**R2Play Development: Fostering User Driven Technology that Supports Return-to-Play Decision-Making Following Pediatric Concussion**

Danielle DuPlessis\(^{a,b}\), Emily Lam\(^{a,b}\), Fanny Hotze\(^{a}\), Ajmal Khan\(^{a}\), Stephanie McFarland\(^{b}\), Andrea Hickling\(^{c,d}\), Michael Hutchinson\(^{a,d,g}\), F. Virginia Wright\(^{a,b,d}\), Nick Reed\(^{a,b,d}\), Elaine Biddiss\(^{a,b,d}\), Shannon Scratch\(^{a,b,g}\)

\(^{a}\) Bloorview Research Institute, Holland Bloorview Kids Rehabilitation Hospital, Canada, \(^{b}\) Rehabilitation Sciences Institute, University of Toronto, Canada, \(^{c}\) Institute of Biomedical Engineering, University of Toronto, Canada, \(^{d}\) Department of Occupational Science and Occupational Therapy, University of Toronto, Canada, \(^{e}\) Faculty of Kinesiology and Physical Education, University of Toronto, Canada, \(^{f}\) Department of Pediatrics, University of Toronto, Canada.

**Objective**
- Post-concussion, return-to-play protocols rely on single-domain assessments and symptom self-reporting\(^{1}\).
- These methods may fail to detect changes elicited by the cognitive, physical, and emotional demands of sport\(^{2,3}\).
- To address this, R2Play was designed to facilitate the implementation of a multi-domain return-to-play assessment.

**Methods**
A design-thinking approach was used, in which we carried out:
1. Problem definition and early ideation via a scoping review and structured brainstorming.
2. Needs-assessment interviews with stakeholders (6 clinicians and 4 youth sports coaches).
3. Building a R2Play prototype and conducting usability testing via cognitive walkthroughs with 5 clinicians.

**The R2Play Prototype**
After problem definition and ideation, the prototype consisted of a tablet-button system that displays numbers and letters, and a clinician tablet that controls the assessment.

During the task, athletes run in a zig-zag pattern in an embodied Trail Making Task by pressing tablets in alphanumeric order.

**Insights from Needs-Assessment Interviews**
- Interviews were analyzed using a conventional content analysis.
- A change table was constructed, in which the themes from user feedback were mapped to potential changes to the prototype.

**Examples of Implemented Changes**

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessibility</td>
<td>Adapting R2Play for wheelchair users</td>
<td>Moved tablets onto elevated stands</td>
</tr>
<tr>
<td>Task</td>
<td>Navigating self in relation to moving/changing stimuli</td>
<td>Implemented a condition where nodes change places during the trial</td>
</tr>
<tr>
<td>Interface</td>
<td>Ability to display results and use them to communicate with athletes</td>
<td>A graphical summary of results was developed with young athletes in mind</td>
</tr>
</tbody>
</table>

**Usability Testing Results**
- The interface achieved a System Usability Scale score of 81% (SD=8.02), indicating “good” to “excellent” usability\(^{4}\).
- Participants seemed comfortable navigating the interface and found the “flow” easy to follow.

**Conclusion**
- R2Play aligns with best practice guidelines for return-to-play by simultaneously integrating multi-domain neuropsychological and physiological measures.
- With further testing and refinement, R2Play may provide clinicians with richer clinical data for making return-to-play decisions.

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