Summary

I. Training Perceptual-Cognitive Skills with NeuroTracker (NT)

II. Scientific Evidence supporting NT

III. Towards New Perspectives: Combined Training (dual NT task)
Perceptual-Cognitive Capacity
NeuroTracker

Presentation
Indexation
Movement
Identification
Feedback

Complex Motion Integration
Distributed Attention
Working Memory
Fluid, rapid processing
# Evidence in Human Performance

<table>
<thead>
<tr>
<th>Population</th>
<th>Finding</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pro &amp; Semi-pro Athletes, Non-Athletes</td>
<td>Sensitivity to sport expertise (processing and learning)</td>
<td>Faubert, 2013</td>
</tr>
<tr>
<td>Pro Basketball Players</td>
<td>Positive correlation with on-field sport performance (≈78%)</td>
<td>Mangine et al., 2014</td>
</tr>
<tr>
<td>Surgeons</td>
<td>Time completion (29%) &amp; efficacy (28%) of surgery</td>
<td>Harenberg et al., 2016</td>
</tr>
<tr>
<td>Young Adults (Non-Athletes)</td>
<td>↑ brain executive functions (qEEG) Transfer on Attention</td>
<td>Parsons et al., 2014</td>
</tr>
<tr>
<td>Military</td>
<td>Transfer on working memory</td>
<td>Vartanian et al., 2016</td>
</tr>
<tr>
<td>Older Adults (Non-Athletes)</td>
<td>Transfer on biological motion perception</td>
<td>Legault &amp; Faubert, 2012</td>
</tr>
<tr>
<td>University Soccer Players</td>
<td>Transfer on passing decision-making</td>
<td>Romeas et al., 2016</td>
</tr>
</tbody>
</table>
Transfer to On-Field Performance

Table 1
Players' information (±SEM).

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>Mean age (years)</th>
<th>Started to play soccer (age in years)</th>
<th>Playing soccer in a club (duration in years)</th>
<th>Hours of training by week (game-free)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3D-MOT</td>
<td>9</td>
<td>21.27 ± 0.81</td>
<td>6.56 ± 0.59</td>
<td>12.78 ± 1.63</td>
<td>8.67 ± 1.32</td>
</tr>
<tr>
<td>Active control</td>
<td>7</td>
<td>21.39 ± 1.03</td>
<td>6.00 ± 1.31</td>
<td>12.86 ± 1.79</td>
<td>11.14 ± 2.97</td>
</tr>
<tr>
<td>Passive control</td>
<td>7</td>
<td>22.48 ± 0.71</td>
<td>8.17 ± 2.12</td>
<td>11 ± 2.38</td>
<td>8.33 ± 1.09</td>
</tr>
<tr>
<td>All of the participants</td>
<td>23</td>
<td>21.67 ± 0.46</td>
<td>6.82 ± 0.71</td>
<td>12.32 ± 1.01</td>
<td>9.36 ± 1.04</td>
</tr>
</tbody>
</table>

Pre
Small Sided Games

Training
Groups:
- **NeuroTracker x10**
- **Active Ctrl x10**
- **Passive Ctrl**

Post
Small Sided Games

Romeas et al. 2016
Transfer to On-Field Performance

* F(1, 17) = 4.708, p = 0.044, η² = 0.162

* t[6] = 3.547, p = 0.012
NeuroTracker x Tactical Awareness
Preliminary Results

The graphs show the speed thresholds over sessions for different groups of athletes and non-athletes. The x-axis represents the number of sessions, ranging from 0 to 30. The y-axis represents the normalized speed thresholds, ranging from 0.00 to 3.00 for the left graph, and from 0.00 to 1.40 for the right graph.

- **Athletes NT (n=17)**: Red dots on the left graph, solid red line on the right graph.
- **Athletes NTTA (n=16)**: Black dots with error bars on the left graph, black line with error bars on the right graph.
- **Non-Athletes NT (n=7)**: Red square markers with error bars on the left graph, solid red line with error bars on the right graph.
- **Non-Athletes NTTA (n=7)**: Black square markers with error bars on the left graph, dotted black line with error bars on the right graph.
Acknowledgments
Thank You for your Attention

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References

- Faubert, J. (2013). Professional athletes have extraordinary skills for rapidly learning complex and neutral dynamic visual scenes. Sc reports
Elites vs Novices

Soccer players (n=9)

Novices (n=12)
# Decision-Making Coding

<table>
<thead>
<tr>
<th>Decision criterion</th>
<th>1 point decision</th>
<th>0 point decision</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Passing</strong></td>
<td>The player made a good decision when the pass went to a teammate who was open and it:</td>
<td>The player made a poor decision when the pass was:</td>
</tr>
<tr>
<td></td>
<td>- directly or indirectly created a shot attempt, or</td>
<td>- made to a player who was closely guarded or when there was a defensive player positioned in the passing line, or</td>
</tr>
<tr>
<td></td>
<td>- went to a teammate who was in a better position than the passer.</td>
<td>- intercepted or turned over, or</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- made to an area of the field where no teammate was positioned, or</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- kicked out of the field of play.</td>
</tr>
<tr>
<td><strong>Dribbling</strong></td>
<td>The player made a good decision to dribble when dribbling if it created:</td>
<td>The player made a poor decision to dribble when he dribbled:</td>
</tr>
<tr>
<td></td>
<td>- space for teammates, or</td>
<td>- when the defenders were in good defensive position, or</td>
</tr>
<tr>
<td></td>
<td>- a scoring opportunity, or</td>
<td>- into a supporting defender that was in good position, and this did not create space for the dribbler or teammates, or</td>
</tr>
<tr>
<td></td>
<td>- space for the dribbler.</td>
<td>- out of the field of play, or</td>
</tr>
<tr>
<td><strong>Shooting</strong></td>
<td>The player made a good decision to shoot when he was open for the shot and it was uncontested.</td>
<td>The player made a poor decision to shoot when the shot:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- was blocked, or</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- was taken off balance, or</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- was taken when one or more defensive players were in good position, or</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- was taken when it was contested.</td>
</tr>
</tbody>
</table>

Adapted from: French and Thomas (1987), Gabbett et al. (2008).
Subjective Assessment

Decision-Making Accuracy

Min

Max
Combined Training - BM

- Athletes BM (n=16)
- Athletes BM+NT (n=16)
- Novices BM (n=7)
- Novices BM+NT (n=7)

Accuracy (%) vs. Angles (°)
Perceptual-Cognitive Training

NeuroTracker

Faubert and Sidebottom 2012
Transfer to On-Field Performance

- Significant improvement in decision-making passing accuracy (15%) following the NeuroTracker training (‘far transfer’)
- Proportional quantitative increase in subjective decision-making accuracy
- Athletes’ NeuroTracker speed thresholds are superior to novices