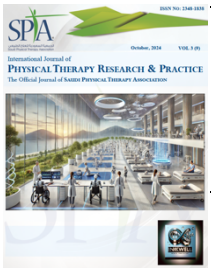

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Original Article

Identifying Awareness and Knowledge Sources for Mobility Assistive Technology Among People with Disabilities in Saudi Arabia

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Abstract

Background: The purpose of this study was to provide empirical evidence on knowledge gaps in wheelchair skills, emerging technology, and preferred sources to find information about mobility assistive technologies (MAT) among Saudi mobility device users. **Method:** A previously developed English-language survey used in a previous pilot study was translated into Arabic and culturally adapted for MAT users within Saudi Arabia. This study followed Beaton guidelines for translating and performing cultural adaptation. A cross-sectional study was conducted anonymously to gather opinions of Saudis with disabilities who use MAT. The Arabic version was administered online using the Pitt-licensed version of the Qualtrics software. Referral sampling technique was used for recruiting, and the data from a sample of (N=353) are represented. **Results:** The overall face validity (FVI) for clarity and comprehension was 0.85, indicating that the Arabic Version was simple, easy to understand, and relevant for Saudi Arabian culture. The average age of respondents was approximately 39 (SD 9.6) years, and most had used their mobility devices for two to five years (N=164, 46.5%). Spinal cord injury (SCI) was the largest diagnostic group (N=141, 40%). Respondents reported gaps in knowledge about both manual wheelchair and power wheelchair skills. Physical therapists and/or occupational therapists, the internet, social media, physicians, and family and friends using AT were reported as the most frequent sources used to find information about mobility devices (85.6%. 72.8%, 60.3%, 48.2%, and 45%) respectfully. **Conclusion:** The survey findings revealed some gaps in knowledge among Saudi MAT consumers with respect to wheelchair skills and emerging technologies, suggesting a more knowledge translation research is needed in this area.

Keywords: Mobility assistive technology, person with disability, face validity, cultural adaptation, knowledge translation, Saudi Arabia, self-help device.

Introduction

According to a recent report by the World Health Organization (WHO), access to appropriate AT remains a global challenge, as only 10% of more than 2.5 billion people with disabilities (PWDs) and older adults who are currently in need of AT devices can have access to such devices (Geneva: World Health Organization, 2022). This number is expected to grow to over 3.5 billion by 2050 due to population ageing and the prevalence of other chronic diseases (Geneva: World Health Organization, 2022). Limited access to AT has a significant impact on the education, livelihood, well-being, and health of PWDs, older adults, families, and communities (Geneva: World Health Organization, 2022).

Several factors influence the need for and access to AT. Absence of knowledge and awareness about the products and services available to AT users, family members, and caregivers is an example of a barrier to the access of the appropriate AT devices (Geneva: World Health Organization, 2022),(Howard et al., 2020). In addition, lack of information about the proper AT might limit awareness, leaving end users with little knowledge about the available products, training, and services. The research consequently found that more than 30% of AT devices were abandoned entirely, and one of the common reasons for abandonment was the users' lack of knowledge about the appropriate AT and inadequate user engagement during the assessment and design process (D. M. Collins et al., 2008),(Phillips & Zhao, 1993). Martine et al. (2011) established a relationship between awareness of the appropriate AT and user satisfaction, whereby lower satisfaction was associated with the lack of knowledge and awareness, resulting in the high level of abandonment of AT devices (Martin et al., 2011). Therefore, cultivating awareness and being informed about AT are critical steps toward accessing the proper provision and services of such technology (Borg & Östergren, 2015). These steps also substantially contribute to the success of AT solutions (Andrich & Besio, 2002).

The Global Cooperation on Assistive Health Technology (GATE) under the auspices of the WHO, the United Nations (UN), and the International Society for Wheelchair Professionals (ISWP) have undertaken serious actions worldwide to address the gap in AT provision by developing a global priority research agenda. In the 2018 Great Research, Innovation, and Education on Assistive Technology (GREAT) Summit, one of the top five research themes on AT was the assessment of awareness, need, and use of AT (World Health Organization, 2017),(Smith et al., 2018). In a recent WHO report, one of the top 10 recommendations for concrete action to improve access to AT is to increase public awareness of the available AT products and services (Geneva: World Health Organization, 2022). In response to this global recall, several research attempts have been made to heed the voice of the consumers and the consumers' perceptions of their needs and priorities in relation to MAT; these research efforts are expected to inform research priorities that could be used for addressing the gaps in the provision process. For example, in the U.S., the human engineering research laboratories (HERL) team conducted a series of studies to explicitly identify the consumers and providers' opinions about their MAT-related needs and priorities. The aim of one of these studies was to inform research priorities that could be used for addressing the gaps not only in the provision process but also in skills training, knowledge of laws, standards, clinical practice guidelines, and preferred information sources (Kelleher et al., 2017),(Dicianno, Joseph, Eckstein, Zigler, Schmeler, et al., 2018),(Dicianno, Joseph, Eckstein, Zigler, Quinby, et al., 2018),(Quinby et al., 2021).

Understanding the gaps in consumer knowledge, awareness, training, and the preferences on accessing information about AT is the first step toward accessing the proper technology and reducing the abandonment rate; in this regard, the researchers at HERL decided to expand the objectives of the VOC projects on a global level to keep up with the demand for MAT. A survey was subsequently developed and piloted in one of the

U.S. VOC studies, with the aim of informing research priorities that could be used for addressing the gaps not only in the provision process but also in skills training, knowledge of laws, standards, clinical practice guidelines, and preferred information sources among MAT-using veterans with disabilities; this survey had been used for this purpose (Quinby et al., 2021).

Saudi Arabia was the starting point of our research undertaking. The next step might include several countries around the world based on the interest we might receive from research collaborators. Thus, the English survey used by Quinby et al. (2021) was translated and culturally adapted into the Arabic language (Quinby et al., 2021). The Arabic version was then assessed among 54 Saudi MAT users. The face validity index (FVI) for the clarity and comprehension of the Arabic version was within the satisfactory level (0.87), indicating that the Arabic version was simple, easy to understand, and culturally relevant to Saudi MAT users. Targeting people with mobility impairments in Saudi Arabia was based on recent findings indicating that mobility impairments in Saudi Arabia were the most frequently reported type of disability; this finding is consistent with the ones from other studies that were conducted in the U.S and India (Bindawas & Vennu, 2018; Courtney-Long et al., 2015; Velayutham et al., 2016). Thus, the aim of this study was to empirically identify the level of knowledge on skill training, emerging technology perceptions, and preferred information sources among a large group of Saudi MAT users.

Methods

The study was approved by the University of Pittsburgh Institutional Review Board (exempt 19100265). Local regulatory approval to conduct the study was also obtained through the National Committee of Bioethics (NCBE) in Saudi Arabia to conduct the study. The survey was administered using the Pitt-licensed version of the Qualtrics software (Qualtrics, Provo, UT, USA) (Qualtrics, 2017).

An email and/or text that had the section in the Arabic language with the link to the survey was created. Participants completed the survey using a web link. The cross-cultural adaptation and validation process involved two phases: Phase 1 covered the adaptation and validation of the original English survey and Phase 2 entailed the translation and face validation of the Arabic version (see Figure 1).by OT education leaders (Al-Heizan et al., 2023).

More specifically, there is a lack of studies addressing the knowledge and awareness of OT by health sciences students in Saudi Arabia, particularly students from applied or allied medical science colleges. This is important to understand as they are the future of healthcare, and their views can impact the profession's development, given the dependency of an effective occupational therapy intervention on the understanding and referral of other healthcare providers. Additionally, gaining insight into students' perspectives can help improve curriculum development and address occupational therapy education and practice challenges (Olaoye et al., 2016; Tariah et al., 2012).

Bridging the gap in knowledge and awareness, will ultimately provide recommendations on ways to improve current educational programs to enhance understanding of the occupational therapy profession (Olaoye et al., 2016). In addition, help students recognize the significance of occupational therapy in enhancing people's quality of life and well-being, and understand the provided services of occupational therapy within the healthcare team.

Therefore, the purpose of the current study is to provide preliminary insight into the status of knowledge and awareness of occupational therapy among students from colleges of applied or allied medical sciences in Saudi Arabia.

Phase 1: Modification of the English Survey

The English version contained some domains that were neither applicable and nor feasible to be included in the Arabic survey. Hence, the English

survey was first modified by the main author, a Saudi Arabian citizen, who had extensive experience in AT and was professionally bilingual in English and Arabic. First, questions about standards and laws, assessment tools, and U.S. clinical guidelines were excluded when neither applicable nor comparable to those used in Saudi Arabia. Second, questions such as information sources that Saudi MAT users utilize to find information about MAT were adjusted based on the available sources in Saudi Arabia. For example, sources such as newsletters, magazines, events, and conferences were adapted to those available in Saudi Arabia or globally. In addition, the new and advanced technology awareness questions were adjusted to include new ATs that may be familiar to Saudi MAT users. Some demographics were adjusted for the Saudi culture. However, no changes were made to other questions (i.e., users' level of skills in using MAT) or to open-ended questions. The English survey items were then assessed by the four authors of this papers (i.e., the expert committee) who have experience in AT-related research and clinical expertise. The authors evaluated the content relevance and simplicity of the individual items and the questionnaire as a tool. They agreed that the revised English survey was feasible and relevant in its content.

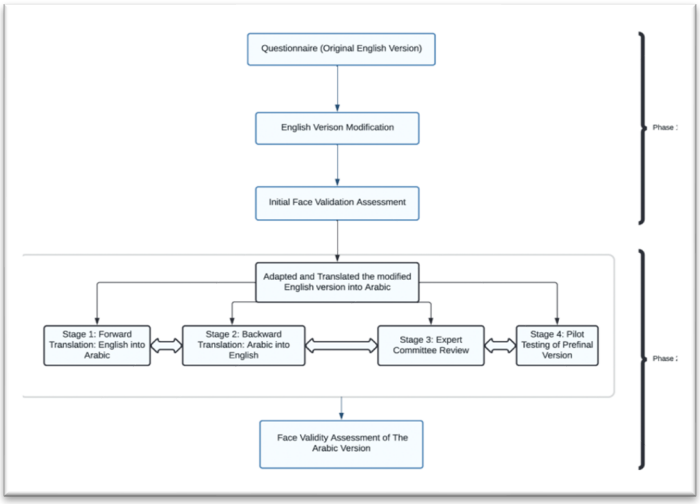


Fig. 1: Flowchart of the cross-cultural adaptation process of the translation and validation of the consumer knowledge sources survey from the English version into Arabic.

Phase 2: Translation and Face Validity Process

Guidelines published by Beaton et al. were used for translating the modified English version in four stages (Beaton et al., 2000). In the first stage, forward translation from English into Arabic was independently performed by our collaborator in Saudi Arabia who is a bilingual and native Arabic speaker with oral and written proficiency in English. The translator is a physiotherapist with extensive experience in translating and validating scales into Arabic. A written report of the forward translation was submitted to the expert committee, along with the translator's comments. In the second phase, the Arabic version of the survey was back-translated into English by a native English speaker with a strong oral and written proficiency in Arabic, and a report was presented to the committee.

During the third phase, the expert committee evaluated all the translations and reviewed both written reports. After the evaluation and review of the reports sent by the translators, the committee reached a consensus on all the discrepancies, and a pre-draft version in Arabic was formulated. Issues were encountered with wording, clarity, and relevance for cultural understanding; several items were then revised in the translated version. A few changes were made to the Arabic version before conducting the pre-final test. These changes included modifying the unit of height from inches into centimeters and culturally adapting the response options ranging from 4 (critical) to 1 (not important). As direct translation to one of the Likert-scale options (i.e., critical) could cause some confusion in wording in Arabic, this option was replaced with "extremely important." Thus, the options were translated as follows: 5 (extremely important), (very important), 3 (moderately important), 2 (slightly important), and 1 (not at all important).

In the fourth phase, the survey was tested on a sample of Saudi mobility device users online through the Qualtrics software (Qualtrics, 2017). The next step was to assess the face validity of the Arabic survey items by a group of participants who

had completed the survey. The interested participants were contacted and asked to evaluate the translated version, determine whether the survey items and the instructions were clear and understandable, and ascertain how well the survey items and the instructions were outlined and presented using an online form. An online form was sent to each participant by email; the participants were asked to rate the current draft of the Arabic version, provide feedback, and make recommendations on the important items to include in the final version. Furthermore, the participants were asked to independently rate the level of clarity and comprehension and provide scores for each item in the survey using a four-point Likert rating scale consisting of 1 (not clear and understandable), 2 (somewhat clear and understandable), 3 (clear and understandable), and 4 (very clear and understandable).

The final Arabic version of the survey was then modified and prepared based on the results of the pre-final test of the survey. The participants for the pre and final tests were recruited from hospitals, rehabilitation centers, and disability associations in Saudi Arabia. They were recruited by AT providers and consumers in person and through flyers. A list of potential participants' emails was obtained through rehabilitation hospitals administrations and disability associations. A collaborator in Saudi Arabia distributed a link to the survey to potentially interested participants by email. The recruitment materials were also posted on a few social media platforms such as Twitter, Facebook, and WhatsApp groups. Referral sampling was used for recruitment, encouraging participants to distribute recruitment materials to their own networks. The potential participants were instructed to access the survey online in the Arabic version. The inclusion criteria were being 18 years of age or older, a Saudi Arabian citizen, live in Saudi Arabia, and a user of any type of MAT devices. No exclusion criteria were involved. The participants were required to complete an online informed consent document prior to accessing the survey. For those with cognitive impairments or inability to complete the survey due to the inaccessibility of some questions in the survey, their family members or friends were asked to complete the survey as a proxy for the participant. The active recruitment period for this study covered more than six months (January - June 2022). The respondents were not reimbursed for their participation.

The survey was designed to take less than 15 minutes to complete and was based on a previously conducted survey (Quinby et al., 2021). The survey included 35 questions. The survey homepage provided an overview and instructions for completing the survey, followed by an overview of informed consent (number of questions = 3) asking the participants to confirm their consent to participate in the survey. The next part of the survey involved the collection of information on a pre-defined list of diagnoses leading to mobility impairment; other diagnoses that were not in the list were provided under the option "other" (number of questions = 4). The participants were allowed to choose multiple diagnoses. The subsequent question asked the participants about their prior use of MAT devices (number of questions = 2). The survey included questions about information sources that participants used for MAT (number of questions = 7), as well as open-ended questions (number of questions = 7). The participants were then asked about the most important sources for learning about new and advanced MAT (number of questions = 2) using open-ended questions. To assess the importance of their providers to have knowledge about new MATs, the participants were instructed to rate such importance on five-point Likert rating scale ranging from 1 = not important at all to 5 = extremely important (number of questions = 1). In addition, they were asked about their awareness of and skills in using MAT (number of questions= 1). Depending on the response to the question about the most frequently used type of MAT device that was being used most, a list of manual wheelchair (MWC) skills was presented to MWC users, and another list of power wheelchair (PWC) skills was presented to those who utilize either PWCs or scooters using a branch logic feature. Additionally, the participants were asked about their knowledge of and familiarity with new

and advanced ATs (number of questions = 1). An image with a description of each MAT was presented, and the participants responded to each question using yes or no options (i.e., whether they were familiar with this type of MAT). At the end of the survey, the participants were asked about the particular type of MAT on which they require further information (number of questions = 1). An open-ended question was provided for those participants who selected another AT device that was not listed (number of questions = 1). Depending on the response to this question, each respondent was led to answer a question about the preferred method of receiving information about the selected device (number of question1). In the final part of the survey, the participants were instructed to provide their demographic information such as gender, age, education level, income level, and the city of residence (number of questions = 4). Question formats in the survey included forced-choice questions with open-ended "other" options, Likert rating scales, "yes or no" dichotomous choices, and open-ended questions. At the end of the survey, some personal identifiable information was collected to ensure that the responses were not repeated.

Statistical Analysis

Microsoft Excel 2011 (Microsoft Corporation, Redmond, WA) was used for data entry and the calculation of face validity statistics. Two forms of face validity index (i.e., FVI for item, or I-FVI, and FVI for scale, or S-FVI) were computed. The clarity and comprehension ratings by the participants in the "English Survey Modification and Validation" portion of the study were recoded as 1 (the scale of 3 or 4) or 0 (the scale of 1 or 2). The I-FVI is the proportion of raters giving an item a clarity and comprehension rating of 3 or 4. The S-FVI was calculated based on the average method, which involved adding the I-FVI scores across all items and dividing the total by the number of the items. For the descriptive analysis, frequency counts, proportions (percentages of the total responses), mean, range, and standard deviation were used for reporting the descriptive statistics for multiple-choice questions using IBM SPSS (IBM SPSS Statistics, Version 22, Armonk, NY). Open-ended responses were examined in detail to identify patterns and themes. The texts were categorized and their frequencies were reported through Microsoft Excel 2011 (Microsoft Corporation, Redmond, WA).

Results

Fifty-four participants responded to the pre-final test. Twenty of them evaluated the face validity of the Arabic version. An online form was sent to them by email to provide scores for each item in the survey.

Table 1. Face Validity Index of Clarity and Comprehension of the Arabic version of the survey.

Items	Raters in Agreement	I-FVI
Instruction and informed consent information	19	0.95
Diagnoses		
Type of diagnoses	18	0.9
Type of Traumatic Brain Injury	17	0.85
Level of Spinal Cord Injury	19	0.95
Type of MAT used often	18	0.9
Time using MAT	19	0.95
Information sources		
Type of information sources	16	0.8
Internet sources	16	0.8
Social media sources	17	0.85
Events	16	0.8
Newsletters	16	0.8
Magazines	16	0.8
Conferences	17	0.85
Importance of AT knowledge	20	1
Skills in using MAT devices	14	0.7
New and advanced AT awareness	9	0.45
Type of MAT devices that need more information on	19	0.95
The ways of receiving information	18	0.9
Demographic Information	20	1
S-FVI/Ave		0.85

The FVI results are shown in Table 1. For the clarity and comprehension of the survey items, the S-FVI score was 0.85, which is above the threshold according to Marzuki et al. (2018) and Yusoff (2019), whereby the acceptable cut-off score of FVI for over 10 raters is at least 0.80 in online survey research (Muhamad Fadhil Mohamad Marzuki et al., 2018),(Yusoff, 2019). Thus, this score indicated a satisfactory level of face validity. However, the item-level indices (I-FVI) for skills in using MAT devices and new and advanced MAT awareness items were below the threshold (i.e., 0.70 and 0.45), respectively, suggesting an unsatisfactory level of face validity. On both items, the participants suggested revision of both questions.

As shown in Figure 2, a total of 388 individuals responded to the final survey, of whom 370 met the inclusion criteria. Other respondents were excluded from the analysis because of duplicates (n = 5), non-completion of the survey (n = 12), or failure to meet the inclusion criteria (n = 18). Thus, data for 353 participants were analyzed.

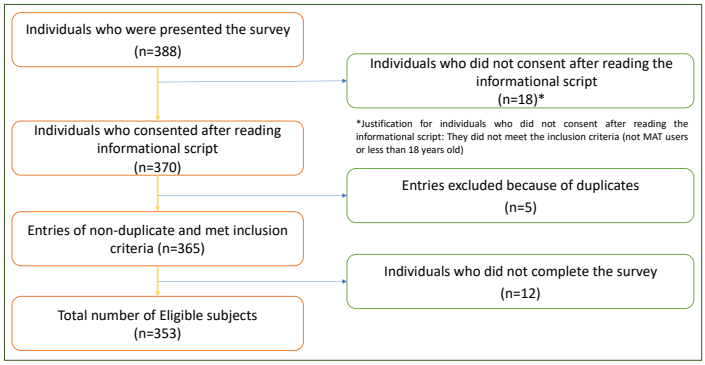


Fig. 2: Exclusion flowchart

The demographic profile of the survey respondents is presented in Table 2. The average age of the participants was 39 (SD 9.6; range 18-55) years, and the participants lived in 18 different cities in Saudi Arabia. Most of the respondents were male (n = 239, 67.7%). The majority of the participants held an associate or a bachelor's degrees (n = 134, and n = 148, respectively).

Table 2. Participant demographics (N = 353)

	No. of respondents
Age (years), mean ± SD	38.92 ± 9.6
Gender n (%)	
Male	239 (67.7)
Female	114 (32.3)
Highest level of education n (%)	
High school diploma or equivalent (GED)	60 (17)
Associate's degree	134 (38)
Bachelor's degree	148 (41.9)
Doctorate level degree	2 (0.6)
None of the above	3 (0.8)
Prefer not to answer	6 (1.7)
Household income Saudi Riyals (SR) n (%)	
Under SR 10,000	50 (14.2)
SR 10,000- SR 15,000	111 (31.4)
SR 15,999- SR 20,000	70 (19.8)
SR 20,999- SR 40,000	3 (0.9)
Prefer not to answer	119 (33.7)
City of living n (%)	
Riyadh	123 (34.8)
Jeddah	47 (13.3)
Dammam	46 (13)
Abha	16 (4.5)
AlQassim	9 (2.5)
Makkah	14 (4)
Madinah	10 (2.8)
Taif	12 (3.4)
Jazan	9 (2.5)
Najran	7 (2)
Hail	6 (1.7)
Tabuk	13 (3.7)
Aljof	12 (3.4)
Alkobar	11 (3.1)
Buraidah	4 (1.1)
Skaka	7 (2)
Arar	6 (1.7)
Other (Khamis Mushait)	1 (0.3)

The diagnoses of participants are shown in Table 3. The participants with SCI comprised the largest diagnostic group (n = 141, 40%) followed by the

participants with cerebral palsy (CP) and traumatic brain injury (n = 48, 13.6% and n = 46, 13.1%, respectively). Table 3. Participants diagnoses (N = 353)

Table 3. Participants diagnoses (N = 353)

	No. (%) of respondents
Stroke	30 (8.5)
Upper extremity amputation/congenital limb deficiency	18 (5.1)
Lower extremity amputation/congenital limb deficiency	41 (11.6)
Multiple sclerosis	9 (2.5)
Amyotrophic lateral sclerosis (ALS)	7 (2.0)
Spina bifida	7 (2.0)
Cerebral palsy	48 (13.6)
Osteo/Rheumatoid arthritis	1 (0.3)
Other	5 (1.4)
Spinal cord injury (SCI)	141 (39.9)
Tetraplegia or quadriplegia (C1-C8)	43 (30.5)
Paraplegia (T1 and below)	98 (69.5)
Complete	97 (68.3)
Incomplete	45 (31.7)
Traumatic brain injury	46 (13.1)
Was your injury traumatic or non-traumatic?	
Traumatic	16 (34.8)
Non-traumatic	30 (65.2)

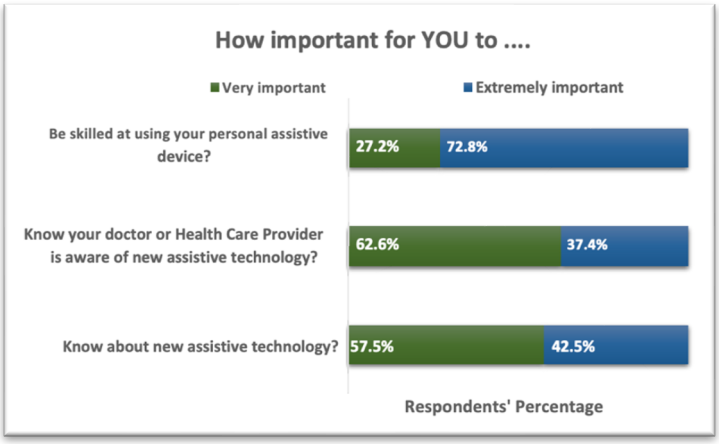
Table 4. Primary MAT and length of time using device (N = 353)

	No. (%) of respondents
What assistive mobility device do you use most of the time?	
Manual wheelchair	139 (39.4)
Power wheelchair	115 (32.6)
Scooter	-
Lower extremity prosthesis	25 (7.1)
Lower extremity orthosis (brace)	11 (3.1)
Assistive device (cane, crutch, walker)	47 (13.3)
Other	16 (4.5)
How long have you been using this device?	
< 1 year	59 (16.7)
2-5 years	164 (46.5)
6-10 years	73 (20.7)
11-15 years	15 (4.2)
> 15 years	42 (11.9)

Of the participants with SCI, 43 (30.5%) had tetraplegia and 98 (69.5%) had paraplegia. Out of 353 participants, 139 (39.4%) reported being MWC users. Meanwhile, 115 participants (32.6%) were PWC users; 47 (13.3%) were users of other assistive devices users (e.g., canes, crutches, walkers); 25 (7.1%) were users of a lower extremity prosthesis; 11 (3.1%) were users of a lower extremity orthosis; and 16 (4.5%) were users of other assistive devices that were not listed in the question (i.e., upper extremity protheses and orthoses). The majority of participants (n = 164, 46.5%) had been using their MAT devices between two and five years (see Table 4).

When asked about the importance of personal knowledge of new MAT, provider knowledge of MAT, and skills in using MAT, all participants reported that skill in using personal MAT devices, healthcare providers' awareness, and knowledge about new MATs were either very important or extremely important (see Figure 3).

Figure 3. Importance of consumer knowledge of mobility assistive technology (MAT)



Participants who reported being MWC, PWC, or scooter users were asked to rate their ability to perform various wheelchair skills. For MWC users, performing a 30-second wheelie balancing and climbing up a four-inch curb were the most difficult skills (75.5% and 50.1%, respectively) (see Figure 4).

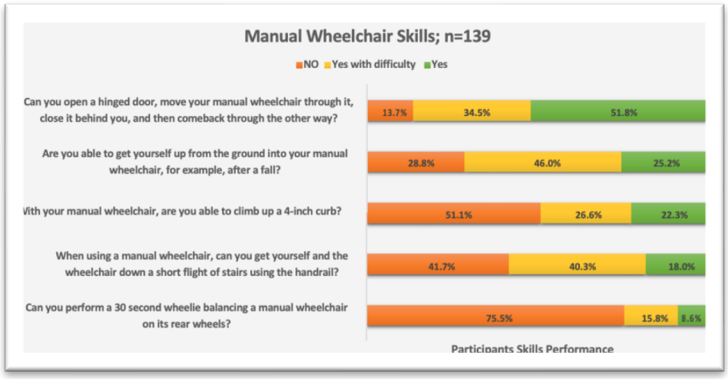


Figure 4. Manual wheelchair skills ability (N = 353)

Meanwhile, the majority of PWC reported the most difficulty with operating the battery charger for their PWCs and operating body positioning options (80.9% and 55.7%, respectively) (refer to Figure 5).

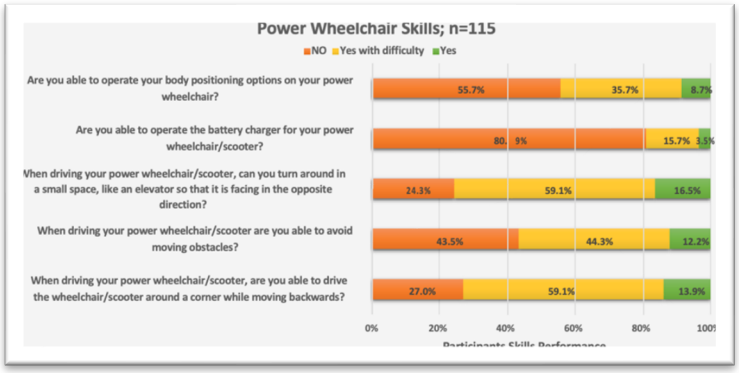


Figure 5. Power wheelchair skills ability (N = 353)

When asked to report the sources used for finding information on MAT, the majority of participants selected physiotherapists (PTs) or occupational therapists (OTs) (n = 302, 85.6%); internet (n = 257, 72.8%); social media (n = 213, 60.3%); physicians (n = 170, 48.2%); and family or friends using AT (n = 159, 45%).

The other sources included conferences (n = 86, 24.4%); events (n = 77, 21.8%); magazines (n = 16, 4.5%); newsletters (n = 15, 4.2%); newspapers (n = 14, 4%); TV (n = 9, 2.5%); and research studies (n = 4, 1.1%). The detailed responses are outlined in Table 5.

Table 5. Information sources (N = 353)

Source	No. (%) of respondents
Internet	**257 (72.8)**
World Health Organization (WHO)	9 (2.5)
Eastin	39 (11)
Disabled-World	79 (22.4)
Wikipedia	62 (17.6)
Google Search	252 (71.4)
Social media	**213 (60.3)**
Facebook	100 (28.3)
YouTube	195 (55.2)
Twitter	181 (51.3)
LinkedIn	59 (16.7)
Instagram	35 (9,9)
TikTok	36 (10.2)
Snapchat	71 (20.1)
Other (WhatsApp)	1 (0.3)
Events	**77 (21.8)**
Paralympics	43 (12.2)
Adaptive Sports - teams, competitions, gyms, or coaches	20 (5.7)
Local disability fairs	52 (14.7)
International Day of Persons with Disabilities	75 (21.2)
International Day of Physical Therapy	21 (5.9)
Newsletters	**15 (4.2)**
The Authority for the Care of Persons with Disabilities (APD)	15 (4.2)
Children with Disabilities Association	11 (3.1)
Disability Ass. Motor for Adults Mobility	15 (4.2)
Al-Arabia News	2 (0.6)
Magazines	**16 (4.5)**
Disability Eco	12 (3.4)
Saudi Disability and Rehabilitation	**15 (4.2)**
Special Education	1 (0.3)
Disability World	8 (2.3)
Conferences	**86**
International Conference of Experts on Disability and Rehabilitation	53
International Conference on Disability and Rehabilitation	50
Saudi Conference for People with Disabilities	68
International Seating and Wheelchair Symposium (ISS)	26
Television	**9 (2.5)**
Newspapers	**14**
Physicians	**170**
Physical or Occupational Therapists	**302**
Research Studies	**4 (1.1)**
Family/Friends using Assistive Technology	**159**

Note: Participants could choose more than one option

Of the social media sources presented, YouTube, Twitter, and Facebook (55.2%, 51.3%, and 28.3%, respectively) were cited as the most commonly utilized sources for locating information about MAT (see Table 5).

One hundred and sixty-four participants (46.5%) responded to an open-ended question about the specific information source that they deem important in learning about MAT. Their responses included healthcare providers (i.e., physicians and PTs or OTs), internet, social media, family or friends using MAT, and rehabilitation centers and disability organizations.

Healthcare providers were identified as the most important source of information by the largest number of participants (n = 63, 38.4%), followed by social media (n = 57, 34.8%) and the internet (n = 35, 21.3%) (see Table 6).

Table 6: Most important information source (N = 164)

Source	No.(%) of respondents
Healthcare Provider	63 (38.4)
Social media	57 (34.8)
Internet	35 (21.3)
Family/friends using AT	6 (3.7)
Rehab centers and disability organizations	3 (1.8)

The participants similarly reported the particular type of MAT on which they require further information (refer to Figure 6).

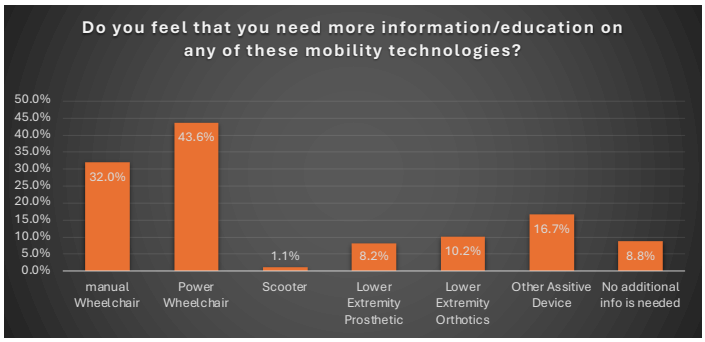


Figure 6. AT Information desired (N=353)

PWC (n = 154, 43.6%) was the most common type of MAT that the participants felt that they need more information on, followed by MWC (n = 113, 32%) and other MAT devices (n = 59, 16.7%).

Those participants who reported that they require further information on other MAT devices were directed to answer a follow-up open-ended question. Their responses about the other MAT devices included computer access technology, communication devices, upper limb prostheses, standing wheelchairs, standing frames, and robotic arms. When asked about their preferred mode of receiving information on MAT, the participants primarily cited videos and workshops, followed by social media and websites (see Figure 7).

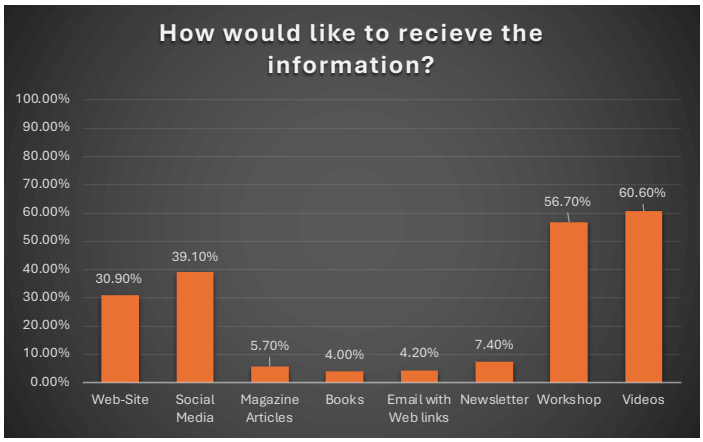


Fig. 7: Preferred Methods of Receiving Information (N=353)

The participants were asked to rate their familiarity with new and advanced MATs including wearable or mobile technology, human-machine interface technology, robotic wheelchair/walker, smart home technology, alternative power sources, and exoskeleton. Their responses are shown in Figure 7.

Almost all the participants indicated their unfamiliarity with all the presented technologies. However, smart home technology was the most familiar technology for 40% of the participants, followed by wearable or mobile technology (38.7%) (Figure 8).

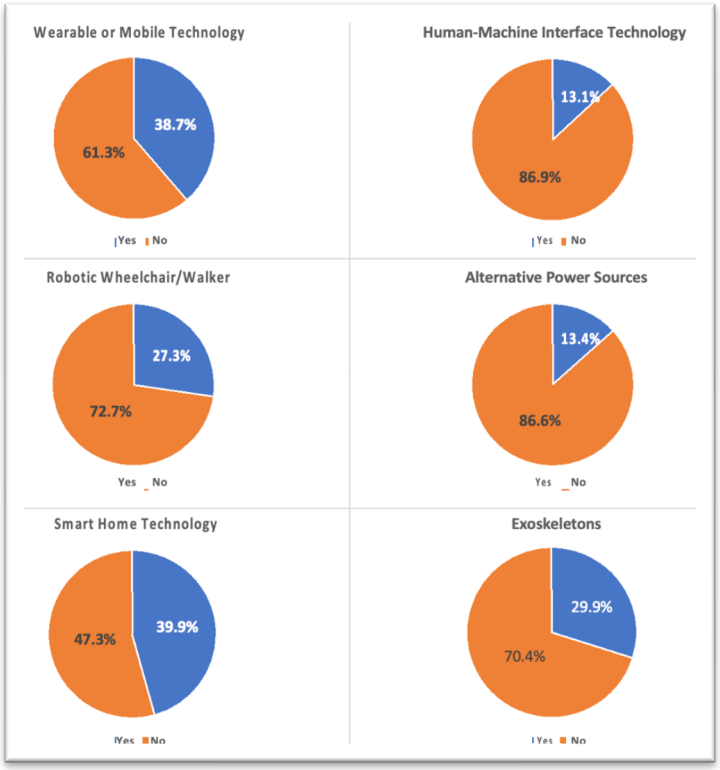


Fig.8: Knowledge of new technology (N = 353)

Discussion

This study presented the cross-cultural adaptation process of a previously developed English-language survey aimed to identify knowledge gaps in wheelchair skills, emerging technology, and preferred sources to find information about AT into the Arabic-language. A final aim of this study was to empirically identify the level of knowledge on skill training, emerging technology perceptions, and preferred information sources among a large group of Saudi MAT users.

This exploratory study adds to the existing literature on MAT by providing an example for researchers who are interested in identifying knowledge gaps in wheelchair skills, emerging technologies, and preferred sources of information about AT in their country. A crucial approach to inform future dissemination strategies is to understand of the gaps in consumer knowledge and training and the consumer preferences concerning accessing information about AT.

Similar to other methods employed in other studies (Alqarni et al., 2018; Paulisso et al., 2020), the recommended protocol of cross-cultural adaptation adopted in the current study is a useful method for establishing the validity and equivalence of the Arabic version of the survey. During the translation process, the translators reported no difficult experiences despite the non-adoption of Beaton's guideline of using two independent translators at each translation step. We believe that the translators' extensive experience and their background in translating and validating some scales into Arabic, combined with the simple language of the English survey, resulted in the non-emergence of major problems during the translation process. Only a few items were modified due to the cultural background of Saudi Arabia, including the metric units of measurement and one of the Likert-scale options (i.e., critical) that might cause some confusion in wording in Arabic; this option was replaced with "extremely important."

The FVI score for clarity and comprehension was within the satisfactory level of face validity was 0.85 indicating a satisfactory level of face validity. The result indicated that the translation process was culturally valid to be used within a large sample of MAT users in Saudi Arabia. However, the I-FVI scores for two items in the survey were below the satisfactory level, which we believe was due to the inappropriate formatting of these two items. For example, the question about wheelchair skills in using MAT devices was confusing as reported by the participants, where the list of MWC and PWC skills was combined and no logic branching was created. The second question about familiarity with new and advanced MATs was unclear, and the description of each technology was lengthy and confusing. The participants, therefore, recommended reformatting the questions and or adding further clarification such as images or weblinks along with the descriptions of the new and advanced MATs. Disclosing the findings of these two items was inappropriate due to their low I-FVI scores. Therefore, reformatting the two items in the final version will facilitate the participants' reporting of meaningful data.

Several interesting findings from this study are worthy of discussion. First, the results show that the participants with SCI comprised the largest diagnostic group. This prevalence rate was aligned with the recent statistical report by the General Authority for Statistics (GASTAT) in Saudi Arabia, which found that SCI was the most frequently reported type of mobility impairment (Bindawas & Vennu, 2018),(Al-Jadid, 2013). In addition, the male participation rate in the study was higher than the female participation rate, which is a similar result as the GASTAT's recent statistical report (Bindawas & Vennu, 2018),(Al-Jadid, 2013). Second, with regard to MWC and PWC skills when using MAT, the results reveal certain gaps when using MAT devices, especially for wheelchair skills. For instance, MWC users reported that the most difficult skills were performing a 30-second wheelie balancing and climbing up a four-inch curb (75.5% and 50.1%, respectively). By contrast, PWC users considered the most challenging skills to be operating the battery charger and the body positioning options as the most challenging skills. In the U.S. pilot study, the majority of the American mobility device users also reported that operating the battery charger for PWC or scooter was the most difficult skill. In addition, the majority of the American mobility users reported that another difficult skill was maneuverability. Similarly, while the majority of the Saudi mobility device users (59%) reported that they could perform maneuverability skills, their responses were "yes, with difficulties." Thus, in line with the recommendation of the U.S. pilot study, MWC and PWC users require additional training in nearly all the skills. To learn many of these skills, MAT users in Saudi Arabia must obtain sufficient training either in person or online as recommended by other studies (Worobey et al., 2016),(Zanca et al., 2011). The gaps in performing the MWC and PWC skills among Saudi MAT users are expected as the majority of the participants have been using their current devices for only two to five years (46.5%); thus, it might require some more time to learn how to perform essential skills. The results show that the majority of the participants reported being MWC and PWC users and only a few participants reported being scooter users. Despite the great funding support from the Saudi government for various types of MAT, the fact that there are not many scooter users in Saudi Arabia signals to the providers' unfamiliarity with prescribing such mobility devices and their lack of knowledge concerning when and for whom these devices should be prescribed (Alqahtani et al., 2021).

The findings about the types of sources that participants use to find information on MAT indicate that the most frequently utilized sources were healthcare providers, the internet, social media, and family or friends using MAT. In the open-ended question about the specific information source that participants deem important for learning about MAT, the majority of participants cite these same resources (i.e., healthcare providers, the internet, and social media). These findings are similar to the findings of the U.S. pilot study, whereby the most frequently utilized sources by the majority of the participants were healthcare providers (i.e., PTs, OTs), the internet, and family or friends using AT (i.e., word of mouth). However, the majority of the American mobility device users reported events as a more common source for finding information about MAT than Saudi mobility device users. This finding can be explained by the paucity of events held in Saudi Arabia compared to the U.S. When it comes to social media resources, the comparison of the studies shows that Saudi mobility device users use social media platforms for locating information about AT more than American mobility device users. The fact that almost 96% of the Saudi population has access to the internet, of whom 79.3% use social media may partly explain why Saudi mobility device users utilize social media to locate information about MAT more than American mobility device users (Kemb, 2021).

Furthermore, the findings about the importance of personal knowledge of new MATs, providers' knowledge of MAT, and skills in using MAT asserted that 100% of the participants recognize that the healthcare providers' knowledge and awareness of AT is very important or extremely important. These

findings accordingly suggest the significance of undertaking another study similar to the one that was conducted in the U.S. (Dicianno, Joseph, Eckstein, Zigler, Schmeler, et al., 2018) to obtain the voice of the providers in Saudi Arabia. The focus of such study should be on the evaluation the providers' opinions about the delivery provision process, their awareness of available AT applications and services, and the value of carrying out certain activities by their clients if the technology could accommodate them. Such investigation will help in understanding the providers' current level of knowledge, which presents an opportunity for researchers to boost the providers and users' awareness of the available technologies and their proper use and maintenance, the emerging technologies, and the application of best practices in the provision process by continuously offering education and training programs.

The gaps identified in the participant awareness of emerging technologies (i.e., nearly all the presented examples of emerging technologies were unfamiliar to the participants) underscore for researchers the importance of enhancing research dissemination and knowledge translation in MAT to ultimately increase the awareness of Saudi MAT users. However, such gaps limit the users' ability to access the appropriate MAT that could improve community participation and enhance the quality of life.

This study has some limitations. The survey was conducted in an online format, we might have oversampled those participants who are technically savvy or have internet access. This factor may partly explain why the internet was identified as a commonly used source of information. In addition, no alternative means of completing the survey were provided, which might result in sample bias. The modification to the English version items was made only by one individual (i.e., the main author, who is a Saudi Arabian citizen with extensive experience in AT and is professionally bilingual in English and Arabic). This indicates that the modified items or options (e.g., information sources) might not be comprehensive and representative of the ones that are available in Saudi Arabia. However, during the validity process, the participants were informed that they could add any question/option they believe would be highly relevant and beneficial. During the translation process, only one independent translator at each translation stage was hired, which was contrary to Beaton's guideline. This limitation might cause some translation issues. However, we believe that the translators' extensive experience and background in translating and validating scales into Arabic, combined with the simple language of the English survey, resulted in the none-emergence of major problems during the translation process, as reported by the translators and the participants. The main form of validity used in this study was face validity, which is considered the weakest form of validity (Yusoff, 2019). It is subjective and may only provide the appearance that a survey procedure was valid.

Additionally, the method used in this study to calculate and report the FVI results was not performed in a standard way. For example, some questions (e.g., demographic ones) were calculated based on the average method, whereby the clarity and comprehension scores on each item within the demographic section were aggregated, and the average score was reported. However, these questions should have been rated individually rather than as a group, and therefore the I-FVI scores of those questions should be interpreted with caution. To help ensure the survey items represent the intended use and to ensure that the translated version of the survey has equivalent properties to the original version, future researchers should assess additional psychometric properties. For example, upon completing the translation and cross-cultural adaptation processes, a panel of experts should establish the content validity of the translated version in terms of the relevancy and representativeness of each item to a specific domain (Andrew Chin et al., 2018; M F M Marzuki et al., 2018). This step should be followed by an

assessment of the survey's face validity (Andrew Chin et al., 2018; M F M Marzuki et al., 2018). Another approach to assess the face validity could be a cognitive approach, such as think-aloud sessions where participants can verbalize their thoughts in order to help clarify survey questions (D. Collins, 2003).

In addition, the participants' average age was approximately 39 (range of 18-55 years old). This result might limit the generalizability due to the limited number of older adult respondents to the survey. In terms of educational level, the majority of the participants have either an associate or a bachelor's degree, thereby increasing the likelihood of responding to the survey as they would be aware of its importance and the impact that the survey results might have on improving the MAT service in Saudi Arabia. This result indicates that the sample was not a comprehensive representation of the population due to the limited number of participants who hold a high school diploma; furthermore, no responses were obtained from those without a formal degree or who have a low level of literacy. Finally, the survey was not fully accessible because this feature is not supported by the Qualtrics software if the survey includes question formats such as Likert scale and questions with graphs. This limitation indicates the lack of clarity regarding the issue of whether those who have severe mobility functions answered the survey by themselves or with the help of their family members, caregivers, or friends, thereby implying the impossibility of generalizing the results.

Conclusion

The study reveals knowledge gaps regarding user perspectives on MAT and underscores the need for further research in this area. This study of surveying Saudi MAT users can be used for creating an effective model for research dissemination and knowledge translation. Its method can also be adopted as a foundation for other researchers who are interested in applying it in other countries. The results of this survey highlight for consumers the importance of being skilled in and knowledgeable about using their MAT devices, and for both consumers and healthcare providers the value of being knowledgeable about and aware of new and advanced technologies. Based on the findings of this study, healthcare providers, the internet via search engine, family/friends using MAT, and social media platforms are considered the most preferred sources for Saudi MAT users for finding information about MAT. For healthcare providers, the assessment of their perspectives and level of knowledge of MAT applications, services, and delivery provision process is essential. In the meantime, a national online platform that includes comprehensive information about available technologies (i.e., their use, simple maintenance, and repairs guidelines) and a list of local service providers could be created to be used as a reference for consumers and their families

and caregivers. In addition, further study should be conducted to obtain the Saudi policy stakeholders' perspectives about their current level of knowledge about MAT applications and services, standards and laws, and current MAT-related regulations. Such a study will provide a comprehensive view of the MAT services in Saudi Arabia and some recommendations to enhance the MAT service, procurement, and provision regulations.

Disclosure

The authors report no conflicts of interest in this work.

Reference

A. Kelleher, B. E. Dicianno, S. Eckstein, R. Schein, J. Pearlman, and R. A. Cooper, "Consumer Feedback to Steer the Future of Assistive Technology Research and Development: A Pilot Study," Top. Spinal Cord Inj. Rehabil., vol. 23, no. 2, pp. 89–97, 2017, doi: 10.1310/sci2302-89.

A. M. Alqarni, V. Vennu, S. A. Alshammari, and S. M. Bindawas, "Cross-Cultural Adaptation and validation of the Arabic version of the Physical Activity Scale for the Elderly among Community-Dwelling Older Adults in Saudi Arabia," Clin. Interv. Aging, vol. 13, pp. 419–427, 2018, doi: 10.2147/CIA.S157007.

B. E. Dicianno et al., "The Future of the Provision Process for Mobility Assistive Technology: A Survey of Providers," Disabil. Rehabil. Assist. Technol., vol. 0, no. 0, pp. 1–8, 2018, doi: 10.1080/17483107.2018.1448470.

B. E. Dicianno et al., "The Voice of the Consumer: A Survey of Veterans and Other Users of Assistive Technology," Mil. Med., vol. 0, no. 0, pp. 1–8, 2018, doi: 10.1093/milmed/usy033.

B. Phillips and H. Zhao, "Predictors of Assistive Technology Abandonment," Assist. Technol., vol. 5, no. 1, pp. 36–45, 1993, doi: 10.1080/10400435.1993.10132205.

B. Velayutham, B. Kangusamy, V. Joshua, and S. Mehendale, "The Prevalence of Disability in Elderly in India - Analysis of 2011 census data," Disabil. Health J., vol. 9, no. 4, p. 584-592, Oct. 2016, doi: 10.1016/j.dhjo.2016.04.003.

D. C. Paulisso et al., "Cross-Cultural Adaptation and Face Validity of the Functional Mobility Assessment into Brazilian Portuguese," Occup. Ther. Int., vol. 2020, 2020, doi: 10.1155/2020/8150718.

D. Collins, "Pretesting Survey Instruments: An Overview of Cognitive Methods," Qual. Life Res., vol. 12, no. 3, pp. 229–238, 2003, [Online]. Available: https://doi.org/10.1023/A:1023254226592.

D. E. Beaton, C. Bombardier, F. Guillemin, and M. B. Ferraz, "Guidelines for the Process of Cross-Cultural Adaptation of Self-Report Measures," Spine (Phila. Pa. 1976)., vol. 25, no. 4, pp. 3186–3191, 2000, doi: 10.1080/000163599428823.

D. M. Collins, M. Scherer, D. D. J. Boccthy, A. Karmarkar, F. Harris, and R. A. Cooper, "Consumers Perspectives on Assistive Technology : Simplicity , Function , Appearance and Cost," RESNA Annu. Conf., 2008.

E. A. Courtney-Long et al., "Prevalence of Disability and Disability type Among Adults— United States, 2013," Morb. Mortal. Wkly. Rep., vol. 64, no. 29, p. 777, 2015, [Online]. Available: https://doi.org/10.15585%2Fmmwr.mm6429a2.Qualtrics, "Qualtrics." Provo, Utah, USA, 2017.

E. Quinby, G. McKernan, S. Eckstein, J. Joseph, B. E. Dicianno, and R. A. Cooper, "The Voice of The Consumer: A Survey of Consumer Priorities to Inform Knowledge Translation Among Veterans who use Mobility Assistive Technology," J. Mil. Veteran Fam. Heal., vol. 7, no. 2, pp. 26–39, 2021, doi: 10.3138/JMVFH-2019-0043.

Geneva: World Health Organization, Global Report on Assistive Technology. 2022.

J. Borg and P. O. Östergren, "Users' perspectives on the provision of assistive technologies in Bangladesh: Awareness, providers, costs and barriers," Disabil. Rehabil. Assist. Technol., vol. 10, no. 4, pp. 301–308, 2015, doi: 10.3109/17483107.2014.974221.

J. Howard, Z. Fisher, A. H. Kemp, S. Lindsay, L. H. Tasker, and J. J. Tree, "Exploring The Barriers to Using Assistive Technology for Individuals with Chronic Conditions: A Meta-Synthesis Review," Disabil. Rehabil. Assist. Technol., vol. 0, no. 0, pp. 1–19, 2020, doi: 10.1080/17483107.2020.1788181.

J. K. Martin, L. G. Martin, N. J. Stumbo, and J. H. Morrill, "The impact of consumer involvement on satisfaction with and use of assistive technology," Disabil. Rehabil. Assist. Technol., vol. 6, no. 3, pp. 225–242, 2011, doi: 10.3109/17483107.2010.522685.

J. M. Zanca, A. Natale, J. LaBarbera, S. T. Schroeder, J. Gassaway, and D. Backus, "Group physical therapy during inpatient rehabilitation for acute spinal cord injury: findings from the SCIRehab Study," Phys. Ther., vol. 91, no. 12, pp. 1877–1891, 2011, [Online]. Available: https://doi.org/10.2522/ptj.20100392.

L. A. Worobey et al., "Effectiveness of group wheelchair skills training for people with spinal cord injury: a randomized controlled trial," Arch. Phys. Med. Rehabil., vol. 97, no. 10, pp. 1777–1784, 2016, [Online]. Available: https://doi.org/10.1016/j.apmr.2016.04.006

M. F. M. Marzuki, N. A. Yaacob, and N. M. Yaacob, "Translation, Cross-Cultural Adaptation and Validation of System Usability Scale (Malay Version) Questionnaire for the Assessment of Mobile

Application," JMIR Hum. Factors, vol. 5, no. 2, 2018.

M. F. M. Marzuki, N. A. Yaacob, and N. M. Yaacob, "Translation, Cross-Cultural Adaptation, and Validation of the Malay Version of the System Usability Scale Questionnaire for the Assessment of Mobile Apps," JMIR Hum. factors, vol. 5, no. 2, p. e10308, 2018, [Online]. Available: https://doi.org/10.2196%2F10308.

M. S. Al-Jadid, "Disability in Saudi Arabia," Saudi Med. J., vol. 34, no. 5, pp. 453–460, 2013.

M. S. B. Yusoff, "ABC of Response Process Validation and Face Validity Index Calculation," Educ. Med. J., vol. 11, no. 3, pp. 55–61, 2019, doi: 10.21315/eimj2019.11.3.6.

R. Andrich and S. Besio, "Being Informed, Demanding and Responsible Consumers of Assistive Technology: An Educational Issue," Disabil. Rehabil., vol. 24, no. 1–3, pp. 152– 159, 2002, doi: 10.1080/09638280110064778.

R. O. Smith et al., "Assistive Technology Products: A Position Paper From the First Global Research, Innovation, and Education on Assistive Technology (GREAT) Summit," Disabil. Rehabil. Assist. Technol., vol. 13, no. 5, pp. 473–485, 2018, doi: 10.1080/17483107.2018.1473895.

R. W. Andrew Chin et al., "Investigating Validity Evidence of the Malay Translation of the Copenhagen Burnout Inventory," J. Taibah Univ. Med. Sci., vol. 13, no. 1, pp. 1–9, 2018, doi: 10.1016/j.jtumed.2017.06.003.

S. Alqahtani, R. Cooper, and R. A. Cooper, "Current State and Conceptual Framework of Assistive Technology pProvision in Saudi Arabia," Disabil. Rehabil. Assist. Technol., vol. 0, no. 0, pp. 1–7, 2021, doi: 10.1080/17483107.2021.2008027.

S. Kemb, "Digital 2021: Global Overview Report-Data Portal-Global Digital Insights," DataReportal, 2021. https://datareportal.com/reports/digital-2021-global-overview-report.

S. M. Bindawas and V. Vennu, "The National and Regional Prevalence Rates of Disability, Type of Disability and Severity in Saudi Arabia—Analysis of 2016 Demographic Survey Data," Int. J. Environ. Res. Public Health, vol. 15, no. 3, 2018, doi: 10.3390/ijerph15030419.

World Health Organization, "Global Priority Research Agenda for Improving Access to High-Quality Affordable Assistive Technology.," 2017.