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Mobile Health Apps and Needs of People with Disabilities: A National Survey

Frank DeRuyter, PhD, Michael L. Jones, PhD, John T. Morris, PhD

Rehabilitation Engineering Research Center for Community Living, Health and Function (LiveWell RERC), Duke University and Shepherd Center

frank.deruyter@duke.edu, mike.jones@shepherd.org, john.morris@shepherd.org

Abstract

This report summarizes data from a national survey on the experiences, needs and potential solutions for mHealth technology by people with physical, cognitive, sensory and emotional disabilities. Convenience sampling was used to draw a sample of 377 adults with disabilities. Data were collected from February to August 2017. The survey was conducted by the Rehabilitation Engineering Research Center for Community Living, Health and Function (LiveWell RERC). The survey instrument includes items on user experiences and needs for a wide range of mHealth solutions. This paper focuses on mHealth apps: 1) types of health/wellness mobile apps currently used by people with disabilities; 2) satisfaction levels with the use of health/wellness apps; 3) ease/difficulty in finding usable and effective health/wellness apps; 4) interest in an online repository of information/reviews of mHealth apps; 5) specific problems or challenges using health/wellness apps; and 6) "wish list" for health/wellness apps that currently do not exist.

Keywords

Health, information and communications technology, mobile apps, survey research, smartphone, wearable technology

Introduction

Mobile health (mHealth) technology is assuming an increasingly important role in fitness, health maintenance and healthcare delivery as maturing and emerging technologies grow increasingly capable of supporting the health monitoring and feedback, education and motivation needs of the population. Fitness and activity trackers, biosensor technologies, and tools for remote patient engagement by healthcare providers (and for general fitness tracking by consumers) can be especially useful in helping individuals manage their overall health and fitness and other chronic conditions. Consumers with disabilities could benefit substantially from these mHealth technology solutions. Disability is often accompanied by higher rates of sedentary lifestyles, obesity, lower levels of exercise and community engagement, and restricted access to transportation. At the same time, consumers with disabilities use mainstream information and communication technologies (smartphones and tablets) at rates similar to the mainstream population (Morris et al. 2016; 2017). These levels of use indicate that consumers with disabilities have the hardware, mobile ICT services and general abilities to use mHealth technologies.

The population of people living with a disability in 2010 was approximately 56.7 million (U.S. Census Bureau, 2012). Assuming growth of this population proportional to the 12.5% growth of the general population between 2010 and 2025, there will be roughly 63.8 million people in the US with disabilities in the middle of the next decade. However, population trends suggest this number will be much higher as people living with disability are living longer (Thomas and Barnes 2010). Between 1990 and 2013 the disability-adjusted life years (DALYs) for non-communicable diseases increased globally (Murray et al. 2015). Age related decline and higher incidence of disability and chronic conditions among older individuals is likely to push

these numbers even higher. The U.S. Census Bureau predicts that the number of people in the United States age 65 and older will grow from 47.8 million in 2015 to 56.4 million in 2020 to 65.9 million in 2025, and continue rising to 82.3 million by 2040 (U.S. Census Bureau 2014). These older individuals have much higher prevalence of disability (Centers for Medicare and Medicaid Services 2012). Indeed, most people with any disability tend to have more than one disability (Ruggles et al. 2017), and older individuals with disability are more likely to have multiple disabilities than others.

People with disability utilize healthcare at substantially higher rates. Hospital re-admissions for people with spinal cord injury and acquired brain injury after 1 year post-injury are substantial – 31% and 26%, respectively (Choo 2015). Among older individuals, hospitalization admissions and readmissions are higher for those with multiple disabilities than with no or only one disability. Ongoing uncertainty regarding the status of national healthcare policy and the future of the Affordable Care Act increases further the need to extend precious healthcare resources, as many individuals face the possibility of losing coverage of "essential benefits" due to more lax requirements for health insurance policies, or losing health insurance coverage entirely.

Hospital admissions and readmissions however, are only one indicator of health and functioning for people with disabilities, and usually occur when chronic conditions worsen. What about the status of people with disability and chronic conditions between hospitalization and clinic visits? Are they exercising, socializing, sleeping well, taking their medications properly, minimizing risks and generally taking care of themselves? Can a model of care that includes ongoing intervention and collection of patient data between clinic or hospital visits enhance the health and functioning of individuals with disabilities, and in a cost-effective manner?

Although technologies that can support health and fitness are developing at a rapid rate, challenges persist. Though promising, these technology advances still are limited by narrow functionality (IMS Institute for Healthcare Informatics 2015), uncertain measurement accuracy of apps and sensors (Cadmus-Bertram et al. 2017; Pobiruchin et al. 2017), concerns over privacy (Filkins et al. 2016; Sajid and Abbas 2016), uneven durability and usability, and high rates of user abandonment (Gartner 2016). Narrow functionality – lack of integration into a more comprehensive model of care – is a particularly critical concern for people with disabilities and chronic conditions, who often suffer from multiple conditions, ailments and limitations.

This report summarizes data from a national survey on the experiences, needs and potential solutions for mHealth technology by people with physical, cognitive, sensory and emotional disabilities. The survey was conducted by the Rehabilitation Engineering Research Center for Community Living, Health and Function (LiveWell RERC). The survey instrument includes items on a wide range of mHealth solutions. This paper focuses on mHealth apps. Key questions addressed include:

- Types of health/wellness mobile apps used by people with disabilities
- Satisfaction levels with the use of health/wellness apps
- Ease/difficulty in finding usable and effective health/wellness apps
- Interest in an online repository of information/reviews of mHealth apps
- Specific problems or challenges using health/wellness apps
- "Wish list" for health/wellness apps that currently do not exist

Discussion

The reported survey data were collected from February to August 2017 using convenience sampling. The total number of respondents consisted of 377 adults with a specific disability. This report constitutes a preliminary analysis, as data collection is ongoing.

The mean age of respondents was 54 years with a standard deviation of 14.5 years. Females constituted 53% of the sample and 74% of the sample reported being white/Caucasian. Annual household incomes were reported below $50,000 for 47% of the respondents. Respondents were asked to identify whether they had difficulties in any of 9 general functional categories (Table 1). Most reported on average as having 2 functional limitations/difficulties with the most common being difficulty walking, climbing stairs and difficulty hearing.

Types of mHealth Apps Used

Respondents reported using a wide variety of mHealth apps. Fitness, exercise and activity tracking apps were the most commonly used type of apps (40% of respondents). Diet/nutrition/healthy-eating and lifestyle apps (including stress management and sleep quality apps) were less common with 27% and 17% reporting using these types of mHealth apps, respectively.

Table 1. Which of the following types of health and wellness apps do you use? (Check all that apply), by disability type.

Disability type	**Fitness**	**Diet**	**Lifestyle**	**Other**
Difficulty concentrating, remembering, deciding	60%	24%	22%	22%
Frequent worrying, nervousness, or anxiety	50%	24%	24%	29%
Difficulty seeing	44%	23%	23%	29%
Difficulty hearing	45%	30%	17%	18%
Difficulty speaking so people can understand you	47%	41%	29%	29%
Difficulty using your arms	30%	30%	22%	30%
Difficulty using your hands and fingers	44%	31%	26%	21%
Difficulty walking or climbing stairs	37%	28%	17%	22%
Difficulty with fatigue / limited stamina	40%	30%	23%	26%
ALL RESPONDENTS	40%	27%	17%	20%

Respondents with difficulty thinking/frequent worry/anxiety reported using fitness apps at rates much higher than the average. For these respondents and those with difficulty seeing, the gap in use rates between fitness apps and all other apps was the greatest. Notably, those with difficulty speaking used diet/nutrition and lifestyle apps at the highest rates (41% and 29%, respectively) among the several functional disability types.

Satisfaction and Ease of Finding Usable and Effective mHealth Apps

To understand the current experiences of consumers with disabilities when using or searching for mHealth apps, respondents were asked to rate their:

- Satisfaction levels with the use of health/wellness apps
- Ease/difficulty in finding usable and effective health/wellness apps

Using a scale of 1-5, with 5 being very satisfied, respondents primarily reported neutral levels of satisfaction with the use of mHealth apps. Only respondents with 1) frequent

worry/anxiety and 2) difficulty speaking reported being satisfied or very satisfied with the functioning of their mHealth apps. For all other disability groups respondents reported either being neutral or dissatisfied with respect to the use of mHealth apps.

The satisfaction levels for each disability type were aggregated to produce overall satisfaction indices (Table 2), which ranged from 3.12 to 4.00; a satisfaction score of 5.00 would indicate that all respondents rated their satisfaction as "very satisfied." The average score for the entire sample including all disability types was 3.46. It is important to note that this score includes a high percentage of respondents rating their satisfaction as neutral (a score of 3), indicating widespread lack of enthusiasm for existing mHealth apps.

Table 2. Satisfaction with mHealth apps and ease of finding mHealth apps that work for me.

Disability type	**Satisfaction index**	**Ease of finding index**
Difficulty concentrating, remembering, making decisions	3.51	3.38
Frequent worrying, nervousness, anxiety	3.68	3.70
Difficulty seeing	3.31	2.98
Difficulty hearing	3.57	3.23
Difficulty speaking so people can understand you	4.00	3.43
Difficulty using your arms	3.19	2.99
Difficulty using your hands and fingers	3.24	3.05
Difficulty walking or climbing stairs	3.29	2.97
Difficulty with fatigue / limited stamina	3.12	2.95
ALL RESPONDENTS	3.46	3.25

Additional findings revealed that most respondents reported neutral or negative feelings regarding the ease of finding mHealth apps that worked well for them. Many more respondents reported that their search was difficult/very difficult (31%), compared to the percentage of those who reported being dissatisfied/very dissatisfied with the use of their mHealth apps (10%). This

was also reflected in the overall index score 3.25 for ease of finding an effective mHealth app as compared to the 3.46 score for satisfaction.

Most respondents with 3 types of disability (difficulty concentrating/ remembering, frequent worry/nervousness, and difficulty speaking) reported that their search for mHealth apps that work for them was either easy/very easy. However, respondents in the other 6 disability categories reported substantially greater difficulty an mHealth app that worked for them.

The low-to-moderate percentage of respondents reporting being satisfied/very satisfied with their mHealth apps or feeling that their search for mHealth apps was easy/very easy suggests that additional tools for reviewing and recommending mHealth apps would be useful. As shown in Table 3, 86% of respondents indicated they would use a website that provided information and recommendations about mHealth apps specifically for people with disabilities. More than 90% of respondents with motor-function disabilities (walking and using arms, hands and fingers) and difficulty speaking reported interest in a website for reviews of mHealth apps.

Table 3. If it existed, would you use a website that provides information and recommendations for mHealth apps specifically for people with disabilities?

Disability Type	**No**	**Yes**
Difficulty concentrating, remembering, or making decisions	18%	82%
Frequent worrying, nervousness, or anxiety	21%	79%
Difficulty seeing	27%	73%
Difficulty hearing	16%	84%
Difficulty speaking so people can understand you	7%	93%
Difficulty using your arms	4%	96%
Difficulty using your hands and fingers	3%	97%
Difficulty walking or climbing stairs	8%	92%
Difficulty with fatigue / limited stamina	14%	86%
ALL RESPONDENTS	14%	86%

Respondents also overwhelmingly supported the idea of including reviews and feedback about mHealth apps by peers with similar conditions on such a website (Table 4). Almost 9 out of 10 respondents (89%) supported the idea of peer reviews; there was little variability in support for this across disability types.

Table 4. Would it be helpful to have a website that provides reviews or feedback about apps from users with conditions like your own?

Disability Type	**No**	**Yes**
Difficulty concentrating, remembering, or making decisions	9%	91%
Frequent worrying, nervousness, or anxiety	11%	89%
Difficulty seeing	16%	84%
Difficulty hearing	11%	89%
Difficulty speaking so people can understand you	14%	86%
Difficulty using your arms	12%	88%
Difficulty using your hands and fingers	11%	89%
Difficulty walking or climbing stairs	10%	90%
Difficulty with fatigue / limited stamina	15%	85%
ALL RESPONDENTS	11%	89%

User Needs for mHealth Apps

We also asked respondents to identify specific problems using apps as well as their "wish list" features or functionality for mHealth apps. The survey provided a variety of responses that included the following:

- need for greater accessibility of mHealth apps, such as improved readability of the output; multimodal output such as sound, vibration and text; and integration with Apple's VoiceOver audible screen navigation by touch; integration with JAWS screen reader; screen magnification; and captioning;

- need for low battery drain of mHealth apps, which is critical for people with disabilities who often regard their mobile devices as personal safety tools;
- broader integration with other apps and biosensors (blood pressure cuffs, thermometers, etc.) or types of devices (like personal computers); customized versions of apps that suited specific personal disability or situation – a calorie counter/activity monitor for sedentary people who consume and use far fewer calories than the general population, an app that captures distance and calories for wheelchair users, an activity tracker that takes into account their severely uneven gait;
- specific app solutions – an app that reads the air quality (pollen count, barometric pressure) in the immediate vicinity, or an exercise app for people with multiple sclerosis or rheumatoid arthritis.

Conclusions

The ongoing evolution of consumer technologies across a wide array of devices, software and services holds enormous promise for supporting the development of mHealth solutions for people with disabilities. The technology development landscape includes continuing enhancements to established technologies like smartphones and tablets, emerging new platforms like wearable fitness trackers and smartwatches, home-based smart speakers and intelligent personal assistants, and cloud services supported by natural voice recognition and artificial intelligence.

At the same time, the rapid pace at which these technologies continue to evolve poses substantial risk of leaving people with disabilities behind. Consumer technology firms generally have made great efforts in recent years to engage people with disabilities. But, basic usability challenges continue to be evident in new technologies and new versions of existing technology

devices, software and services. Furthermore, the exigencies of business survival often mean that products must be engineered initially with the widest possible user base in mind, leaving people with disabilities to wait for subsequent updates that are accessible and useful.

The survey research data presented here indicate that people with disabilities have substantial unmet needs for mHealth apps and related technology. Overall, few respondents reported moderate-to-high levels of satisfaction with their existing mHealth apps, and even fewer reported that finding effective mHealth apps was easy or very easy. Respondents overwhelmingly indicated that they would use an online resource with information and recommendations for mHealth apps, and that they would find it helpful if such a resource offered reviews by peers with disabilities like their own.

The number and variety of needs and wishes for mHealth apps identified by respondents also indicates that this is an area where there are substantial unmet needs. As mHealth technologies and mobile app solutions proliferate, researchers and developers must make sure that the needs of people with disabilities are addressed.

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