

Development and Validation of a mHealth Fall Management Program: A Multi-Stage Study

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Background

- Falls pose a significant health risk for individuals who use wheelchairs and scooters (WC/S) full-time, yet fall prevention programs for this population are scarce.¹
- The Individualized Reduction of FaLLs (iROLL) program addresses the needs of people who use WC/S.²
- The iROLL was initially implemented in-person for WC/S users with Multiple Sclerosis (MS).³
- Later, iROLL transitioned to an online platform (iROLL-O) and was further expanded to meet the needs of people with Spinal Cord Injury (SCI).⁴
- The iROLL-O pilot testing demonstrated significant reductions in fear of falling and improvements in fall management knowledge, with participants valuing peer learning.⁵
- Participants expressed a desire for more flexible access to educational content and ongoing engagement with the program.^{5,6}
- The interdisciplinary iROLL research team translated the program into a mobile platform (iROLL-O+) to address the desired needs of participants.⁶

Aim

- To inform the initial development & design of the iROLL-O+ mockup through a systematic literature review & focus groups with end-users.
- To determine the human factors, accessibility requirements, aesthetic preferences, perceived usefulness, and ease of use of the iROLL program delivered by the iROLLO+ mobile app.

Phase I: Initial Development and Design

Method

a. Systematic Literature Review:

- Review of studies published between 2010-2022 on mHealth apps for health behavior change in adults with disabilities using WC/S.⁷

b. Focus Groups with target population:

- Two focus group discussions with nine adults (mean age 63, 67% male) with SCI/MS who used WC/S full-time for ≥ 1 year, with ≥ 1 fall experience in the last three years
- Input on key design features for the iROLL O+ app.
- Thematic analysis by two independent researchers.⁶

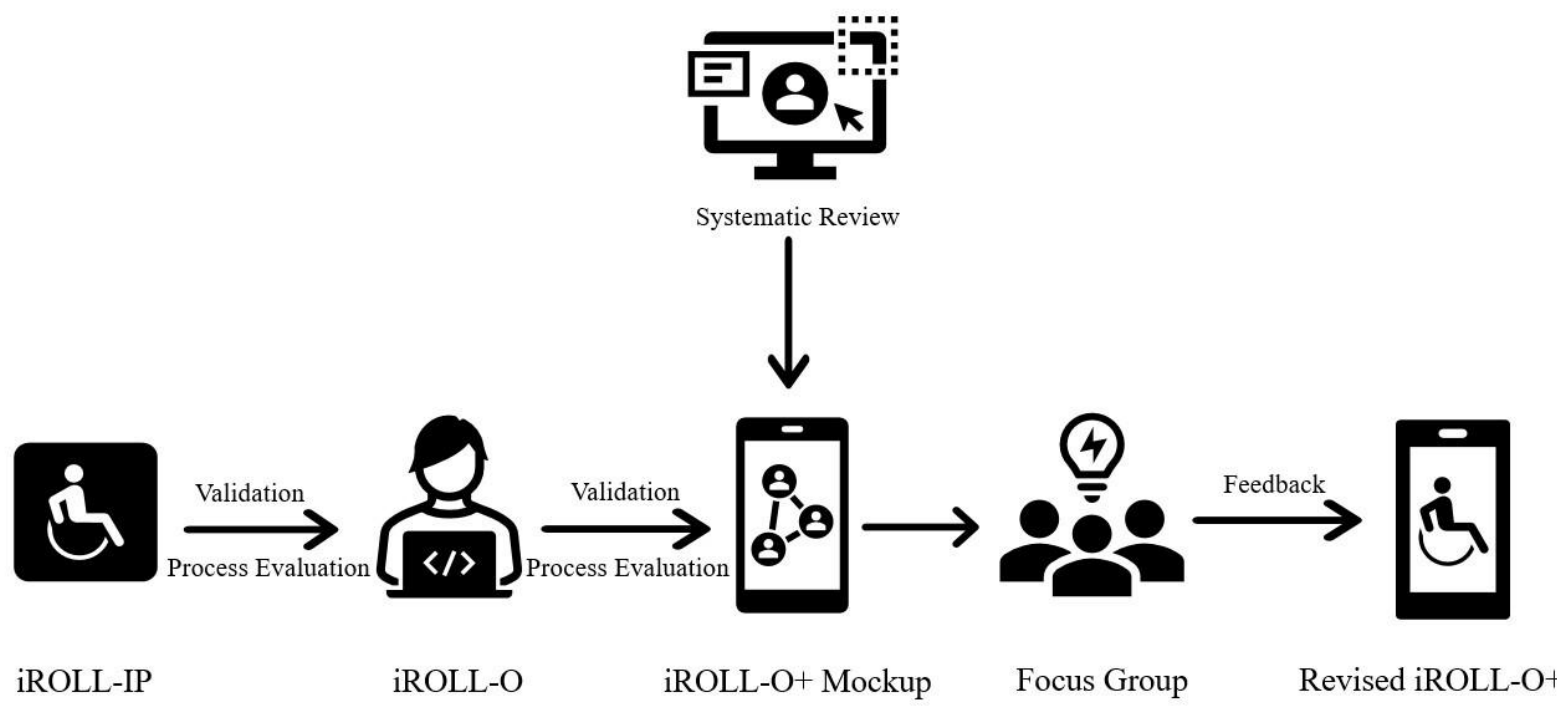


Figure 1. iROLL O+ app development process.

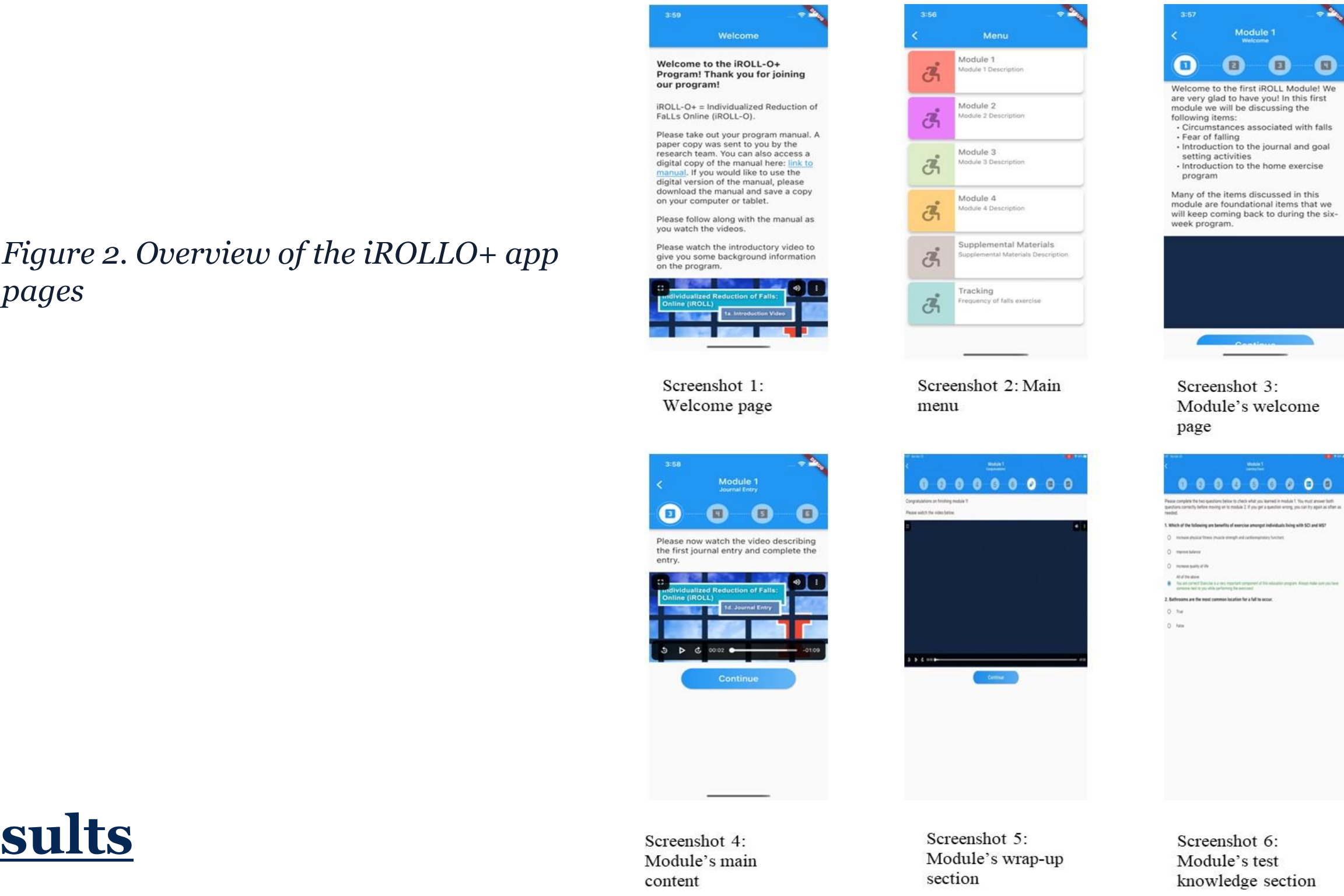


Figure 2. Overview of the iROLLO+ app pages

Results

a. Literature Review:

- The search yielded 2119 studies, and nine articles met the inclusion criteria.
- People who use WC/S found mHealth apps acceptable and usable.
- Key features for user satisfaction included intuitive navigation, clear instructions, and opportunities for peer/coach collaboration.⁷

b. Focus Groups:

- Participants highlighted the app's potential to expand program reach and access.
- Features supporting mHealth user satisfaction and usability:
 - ✓ Intuitive navigation and design
 - ✓ Meaningful icons
 - ✓ Peer and/or coach collaboration.
 - ✓ Participant pre-intervention training.
 - ✓ Search and browsing option.
 - ✓ Help desk to solve problems.

- Participants emphasized the importance of accessibility features such as adequate color contrast and operability for users with visual and fine motor impairments.⁶



Phase II: Usability & Usefulness Testing

Method

- The iROLL-O+ app was refined based on Phase I findings.
- A 6-week usability study + 2 extra weeks of sustained engagement was conducted.
- 10 participants (5 female, mean age = 50) living with SCI (n = 9) and Spina Bifida, using manual (n = 6) and power WCs.
- Participants used the app while participating in the iROLL program.
- Feedback through online surveys and semi-structured interviews.

Results

- Participants found the app easy to navigate.
- The video content was seen as helpful for its clear delivery of information.
- Requested interactive features:
 - ✓ In-App Tracking: integrated fall and exercise tracking within the app.
 - ✓ Action Planning to encourage continued engagement.
 - ✓ Journaling: a possibility to add and store journal entries inside the app to avoid paper-based methods.

- Most participants found the app accessible.
- Some concerns for users with limited hand mobility.
- Participants noted video playback glitches.
- The visual design generally received positive feedback regarding the user interface, with some finding it outdated.
- Participants agreed the online format was very convenient and improved program reach.

Conclusion

- The app showed promise as an effective platform to deliver the iROLL program, though further refinement and testing are needed.
- Additional research is needed to understand key active ingredients that support sustaining long-term change/maintenance of health behaviors using the app.

Future Directions

- Refining the iROLL-O+ app based on feedback from Phase II.
- Randomized trial to evaluate the efficacy and effectiveness of the app-based intervention.
- Expanding the program to other diagnostic groups that use WC/S full-time.

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