Mobile Health Systems May Benefit People with Physical Disabilities, But Some People May Have Challenges Using Them

People with physical disabilities may need to engage in ongoing self-care in order to stay healthy. For example, people with physical disabilities may need to take medications to improve symptoms and stabilize their health. People with spina bifida (SB) or spinal cord injury (SCI) may need to check their skin regularly to detect wounds or sores before they get worse. Mobile health (mHealth) applications are smartphone apps that can help people with physical disabilities keep track of and manage their health.

The Interactive Mobile Health and Rehabilitation (iMHere) is a new system for Android smartphones that includes several self-management modules within one application (app). The app allows people with physical disabilities to set up self-care alerts, such as reminders to take medications or to check their skin for problems. The system also enables users to communicate securely with a clinician about any concerns. Although systems like iMHere can be very useful, they may pose challenges for people with limited dexterity in their hands. These individuals may have difficulty typing or tapping buttons on a smartphone, which may make it difficult for them to use the app effectively. In a recent NIDILRR-funded study, researchers tested the iMHere system with a group of people who have limited hand and finger dexterity. The researchers wanted to find out how well these individuals could use iMHere and what feedback they had for improvements to the interface that could make the app easier to use.

Researchers at the project on Promoting Independence and Self-Management Using mHealth and the Rehabilitation Engineering Research Center from Cloud to Smartphone: Empowering and Accessible Information and Communication Technology enrolled 9 adults with physical disabilities in a study. The participants were 18-55 years old. Eight participants had SB, and one had an SCI. All of the participants had some trouble moving or using their fingers. The participants completed a test of hand and finger dexterity, and were classified as having mild, moderate, or severe dexterity limitations based on how well they could place pegs into holes on a pegboard.

During the study, all participants were given a smartphone with two iMHere modules installed. In the first module, called MyMeds, the participants scheduled reminders to take their medications and responded to those reminders to indicate that a medication was taken. In the second module, SkinCare, the participants scheduled reminders to check their skin for wounds and responded to those reminders. As part of this task they filled out a form describing potential skin issues and uploaded photos of any wounds to show to their doctors.

The participants met with researchers for a 15-minute training session on using the iMHere modules and took the phone home for a week to practice. Then, each participant met again with the researchers and was asked to complete five tasks: setting up a medication alert, modifying an existing alert, responding to a medication alert, setting up a skin check alert, and responding to the alert and reporting a skin problem. For each task, the researchers kept track of how long it took the participant to complete the task, any errors the participant made, and how much help the participant needed to correct errors. The participants also completed a questionnaire where they rated how much they liked using iMHere and gave suggestions for improvements to make the system easier to use.

Four of the participants had mild dexterity limitations, three had moderate limitations, and two had severe limitations, meaning that they could not put the pegs into the pegboard at all. The researchers found that the participants in the three dexterity groups took similar amounts of time to complete the iMHere tasks. However, the participants with more severe limitations made about twice as many errors as the participants with mild or moderate limitations. The most common error was related to dexterity, where users had difficulty clicking or tapping the right commands due to fingers sliding off the onscreen buttons. Other common errors were not related to dexterity, such as forgetting to save information or neglecting to check all the required boxes for a task. The participants were able to correct about half of their errors on their own, while they needed guidance from the researchers to correct other errors.

The participants were generally satisfied with the iMHere system, but they also gave suggestions to make the system easier to use. The most common suggestions included simplifying the layout, making the buttons larger, using thematic colors to distinguish between different modules in the app, providing more on-screen hints or instructions, and reducing the amount of typing required. Some participants also had trouble using the phone's built-in camera to take pictures of their skin, either because they could not hold the phone and use the onscreen button or they had difficulty accessing the area of the skin that was injured.

The authors noted that while mHealth applications may have great potential to help people with physical disabilities manage their health and prevent health problems, some people with physical disabilities may have trouble using standard smartphone apps, especially if they have trouble moving their fingers. These individuals may benefit from personalized modifications such as the addition of physical buttons instead of a touch screen, using a stylus to interact with the screen, or using voice commands and dictating information instead of typing. The authors also suggested mapping the camera's shutter function to an external button or using the camera's timer to make it easier to take pictures of injuries. App developers may want to identify the needs and preferences of their potential users to ensure the accessibility and usability of their products. Future research may be useful in testing the usability of mobile health applications across a wider range of physical disabilities.

To Learn More

Development of iMHere continues at the University of Pittsburgh. The current version of iMHere 2.0 is a cross-platform app suite that runs on any smartphone or tablet. The lessons learned from this research is used to make iMHere 2.0 apps more accessible for individuals with disabilities. To see iMHere in action, check out these YouTube videos from the project: https://www.youtube.com/watch?v=WKXtOngBmVw

The Rehabilitation Engineering Research Center for Information and Communication Technology Access "From Cloud to Smartphone: Empowering and Accessible Information and Communication Technology"   conducts research and development on mitigating barriers to ICT access for people with disabilities (PwDs) and to harness the power of ICT to improve health and function, social participation, and employment among PwDs. . Their activities include the design and development of accessible mobile health, development of cloud-based screen reader, telehealth speech-language training after cochlear implant, and mHealth intervention for traumatic brain injury (TBI). http://www.rercict.pitt.edu/

To Learn More About this Study

Yu, D.X., Parmanto, B., Dicianno, B.E., Watzlaf, V.J., & Seelman, K.D. (2017) Accessibility needs and challenges of a mHealth system for patients with dexterity impairments. Disability and Rehabilitation: Assistive Technology, 12(1), 56-64. This article is available from the NARIC collection under Accession Number J76308.