• Both pretest (baseline) and posttest (after training) assessments performed at Level 1; 60-s trial
• Group assignment based on pretest Level 1 performance; median RT=680 ms
  - Upper 50% (>680 ms) assigned to control condition; Lower 50% (<680 ms) selected for training program
  - Training sessions performed for 120 s: 1-4 at Level 2, 5-8 at Level 3, 9-12 at Level 4, and 13-16 at Level 5
  - Training program compliance: 73% of participants attended all 16 sessions
  - Participants who failed to attend 50% of training sessions (n=10) reassigned as control group cases
• Both pretest (baseline) and posttest (after training) assessments performed at Level 1; 60-s trial

RESULTS

• Distributions of Pretest and Posttest RT values for training program participants (n=15) displayed in Figures 3 and 4
• Means and standard deviations for Pretest and Posttest RT presented in Table 1 (original group assignments)
  - A statistically significant group x trial interaction effect was evident (F1,50=66.5; p<.001; η2=.57)
• Time series graph for training program participants who completed every session (n=11) presented in Figure 6
  - As participants progressed through each level, variation in RT values attributable to changes in task complexity
  - Pretest RT=773 ±81 ms – Posttest RT=548 ±45 ms (reassignment of non-compliant players to control group)
• Pretest – Posttest comparison: Training group n=15; Control group n=37
  - Repeated measures analysis of variance used to evaluate statistical significance of group x trial interaction (p<.05)

CLINICAL RELEVANCE

• A recent unpublished analysis demonstrated an association between RT and injury among college football players
  - Dynavision D2 Level 1 RT ≥765 ms associated with 2.5 greater odds for core/lower extremity sprains/strains
  - 36% sensitivity and 76% specificity for identification of injuries among 76 NCAA Division I-FCS football players
• Average RT improvement for participants who completed 8 or more of the 16 training sessions was 39%
  - All training program participants’ RT Pretest values were >765 ms and all RT Posttest values were <765 ms
• Further research is needed to assess the extent to which training-induced improvement in RT is retained
  - Optimal mode, duration, and frequency of training sessions for maintenance of improved RT is unknown

REFERENCES


Table 1

<table>
<thead>
<tr>
<th>Participants</th>
<th>Pretest RT Mean ±SD</th>
<th>Posttest RT Mean ±SD</th>
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</thead>
<tbody>
<tr>
<td>Untrained (n=37)</td>
<td>684 ±64 ms</td>
<td>692 ±103 ms</td>
</tr>
<tr>
<td>Trained (n=15)</td>
<td>791 ±67 ms</td>
<td>571 ±63 ms</td>
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</tbody>
</table>

Figure 1 Figure 2

Figure 3 Figure 4

Figure 5 Figure 6