WIRELESS inclusive RERC

RESEARCH BRIEF

Survey of User Needs, SUNspot 2

Use of Wireless Technology Features and Wireless Device Activities by Individuals with Disabilities, 2019-2020

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Introduction

This report presents findings from the Rehabilitation Engineering Research Center on Wireless Inclusive Technologies' (Wireless RERC) Survey of User Needs (SUN) for 2019-2020. In this report, we present key findings regarding the use of wireless technology features by SUN respondents, including real-time-text, intelligent assistants, and visual and audio display options. We also discuss the use of wireless devices by individuals with disabilities for a variety of activities. Whereas SUNspot 1 focused on the devices themselves, this report focuses primarily on the capabilities built into those devices and their relationship to users' reported functional limitations and difficulties.

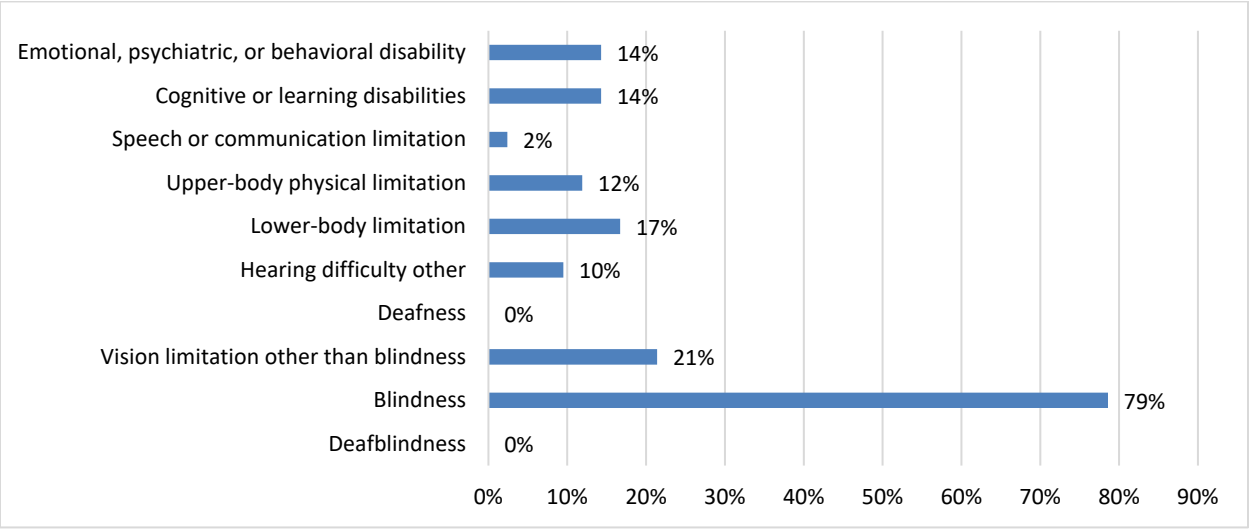
Visual and Audio Display Technologies

Screen-reader technologies

The SUN probed on the use of technologies to present textual or graphical content in alternate formats to make this content accessible for users, including individuals who are blind, individuals with low vision, or for individuals with other vision-related disabilities. Of our total valid sample (N=223), a total of 115 indicated one of the vision impairments listed. Of the valid Vision sample, 42 respondents, or 37%, indicated their use of screen-reader technology. Of this group, 33 individuals, or 79%, reported blindness, 7 (17%) reported having a vision difficulty, 2 respondents indicated (5%) indicated either a cognitive (1) or speech (1) impairment. *Respondents were allowed to indicate multiple difficulties so percentages may exceed 100% due to reported comorbidities*. However, over 20% of screen-reader users report difficulties with cognition, anxiety, hands and fingers, or mobility.

Screen-reader technology users reported 1.7 + 1 difficulties on average. Of this group, 62% of the sample reported only one difficulty, 33% reported 2 or 3 difficulties, and 5% reported four or more. Sixty-two percent (62%) of screen-reader users in the SUN sample were female; 86% identify as white or Caucasian; 62% had a bachelor's degree or higher; and 48% are currently employed either full or part-time. The average age of screen reader users was 53 years of age.

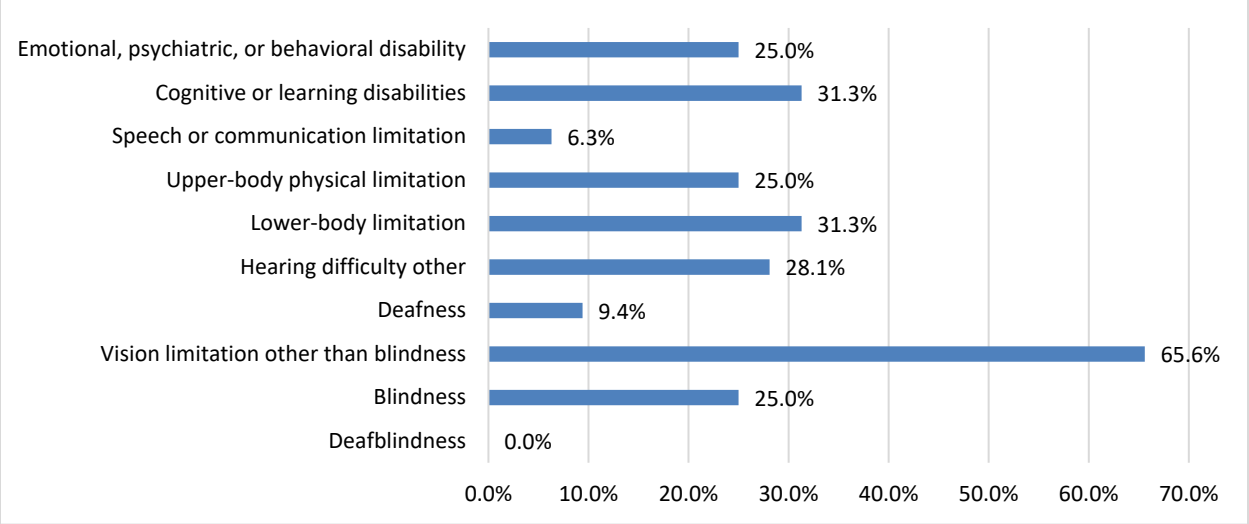
Figure 1: Reported Difficulties for Screen-Reader Technology Users (N=42)



Screen magnifier technologies

A total of 32 respondents, or 15% of the SUN sample, reported the use of screen magnifier technologies for their wireless devices. Of this group, 21 individuals, or 66% of these users, reported a vision difficulty, while 25% reporting being functionally blind. Considering the application of this technology and its reliance on vision, these findings may be as expected. *Because the questionnaire does not specify the nature of blindness in diagnostic terms, it is possible that respondents that indicated as "blind" may have some usable vision*. Interestingly, over 31% of screen magnifier users reported difficulties with mobility, and 56% reported difficulties with cognition or emotional, psychiatric or behavior, as shown in the following graph.

Figure 2: Reported Difficulties of Screen Magnifier Technology Users (N=52)



Screen magnifier technology users, on average, reported 2.5 ± 2 difficulties. The median number of difficulties was 2. Sixty-nine (69%) of screen magnifier technology users in the SUN sample were female; 81% identified as white or Caucasian; 53% had a bachelor's degree or higher; and 41% were employed full or part-time. The average age of these users was 52+15 years old, with 41% of users being 50 years of age or older. While these findings strongly suggest a relationship between vision difficulty and the use of this technology, it also implies a possible relationship between age and screen magnifier use, as well.

Wireless Device Features

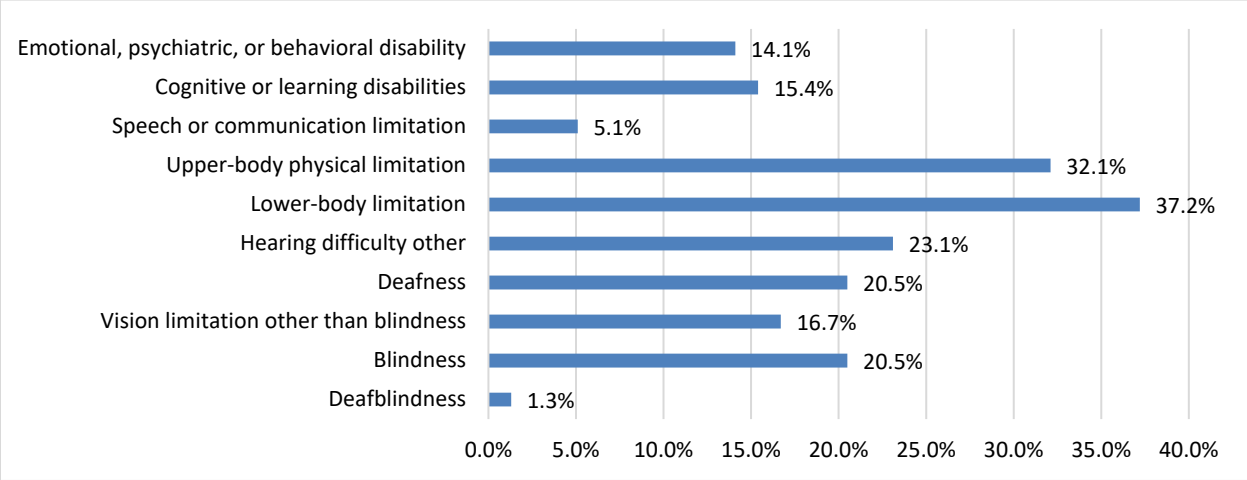
Real-time-text (RTT)

The SUN also probed on features and applications generally not considered as assistive technologies, but which may support accessibility and usability within specific contexts. Two of these features, real-time-text (RTT) and intelligent personal assistants are presented here.

A total of 78 respondents indicated the use of RTT, which may be defined simply as text messaging that is transmitted instantly as it is typed or created. Of these users, 18 individuals, or 23%--reported difficulty with hearing. An additional 22% of respondents reported functional deafness. *Also, over 32% of RTT users reported upper or lower body limitations. Real time text users by disability are displayed in Figure 3.*

Blindness	16	20.50%
Vision limitation other than blindness	13	16.70%

Figure 3: Reported Difficulties of Real-Time-Text (RTT) Users (N=32)



The total number of difficulties reported by RTT users ranged from 0-6, with 1.9 difficulties reported on average. Forty-one percent (41%) of the sample reported only one difficulty; 45% reported 2 or 3 difficulties; and 9% reported four or more. Sixty-three (63%) percent of RTT

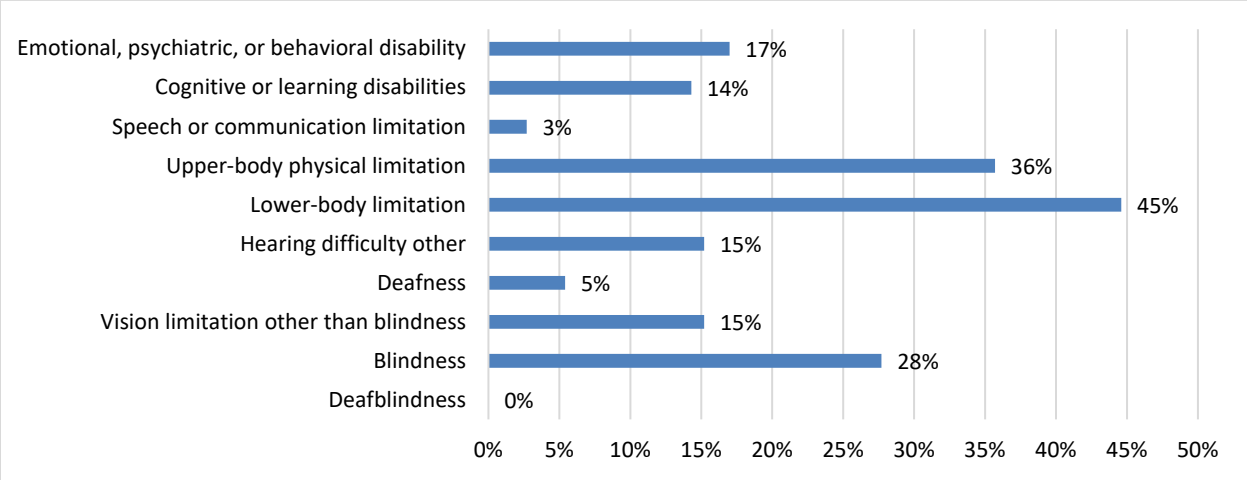
users in the SUN sample were female; 77% identified as Caucasian; 64% reported earning a bachelor's degree or higher; and 31% reported annual incomes of $50,000 or greater. Thirty-four percent (49%) were currently working either full or part-time. The average age of RTT users was 52+15, and 37% of users were over age 60.

Intelligent Personal Assistants

The SUN also queried on the use of intelligent personal assistants for wireless devices, such as Apple Siri, Google Now, Microsoft Cortana, and Amazon Alexa. A total of 112 respondents, or 50% of the SUN sample, indicated their use of intelligent personal assistants. Users indicated a diverse range of functional abilities, with lower and upper body limitations tied as the top two difficulties (N=50 (45%) upper and 40 (36%, respectively.)

Vision difficulties including blindness were reported by 43% of users (N=48). The following chart presents a breakdown of intelligent personal assistant use by functional difficulty.

Figure 4: Reported Difficulties of Intelligent Personal Assistant Users (N=112)



Forty percent (40%) of the sample reported only one difficulty; 43% reported two or three limitations; and 9% reported four or more. Sixty-one percent of intelligent personal assistant users in the SUN sample were female, and 78% identified as Caucasian. Fifty-three percent (53%) reported obtaining a bachelor's degree or higher, and 37% reported annual incomes of over $50,000. Fifty-four (54%) were currently working full or part-time. The average age of users of intelligent personal agents was 51 + 14 years of age. Fifty-five percent (55%) of this group 50 years of age or older.

Device Use by Activity and Disability

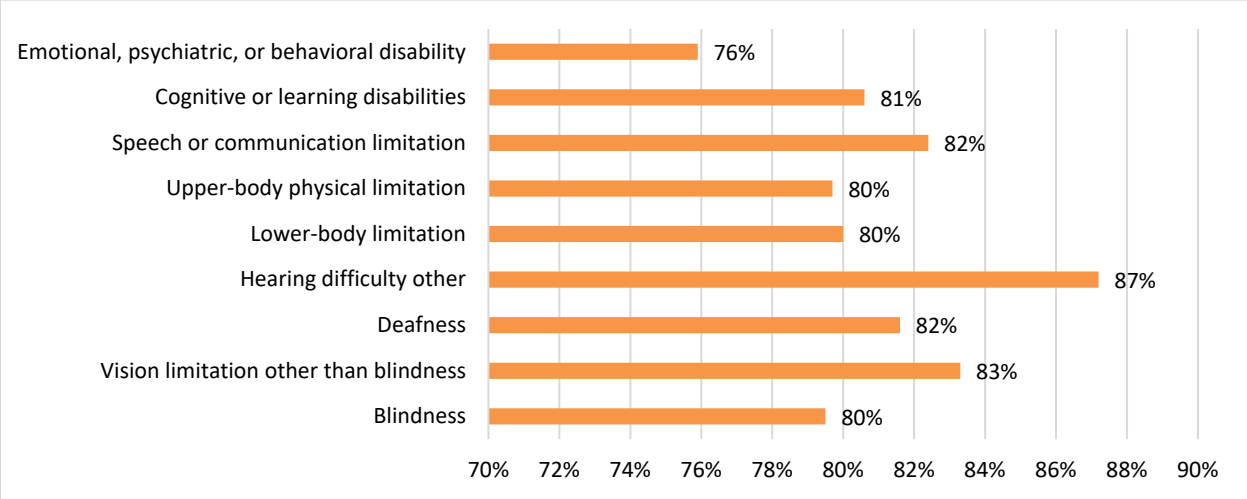
The SUN also queried respondents with disabilities regarding the activities for which they used their wireless devices beyond "core" communication functions. We present the findings for six

categories, based upon the key functions associated with many frequently used applications for smartphones, tablets, and other wireless devices. These may include address books, electronic calendars, notepads, and voice recorders for organization. They also may include GPS and map-based apps such as Google Maps, Waze, or Apple Maps for navigation and directions. A variety of apps exist to assist individuals with saving or managing money, as well as the apps provided by banks for online banking and bill-pay apps provided by many utilities and service providers. Rather than consider specific apps, this version of the SUN took a functional approach.

Organizational Activities

SUN participants were queried about the use of their wireless devices for organizational activities for everyday activities, such as time management or keeping up with contacts. The most commonly indicated uses included keeping a directory of contacts (87%), keeping a calendar of appointments (72%), and recording notes or reminders (60%). A minority of respondents, only 42%, indicated using their devices for completing work activities, such as word processing or creating and showing presentations. From the four options provided, respondents indicated an average of 2.5 $\pm$ 1.4 activities reported in this category. Figure 5 presents the use of wireless devices by disability or functional limitation.

Figure 5: Use of Wireless Devices for Organization Activities, by Disability or Functional Limitation (N=223)

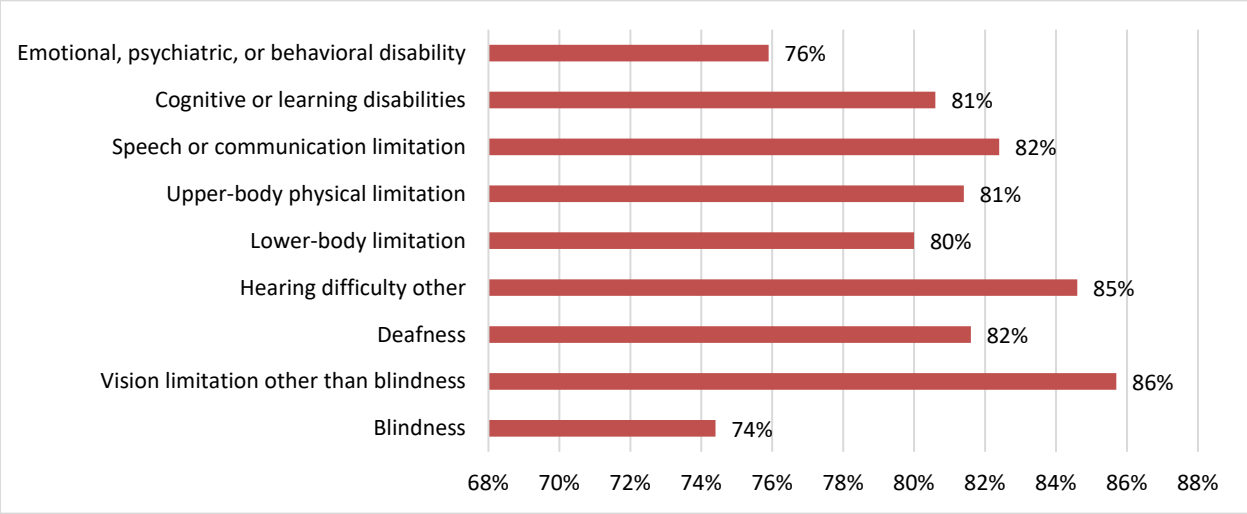


Respondents who identified as having a hearing difficulty, functionally deaf, blind, or individuals who had a vision difficulty used their devices organizational activities most frequently. However, at least 76 percent of respondents in all disability categories indicated using their devices for organizational activities.

Community Mobility Activities

Next, the SUN queried on the use of wireless devices for assisting individuals with navigation and wayfinding, which are commonly associated with apps such as Google Maps or Apple Maps. A sizable majority of respondents used their devices for two uses, in particular, navigating and wayfinding through GPS and map-based apps (89%) and locating places of interests such as restaurants and stores (85%). Wireless devices were used for an average of 1.5 + .77 c community mobility activities. The following graph presents the use of wireless devices by disability or functional limitation.

Figure 6: Use of Wireless Devices for Community Mobility, by Disability or Functional Limitation (N=223)

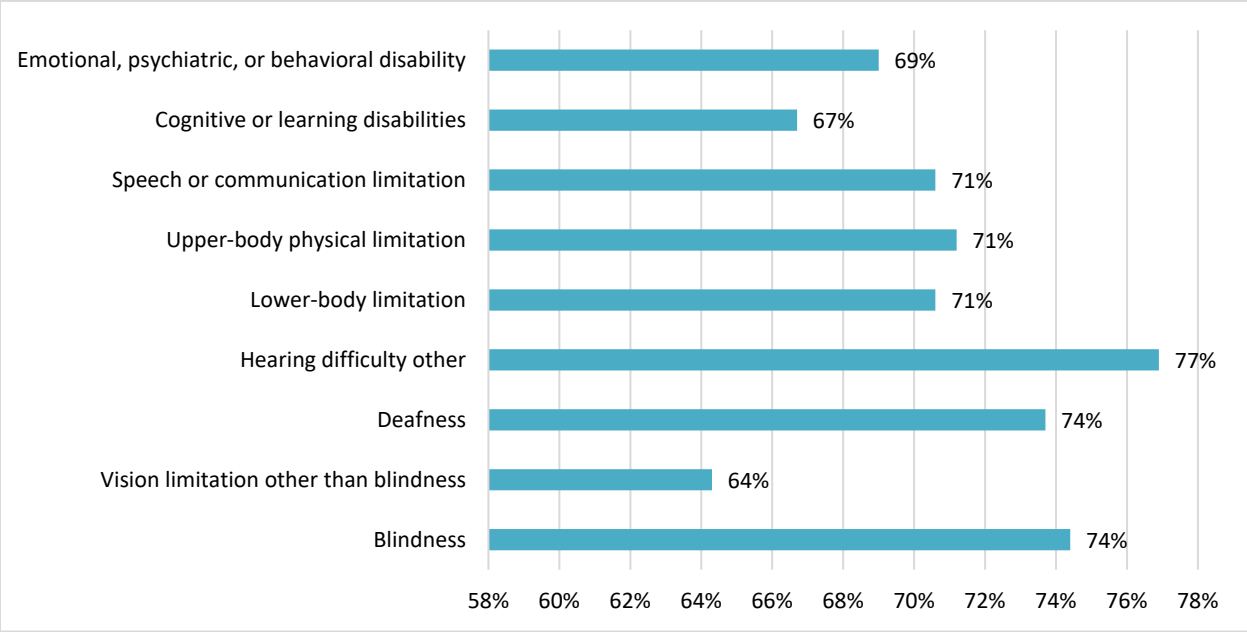


Respondents who identified as having a vision limitation used their devices for community mobility far more than any other group, at 86%, closely followed by individuals who had a hearing difficulty. However, at least 74% of all SUN participants indicated the use of their devices for community mobility, regardless of disability or functional limitation.

Money Management and Personal Finances

SUN participants were asked about the use of their wireless devices for managing money and finances. The most commonly indicated uses included shopping online either to compare prices or make purchases (74%), banking online (63%), or paying bills (54%). Only 34% of respondents indicated their use of instant payment applications such as Apple Pay or Google Pay. The following graph presents the use of wireless devices for financial related activities by disability or functional limitation.

Figure 7: Use of Wireless Devices for Money Management and Personal Finances, by Disability or Functional Limitation (N=223)



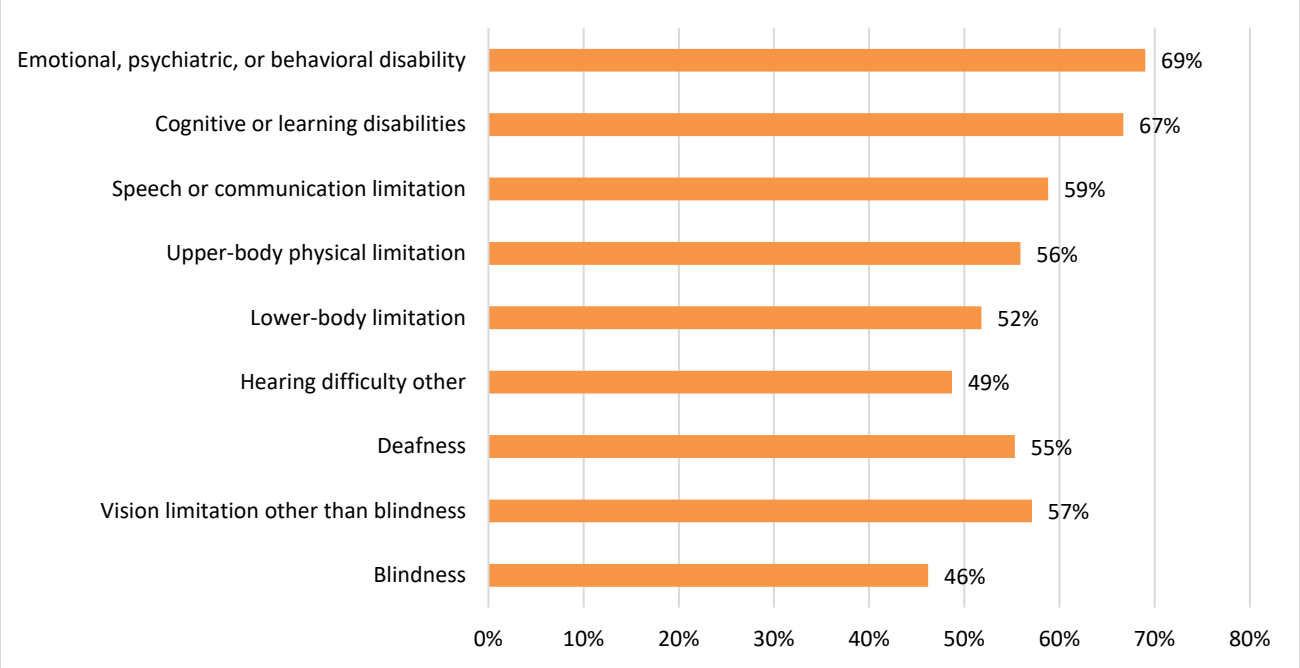
Use of wireless devices for the five finance activities listed had an average of 2.2 ± 1.5 activities, which suggests that while no one activity was performed by a majority of respondents, over sixty-four percent of SUN participants used their devices for at least one of the possible options. Users who identified as having a hearing difficulty (77%), deaf (74%), having a vision difficulty (64%), blind (74%), or having a speech difficulty (70%) were the most frequent users of devices for managing money or finances.

Health, Wellness, and Home Environment

SUN participants were asked about the use of their wireless devices separately for health and wellness, as well as control of the home environment. Taken together, however, these activities were the least commonly indicated uses for wireless devices. In no instance, did any activity receive a response of greater than 40%. In order, use of the wireless devices for these activities included, tracking personal fitness such as steps taken, calories burned, or nutrition (40%), monitoring personal health such as weight, blood sugar, blood pressure, or heart rate (37%), using wireless devices for home automation such as control of lights, thermostats, or other environmental devices (27%), using wireless devices to control home security systems (21%). Only 21 SUN participants (13%) indicated using their devices either for personal medical alerts such as Alert1 or Life Alert. Use of wireless devices for the health, wellness and home environment activities listed had an average of 1.3 ± 1.3 activities. As shown in the graph below, those who reported an emotional, psychiatric, or behavioral disability or cognitive or

learning disabilities were the most frequent users of these functions at 69 and 67 percent, respectively. Those with functional blindness were the lowest users with 49% …

Figure 8: Use of Wireless Devices for Health, Wellness and Environment Activities by Disability or Functional Limitation (N=223)



Leisure and Social Activities

Finally, SUN participants were queried regarding the use of their wireless devices for and leisure and social activities, which range from the use of social media to entertainment to gaming. Use of wireless devices for watching videos and movies or videos on sites such as YouTube were the most commonly indicated recreation and leisure activity (76%) followed closely by social networking on such sites as Facebook, LinkedIn, Twitter, and Instagram, and sharing photos (both at 75% each.) Use of wireless devices for other related activities included, in order, listening to audio content such as music, podcasts, radio, or audiobooks (71%), reading or studying (59%), and playing games (56%). Use of wireless devices for the six recreation and leisure activities listed had an average of 3.9 $\pm$ 2.1 activities reported. The following graph presents the use of wireless devices for leisure or social activities by disability or functional limitation.

Respondents who reported speech or communication limitations used their devices for leisure or social activities the most, at 94%, following by individuals with hearing difficulty (90%). However, at least 82% of all SUN participants indicated the use of their devices for leisure and social activities, regardless of disability or functional limitation.

Figure 9: Use of Wireless Devices for Leisure and Social Activities

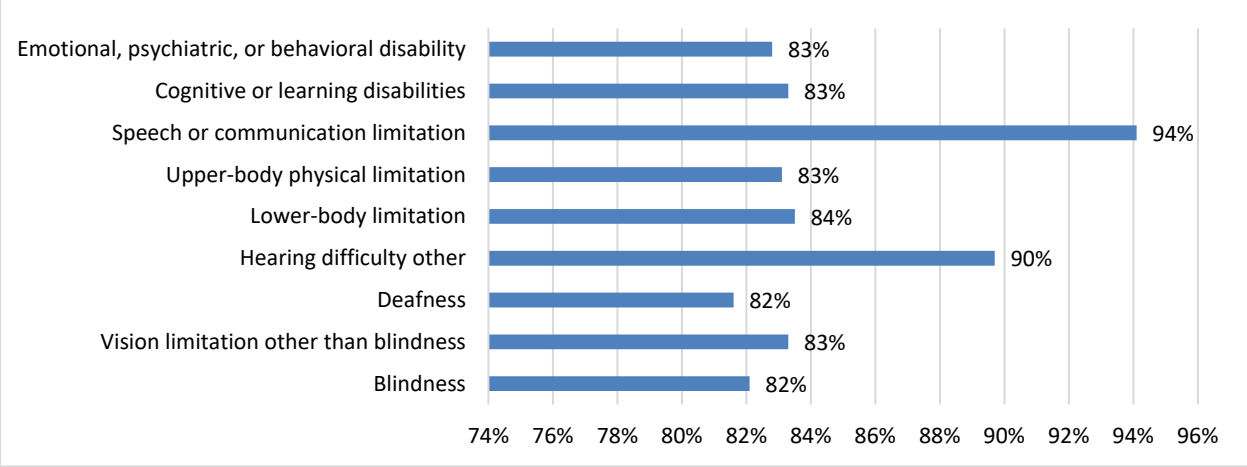
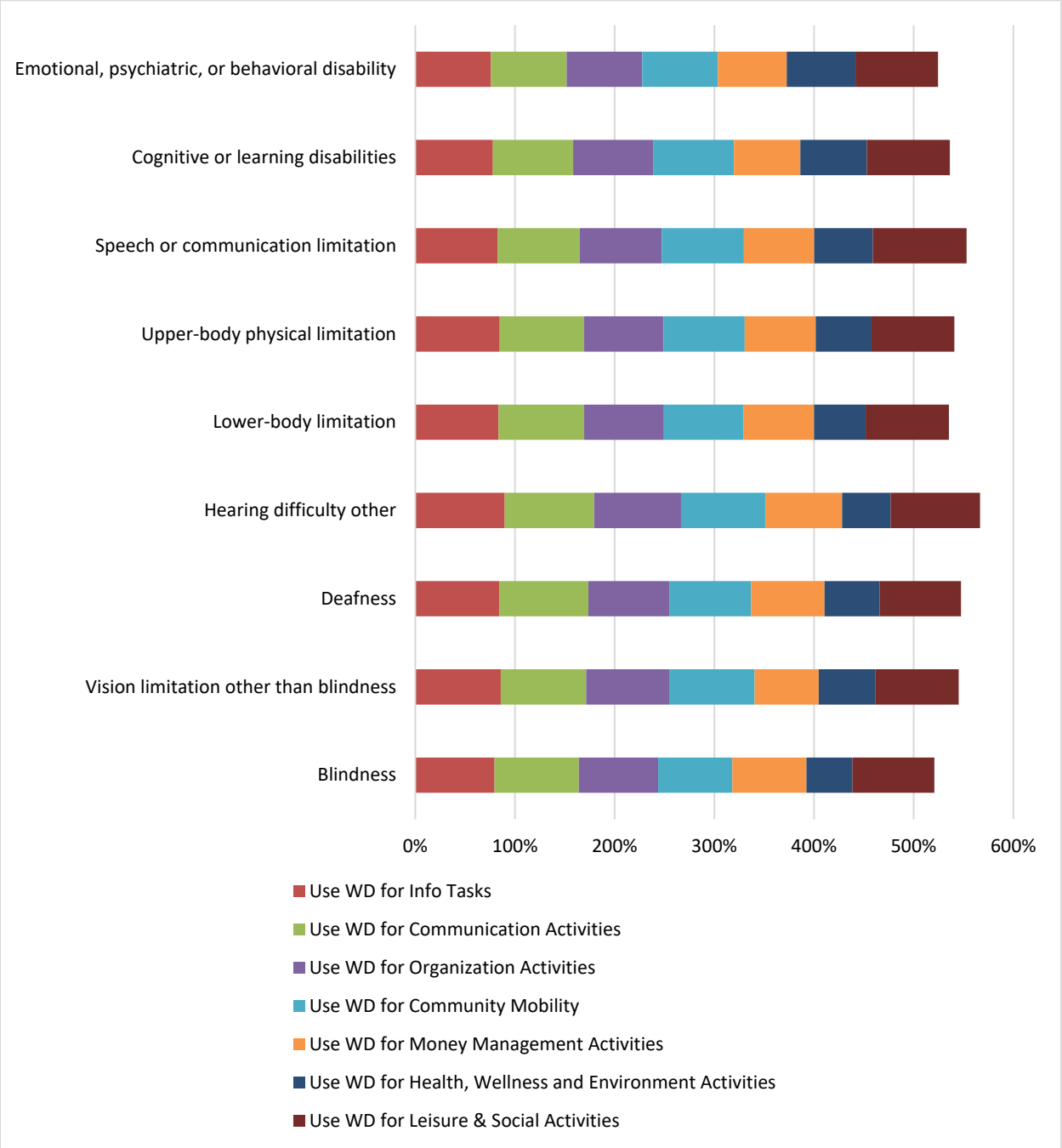


Figure 10: Use of Wireless Devices Activities by Disability



Discussion and Conclusion

Drawing upon the SUN's sample of users with disabilities, it remains clear that certain wireless technology features for accessibility continue to experience high levels of use based on their utility to certain groups. The use of screen readers and screen magnifiers at high levels by individuals who reported blindness or vision difficulties provide but one example of how built-in

accessibility features remain vital to technology access. By contrast, relatively less established, newer features such as real-time-text and intelligent personal assistants have yet to be widely adopted. However, the higher-than-average use of real-time-text among individuals who reported deafness or difficulty hearing suggests this features' potential for increasing usability and accessibility of these devices, specifically, and communications, in general. Meanwhile, the use of intelligent personal assistants, while rather lower than average overall, has a more diffuse group of users, which may suggest these features' usefulness across multiple disability categories. The voice control associated with intelligent personal assistants may benefit people with vision-related disabilities and individuals who have difficulty using their hands or fingers in equal measures.

Regarding the use of devices for more general activities, it is clear that some uses are more established than others. The relative novelty of "smart home" technologies that rely upon wireless devices for controlling the home environment or specific devices for health probably explain their lagging adoption by individuals with disabilities. On the other hand, activities that are enabled by applications intrinsic to the devices themselves, such as those for organization, enjoy wider use among individuals with disabilities.

Recommended citation:

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About the Wireless RERC

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