

R2Play is a return-to-play assessment designed with stakeholders to better reflect the multi-domain demands of sport.

Learn more about the *R2Play* assessment here:



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

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Objective

- Traditional return-to-play protocols after concussion rely on single-domain assessments (e.g., standing balance, running on a treadmill) and symptom self-reporting¹
- These methods may fail to detect changes elicited by the *combined* physical, cognitive, and emotional demands of sport^{2,3}
- To address this gap, we developed the *R2Play* system to facilitate a multi-domain return-to-play assessment

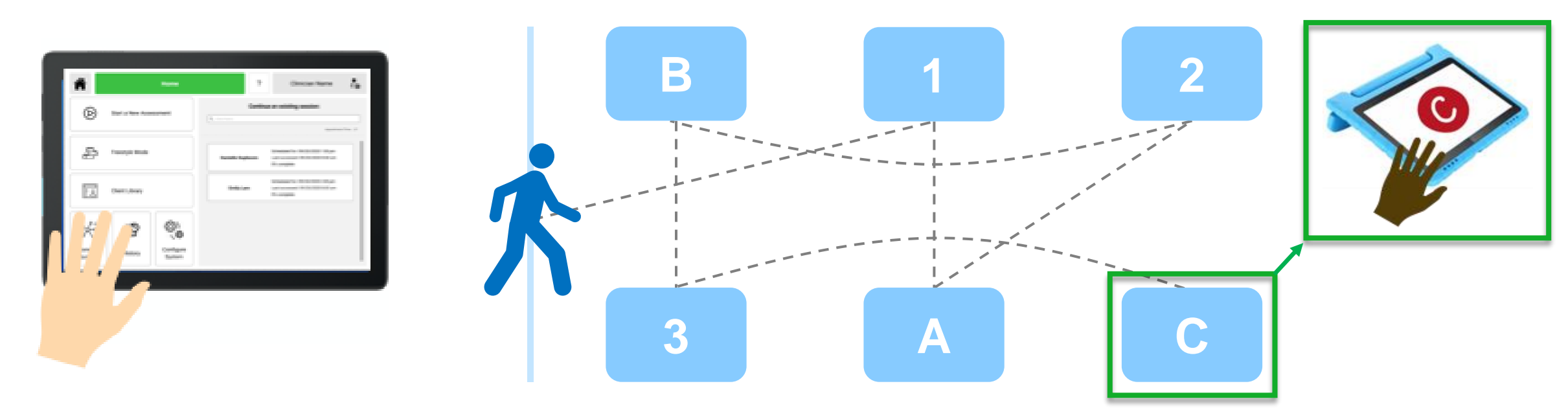
Methods

A design-thinking approach to development was used, involving:

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 prototype** of *R2Play* 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 conventional content analysis
- A change table was constructed, in which the themes from user feedback were mapped to potential changes to the *R2Play* prototype

Examples of Implemented Changes

Category	Description	Change
Accessibility	Adapting <i>R2Play</i> for wheelchair users	Moved tablets onto elevated stands
Task	Navigating self in relation to moving/changing stimuli	Implemented <i>scramble</i> condition in which nodes change places during the trail
Interface	Ability to display results and use them to communicate with athletes	A graphical summary of results was developed with young athletes in mind

Usability Testing Results

- The interface achieved a System Usability Scale score of 81% (SD=8.02), indicating “good” to “excellent” usability⁴
- Participants were comfortable navigating the interface and found the “flow” easy to follow

Conclusion

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

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2. Fino, P. C. *et al.* Detecting gait abnormalities after concussion or mild traumatic brain injury: A systematic review of single-task, dual-task, and complex gait. *Gait & Posture* **62**, 157–166 (2018).
3. Toong, T. *et al.* Sensitivity and Specificity of a Multimodal Approach for Concussion Assessment in Youth Athletes. *J Sport Rehabil* 1–10 (2021) doi:10.1123/jsr.2020-0279.
4. Sauro, J. & Lewis, J. R. *Quantifying the User Experience: Practical Statistics for User Research*. (Morgan Kaufmann, 2016).

