Psychosocial Predictors of Non-adherence to Prescribed Mobility Assistive Devices by Community-dwelling Older Adults: Development of a Predictive Model

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Abstract

Mobility is essential to healthy aging and is closely related to health and overall quality of life. Mobility impairment is an early predictor of disability, and is intimately linked to falling injuries, loss of independence, hospitalization, and mortality. Mobility Assistive Devices (MADs), such as canes, walkers, and wheelchairs, provide support to older adults to improve their balance, coordination, and strength. Despite the acknowledged benefits of MADs for the older adult population research shows that as many as 75% of older adults are non-adherent to prescribed MADs. As non-adherence is a contributing factor to declines in mobility and overall quality of life, it is important to consider the reasoning behind it. Therefore, this doctoral project took a psychosocial perspective and investigated the psychosocial factors that predict non-adherence to MADs among older adults.

This study considered a sample of older adult MADs users from long-term care units at the Perley Health Centre in Ottawa with different types of mobility limitations. The study examined the role of psychosocial variables using the Psychosocial Impact of Assistive Devices Scale (PIADS), social support using the Medical Outcomes Study Social Support Survey (MOS-SS), and the demographic variable of sex in the prediction of MADs non-adherence. Predictor variables that were associated with non-adherence in a univariate regression analysis were subsequently entered into a multiple regression analysis.

Of the 96 residents invited to participate in the study, 49 gave their consent to participate, and out of this number, 48 completed the study, for a response rate of 51%. The data from the 48 residents (26 females and 22 males), with a mean age of 86.8 (Standard Deviation (SD) = 10.2, age range= 66 - 101), were therefore available for analysis.

The most common reported mobility limitations were due to balance problems and leg weakness (29.17% for each). The most common device used was a walker (47.92%), followed by a manual wheelchair (33.33%). No statistical difference was detected between the groups of sexes regarding any of the study variables ($P \geq 0.05$). In the univariate regression analysis, the three PIADS subscales, namely, Competence, Adaptability, and Self-esteem, were significantly correlated with non-adherence ($p < 0.001$). Sex was an insignificant variable, while social support was significantly correlated with Competence, Adaptability, Self-esteem, and non-adherence. In the multiple regression analyses, only Self-esteem showed significant associations ($p < 0.05$), and the Self-esteem multivariate model explained 43.5 - 54.3% of the variance in non-adherence.

This study revealed that the Self-esteem construct, which includes several concepts related to psychological wellbeing, was the only significant predictor of non-adherence among the studied sample of older adults. The theoretical and clinical implications of the findings are subsequently discussed.

Dedication

To my lovely kids.

To the souls of my dad and mum.

Acknowledgements

Throughout this long journey, I have received a great deal of support and assistance, and here I would like to pay tribute to some of those who helped make it possible:

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Chapter 1 - The Research Problem

Introduction

Canadians are living longer as life expectancy continues to increase for both men and women (Statistics Canada, 2020). The portion of Canadians who are 65 years or older is growing faster than ever before. According to Statistic Canada (2020), over 5 million people (15.3% of Canada's population) were 65 years or older in 2013, and by 2056, one-quarter of the population (13 million) will be older adults. In light of this development, aging-in-place can be conceptualized as a preference, not only for policymakers as a way to manage the cost of hospitalization, but also for the older adults themselves (Peek et al., 2017; Wiles et al., 2012; World Health Organization, 2007).

Mobility is essential to healthy aging and is closely related to health and overall quality of life (Webber et al., 2010). Previous studies have indicated that mobility limitation is an early predictor of disability (Heiland et al., 2016; Vincent et al., 2010), and is intimately linked to injuries from falls, loss of independence, hospitalization, and mortality (den Ouden et al., 2013; Huang et al., 2010; Minneci et al., 2015). Additionally, mobility limitations prevent older adults from attending social events and disrupt their daily routines (Lin & Wu, 2014). For these reasons, healthcare professionals and researchers are interested in helping older adults maintain functional mobility as they age (Satariano et al., 2012).

Mobility, simply defined, is the ability to ambulate from point A to point B in a given context (Hoyer et al., 2018). By this definition, a person who is confined to a wheelchair would have a total mobility impairment, However, it does not mean that this person necessarily has mobility disability. According to the International Classification of Functioning, Disability and

Health (ICF) framework (World Health Organization, 2001), as long as a person can move from one place to another to perform desired tasks, there is no disability. Thus, being in a wheelchair would not be considered a disability since the person can still function. Based on the WHO view, mobility can be conceptualized as being able to go to the desired locations safely, reliably, and effectively.

Figure 1 presents a conceptual map of mobility and how a person might transit from complete mobility status to immobility (or disability) (Moulton, 2020). Since mobility among older adults is a spectrum, it is represented by a line, with complete mobility on one extremity and immobility on the other. The individual's current mobility level is represented with an arrow pointing downward to the line. This level of mobility capacity may change over time. That is, it can move to the right end (i.e., immobility) due to stressors such as illness/injury, environmental barriers or physical or cognitive decline. Likewise, the level of mobility can move to the left end (i.e., complete mobility) with the help of supports such as the ability to move, the accessible environment, and the availability of mobility assistive devices.

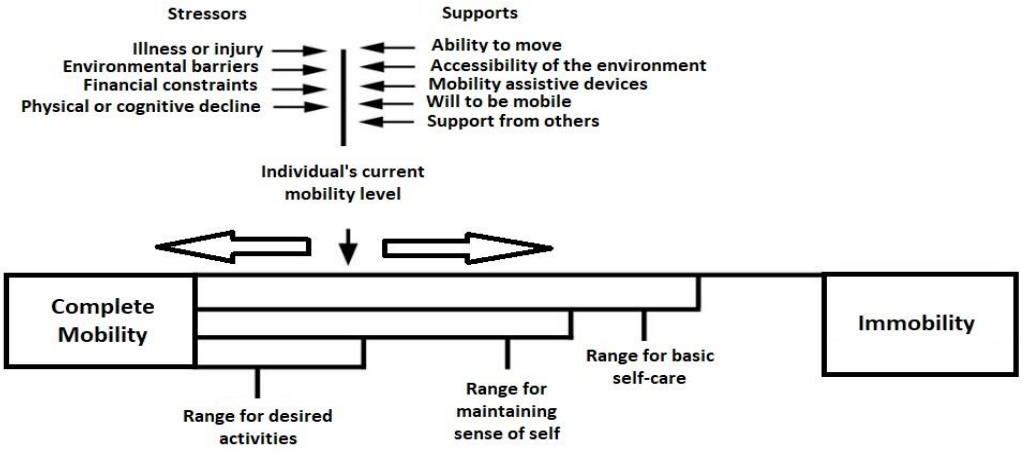

Figure 1. Conceptual Mapping of Mobility

Source: Adapted from Moulton (2020). Movement and Mobility: Conceptual definitions and relevant measures. Queen's University. (p.109).

As impaired mobility is associated with negative health outcomes, older adults' health and well-being can be optimized through strategies that enhance mobility (Satariano et al., 2012). One method used to help older adults maintain mobility in their environment is through Mobility Assistive Devices (MAD). MADs are defined as "[physical tools] that augment or replace ambulation for individuals with mobility limitations" (Cook & Polgar, 2015, p. 230). Examples of MADs include canes, crutches, walkers, and wheelchairs.

MADs represent one category of Assistive Technologies (ATs). ATs, as defined by the WHO, is an umbrella term that includes systems and services related to assistive products such as, hearing aids, mobility assistive devices, communication aids, and memory aids, to mention a few (World Health Organization, 2018). MADs as a sub-category of ATs constitute a long list of devices that range from basic (or low-tech) mobility devices such as walking sticks and canes to

more sophisticated (high-tech) devices such as powered wheelchairs and scooters. There are various equivalent terminologies when it comes to MADs. Indeed, researchers often use different names to refer to MADs, such as walking aids (Bertrand et al., 2017), adaptive equipment (Boland et al., 2017), ambulatory assistive devices (Faruqui & Jaeblon, 2010), or mobility aids (Nikolaus & Bach, 2003).

Jutai et al. (2005) defined MADs to include "both assistive devices (applied to or directly manipulated by a person—for example, a wheelchair) and special equipment (attachments to the original structure of the physical environment—for example, grab bars in the bathroom)." (p.294). In this research project, the focus was on devices that people carry with them or move with them as part of their mobility, and not grab bars and other technologies that may require building modifications.

All in all, as cited in the World Health Organization's definition, MADs can "… maintain or improve an individual's functioning and independence to facilitate participation and to enhance overall well-being. They can also help prevent impairments and secondary health conditions." (World Health Organization, 2018). Moreover, MADs facilitate the success of rehabilitation plans (Agree & Freedman, 2011), alleviate burdens related to caregiving (Marasinghe, 2016; Mortenson et al., 2017), and improve the overall quality of life of older adults (Mckee et al., 2012). Research shows that MADs users report less functional decline than their peers who rely only on human assistance (Agree, 1999; Gitlin et al., 2006; Mann et al., 1999). Furthermore, MADs use may provide psychological benefits to older adults by enhancing decision-making about when and how they perform daily activities and engage in meaningful participation (Cornman et al., 2005; Pape et al., 2002). As stated by Orellano-Colón et al. (2016), MADs use improved confidence and self-esteem of older adults.

There are various ways of obtaining MADs. Although MADs are often prescribed by healthcare professionals and dispensed under their supervision, many of these devices can be easily purchased in general and specialty stores (Gooberman-Hill & Ebrahim, 2007; Van der Esch et al., 2003). Notably, MADs can also be obtained from friends, family members or other community settings without any professional supervision (Khasnabis et al., 2010).

Positive health-related outcomes from MADs depend upon a person's adherence to healthcare recommendations (Martin et al., 2005). Non-adherence refers to the device user's decision to discontinue using the MAD that was prescribed by their healthcare professionals (i.e., deviating from the agreed healthcare plan).

Non-adherence to a prescribed MAD can be detrimental to an older person's safety and quality of life (Liu, 2009; Luz et al., 2017; Stinchcombe et al., 2014). Also, non-adherence to MADs results in a negative economic impact on the healthcare system including, waste of public resources (Andrich et al., 2013). Although data on the economic impact of MADs is not available, reports suggest that yearly expenditures for the consequences of non-adherence to medical interventions have been estimated to be in the hundreds of billions of US dollars, and as many as 125,000 deaths occur each year due to non-adherence to clinician's advice (Martin et al., 2005).

It is worth noting that non-adherence may take several forms, which in the literature are referred to as discontinuance, abandonment, intermittent use, avoidance, non-acceptance, non-use, and rejection. Therefore, in summarizing the literature in the following sections, the terms will be used as they are used by the cited authors, and clarifications of their relationship with non-adherence will be noted, as needed.

Psychosocial factors have been documented by many authors as potential predictors of MAD non-adherence (Jutai & Day, 2002). Indeed, consideration of psychosocial benefits for users has been suggested as a critical evaluative step prior to selecting assistive technology in an effort to improve technology adoption rates (Fellendorf, 1983; Pape et al., 2002; Phillips, 1993). Subjective well-being is among the most commonly cited psychosocial factors in the literature that predict device discontinuance. Subjective well-being refers to elements at the level of subjective psychological functioning, such as self-esteem, quality of life, and satisfaction. In line with the Consortium for Assistive Technology Outcomes Research (CATOR) framework by Fuhrer et al. (2003), and the CATOR taxonomy by Jutai et al. (2005), this project supports the principle that the prescription of MADs should include both objective and subjective perspectives. It is critical to assess the clients' subjective needs to optimize adherence because perceived needs do not always match the objective needs for a MAD as determined by healthcare professionals (Scherer et al., 2007). While there is substantial research conducted on the topic of psychosocial determinants for MADs retention and abandonment among older adults, studies fail to adopt an intersectional approach to understand how the different psychosocial factors predict non-adherence to MADs. Moreover, none of the models included in these studies was developed specifically for older adults who use MADs.

Healthcare professionals who prescribe MADs lack evidence-based predictive models that guide an appropriate device prescription (Ferguson-Pell et al., 2005). The paucity of such powerful models forces healthcare professionals to rely on trial and error when prescribing MADs (Lenker et al., 2012). In light of these challenges, there is a need to develop a more compelling evidence-based model to guide MAD prescription (Dejong et al., 2004). As the acceptance and use of MADs is an intersectional result between the person, the device, and the

environment, it is essential to consider not only the technological and functional factors but also the psychological and social components that influence MAD non-adherence among older adults.

The purpose

The purpose of this research was to develop a model of how psychosocial factors predict non-adherence to MADs. A practical benefit of this research project will be improved rehabilitation decision-making to ensure the adherence to MADs amongst older adults. By identifying psychosocial predictors of MADs non-adherence, healthcare professionals can become more confident in prescribing the right device on an individual basis (i.e., not only the functional and technological needs of the person but also their psychological and social factors).

The theoretical framework

To examine the psychosocial factors that may predict non-adherence to MADs among older adults in the community, the CATOR's framework was deemed the best fit as a guide to conceptualize this research project. Although the purpose of this project is not to test a particular model, CATOR's framework was used as a point of departure to guide model development and selection of potential psychosocial predictors of MAD non-adherence.

The CATOR framework has been developed for the classification of assistive device outcomes which can be used to understand why MADs are used or discontinued (Jutai et al., 2005). The CATOR framework was developed by integrating the perspective of the World Health Organization's model (ICF) (World Health Organization, 2001). The ICF model was based conceptually on the notion that is commonly cited in health sciences literature in which outcomes are viewed because of an interaction among characteristics of an intervention, its receiver, and his/her environment.

The CATOR framework classifies assistive devices' outcomes into three vantages (i.e., perspectives on outcome domains): Effectiveness, Social Significance, and Subjective Well-being. The effectiveness vantage means how an assistive device can affect an individual's ability to function in relation to participation in different life situations, such as mobility, and self-care. The social significance is related to the meaning that society places on outcomes for assistive devices. Subjective well-being refers to the degree to which individuals feel that an assistive device is impacting their well-being (Jutai et al., 2005).

Among the strengths of the CATOR framework is that it can be applied to any form of assistive devices, it is relevant to any age group, and it uses similar concepts and terminology of the ICF (World Health Organization, 2001). Also, this framework identifies numerous features of the person and his/her environment that must be in account as potential predictors of assistive device retention or discontinuance. The environmental and personal factors represent the context in which the MAD acceptance and use take place. According to the CATOR framework, it is essential to distinguish between objective and subjective perspectives for assistive devices to be able to predict their use or discontinuance. Several authors have called attention for considering subjective perspective in clinical practice and research (Jutai et al., 2005; Kraskowsky & Finlayson, 2001; Roelands et al., 2002). This framework, as the authors have highlighted, is important to consider as a conceptual base in developing predictive models of MAD adherence/non-adherence. Therefore, CATOR has been used as a conceptual structure to examine psychosocial factors that predict non-adherence to MADs use among older adults who are living in the community.

This project is concerned with the factors that exist in the social environment (i.e., the availability of social support), and the psychosocial factors (represented in the PIADS).

Understanding the psychosocial impact of a MAD on older adults' life may shed light into the reasons for non-adherence to prescribed MADs among this population. It may also help healthcare professionals, MADs designers and manufacturers to better understand the psychosocial factors that predict device non-adherence, leading to develop improved devices and services.

Thesis outline

Chapter 1 of this doctoral thesis introduces the topic of interest; the non-adherence to the prescribed mobility assistive devices (MADs) to community-dwelling older adults.

Chapter 2 presents the methods and results of the scoping literature review on the psychosocial factors that influence non-adherence to MADs by community-dwelling older adults.

Chapter 3 presents the methods and results of the narrative literature review of the definitions of non-use, abandonment, and non-adherence.

Chapter 4 presents the methods and results of the empirical study.

Chapter 5 presents a discussion and elaborates on the theoretical and clinical implications of the achieved results and suggests future research directions.

Chapter 2 – A Scoping Literature Review

Psychosocial factors that influence mobility assistive devices non-adherence by community-dwelling older adults

This chapter presents the methods and results of the scoping literature review study. This study, as a standalone document, has the potential to inform a wide range of audiences on the extent and nature of the existing literature that has studied the psychosocial factors that are likely to influence MADs non-adherence. This scoping review is also an essential part of this doctoral research project to determine a set of core factors that pertain to MADs non-adherence among older adults living in the community. Therefore, its end purpose was to present a comprehensive list of potential psychosocial factors that is organized in a structured and meaningful way to inform the next steps of this doctoral project.

Background

Mobility assistive devices (MADs) are the most common types of devices among older adults. The main reason for prescribing MADs to older adults is to improve well-being, give a sense of dignity, and optimize their quality of life (QoL) (Jutai & Gryfe, 1998). MADs have been recognized as powerful tools with the potential to compensate body structure and function (Layton et al., 2020), and to support older adults in staying active at home (Bradley & Hernandez, 2011). MADs can be defined as any "[physical tools] that augment or replace ambulation for individuals with mobility limitations" (Cook & Polgar, 2015). MADs constitute a long list of devices that range from basic (or low-tech) devices to more sophisticated (high-tech) devices. Examples of MADs include canes (e.g., walking sticks, single-point, and quad support), crutches (e.g., forearm or axilla crutches), walkers (e.g., rolling walkers, three-wheeled walkers), wheelchairs (e.g., manual, powered), and scooters (Jutai et al., 2009). These devices

are directly manipulated by the user or their caregivers to facilitate daily life mobility (Gitlin, 2002). This definition of MADs does not include devices that are mobility-related but are worn (e.g., lower limb orthoses or prostheses), as well as those that are attached to the original structure of the physical environment (e.g., grab bars). Thus, those devices are excluded from this study.

Previous research has shown that many older adults are MADs users. A recent study of the prevalence of MADs use among community-dwelling users in Canada found that the proportion of older adult device users (65+ years) is 27.8% (Charette et al., 2018). Nevertheless, the literature also shows that older adults are selective about the MADs they are willing to use (Scherer, 2002). In other words, older adults who might benefit from using MADs do not or will not always accept them. Research shows that older adults' attitudes, and beliefs significantly impact the decision to adopt MADs (Berkowsky et al., 2018; Yusif et al., 2016).

Notwithstanding the acknowledged benefits of MADs for the older adults population, using these devices without medical consultations, without adequate training, or for a longer period of time after injury with out follow-up poses several physical, psychological, and social problems (Bradley, 2011; Gitlin et al., 2006; Liu et al., 2011). A study by Liu (2009) reported that nearly 80% of study participants obtained their walkers without consulting with healthcare professionals.

Failure to find a fit between the device, the end-user, and the environment has been identified in the literature as a reason for the phenomenon known as non-adherence (Demers et al., 2008; Edelstein, 2019).

Typically, MADs prescription process involves two types of assessments: objective and subjective assessments. The difference can be identified by looking at the outcome. For instance, walking 50 meters on a smooth surface can be assessed from objective "outsider" and subjective "insider" perspectives. The objective perspective can be done by measuring the distance walked by a client. The subjective approach, on the other hand, can be achieved by asking the person questions like, 'How do you feel walking 50 meters on a smooth surface'. The answer could be anywhere between 'Cannot do it at all', and 'No difficulty at all' (Fuhrer et al., 2003, p. 1245). In line with the CATOR framework by Jutai et al. (2005), this project supports the principle that MADs should be prescribed based on both objective and subjective perspectives. The objective measures are well established in clinical decision-making (Costamagna et al., 2017), however, subjective approaches to prescribe MADs is problematic because it is rarely considered in clinical settings (Souza et al., 2010).

Research shows that how older adults perceive, and experience devices is vital in their decision to using them. As noted by Pressler (2014) and Gitlin et al. (1998), older adults who perceive their device as unsafe, as making them look old, or as attracting unwanted attention are very likely to be non-adherent.

The published rate of non-adherence to MADs ranges from 14% (Federici & Borsci, 2016) to 75% (Luz et al., 2017). Non-adherence to a prescribed MAD can be detrimental to an older adult's safety and quality of life (Stinchcombe et al., 2014). A recent study by Luz et al. (2017) shows that 75% of older adults who have had fall injuries were not using their device at the time of fall. Non-adherence not only affects the health and safety of older adults, but it can also further impose economic strains on the healthcare system and on the individuals to be transferred to permanent health care facilities rather than sustaining their independence at home.

By not adhering to the prescribed devices, the physical, psychological, and social well-being is at risk. Therefore, understanding the factors that influence non-adherence to the prescribed device is of utmost importance in promoting the MADs desired outcomes.

This research project is specifically looking at the subjective part of MADs prescription represented in the psychosocial factors. Psychosocial factors refer to "both factors that are within the person and factors attributable to the environment that affect the psychological adjustment of individuals who have a disability" (Jutai & Day, 2002). Psychosocial factors have been documented by many authors as potential predictors of MAD discontinuance (Abrilahij & Boll, 2019; Jutai & Day, 2002).

Considering the psychosocial factors in the assessment process is a valuable addition to the objective assessments that are usually performed in rehabilitation settings. According to many studies, acceptance and continued use of MADs can be determined by assessing clients' needs, preferences, views, as well as, their subjective well-being (Jutai & Day, 2002; Lenker et al., 2012; Scherer, 2017). Therefore, it is critical to assess the psychosocial factors of clients to optimize adherence.

With the paradigm shift of rehabilitation practices from the medical model, in which the client is regarded as passive recipient of the service, to a more psychosocial model, the clients' psychological and social aspects need to be considered. In the context of MADs, predispositions of older adults to accept and use MADs, as well as their expectations and reactions to a particular device are highly personal (Scherer et al., 2011). Furthermore, MADs can elicit a sense of helplessness, frustration, and loss of control for some clients when these devices do not meet

their expectations (Jutai & Day, 2002). Therefore, considering the psychosocial factors of older adults prior to MADs prescription is of great importance.

Methods

This scoping literature review was guided by the Arksey and O'Malley Framework (Arksey & O'Malley, 2005). A scoping review is defined as: "...a form of knowledge synthesis that addresses an exploratory research question aimed at mapping key concepts, types of evidence, and gaps in research related to a defined area or field by systematically searching, selecting and synthesizing existing knowledge" (Colquhoun et al., 2014, p. 1294).

Study Objectives

The objectives of this scoping review were: 1) to conduct a comprehensive search of the literature on the concepts, domains, and psychosocial factors related to MADs non-adherence among older adults living in the community; 2) to develop a list of the important psychosocial variables, factors, and other elements that pertain to MADs non-adherence; and 3) to classify these factors into meaningful categories to help inform the development of further research.

Research Question

This study sought to answer the following research question: What is known from the existing literature about the psychosocial factors that influence non-adherence to mobility assistive devices by older adults with mobility limitations (e.g., stroke survivors, normal aging, or aging with mobility disability) who are living in the community (homes, residences, or long-term care or assisted living homes)?

Definitions

In this scoping review, the following definitions were considered:

Older adults:

In this work, older adults are defined as persons who are 65 years and older AND living with mobility limitations due to chronic impairments, including stroke, lower limb amputation, brain injuries, etc.

Influencing factors:

In this review, all social and psychological issues related to MADs non-adherence were included. Therefore, all factors, situations, conditions, barriers, obstacles, and issues influencing MADs non-adherence were considered.

Mobility assistive devices:

For the purposes of this review, mobility assistive devices (MADs) are defined as "assistive devices that augment or replace ambulation for individuals with mobility limitations" (Cook & Polgar, 2015, p. 230). This study only included devices that are directly applied to or manipulated by the user to facilitate (augment or replace) locomotion in daily activities.

According to Shoemaker et al. (2010), MADs are classified into domains (i.e., ambulation aids, manual wheeled mobility aids, or powered wheeled mobility aids) and device types (i.e., cane, walker, manual wheel chair, or powered wheelchair) and subtypes (i.e., straight cane, wheeled walker, wheelchair with recline … etc.). Thus, the scope of this review includes devices that are conventionally described as ambulation aids, manual wheelchairs, and powered mobility devices. All devices that are worn, such as lower limb orthoses or prostheses, and those that

support bed mobility and transfers were included. Furthermore, devices and technologies that are mobility-related but are attached to the physical environment, such as grab bars, were excluded from the study.

Search strategy

The specific search strategy was developed in cooperation with a Health Sciences librarian with extensive experience in scoping literature review searches. Also, Sampson et al.'s (2009) recommendations for electronic databases searching were used as a guide to create the search strategy.

Databases: Medline, CINAHL, PsychINFO, Nursing and Allied Health Science, Web of Science Core Collection, Scopus, AARP Ageline, and Cochrane Wiley (trials). See **Table 1** for details.

Other sources:

1) The bibliographies of studies found through the database searches, especially systematic reviews and traditional literature reviews, were reviewed to identify relevant studies that were not located in the initial searches.

2) Dissertations and theses were searched in the following databases: Open Access Theses and Dissertations, ProQuest Dissertations & Theses Global, Networked Digital Library of Theses and Dissertations, DART Europe E-Theses Portal, and Theses Canada.

3) Conference proceedings were searched in the following databases: CINAHL (EBSCO), Embase, ERIC (ProQuest Platform), PubMed (Medline), and Scopus.

4) The websites for the following existing networks and organizations were also searched: Canadian Institute for Health Information (CIHI), Canadian Research Index, Health Canada, and the World Health Organization (WHO).

Key Words/ Descriptors/Identifiers

The search terms were identified through the existing literature on the related subjects and with the advice of an experienced librarian. The search terms involved a combination of the following sets:

Set 1: Any relevant term related to aging persons (e.g., older adult, aging, senior, elderly, frail).

Set 2: Any relevant term related to community dwelling (e.g., aging-in-place, independent living, assisted living, long-term care, nursing home, domiciliary).

Set 3: Any relevant term related to mobility assistive devices (e.g., self-help devices, rehabilitative technology, mobility aid, mobility equipment, technical aid, cane, walker, wheelchair).

Set 4: Any relevant term related to non-adherence (e.g., abandonment, rejection, non-compliance, non-use, non-adherence, non-acceptance, discontinuance, avoidance).

Within the sets, the sources were searched using OR relations, while between sets, AND relations were applied.

Inclusion criteria

To be included, studies had to report research data on the psychosocial factors associated with MADs non-adherence by community-dwelling older adults.

Participants included/concerned

To be included, studies had to report study findings on older adults living in the community (home, residence, long-term care, or assisted living home) who were aged 65 years or older.

Type of documents:

Only published peer-reviewed studies, theses, and dissertations were included. No restriction regarding study design was applied if the studies met the inclusion criteria in terms of participants and outcomes of interest. Relevant theoretical articles, policy documents, opinion pieces, and similar materials were also analyzed to provide background and context. Outcomes used must be validated measures (for studies presenting quantitative data), established ways of analyzing data (for qualitative studies), and rigours methodology (for reviews).

Publication language: English

Dates of publication: from January 1st, 1990, to December 31st, 2020.

No other exclusion criteria, such as, sex, disability type, or comorbidities, were applied.

Screening

First, all the identified citations were exported to Covidence software, a web-based systematic reviews management tool. Then, titles and abstracts were screened for potential eligibility. Next, the full texts of the final set of potentially eligible studies were obtained and further screened against the eligibility criteria. Finally, all eligible citations were analyzed and prepared for data extraction.

Data extraction (or data charting) is a technique used to synthesize and interpret data by sifting, charting, and sorting material according to key issues and themes (Ritchie & Spencer, 1994). A data charting form was developed to capture detailed information on each included study. The data were extracted using a 'descriptive-analytical' method, which involves applying a common analytical framework to all the primary research reports and collecting standard information on each study (Pawson, 2002).

Results

Figure 2 is a flow diagram presenting the screening strategy. The initial search of the literature identified 493 citations. The search in gray literature identified 81 potentially relevant documents. All identified articles (n=574) were then imported to Covidence and of the 574 articles imported, 162 duplicates were removed. Also, after title and abstract screening, 214 and 101 articles were excluded, respectively. A total of 65 articles was further excluded at the full-text screening phase. The reasons for exclusion were different population, different outcomes, different intervention, or not in the English language. Ultimately, 32 studies were deemed eligible for inclusion in the final review.

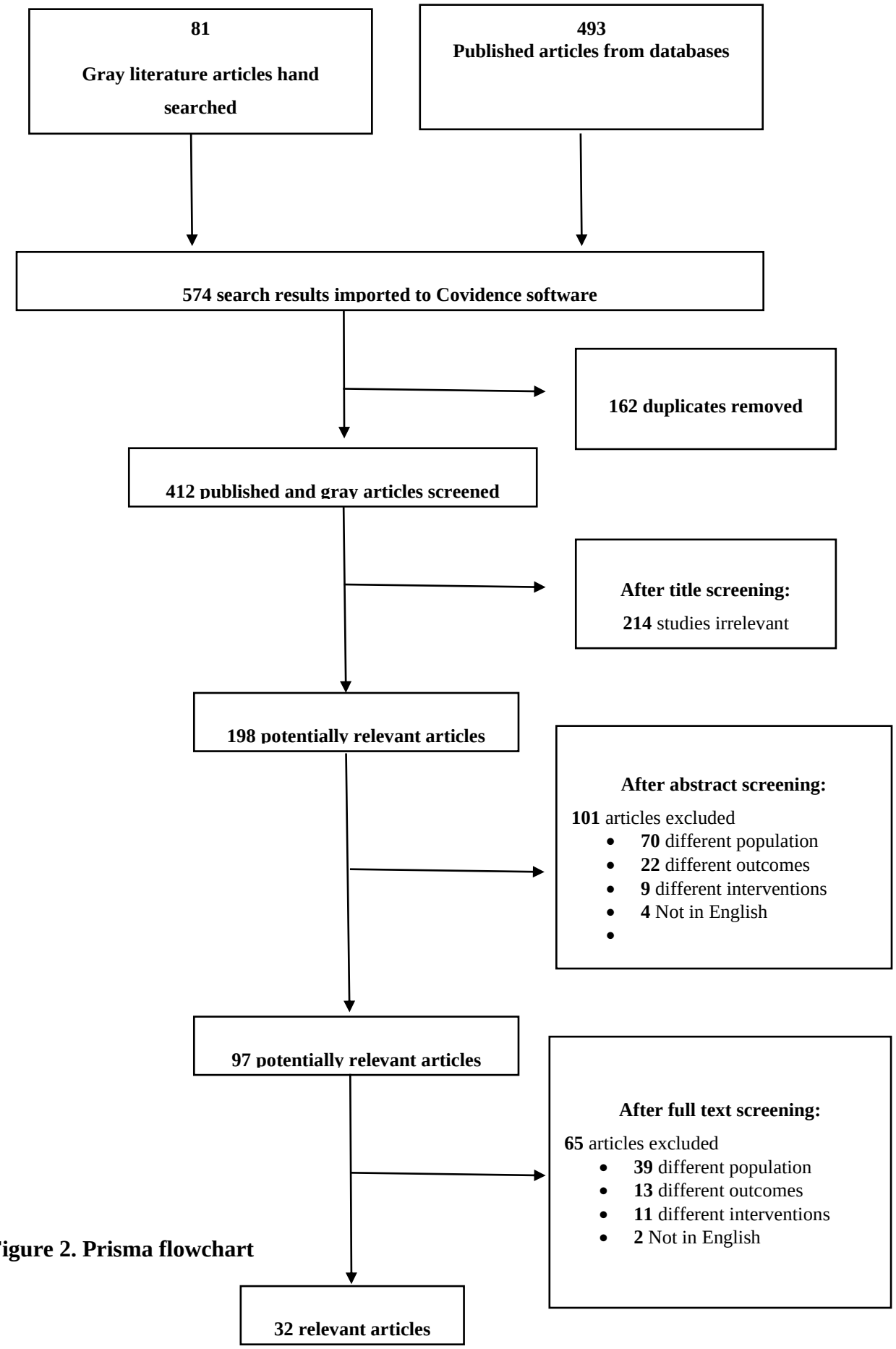

Figure 2. Prisma flowchart

Table 1 presents characteristics and the main findings of the reviewed studies. Fourteen of the included studies used qualitative research methods (Aminzadeh & Edwards, 1998; Barker et al., 2004; Chen, 2020; Chen et al., 2000; Evans et al., 2007; Gitlin et al., 1998; Gooberman-Hill & Ebrahim, 2007; Hass et al., 1996; Mortenson et al., 2015; Orellano-Colón et al., 2016; Pressler, 2014; Resnik et al., 2009; Skymne et al., 2012; Spiteri, 2018), while ten studies employed quantitative research methods (de Boer et al., 2009; Edwards & Jones, 1998; Federici & Borsci, 2016; Haggblom-Kronlöf & Sonn, 2007; Luz et al., 2017; Orellano-Colón et al., 2015; Roelands et al., 2002; Sakakibara et al., 2014; Seplaki et al., 2014; Walsh, 2014), three studies used mixed methods (Lilja et al., 2003; Mann & Tomita, 1998; Yeh, 2009), and three studies were literature reviews (Abrilahij & Boll, 2019; Gitlin, 1995; Kraskowsky & Finlayson, 2001), including one systematic review (Abrilahij & Boll, 2019).

Table 1. Summary of the articles included in this review

#	Authors (year)	Study sample	Study design	Device type	Defining term	Key findings relevant to non-adherence
1	Chen (2020)	50 community-dwelling older adults (Mean age 67.47 ± 7.96) Hong Kong	Qualitative interviews	Mobility aids and other ATs	Discontinuance Abandonment	Device abandonment is affected by the users' level of frustration and satisfaction.
2	Abrilahij & Boll (2019)	NA	Systematic review	Canes Walkers wheelchairs	Non-use	The subjective reasons of non-use: 1) Beliefs about unreliability and difficulty to use ADs. 2) Negative view by others toward the user, 3) Low self-efficacy and feeling of insecurity.
3	Spiteri (2018)	4 community-dwelling older adults	Qualitative interviews	Crutches Wheelchair	Abandonment	The subjective reasons of abandonment:

		Age range (68-83) Malta		Scooter		1) Frustration, dissatisfaction, and social networking with healthcare providers. 2) Friends and peers play an instrumental role in device abandonment.
4	Luz et al. (2017)	262 community-dwelling older adults. Age range (60-99) USA	Cross-sectional	Canes walkers	Non-use	The subjective reasons of non-use: 1. Believing it was not needed. 2. The device made them feel old.
5	Orellano-colon et al. (2016)	60 community-dwelling older adults Age range (70-97) Puerto Rico	Qualitative interviews	Canes Walkers Scooters Others.	Non-use	The subjective reasons of non-use: 1. Fear of falling. 2. Dissatisfaction about MADs. 3. Social Stigma associated with device use.
6	Federici and Borsci (2016)	201 community-dwelling older adults (mean age 77.25±9.61) Italy	Cross-sectional	Mobility assistive devices	Abandonment Non-use Disuse	MAD abandonment is affected by the users' level of frustration and satisfaction about the device, the services delivery and the follow up process.
7	Orellano-colon et al. (2015)	60 community-dwelling older adults Age range 70-97 yrs. Puerto Rico	cross-sectional	Canes Walkers wheelchair Scooters Others.	Abandonment	Abandonment of MADs influenced by social stigma, self-esteem, and self-image.
8	Mortenson et al. (2015)	13 community-dwellings Age = 60 Canada	Qualitative interviews	Power wheelchair	Reluctant use	The participants experienced social pressure (Stigma) that make them reluctant users.

9	Sakakibara et al. (2014)	124 community-dwellings Mean age 59.67 yrs.	Cross-sectional	Manual Wheelchair	NR	Low self-efficacy directly and indirectly influences the frequency of device use.
10	Walsh (2014)	13570 residents in nursing homes and other community settings. Age range 65-90+ USA	Secondary data analysis	Cane Walker Wheelchair Scooter	Abandonment	Public, social, and personal consequences of device use, such as lowered prestige, stigma and being viewed as a dependent person, were reasons for device abandonment.
11	Pressler (2014)	32 older adults (15 inpatients and 17 outpatients) Age range 65-89 USA	Qualitative interviews	Cane Walker front-wheeled walker Rollator wheelchair	Abandonment	Friends' and family members' reactions toward the devise, feeling of empowerment and control, perceived self-efficacy, perceived threats (e.g., fear of falls) and device dissatisfaction were important predictors of MAD use or abandonment.
12	Seplaki et al. (2014)	875 community-dwelling older adults Age range 65-101 USA	Cross-sectional	Cane Walker Wheelchair	Non-use	The presence of greater physical challenges in the home is associated with lower levels of MAD use. No significant association between social challenge in the home and AD use.
13	Skymne et al. (2012)	18 community-dwelling older adults Age range 80-92 Sweden	Focus groups	Mobility assistive devices	Non-use	The social environment both encourages and restrict adherence to MADs use: Self-confidence and users' expectations play an important role in MADs adoption.

14	de Boer et al. (2009)	240 community-dwelling older adults. Age 63+ Netherlands	Cross-sectional	Orthopedic footwears, rolling walkers, scooters, electric wheelchairs, electric bikes.	Non-usage	Main subjective reasons for non-usage: 1) Patient satisfaction with the device and/or service delivery. 2) Low self-efficacy. No association with gender and non-usage was found.
15	Resnik et al. (2009)	61 community-dwelling older adults. Age range 60-85 USA	Focus groups	Cane, Walker, Wheelchair, scooter	NR	Social pressures and perceived stigma deter mobility aid use.
16	Yeh (2009)	27 community-dwelling older adults Age range 59-100 Australia	Mixed methods	Crutches Cane Quad stick Walker Rollator Scooter Other	Disuse	The subjective reasons for disuse: 1) Feeling of embarrassment and social stigma. 2) Denial “no need to use it”.
17	Häggblom-Kronlöf and Sonn (2007)	201 community-dwelling older adults Age range 76-86 Sweden	Cohort	Canes Crutches Rollators for outside Rollators for inside Wheelchairs Others	No use	The subjective reasons for no use: 1) Fear of becoming victims of the surroundings/environment. 2) The device makes them look old. 3) Feeling of embarrassment. 4) Feeling unsafe.

18	Hedberg-Kristensson et al. (2007)	22 community-dwelling older adults Age 65+ Sweden	Focus groups	Power wheelchair, walkers walking-sticks	Non-acceptance	The subjective reasons for non-acceptance: 1) Listening to other people's negative opinions. 2) Negative feelings about their mobility limitation or disability 3) Low self-esteem, skepticism and feeling of shame 4) Unwillingness to display dependence on mobility devices.
19	Evans et al. (2007)	17 community-dwelling older adults age range 60-81 UK	Qualitative interview	Electric wheelchairs	Barriers to use	The subjective for non-use: 1) Feelings of insecurity in the chair. 2) Dissatisfaction with the device and the service. 3) The social environment is discouraging.
20	Gooberman-Hill and Ibrahim (2007)	24 community-dwelling older adults Age range 69-90 UK	Qualitative interviews	walking sticks Crutches Walking frames Wheelchairs	Disuse	The subjective reasons for disuse: 1) Stigma related to walking limitations and walking aids, 2) Feeling self-conscious about appearing old: 3) Dissatisfaction about the devices 4) Fear of becoming dependent on walking aids.
21	Barker et al. (2004)	10 home-living stroke survivors Age range 70-80 yrs. Canada	Qualitative interviews	Manual wheelchair Powered wheelchair	Reluctant Acceptance Discontinuance	Participants who perceived the wheelchair as a necessity reported the lowest mean years of device use (<5.6 years). They seemed to reluctantly accept the device.
22	Lilja et al. (2003)	120 community-dwelling older adults Age range 65-90 Sweden	Mixed methods	wheelchairs, walkers, canes, and other ADs.	Avoidance	Participants' attitude towards their disability and social engagement was an important reason for avoidance of MADs

23	Roelands et al. (2002)	491 community-dwelling older adults Age range 70-89 Belgium	Survey	Cane, Crutch, Walking frame, Rollators, Wheelchair, Electric wheelchair	Non-use	The subjective reasons for non-use: 1) The intention to use 2) Awareness of MADs 3) Attitudes toward MAD use 4) The subjective norm regarding MAD use. 5) Self-efficacy concerning MAD use.
24	Kraskowsky & Finlayson (2001)	Included studies that reported ADs use by older adults (55+ years) in any setting.	Literature review		Non-use Rejection	The subjective reasons for rejection: 1) The device called unwanted attention. 2) The device too cumbersome 3) The device use is time consuming 4) Client's perception of no need.
25	Chen et al. (2000)	20 older adults 20 caregivers Age range = 64-87 USA	Qualitative interview	Crutches Cane Power wheelchair	Non-use	Caregivers' involvement in the MADs adoption was associated with user satisfaction. Caregivers sometimes prevented their family members from using a device.
26	Mann and Tomita (1998)	508 from hospital and rehabilitation settings mean age=74.84 USA	Mixed methods	Cane Walker wheelchair	Abandonment	The subjective reasons for abandonment: 1) Stigma and embarrassment. 2) The device is not safe. 3) Dissatisfaction about devices and services.
27	Gitlin et al. (1998)	52 community-dwelling older adults Mean age 72.6±8.86 USA	Qualitative interview	Quad cane Wheelchair Walker	Non-compliance Rejection	Device use posed cultural value dilemmas originating in discrepancies between sociocultural beliefs and conflicting normative expectations.
28	Edwards & Jones (1998)	1405 community-dwelling older adults Age 65+ UK	Cross-sectional	Walking sticks Crutches Walking frames	Non-use	MADs use increases with age and is more common with women than men.

				Wheelchairs Others.		
29	Aminzadeh & Edwards (1998)	30 community-dwelling older adults Age range 61-79 Canada	Focus groups	Cane Walkers	Rejection Barriers to use	The subjective reasons for rejection: 1) Social stigma. 2) Negative sociocultural values and beliefs towards MADs.
31	Hass et al. (1996)	189 age range (58-88) Sweden	Qualitative interview	Cane, walker, manual and electrical wheelchair, scooter	Non-use	The majority of the participants (about 75%) had no influence on the selection of MADs.
32	Gitlin (1995)	NA	Literature review	Cane Walker Wheelchair Others.	Abandonment	The subjective reasons for abandonment: 1) Feeling of embarrassment 2) Denial of need

(NA) not applicable; (NR) not reported

The identified psychosocial factors influencing MADs non-adherence are discussed in the following section. For clarity purposes, the psychosocial factors have been grouped as psychological and social factors.

Psychological factors

Psychological factors are defined as "individual-level processes and meanings that influence mental states." (Upton, 2013, pp 1580–1581). Research shows that the way older adults feel and think about themselves, and their devices play an essential role in their adherence to the healthcare plan (Chen, 2020; Federici & Borsci, 2016; Scherer et al., 2011). Psychological

factors such as self-confidence, self-esteem, sense of control, and satisfaction are among the most stable and consistent elements that influence non-adherence to the prescribed MADs.

Self-confidence refers to the feeling of trust in one's capabilities and judgment. The way older adults feel and think about their capacity to use a device can influence their motivation to adhere to rehabilitation plans (Gitlin, 1995; Tuazon et al., 2018). Low self-confidence has been widely discussed in literature as a potential determinant of non-adherence to MADs among older adults. For example, Skymne et al. (2012) conducted a focus-group with 18 community-dwelling older adults to explore their experiences with MADs use in Sweden (Skymne et al., 2012) . Two main themes emerged from this qualitative study, which were identified as "self-confidence" and "getting used to assistive devices in daily activities". The researchers also commented that low confidence in one's capacity to use the prescribed device was likely to lead to non-adherence. For instance, participant 1 stated: *She [the therapist] walked beside me when I tried it [the walker], but I got so scared. Then I said, 'not another step with that thing'. I knew myself."* (pp. 197-198, 2012).

Similarly, a study of the effects of a wheelchair-skills-training-program on self-confidence in wheelchair users was carried out by Sakakibara et al. (2013). They found that self-confidence in operating a wheelchair is associated with a stronger motivation to keep using it in everyday life activities. The authors explained this finding by making a reference to the Social Cognitive Theory, which describes self-confidence as "a motivator" to continue participating in a given activity when specific goals are determined (Bandura, 1977).

Self-efficacy is another important factor to consider when examining non-adherence to MADs among older adults (Roelands et al., 2002; Sakakibara et al., 2014; Tuazon et al., 2018). The concept of self-efficacy was first introduced by Bandura (1977), and it refers to the sense of

competence and ability to successfully complete a given task. Multiple studies have found self-efficacy to be a consistent predictor of MADs non-adherence in older adults. For example, a study by Sakakibara et al. (2014) involving older adult found that self-efficacy in using a manual wheelchair is a positive and significant predictor of device frequency of use. De Boer et al. (2009) conducted a cross-sectional study in the Netherlands, with a sample of 240 older adults with rheumatoid arthritis. They found that self-efficacy is a potential determinant of non-adherence to 21 common assistive devices, including MADs.

Self-esteem – a feeling of self-worth – is another important factor of the adaptive processes in human development. It is associated with quality of adaptation, well-being, satisfaction with life and overall health (Alaphilippe, 2008). Self-esteem has also been shown to influence MADs non-adherence in several studies. Orellano-Colón et al. (2016) surveyed a sample of 60 older adults in Puerto Rico to assess the psychosocial impact of MADs, among other devices, and found that participants' decision to use MADs is partially dependent on how they feel about themselves (Orellano-Colón et al., 2016). Another study conducted in Portugal on a sample of 96 community-dwelling MADs users (aged 45–97) found that Self-esteem, as measured by the Portuguese version of the Psychosocial Impact of Assistive Devices Scale, was an important indicator of MAD non-adherence (Martins et al., 2016). It is important to note that in this study the authors used the term "abandonment" and recruited participants with prescribed MADs in three rehabilitation settings.

Dissatisfaction and frustration about the device or the services were also highlighted by many authors as important considerations in MADs adherence. Several articles mention device satisfaction as an important predictor of device non-adherence (Brandt et al., 2010; de Boer et al., 2009; Dijcks et al., 2006; Larsson & Lidström, 2017; Martins et al., 2016; Phillips & Zhao,

1993; Samuelsson & Wressle, 2008). Overall, the prevailing assertion was that the more satisfied participants were with their prescribed devices, the more likely they were to retain them. de Boer et al. (2009) reported that device satisfaction, was a potential factor of continued MAD use, having studied a sample of rheumatoid arthritis patients in three outpatient centres in the Netherlands. Device satisfaction and continued use of a given device are two variables that increase when users are involved during the prescription process (Borg et al., 2012).

Overall, internal factors, such as self-confidence, self-esteem, self-efficacy, and satisfaction are the core dimensions of psychological well-being (Ryff & Singer, 1998). As mentioned by Jutai (1999), these components are essential in how end-users perceive the impact of the devices on their quality of life (Jutai, 1999). Furthermore, older adults prefer being in control rather than a MAD controlling them (Horton, 2008). This preference can be explained by the Control Theory, which suggests that selective primary control (i.e., the ability to achieve a goal through one's own means) is a concept that should be considered to promote adherence (Becker et al., 2005).

Social factors

Social factors are "at the level of human society concerned with social structure and social processes that impinge on the individual" (Upton, 2013). Social factors are often included under the contextual or environmental factors that influence MADs non-adherence. In the CATOR framework, the social factors are included under the social significance vantage, which refers to "the meaning that society attaches to effectiveness outcomes" (Jutai et al., 2005, p. 298). The main social factors affecting discontinuance of MADs use are social support, and social stigma.

Social support or interpersonal factors play a role in discontinuance of MADs. Typically, social support comes from social structures, such as family members, and friends. Previous

research acknowledged the value of partnering with family members to minimize MADs discontinuance (Aminzadeh & Edwards, 1998; Beck, 2013; Pressler, 2014). Wielandt and Strong (2000) conducted a review of 31 articles and found that the users' social environment is sometimes discouraging to device use. Social circles may provide conditions that make it easy for older adults to move without the prescribed device. Consequently, MADs are often replaced by human assistance (Wielandt & Strong, 2000). Gooberman-Hill and Ibrahim (2007) conducted a longitudinal qualitative study included a sample of 24 older adults in the UK and found that social environment is often encouraging to MADs continuance. A more recent study by Pressler (2014) that interviewed 32 veterans in the USA suggests that family members who have positive opinions about MADs were supportive to older adults and contributed to device continued use (Pressler, 2014). However, research on the role of social support in relation to MADs non-adherence among older adults is limited, and further research have the potential to improve healthcare services to this population by better understanding how social networks influence, not only discontinuance, but also non-adherence to the prescribed MADs that typically happens within a rehabilitation plan, as discussed before.

Social stigma has been discussed for decades as major factors that influence MADs non-use, discontinuance, and non-adherence. Empirically, a significant correlation between social stigma and high discontinuance rates has been emerged from several studies (Gitlin et al., 1996; Gooberman-Hill & Ebrahim, 2007; Mann & Tomita, 1998; Orellano-Colón et al., 2016; Resnik et al., 2009). Older adults using MADs have been struggling to overcome the burden of social stigma, which can be defined as a "belief held by a large faction of society in which persons with the stigmatized condition are less equal or are part of an inferior group" (Ahmedani, 2011). Such an obstacle can be viewed as a double-sided issue. First, users can become the target of

discriminatory or ableist behaviors. Such discriminatory and ignorant behaviors can adversely effect on MADs users and reify an existing stigma (McNeill & Coventry, 2015; Parette & Scherer, 2004). Efforts to eliminate these types of behaviors by increasing the public awareness may be helpful in the pursuit of promoting MADs in the community.

Some older adults experience stigma by using an MAD due to the fear of being noticed as disabled, which, in their opinion, would put them in the risk of being targets for crime (Mann & Tomita, 1998). In a mirroring fashion, the absence or lack of efforts to resist and dismantle the stigma accompanying MADs use is likely to be associated with higher rates of clients' non-adherence to MADs.

All in all, the findings of previous research agreed that the perceived social stigma negatively impacts MADs non-adherence, especially devices that are universally identified with disability, such as wheelchairs. One strategy to improve MADs adherence among older adults is having them select their own devices (Resnik et al., 2009). To achieve this, healthcare professionals should involve their clients in the prescription process and consider their preferences and concerns.

Demographic factors

Demographic factors, such as sex, has been studied for decades in relation to MADs non-use, discontinuance, abandonment, and non-compliance (de Boer et al., 2009; Edwards & Jones, 1998; Gitlin et al., 1996; Ishigami et al., 2021; Peterson et al., 2017; Sonn & Grimby, 1994). In the context of this research project, sex refers to "… the biological and physiological characteristics that distinguish males from females" (Canadian Institutes of Health Research, 2015).

Sex differences in relation to non-adherence of MADs was first reviewed by Scherer (2002). She devoted a whole chapter in her book discussing these differences on the use of MADs. Although the scientific evidence was scarce at the time, she highlighted important points to consider when healthcare professionals recommend MADs to their clients: "the client's and family's degree of acculturation, their racial-ethnic identity, and the views of their own culture and of the dominant culture (Scherer, 2002, p. 103)."

A recent study by Ishigami et al. (2021) based on data from 51,338 older adults in Canada aged between 45 and 85 years and found that MADs use was higher among females than males. The sex difference increases as people age; higher difference between males and females were reported among people who are 65–85 years of age than in those who are 45–65 years of age (Ishigami et al., 2021). Similarly, another Canadian study by Smith et al. (2016) found a higher segment of manual wheelchair, power wheelchair and scooter users were females (54.5 % aged 45-64; 70.8% aged 65-74 and 62.1% aged 75+)). Another study conducted on 5503 community-dwelling older adults cane users in the US found significant differences between men and women; women were less likely to use canes compared to men (Peterson et al., 2017).

Building on the assumption that MADs are helpful in compensating for mobility limitations, understanding sex difference in relation to non-adherence to MADs is of utmost importance to optimize the physical, psychological, and social well-being of older adults. While not yet verified by research, sex differences could influence non-adherence due to the differences in their psychosocial characteristics (Sjögren & Kristenson, 2006; Weisberg et al., 2011). Therefore, assessing the psychosocial factors of MADs users based on sex differences can potentially improve our understanding of non-adherence behaviors, and is also relevant for informing future policy decisions.

Measuring non-adherence to MADs

Several tools have been developed in the past few decades to measure outcomes from using MADs. However, from the users' perspective, a limited number of outcome measures have been developed; namely, the Quebec User Evaluation of Satisfaction with Assistive Technology Scale (QUEST) (Demers et al., 2002), the Assistive Technology Device Predisposition Assessment (ATDPA) (Scherer & Cushman, 2001), the Assistive Technology Outcome Profile for Mobility (ATOP/M) (Bode et al., 2010), and the Psychosocial Impact of Assistive Device Scale (PIADS) (Day & Jutai, 1996). Except for the ATOP/M, which is still in the development stage as the authors have highlighted in their studies (Auger et al., 2018), the QUEST, the ATDPA, and the PIADS are well established and valid in measuring the constructs of user satisfaction (Demers et al., 2002); the match between end-users and assistive devices (Scherer & Craddock, 2002), and the psychosocial impact of assistive devices use (Day & Jutai, 1996), respectively. The PIADS is a good example of a validated measures that can be used to help understand and conceptualize non-adherence to MADs.

Day and Jutai (1996) developed the PIADS to measure the psychosocial impact of assistive devices. The PIADS is a 26-item self-reported measure of the impact of assistive devices (ADs) on independence, well-being, and quality of life. It was designed to capture the experiences of ADs from the users' perspective (Day & Jutai, 1996). Although the PIADS was developed more than twenty years ago, it remains the only validated measure that assesses the psychosocial aspects of ADs, such as satisfaction, embarrassment, and ability to try new things, all of which can be linked to several models of MADs adoption. For example, the PIADS was incorporated into Fuhrer et al.'s framework that conceptualizes assistive technology devices outcomes, which provides helpful insight in defining non-adherence. According to this

framework, MADs outcomes are considered a function of time since MAD was introduced into the end-user's life, which was an important finding in this literature review. Most recently, the PIADS has also been linked to the International Classification of Functioning, Disability and Health Framework of the World Health Organization (ICF), and the conceptual relationships between PIADS and the ICF showed a good fit (Traversoni et al., 2018).

In the context of this current study, the PIADS is an informative tool because it helps to identify the reasons why an older adult might discontinue the use of a MAD. For example, by using the PIADS, it was found that the psychosocial impact of MADs is positively correlated with device discontinuance (Martins et al., 2016). As such, the PIADS is a promising tool in tracking the factors that may predict non-adherence and foster a greater appreciation for the psychological and social factors behind MAD non-adherence.

Discussion

While there is substantial research conducted on the topic of psychosocial determinants for MADs retention and discontinuance, there is a need to investigate the concept of non-adherence among the older adult population. A review of the existing literature, however, revealed some problematic areas that need to be addressed.

First, the key observation is that there is a wide variance in the definition of concepts related to non-adherence. The lack of a unified definition limits the contribution of non-adherence research to the healthcare community. With a better understanding of the factors that affect non-adherence, researchers would be better able to study it in relation to concepts with which it is often confused such as non-compliance, abandonment, and discontinuance, develop valid measures of non-adherence, and compare and interpret their findings.

Second, it is not clear why a significant portion of community-dwelling older adults (for example 75% in a study by Luz et al., 2017) do not adhere to prescribed MAD and ignore their healthcare providers' recommendations. Research shows that giving older adults a role in deciding what devices to receive and considering their needs, preferences, beliefs, and values appears to improve adherence (Gitlin et al., 1996; Thomas et al., 2010; Wielandt et al., 2006; Wielandt & Strong, 2000).

Third, it is not clear how the availability of social support influences non-adherence to prescribed MADs. Gooberman-Hill and Ibrahim (2007), have found that the presence/absence of encouragements from the social environment often played a significant role in decisions to continue using the walking aids (Gooberman-Hill & Ebrahim, 2007). It is worth noting that this study did not mention whether MADs were prescribed or not. Since the data used in this study was collected using a national survey, it is likely that participants had their devices from different sources (e.g., prescribed, borrowed from friends, purchased … etc.). Therefore, their findings may or may not apply to non-adherence. However, a study by Wielandt and Strong (2000) that used the terms compliance/non-compliance and included participants with prescribed MADs claimed that older adults' social environment can be discouraging to device use. However, very little research has been done in this regard, and there are many acknowledged limitations that may affect the generalizability of these findings. For instance, multiple studies identified the limitation of incorporating young and middle-aged adults in the population sample. As discussed before, older adults possess a unique set of psychological and social values that can differ from other age groups. Therefore, it is essential to explore the role of social support in predicting MADs non-adherence specifically among the population of older adults.

Fourth, while previous research has provided important knowledge in the role of demographic factors, such as sex, in MADs use and discontinuance (Arim, 2015; Ishigami et al., 2021; Kaye et al., 2008; Peterson et al., 2017), there is a need to investigate how such factors influence non-adherence to MADs among older adults. To fill this gap, the European Commission and the Canadian government have identified demographics such as age, sex as priority areas of research and future policy developments (Government of Canada, 2021; Schiebinger & Klinge, 2013).

Finally, there is a lack of studies that applied regression analyses to test correlations between psychosocial factors and non-adherence to MADs. As stated by Fuhrer et al. (2003), Lenker et al. (2012), Jutai et al. (2005), Scherer et al. (2007), and Abrilahij & Boll (2019), AT literature has not determined the predictor factors underlying MADs' non-adherence to a degree that can guide clinical decision-making process, and there is a widespread call to fill this literature gap in future research. Obviously, the first step is to develop predictive models that can identify mediating processes of MADs adoption, predicting specific outcomes, and explaining why those outcomes are expected.

Implications of the findings

Although the findings from the literature review helped to identify some variables and domains that might be of interest, one cannot assert it is complete. Since the literature review identified some gaps and limitations, these findings may not be sufficient to develop a new predictive model of MADs non-adherence. Therefore, there is a need to empirically examine the factors that seem important from a user's perspective. The best way to test the identified factors on non-adherence is to examine the impact of MADs on older adult's lives, using valid measures.

There is substantial evidence that the Psychosocial Impact of Assistive Device Scale (PIADS) is a good filter and an adequate representation of important psychosocial factors for MADs non-adherence, but one cannot claim it complete. There may be other factors, such as social support, that PIADS does not include. As the overall goal of this doctoral research is to develop a model that includes important psychosocial factors, it was essential to conduct research beyond the concepts included in the PIADS.

There are inconsistencies in the literature regarding some factors, such as the influence of social structures (i.e., family members and friends), demographics such as sex in predicting non-adherence to MADs. The results of the empirical study would tell how many of these considerations are adequately represented in the PIADS. The PIADS has been proved as a powerful tool to predict retention and discontinuance of several forms of ADs (Jutai et al., 2003; Nordström et al., 2014). The PIADS is also valuable in identifying the reasons why an older adult might discontinue the use of a MAD.

Although non-adherence is the client's decision, it may be influenced by external factors. It can be the product of a lack of effort from health care professionals in ensuring that the prescribed device is appropriate for their needs and preferences. Although it is assumed that healthcare professionals follow an evidence-based process to prescribe MADs, this is not always the case (Bartfai & Boman, 2014; Lenker et al., 2012; Scherer et al., 2007; Souza et al., 2010).

Study limitations

Although the search terms used in this study were comprehensive and involved multiple databases, it is possible that relevant articles were missed because they did not appear in the initial search. Also, because the literature search was limited to articles published in English, it is

possible that potentially important critiques in other languages were missed that could have provided different cultural viewpoints on the matter.

Conclusion

After reviewing the literature, it is valid to say that non-adherence to MADs is a complex and multidimensional concept that includes several components, such as the end-user, the caregiver, the environment, the prescriber, and the device itself. From the perspective of users, there are important psychosocial dimensions that should be considered. Applying only the dominant biomedical perspective when prescribing or recommending MADs may ignore the opinion of end-users, leading to MADs non-adherence. In fact, many studies suggest that the intake processes for older adults requiring MADs sometimes fail to consider their values, needs, and preferences, which ultimately leads to non-adherence. This reflects the need for healthcare professionals to better involve their clients when considering and understanding their options to help increase adherence to the prescribed MAD.

Chapter 3 – A Narrative Literature Review

Assistive devices non-use, abandonment, or non-adherence? Towards unified definitions of assistive devices outcomes

The concept of non-adherence to mobility assistive devices has been the focus of this doctoral project due to its importance in device prescription and follow-up. However, one of the main observations in the scoping literature review described in the previous chapter, is that researchers employ different terms, often interchangeably, without providing clear definitions or rationales for their choices. Considering these inconsistencies, one can conclude that assistive technology research is fragmented due to the lack of unified definitions of MADs outcomes, such as non-use, abandonment, non-compliance, and non-adherence.

A narrative literature review focusing on the definitions of these outcomes was conducted to include studies published between January 1990 and December 2021 in an effort to better understand these concepts and based on the inclusion/exclusion criteria outlined in this chapter, a total of 1028 articles were identified for potential inclusion. From this number, 25 articles were selected for further analysis, with an emphasis placed on the conceptual and operational definitions of these concepts. Only 9 of the reviewed articles cited definitions or contained some conceptual discussion of the terms used by the authors. As a result, and due to the lack of cohesion in the literature about the terms involved, conceptual definitions of non-use, abandonment, discontinuance, non-adherence, and non-compliance have been proposed and discussed.

Background

Nowadays, it is well-established that non-adherence to prescribed or recommended mobility assistive devices (MADs) can be detrimental to person's safety and is associated with poor quality of life (Liu, 2009; Luz et al., 2017; Stinchcombe et al., 2014) in addition to increased healthcare costs (Andrich et al., 2013). In recent studies (e.g., Luz et al., 2017), it has been reported that as many as 75% of clients are non-adherent to their MADs. Considering the high prevalence of non-adherence and its negative consequences, it is therefore not a surprise that this has become a challenge for researchers, clinicians, and others.

As noted above, existing research on MADs presents varying terminologies for defining non-adherence. Many studies rely upon synonyms such as non-compliance, non-use, rejection, abandonment, and discontinuance; however, these terms do not have the same exact meanings. Many researchers fail to explain their choice of terminology in their studies, and they neglect to consider a clear approach to understanding the distinct nature of MADs non-adherence (Dahler et al., 2016; Sakakibara et al., 2013). This lack of uniformity in how non-adherence and its related concepts are defined and measured makes it difficult to draw meaningful comparisons between studies, even between those using the same terms.

For those reasons, it was necessary to first define what non-adherence to MADs means, and whether or not non-adherence was distinguished from other, similar terms. Therefore, to better understand adherence-related research, this narrative literature review was performed to assess the definitions and unique characteristics of these terms. It is worth noting that some of these terms are more commonly used than others, and therefore the aim of this work is to provide an overview of the key terminology and concepts related to MADs adoption.

Methods

In this study, a narrative literature review methodology was employed to address the predetermined objectives. Unlike systematic reviews, which have very narrowly defined parameters and precise eligibility criteria, a narrative review is more flexible in terms of the inclusion and exclusion rules (Allen, 2017). Narrative reviews are extremely valuable in synthesizing knowledge through summarizing and presenting similar concepts based on the published literature in a more abstract and meaningful way (Dixon-Woods et al., 2005). A narrative review also examines a given research question by including diverse empirical, theoretical, and methodological literature (Greenhalgh et al., 2018). In this work, there was no restriction on study designs, and thus, it was possible to present the findings based on different evidence types.

Literature search

An online database search was performed on PubMed, CINAHL, Scopus, PsycINFO, and Web of Science. The database search strategy and selection of search terms was guided by an experienced librarian to retrieve the most relevant citations from each database. All potentially relevant articles published in the English language during the period January 1990 to December 2021 were included for further screening.

The search terms were a combination of the following sets:

Set 1: Any relevant term related to mobility assistive devices (e.g., mobility assistive device, assistive device, assistive technology, self-aid devices, rehabilitative devices, cane, walker, wheelchair, scooter).

Set 2: Any relevant term related to non-adherence (e.g., non-use, non-adherence, non-compliance, abandonment, discontinuance, avoidance, rejection).

Within the sets, the sources were searched using OR relations, and between sets, AND relations were applied. For example, ("mobility assistive device" OR "assistive device" OR "assistive technology" OR "self-aid devices" OR "rehabilitative devices" OR "cane" OR "walker" OR "wheelchair" OR "scooter") AND ("non-use" OR "non-adherence" OR "non-compliance" OR "abandonment" OR "discontinuance" OR "avoidance" OR "rejection"). This search strategy resulted in the retrieval of 1015 articles, and an additional 13 articles were identified through other sources, resulting in 1028 articles (including duplicates) that were eligible for screening.

Selection of Studies for Review

After removing the duplicates, screening of all the article titles and abstracts was performed using inclusion/exclusion criteria. To be included in this review, studies had to be peer-reviewed publications and had to report research findings with any research design (i.e., quantitative, qualitative, or literature reviews) on any of the MADs adoption outcomes outlined in the previous section. Articles were excluded if the full text was not available or if they were non-English publications. Also, editorials, correspondence papers, opinion essays, and gray literature were excluded from this review. Eventually from the 1028 articles identified for potential inclusion, 25 were selected for further analysis.

Results and Discussion

In the Assistive Technology (AT) literature, the term non-adherence is not common. Terms such as compliance/non-compliance are more commonly used (Gitlin, 1998; Thomas et

al., 2010; Wielandt & Strong, 2000). Many other terms are used interchangeably in the AT literature to describe the decision of not using MADs. These terms include device ***non-use*** (de Boer et al., 2009; Edwards & Jones, 1998; Hass et al., 1996; Ishigami et al., 2021; Luz et al., 2017; Roelands et al., 2002; Skymne et al., 2012), ***discontinuance*** (Lauer et al., 2015; Petrie et al., 2018; Riemer-Reiss & Wacker, 2000), ***abandonment*** (Chen, 2020; Cruz et al., 2016; Federici & Borsci, 2016; Haggblom-Kronlöf & Sonn, 2007; Orellano-Colón et al., 2016; Phillips & Zhao, 1993; Spiteri, 2018), ***rejection*** **(**Aminzadeh & Edwards, 1998), ***disuse*** (Gooberman-Hill & Ebrahim, 2007; Yeh, 2009), ***non-acceptance*** (Barker et al., 2004; Hedberg-Kristensson et al., 2007), or ***avoidance*** (Lilja et al., 2003). All of these terms are discussed in the following section.

Table 2 presents a selection of articles that used only one term consistently and provided a reasonably clear definition or at least a description of the situation in which the term used. Articles that used more than one term interchangeably were excluded from the table for clarity purposes. Gitlin (1998) is an example of authors who used more than one term interchangeably without a clear definition. Table 2 presents the different terms from the most neutral terms, such as non-use, to the more specific ones, such as non-compliance and non-adherence. The articles were also arranged in chronological order with reference to whether the authors defined the term and if they included participants with prescribed devices. The latter is important because it elucidates the study context.

Table 2. Terms associated with non-use that were identified in the literature

#	Author(s) (year)	Defining term	Definition cited	In what context(s) did the authors use the term?			
				Study population	Study design	MAD was prescribed ?	Did the study examine reasons for non-use?
1	Ishigami et al. (2021)	Non-use	Yes	Home-dwellings[1] Canada	Cross-sectional	No	No

2	Luz et al. (2017)	Non-use	Yes	Home-dwellings USA	Cross-sectional	Yes	Yes
3	Skymne et al. (2012)	Non-use	No	Community-dwellings[2] Sweden	Focus groups	Yes	Yes
4	de Boer et al. (2009)	Non-use	No	Community-dwellings Netherlands	Cross-sectional	Yes	Yes
5	Roelands et al. (2002)	Non-use	No	Home-dwellings Belgium	Cross-sectional	No	Yes
6	Edwards & Jones (1998)	Non-use	No	Community-dwellings UK	Cross-sectional	No	No
7	Hass et al. (1996)	Non-use	No	Home-dwellings Sweden	Qualitative interviews	Yes	No
8	Lauer et al. (2015)	Discontinuance	Yes	Community-dwellings USA	Cross-sectional	No	Yes
9	Riemer-Reiss et al. (2000)	Discontinuance	No	Home-dwellings USA	Cross-sectional	Yes	Yes
10	Chen (2020)	Abandonment	Yes	Community-dwellings Hong Kong	Qualitative interviews	No	Yes
11	Spiteri (2018)	Abandonment	No	Community-dwellings Malta	Qualitative interviews	Yes	Yes
12	Orellano-colon et al. (2016)	Abandonment	No	Community-dwellings Puerto Rico	Qualitative interviews	No	Yes
13	Cruz et al. (2016)	Abandonment	No	Home-dwellings Brazil	Cross-sectional	No	Yes
14	Federici & Borsci (2016)	Abandonment	Yes	Community-dwellings Italy	Cross-sectional	Yes	Yes
15	Häggblom-Kronlöf & Sonn (2007)	Abandonment	No	Home-dwellings Sweden	Cross-sectional	No	Yes
16	Phillips & Zhao (1993)	Abandonment	Yes	Home-dwellings USA	Cross-sectional	No	Yes
17	Aminzadeh & Edwards (1998)	Rejection	No	Community-dwellings Canada	Focus groups	No	Yes
18	Yeh (2009)	Disuse		Community-dwellings Home-dwellings Australia	Mixed methods	No	Yes
19	Gooberman-Hill & Ibrahim (2007)	Disuse	No	Home-dwellings UK	Qualitative interviews	No	Yes
20	Hedberg-Kristensson et al. (2007)	Non-acceptance	No	Home-dwellings Sweden	Focus groups	Yes	Yes
21	Barker et al. (2004)	Non-acceptance	No	Home-dwellings Canada	Qualitative interviews	Yes	Yes
22	Lilja et al. (2003)	Avoidance	No	Home-dwellings Sweden	Qualitative interviews	No	Yes

23	Thomas et al. (2010)	Non-compliance	Yes	Hospitalized[3] USA	Qualitative interviews	Yes	Yes
24	Gitlin et al. (1998)	Non-compliance	Yes	Community-dwellings USA	Structured interview	Yes	Yes
25	Tuazon et al. 2018	Non-adherence	Yes	Community-dwellings Home-dwellings Hospitalized	Literature review	Yes	Yes

[1] Home-dwellings = individuals are residing in their own home.
[2] Community-dwellings = individuals are residing in long-term care units, assisted-living homes, nursing homes, or senior housing.
[3] Hospitalized = inpatients due to health conditions that need close medical attention.

Some of the above-mentioned terms lack specificity and clarity and can thus be confusing. Additionally, most of these terms refer to the negative impression of making the decision (i.e., the person consciously makes the decision to not use the device). However, some terms such as "discontinuance" may connote a valid reason for not using a device (e.g., healing, updating the device, or even deterioration of the functional status) and thus are helpful.

In the literature, there has been limited research that investigated the concept of non-adherence to the use of MADs by older adults from the psychosocial perspective. The literature review identified only one study that specifically looked at ***non-adherence*** (Tuazon et al., 2018). The rest of the studies reviewed used other terms (see Table 1). A concise and unified definitions of these terms may help healthcare professionals and researchers better distinguish between the action of not using a device (e.g., non-use or abandonment) and the action of not using the device in the context of rehabilitation plans (e.g., non-compliance or non-adherence).

The term "non-use" has been used widely in the AT literature to refer to the scenario when a device is not used (Abrilahij & Boll, 2019; Chen et al., 2000; Dijcks et al., 2006). The most straightforward way to define non-use is to answer the following question: "Is the device

being used at this moment in time, yes or no?" (Dijcks et al., 2006). The term non-use seems to be a neutral description of the phenomenon.

Precise and consistent definitions are needed to better understand the literature on this topic, because current applications of the term non-use by researchers may or may not adequately represent different concepts. Some authors have used the term non-use in their studies, where in fact they were looking at non-adherence. Examples of these studies include those by Luz et al. (2017) and Skymne et al. (2012), which included participants with prescribed MADs and in which the psychosocial reasons of non-use were investigated. This inappropriate application of the term non-use by some authors may be, as mentioned by Wessels et al. (2003), due to the lack of a solid theoretical framework that provides the definition and explains the mechanism of device non-use.

Non-users are not always non-adherent or non-compliant. For example, the functional needs of individuals may change so that they no longer need to use the device. Likewise, a client may use their prescribed device only once a month or so, and so while they can technically be labelled "device users", in fact the client is non-adherent or non-compliant because they do not follow the professional recommendation, which is usually to use the device daily (or at least three times per week) (Evans et al., 2007; Wressle & Samuelsson, 2004). This simple example reflects the complexity and sensitivity of picking one term over another because there are methodological implications for each. A term's concise definition and the population it applies to, in addition to the variables and the outcome measures regarding the manner and times of usage, are all methodological considerations that should be considered to provide consistent findings.

The term “discontinuance” is defined as the process by which an individual ceases to use MADs after a period of time (Lauer et al., 2015). To better understand the nuances of this term, it is helpful to look at some conceptual models that explain this phenomenon.

Rogers (1983), in his model, explained the behaviour of device use and discontinuance and introduced two important components of this process namely, the adoption decision and the diffusion process. According to Roger’s philosophy, the process by which end-users transition through from the adoption of an innovation to its diffusion consists of a five-stage decision-making process. These stages include knowledge, persuasion, decision, implementation, and confirmation (Rogers, 1983, 2003).

Knowledge and persuasion phases take place before the adoption decision, as the potential user explores the available options of devices, becomes aware of the device of interest, and collects persuasive information about its features. This followed by the conscious decision to adopt or reject the device. If the adoption is considered, the potential user moves to the implementation phase, in which the prescription process and training of use takes place. Finally, the end-users evaluate whether the device meets their needs and expectations. If the needs and expectations are met, the user moves to the state of continued use. If the user is unsatisfied with the device, the discontinuance decision may be taken (Riemer-Reiss, 1999). (See Figure 3)

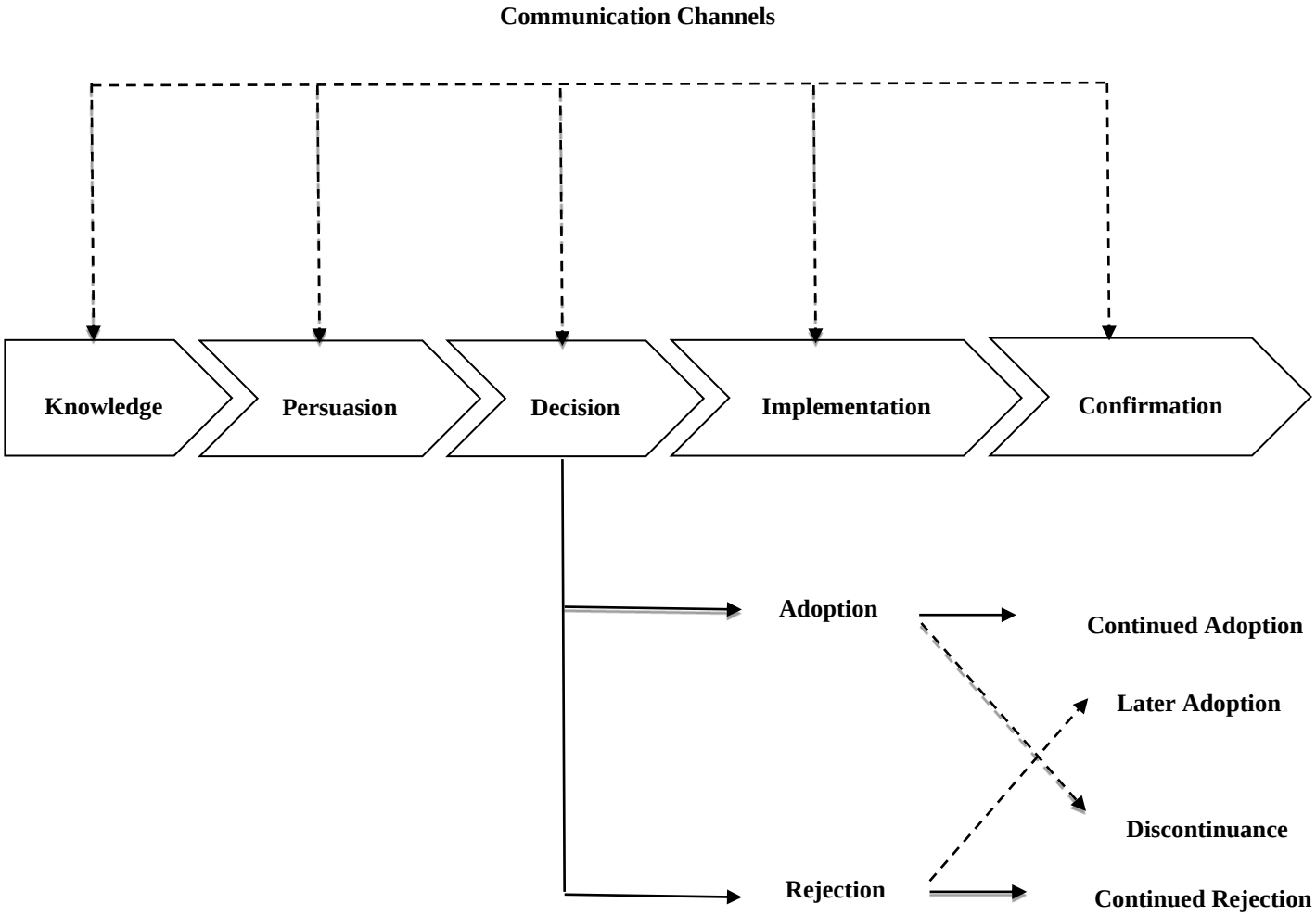

Figure 3. Roger's Model

Source: Adapted from Rogers (1983). Diffusion of innovations. New York; London: Free Press; Collier Macmillan. (p.165).

The Roger's process view of adoption and diffusion of innovations is helpful in conceptualizing the different phases of MADs use from initiation phase all the way to the discontinuance decision. As documented by several authors, adopting such generic process view is helpful to capture both the static and the dynamic nature of device discontinuance phenomenon (Beer et al., 2017; Riemer-Reiss & Wacker, 2000; Soliman & Rinta-Kahila, 2020;

Van De Ven, 1992). Discontinuance, however, can happen in any of the five stages mentioned above, as noted by Rogers (2003).

Fuhrer et al. (2003) described two types of discontinuance: namely, shorter-term and longer-term discontinuance. The shorter-term discontinuance takes place in the introductory phase, while the longer-term discontinuance can happen anytime after the introductory period. Both types of discontinuance can happen as a result of an interaction between device use and a number of moderating cofactors that include personal and environmental factors, among others (Fuhrer et al., 2003). The term discontinuance has a neutral connotation, referring to the termination of device use after a period of time.

Discontinuance is the most objective way to describe whether a person has continued or stopped using a device. Discontinuance in the classic scenario is a decision to stop using a device after previously accepting it. According to Rogers' (2003) theory of diffusion, there are two reasons for an individual's decision to discontinue using a device: replacement and disenchantment. The *replacement* (e.g., stop using a device for an updated one) and *disenchantment* (e.g., stop using a device due to dissatisfaction). The replacement decision is a valid reason for discontinuance that may happen due to improvements or deterioration of functional capacities of older adults. However, disenchantment decision is the unfavored discontinuance that concerns all the stakeholders of MADs services.

As mentioned above, this literature review also identified other terms, such as ***rejection***, ***disuse***, ***avoidance***, ***non-acceptance***, and ***abandonment***. These terms are sometimes used interchangeably to refer to not using assistive devices; however, these terms lack specificity and thus are confusing. As stated by Lauer et al. (2015), "these terms connote negative meanings,

when in fact the reason for not using a device may be related to a positive factor for an individual (e.g., healing)."

Among the terms mentioned above, the term "abandonment" is the most common in literature and refers to a somewhat active or conscious decision to stop using a device (Wessels et al., 2003). In this sense, abandonment is a more absolute term that often indicates that the device is no longer used at all and may represent only a small percentage of cases (Swinnen & Kerckhofs, 2015).

Some authors have intentionally used the term abandonment to refer to a decision resulting from a motivational emotional reaction. Individuals may sometimes be dissatisfied, or they decide that the device is not a good fit for their lifestyle or environment. However, other researchers inappropriately use the term abandonment, and thus interpretations of their findings can be misleading.

One example is the study by Phillips and Zhao (1993), who employed a definition of abandonment that described only one outcome of a person-device interaction (use vs. non-use), and they considered a device to be abandoned if it was replaced by another device. In this case, the authors were talking about situations where a person felt that they needed more functional support, and so, they may have stopped using a cane in favour of using a walking frame, for instance. Thus, the authors used the word abandonment in this context to imply that an individual stopped using one type of device in favour of another, which is different from other researchers' use of the term abandonment. Also, Phillips and Zhao's definition of abandonment ignores the changes from one category of devices to another due to dissatisfaction with the original device. The authors did, however, acknowledge this limitation, and they clearly stated that ""expected"

abandonment was not distinguished from abandonment due to user dissatisfaction" (Phillips & Zhao, 1993).

Meanwhile, Chen (2020) used a slightly different definition of abandonment than Phillips and Zhao (1993). Chen's definition included emotional reasons for device abandonment. However, this study measured device abandonment in the exact same way, i.e., by looking at the use or non-use of a device. Interestingly, Chen (2020) concluded that a user's dissatisfaction or frustration could lead to device abandonment.

Federici and Borsci (2016) investigated device abandonment in a sample of older adults in four healthcare centres in Italy who had obtained their devices under professional supervision. Their definition of abandonment was similar to that of Chen's (2020), and measured it in the same way, i.e., by examining device use/non-use. They also provided motivational reasons for device abandonment. They concluded that users' frustration or dissatisfaction with their devices and with the service delivery and the follow-up processes were the main reasons for device abandonment. However, the context of Federici and Borsci's (2016) study and the way they discussed their findings were different from those of Phillips and Zhao (1993) and Chen (2020). Federici and Borsci's (2016) often referred to the relationships between prescribers and the end-users and emphasized a person-centred approach in assistive device recommendation. This definition is more relevant for device non-adherence or non-compliance, but not for device abandonment.

Despite the progress brought by previous research, it is valid to say that the efforts in the AT literature are fragmented due to a lack of conceptual uniformity when using different terms that apply to different situations. It is also difficult to draw meaningful comparisons between

studies, even those using the same terms. The term abandonment is often misleading, for example, especially when applying it when clients stop using their devices due to improvement or deterioration in their physical functioning (Verza et al., 2006). Therefore, some authors have called for replacement of the term “abandonment” with the more neutral term “discontinuance” because the term abandonment suggests a negative impression that is not representative of all situations where devices are no longer being used (Lauer et al., 2015).

Non-adherence, on the other hand, is a clinically oriented concept and is a special case of discontinuance. The term non-adherence is applicable when a device is prescribed or recommended by qualified healthcare professionals within a rehabilitation plan. Thus, the reasons for non-adherence fall into the disenchantment category of Rogers’ (1983) model. That is, the client stopped using the prescribed device, not because of improvement or deterioration of their functional capacities, but due to psychosocial reasons.

Based on this definition, non-adherence implies a more active and conscious decision to not use the prescribed device. This definition also places great emphasis on the client’s role in making informed decisions among the available device options. In this sense, more collaborative involvement of the client and more work with their clinicians is needed in planning and implementing MADs.

In clinical practice, healthcare professionals are constantly giving instructions to their clients on how to use their prescribed devices to meet a predetermined healthcare goal. Clients, however, can either follow the instructions or ignore them. When clients do not follow their instructions, they fall under one of two concepts, called “non-adherence” or “non-compliance”, which respectively refer to different points of view. To better understand the concept of MADs

non-adherence, therefore, it is helpful to make a conceptual distinction between non-adherence and non-compliance, as the two concepts are commonly confused.

The term non-compliance first appeared in the medical literature in the 1970s, and since then has been used to describe a quantifiable parameter of "the extent to which a patient's behavior (in terms of taking medications, following diets or executing other lifestyle changes) coincides with the clinical prescription" (Jay et al., 1984, p. 125). In this classic situation, the prescriber informs the client how to use the treatment regimen. Thus, the role of clients' opinions is neglected (Vrijens et al., 2012). In recent years, however, non-compliance has been criticised for the negative implication that clients are expected to passively follow clinicians' orders (Ahmed & Aslani, 2014; Hugtenburg et al., 2013).

As stated by Wessels et al. (2003, p. 234), "(Non-) compliance relates to how well the patient obeys (or complies with) the doctor's orders. The patient is perceived as a passive receiver of instructions. Non-adherence, on the other hand, relates to the willingness and the possibility of a patient to develop his own health plan. Adherence has to do with commitment. The patient is perceived as someone who has the right to make choices, guided by the professional."

The main challenge that comes up from this research project lies in the long list of concepts used by researchers to refer to similar yet different observations without clear and consistent definitions. Examples of these concepts include non-use, non-acceptance, rejection, disuse, abandonment, non-compliance, and non-adherence. This is a valid concern because such inconsistency in the use of these different terms may hinder the development of the field. There is no clear chronological order of the appearance of these terms in the literature; however, it

seems that the field of Assistive Technology adopted different definitions over time. Although there have been some attempts to explain and differentiate between these terms, there is still a need to clearly define and distinguish between them.

In line with this concern, the developers of the CATOR framework acknowledged that some confusion exists (Jutai et al., 2005). Therefore, they encouraged researchers to be clear about what their core phenomenon and what goes around it. In other words, what is the core concept that has the most neutral meaning, and what are the other special cases of that core concept? It is clear that there is a simple observable fact of whether or not somebody is using a device. In this context, terms like 'continuance' and 'discontinuance' may be relevant; people either continue to use the device or they do not. This simple way is easily verifiable and not too controversial. Then, there are terms that go further and imply motivations or reasons for using or not using a device, like 'abandonment' or 'misuse'. Finally, the terms 'non-compliance' and 'non-adherence' are more clinically oriented concepts and refer to special cases that involve particular healthcare professionals, caregivers, or social circles.

Another relevant point in this discussion is whether or not device prescription was involved in the adoption process. For instance, if someone simply bought a cane on their own initiative and stopped using it, it has nothing to do with non-compliance or non-adherence because the device was not prescribed by a professional anyway. As well, if a device was not prescribed by a qualified healthcare professional, then there is no negotiated healthcare plan to adhere to. Thus, the terms non-compliance or non-adherence are not relevant. When authors bring in terms like non-compliance or non-adherence into the picture, they are not bringing in just a fact about whether somebody is using a device or not, they are bringing in a relationship between the user and a professional.

Clear distinctions should be made between terms like non-compliance and non-adherence, which involve a relationship between prescriber professional and users, terms that imply a reason why somebody stopped using a device like abandonment or rejection, and neutral terms such as non-use and discontinuance. In the current literature, however, this distinction is not an easy task because not all authors use these terms in a common, consistent way. Some authors say that devices are sometimes deliberately rejected or abandoned because of a reason (e.g., emotional), as in Chen's (2020) study, while others use these terms just because they had been used before and they just did some surveys around and used the term abandonment while documenting whether people were using the device or not (e.g., Phillips & Zhao, 1993).

It is clear that how non-adherence-related terms and concepts are defined in the current literature makes it difficult to draw meaningful comparisons between studies. This inconsistency may be partly due to the complexity of studying the non-adherence phenomenon. However, it is essential for researchers and clinicians to consider specific definitions of their terms and to provide a clear context for their intended measures to help maintain the continuum of the assistive technology domain.

This review of the current literature has sought to unify the inconsistent terminology under the guidance of existing models and frameworks that provides a potentially helpful roadmap for future research. Finally, this work has uncovered crucial literature gaps and methodological biases in the current literature that future researchers may consider improving the quality of their findings.

Study limitations

This study has a few limitations that should be acknowledged. Although efforts were made to thoroughly search the relevant literature, it is possible that a few articles were missed due to methodological limitations. For example, due to the long list of terms used in the literature to refer to non-adherence, the search strategy might have failed to capture some studies that used less common terms. Also, since only literature in English was included in this review, studies that were published in other languages might have been missed.

Conclusion

Based on the findings of this narrative review, it is valid to say that there is inconsistency in the use of terms such as abandonment, non-use, non-compliance, and non-adherence in the literature on assistive technology. Also, the term abandonment seems problematic, as researchers have used it widely to investigate slightly different situations without clear definitions. In this review, an attempt was made to cut through some of that confusion, and to accomplish this, a conceptual distinction was made between the various terms, and operational definitions were provided based on published theories and models (e.g., the CATOR framework and Rogers' theory of diffusion). The straightforward recommendation for other researchers here is that they provide clear definitions based on the context of their research to help advance the field further.

Chapter 4 – The Empirical Study

Psychosocial predictors of mobility assistive devices non-adherence among older adults: A cross-sectional study

This chapter presents the methods and results of the empirical study in this doctoral project. This study took the psychosocial perspective and investigated the psychosocial factors that predict non-adherence to MADs among older adults. To meet the study objectives, a sample of 48 older adult MADs users from long-term care units at the Perley Health Centre in Ottawa were recruited. The study examined the role of psychosocial variables using the Psychosocial Impact of Assistive Devices Scale (PIADS), social support using the Medical Outcomes Study Social Support Survey (MOS-SS), and the demographic variable of sex in the prediction of MADs non-adherence. Predictor variables that were associated with non-adherence in a univariate regression analysis were subsequently entered into a multiple regression analysis.

In the univariate regression analysis, the three PIADS subscales, namely, Competence, Adaptability, and Self-esteem, were significantly correlated with non-adherence ($p < 0.001$). Sex was an insignificant variable, while social support was significantly correlated with Competence, Adaptability, Self-esteem, and non-adherence. In the multiple regression analyses, only Self-esteem showed significant associations ($p < 0.05$), and the Self-esteem multivariate model explained 43.5 - 54.3% of the variance in non-adherence.

This study revealed that the Self-esteem construct, which includes several concepts related to emotional wellbeing, was the only significant predictor of non-adherence among the studied sample of older adults. The findings of this study have theoretical and clinical implications which are discussed in the following sections.

Background

Every day, approximately 10,000 people turn 65 years old worldwide (Cohn & Taylor, 2010). Among them, about 25% are expected to live into their 90's and beyond (Social Security Administration, 2014). Aging is characterized by functional declines that may affect mobility. Mobility impairment can be interpreted as the loss of connection between a person's physical capabilities (mainly muscle strength and balance) (Marko et al., 2012), and their environment (including social environment) (Lotvonen et al., 2017). Research has defined mobility in the context of aging as more than just the physical ability to walk. It includes other important factors, such as the ability to accommodate and the degree of self-motivation (Brown & Flood, 2013). Mobility limitations can be detrimental to older adults by affecting physical, psychological, and social aspects of their life (Groessl et al., 2007; James et al., 2011).

The main goal of healthcare professionals is to support older adults to stay active at their environment as long as possible, in order to avoid the adverse effects of hospitalization on individuals and their families along with decreasing health care expenses. Mobility assistive devices have been acknowledged and recognized as powerful tools with the potential to compensate body structure and function (Layton et al., 2020), and to support older adults in staying healthy (Bradley & Hernandez, 2011). Mobility assistive devices (MADs) can be defined as any "[physical tools] that augment or replace ambulation for individuals with mobility limitations" (Cook & Polgar, 2015). Examples of MADs include canes (e.g., walking sticks, single-point, and quad support,), crutches (e.g., forearm or axilla crutches), walkers (e.g., rolling walkers, three-wheeled walkers), wheelchairs (e.g., manual, powered, tilt-in-space wheelchairs), and scooters (Jutai et al., 2009). These devices share a common feature that they are directly

manipulated by the user or their caregivers to facilitate daily life mobility (Gitlin, 2002). The scope of this research project is limited to devices that are conventionally described as mobility aids, such as canes, walkers, wheelchairs, and scooters. Thus, devices that are mobility-related but are worn (e.g., lower limb orthoses or prostheses), as well as those that are attached to the original structure of the physical environment (e.g., grab bars), are excluded from this study.

Notwithstanding the acknowledged benefits of MADs for the older adult population, clinicians should be aware of their drawbacks when recommending devices to their clients. Using MADs without medical consultations poses many serious problems (Bradley, 2011; Liu et al., 2011). For example, when MADs are inappropriate to end-users or unprescribed to them by healthcare professionals, they are associated with higher risks of falling (Brown & Flood, 2013; Stevens et al., 2009). Furthermore, failure to find a fit between the device, the end-user, and the environment has been identified in the literature as a reason for non-adherence (Edelstein, 2019).

To better understand the concept of non-adherence to MADs, it is imperative to consider the different parties that take part in the prescription process. Namely, the prescriber, the end-user, and the caregiver. Older adults rely largely on the psychosocial motivators to accept or reject the prescribed device. As cited by Wessels et al. (2003), "non-adherence relates to the willingness and the possibility of a patient to develop his own health plan. Adherence has to do with commitment. The patient is perceived as someone who has the right to make choices, guided by the professional."

Drawing upon this definition by Wessels et al. (2003), this project defines non-adherence as the conscious decision of not using the MAD as prescribed by the healthcare professionals. In other words, deviating from the agreed healthcare plan, either in a conscious momentary decision, or over time.

Research shows that the way older adults perceive and experience a device is vital in their decision to accept or reject them. As noted by Pressler (2014) and Gitlin et al. (1998), older adults who perceive their device as unsafe, as making them look old, or as attracting unwanted attention are very likely to be non-adherent to them. The published rate of non-adherence to MADs ranges from 14% (Federici & Borsci, 2016) to 75% (Luz, et al., 2017). By not adhering to the prescribed devices, the physical, psychological, and social well-being is at risk. Therefore, understanding the psychosocial factors of non-adherence to the prescribed device is of utmost importance in promoting the MADs desired outcomes.

Phillips and Zhao (1993) studied about 200 MAD users and identified the failure of providers to take consumers' opinions into account was associated with device abandonment. Wielandt and Strong (2000), conducted a literature review on the compliance of a prescribed devices to identify the factors that influence non-compliance. They highlight the importance of client-related factors in the successful adaption of device prescription. Scherer et al. (2005) stated that personal characteristics (e.g., self-esteem, self-determination, and motivation), and social characteristics (e.g., friend and family support) are important predictors of device adoption. Jutai et al. (2005) highlighted the concept of subjective well-being as a promising way to evaluate the outcomes of ADs. Subjective well-being is also one of the most consistently mentioned concepts that directly influences quality of life (Scherer et al., 2011). It comes as no surprise that the construct of subjective well-being is included in several MADs adoption models (e.g., Fuhrer et al. (2003), Jutai et al. (2005), and Scherer et al. (2007)).

The most obvious finding emerging from the literature is that personal factors in relation to MADs adoption constitute a pattern, with the users' psychological characteristics (e.g., self-confidence, self-efficacy, and sense of control), and social factors (e.g., feeling of embarrassment

and Stigma, social support, and social values and contexts) prevailing as bearing the most significant effect of MADs non-adherence. Interestingly, there were other sociodemographic factors such as sex that seem to be important to MADs non-adherence, according to some studies (Peterson et al., 2017; Resnik & Allen, 2006; Rintalia, 2002). Although the findings about the role of sex in MADs non-adherence seems inconclusive, a recent study was conducted on 5503 community-dwelling older adults cane users in the US found significant sex differences between men and women. Women were less likely to use canes compared to men (Peterson et al., 2017).

Identification of older adults who are at risk of poor adherence would be helpful for healthcare providers to intervene by directing their clients to other resources, thus enable such individuals to continue their healthcare plan successfully. Unfortunately, based on the available evidence it is not possible for healthcare professionals to predict which clients are likely to be non-adherent.

The main goal of rehabilitation professionals is to make the right clinical decisions, informed by empirical findings which in turn will improve their practice. To that end, this project aims to build a predictive model of important psychosocial factors that can be used by healthcare professionals in recommending MADs for older adult clients. The model is intended to include important psychosocial factors that may predict non-adherence to prescribed MADs among community-dwelling older adults.

Research questions

This research project addressed the following research questions:

Research Question 1: What role do the psychosocial variables play in predicting non-adherence to prescribed MADs among community-dwelling older adults?

Research Question 2: What role does the demographic variable of sex play in the prediction of non-adherence to MADs use among community-dwelling older adults?

Research Question 3: What is the influence of social support in predicting non-adherence to MADs among community-dwelling older adults?

Methods

Study design

A cross-sectional approach was used to answer the research questions. A cross-sectional research design is a type of observational research that collects data at one given point in time across a sample population (Levin, 2006) In a cross-sectional research design, investigators use interviewer or self-administered surveys or questionnaires to collect data based on predetermined inclusion and exclusion criteria (Wang & Cheng, 2020). The aim of this study was to investigate predictors of MADs non-adherence among a group of older adults living in the community using a questionnaire. This research project is a predictive correlational study that employed regression analysis. Correlation is a statistical association or relationship between variables (Warner, 2013), and a valid use of regression correlation is prediction (Cohen et al., 2003).

Participants

A convenience sample of the community-dwelling older adults in Ottawa was invited to participate in this study. Individuals were included if they meet the following criteria.

Inclusion criteria:

1) English-speaking older adults who were 65 or older and community-dwellings. To the best of the researcher's knowledge, there is no universally accepted unified definition of community-dwelling older adults. In this research project, the term 'community-

dwelling older adults' is defined as older adults who either live in their homes, residence or long-term care facilities. This research considers all these facilities as community institutions based on similar research (Olanrewaju et al., 2016; Steultjens et al., 2004). However, a facility labelled as a 'hospital' is not included in this definition, and patients admitted to hospitals for medical treatments are not considered community-dwellings. In this research project, only residents of long-term care units were recruited (due to constrains discussed in the limitations section); therefore, the terms "long-term care" and community-dwelling" were used interchangeably to refer to the study sample.

This criterion did not intend to exclude Francophones or other language speaking communities. Individuals from various cultural backgrounds could participate as long as they could understand the English language (i.e., bilingual). Also, there is no literature suggesting that the psychosocial factors in relation to MADs adoption are significantly different between French- and English Canadians.

2) Older adults who were living with mobility limitations due to chronic impairments, including stroke survivors, lower limb amputation, brain injury, etc.

3) Older adults who used prescribed (by physicians) or recommended (by healthcare professionals) MADs such as canes, crutches, walkers, wheelchairs, and scooters for everyday life activities

4) Older adults who had been using their devices for at least six months.

5) Older adults who agreed to participate in the study and had signed the required consent form.

Individuals were excluded if they meet the following criteria.

Exclusion criteria

1) Currently hospitalized due to a medical condition.
2) Diagnosed with severe cognitive impairment, such as dementia, that prevented them from using MADs.
3) medically fragile (i.e., who had a chronic physical condition which resulted in a prolonged dependency on medical care for which daily skilled nursing intervention was medically necessary).
4) Did not speak and understand the English language.
5) Unable to sign the consent form.

The decision to exclude older adults with severe cognitive impairment was based on the judgment of a clinician at Perley Health. If somebody had or was suspected to have a cognitive problem, they were included only if an experienced clinician believed that they were able to answer the questionnaires, and could understand how to effectively use a MAD. Previous research shows that cognitively impaired older adults are more likely to use MADs ineffectively than cognitively intact individuals (Alkadri & Jutai, 2016). There is evidence suggesting that healthcare professionals may not recommend MADs to certain clients based on their cognitive abilities.; thus, individuals with moderate to severe cognitive impairments might be non MADs users anyway (Bradley & Hernandez, 2011; Jutai et al., 2007).

The interviews were conducted face-to-face with the older adults only. No formal or informal caregivers were involved in the data collection of this research because all the study

participants could sign the consent form by themselves and were able to communicate with the principal investigator without assistance.

Recruitment

Recruitment of participants took place at Perley Health in Ottawa between January 10th to March 17th, 2020. The Perley Health is an older adults Village with 450 long-term care beds and 139 independent-living apartments. According to the Perley Health website, residents are classified into dementia patients and healthy aging individuals. Among the healthy aging group, most residents live with mobility limitations and use MADs. Some of the residents are veterans and have uni- or bi-lateral lower limb amputations. Equally important, not all residents of Perley Health are veterans. Of the 450 long-term care beds, 250 are designated as priority access beds (also known as 'contract beds') for veterans, while non-veteran patients from the community occupy the remaining 200 beds.

The Research Coordinator at the Perley Health was contacted by the principal investigator through email (see Appendix 1) to facilitate the recruitment. This person expressed interest in the research and invited the principal investigator to a face-to-face meeting. During the meeting, the process of recruitment and the documentation needed to get the approval were discussed. At the end of the meeting, the research coordinator requested the study information package and the ethical approval form from the Research Ethics Board of the University of Ottawa (Appendices 2 and 3), respectively. After reviewing all the study documents, the Perley Health granted the principal investigator approval and determined that the data collection could start on January 10th, 2020 (see Appendix 4).

The recruitment was done in two stages, as follows:

1) The recruitment flyer and the text describing the project were sent to the research coordinator at the Perley Health (Appendix 5), who helped with: (a) identification of potential participants according to the inclusion and exclusion criteria; and (b) gave the principal investigator the dates, times, and locations of the meetings with eligible participants.

2) Persons who expressed interest in participating were invited to face-to-face meetings with the principal investigator either in their rooms or at a conference room at the Perley Health. During this meeting, the principal investigator (a) went through the information package and reminded the potential participants about the project; (b) confirmed their interest in participating; (c) had them sign the consent form; and (d) asked them for their willingness to answer the questionnaire during the session or whether they would prefer to schedule another meeting.

During this stage, each participant was asked if they wished for someone else to complete the questionnaire on their behalf. This was done because although each participant was in fact the respondent, they might wish to be supported by another person. However, all participants in this study signed the form by themselves and did not require any assistance.

Sample size

The aim was to recruit at least 36 participants who met the above-mentioned inclusion criteria. The power calculations were done based on the outcome variable (i.e., non-adherence). Although there is no consensus on the number of observations needed per variable (Moons et al., 2009), it has been proposed theoretically that 10 to 20 observations per variable are necessary (Harrell et al., 1996). Statisticians suggest that between 10-20 observations per one continuous variable are needed to conduct a valid regression analysis (Riley et al., 2020). They also

recommend including not more than five continuous variables when the study sample is less than 50 participants (Harrell, 2015). These recommendations were considered when the sample size was estimated.

By looking at similar studies that used the PIADS (Harris & Sprigle, 2008), the minimum sample size was estimated to be 30 participants. This sample size should be sufficient to detect a mean difference on one of the subscales of PIADS, which has been shown to be associated with MADs non-adherence (Harada et al., 2014). However, to account for an expected attrition rate of 20%, the minimum sample size was revised to 36 participants (30 + 20% of 30).

Framework for selections of variables

The selection of variables was based on the literature review with the guidance of the CATOR framework, under which all variables identified from the literature were represented. Therefore, all the variables were defined according to the CATOR framework. These variables were:

1. Non-adherence, known as "device utilization," in the CATOR framework. Device utilization is a domain in the CATOR framework and includes the following categories: 1) frequency of use; 2) duration of use; and 3) intention to use.
2. Subjective well-being, which is the third vantage of the CATOR framework and includes "user's cognitive and affective evaluation of how assistive devices have affected their lives" (Jutai et al., 2005, p. 298).
3. Social support is a category under the domain of caregiving, which is located under the social significance vantage in the CATOR framework. Social support refers to the level of assistance from significant others.

Outcome variables

Device non-adherence as an outcome variable was measured by evaluating the actual use of a prescribed device(s). For actual use, the term "device utilization" was used as defined by the CATOR framework. After the respondents selected one or more MADs for their type of currently in-use device(s) from the provided list, they were asked about their utilization of the device. Device utilization was measured by:

1) Frequency of use (i.e., on a typical day, how often the device is used). Participants were asked to choose from a 5-point Likert scale with responses ranging from 1 (never) to 5 (every day) to determine the frequency of device use.

2) Duration of use (i.e., the amount of time the user spent interacting with the device at the time of answering the survey). Participants were asked to choose from a 5-point Likert scale with responses ranging from 1 (never) to 5 (very frequently) to determine their interaction time with the device.

3) Participants' intention to use a MAD in the future was measured by asking a question about the likelihood of their future device use, with responses ranging from 1 (extremely unlikely) to 5 (extremely likely).

The interpretation of the scores of the three measures (i.e., frequency of use, duration of use, and intention to use) are calculated based on the previous research. In medical literature, studies that investigated medication adherence suggest that higher than 80% should be considered good adherence (Chowdhury et al., 2013; Cramer et al., 2008). Thus, this research project suggests that ratings on the measures of 4 would equate roughly to 80%. Therefore, a

rating of 3 and lower on the three measures would indicate poor adherence (i.e., ratings of 4 and higher would indicate good adherence).

Predictor variables

The psychosocial variables

The psychosocial variables were assessed by using the Psychosocial Impact of Assistive Devices Scale (PIADS) (Jutai & Day, 2002). The PIADS was developed specifically to measure the perceived impacts assistive devices have on users' quality of life, and it captures the constructs of perceived Competency, Adaptability, and Self-esteem in three separate subscales (Jutai & Day, 2002). The PIADS is a 26-item self-reporting measure that is available in English, French, and many other languages and cultural translations.

For each item, the scores are on a seven-point Likert scale ranging from −3 (maximum negative impact) to +3 (maximum positive impact). The midpoint (zero) indicates no impact or no perceived change as a result of using the device (Jutai & Day, 2002). The PIADS subscales are scored as follows:

1. The Competence subscale (12 items) was derived by adding the values corresponding to items 1,3,4,6,8,11,13,14,16,17, and 18, subtracting the value corresponding to item 5 and dividing the total by 12.
2. The Adaptability subscale (6 items) was derived by adding the values corresponding to items 15, 22, 23, 24, 25, and 26, and dividing the total by 6.
3. The Self-esteem subscale (8 items) was derived by adding the values corresponding to items 2, 7, 9, 12, 19, and 20, subtracting the values corresponding to items 10 and 21 and dividing the total by 8. The complete PIADS questionnaire can be found in Appendix 7.

The validity and reliability of the PIADS are very well established in the literature, with Cronbach's alpha values being 0.95 for the total PIADS score and 0.92, 0.88, and 0.87 for the Competence, Adaptability, and Self-esteem subscales, respectively (Demers et al., 2002; Orellano-Colón & Jutai, 2013). The PIADS corresponds well with the WHO-ICF framework. Twenty-three out of 26 items of the questionnaire showed a good fit with the ICF categories, which is evidence for a shared theoretical foundation (Traversoni et al., 2018).

The three subscales (i.e., Competence, Adaptability, and Self-esteem) have generic names that include several concepts to assess the user's functional independence, well-being, and quality of life. For example, the Competence subscale measures the user's feelings of competence and efficacy, and it captures the perceived impacts of MADs on performance and productivity. The Competence subscale includes items such as, competence, productivity, usefulness, performance, and independence (Jutai & Day, 2002).

The Adaptability subscale measures the user' willingness and possibility to try new things. It captures the enabling and liberating aspects of MADs that might be expected if the devices improved participation. The Adaptability subscale includes items such as, the ability to participate, willingness to take chances, eagerness to try new things, and the ability to take advantage of opportunities (Jutai & Day, 2002).

Similarly, the Self-esteem subscale does not measure only self-esteem; rather, it is a generic name that includes several concepts related to psychological wellbeing such as happiness, self-esteem, feeling of security, self-confidence, sense of power, sense of control, frustration, and embarrassment. For example, a positive psychosocial impact of MADs means that a device should make a user feel more self-confident and happier, and less frustrated and embarrassed. Therefore, the ratings on the items "frustration" and "embarrassment" are

subtracted from the ratings for happiness, self-esteem, feeling of security, self-confidence, sense of power, and sense of control (Jutai & Day, 2002). All these emotional experiences have significant positive or negative impacts on a decision of adherence/non-adherence of MADs among older adults (Scherer et al., 2011).

There is substantial evidence that PIADS is a good filter and an adequate representation of important psychosocial factors identified in the literature that potentially influence MADs non-adherence. The PIADS subscales also map onto key constructs for this current study, such as self-esteem, self-confidence, self-efficacy, and stigma as defined in the literature. (See Chapter 2 for the definitions)

The psychometric properties of the PIADS have been extensively analyzed and tested in several studies and showed an excellent validity. A recent systematic review by Atigossou et al. (2022) concluded that the psychometric properties of the PIADS (content validity, structural validity, internal consistency, and test–retest reliability) show high levels of validity. Atigossou et al. (2022) support the use of the PIADS both in clinical practice and research. The standardized language of the PIADS enhances its compatibility and applicability in clinical settings and research (Atigossou et al., 2022).

Social support

Social support was measured by using the tangible (instrumental) domain of the Medical Outcomes Study Social Support Survey (MOS-SS) (Moser et al., 2012). The original MOS-SS questionnaire is a 19-item questionnaire that was developed to measure functional social support in community-dwelling chronically ill individuals. The 19 items cover four domains (emotional/informational support, tangible (also called instrumental) support, positive social interaction, and affection) and are recommended for both combined and individual use

(Sherbourne & Stewart, 1991). For more than twenty years, the MOS-SS and modified versions have been widely used as self- and interviewer-administered questionnaires in many populations, including community-dwelling older adults (Hurria et al., 2007; Stuck et al., 2007). Several studies have used the modified version of the Medical Outcomes Study Social Support Survey (mMOS-SS) to reduce respondent burden. The tangible domain of the mMOS-SS has four items, and has a Cronbach's alpha of 0.93 (Unni, 2008). It is anchored on a 5-point Likert scale ranging from 1 (none of the time) to 5 (all of the time). The total score is the average of the four items, and higher scores indicate better social support.

Demographic variables

Demographic variables including age, sex, type of disability, social and familiar status, clinical-medical condition, and type of MAD currently used were also collected to examine whether any of these variables would affect non-adherence to MADs among community-dwelling older adults.

Research ethics

All the study procedures and questionnaires were reviewed and approved by the Research Ethics Committee of the University of Ottawa [Certificate# H-08-19-4850] (Appendix 3). The consent form (Appendix 8) and the information letter (Appendix 2) were provided to the participants at the beginning of the meeting session to give them all the information needed to give informed consent. In this document, the participants were asked if they would need someone to explain the content of the forms to them. The principal investigator was physically present to support the participants in understanding the consent form before the start of the data collection procedure.

The data collected during this study were transferred into password-protected computers. All electronic copies of research-related materials with de-identified data were stored in a locked file with restricted access. All the information obtained in this study was used for research purposes only. The data collected during this study were analyzed, and the findings were presented in summary form in a way that did not identify any individual. During the study, hard copies of consent forms and completed questionnaires were kept securely in a locked filing cabinet in a locked office in the study's supervisor's lab at the University of Ottawa.

Procedures

Once each participant agreed to take part in this study and signed the consent form, the interview started. The study questionnaires were completed through a face-to-face interview. The questionnaires used for this study (i.e., PIADS and mMOS-SS) are valid to use in face-to-face interviews. Under normal circumstances, the interview took between 15 to 20 minutes to complete.

As discussed before in the Variables section, Part 1 of the questionnaire contained basic information about the participants and their living situation, such as age, sex, disability type, type of MADs they were using at the time of answering the questionnaire, and availability of social support from significant others (Appendix 6). The second part of the questionnaire contained the PIADS scale, which consisted of three subscales that measured perceived Competency, Adaptability, and Self-esteem (Appendix 7).

The participants could also decide to fill out the questionnaire at their convenience. The principal investigator explained to the participants that it was okay to schedule a second meeting if they preferred to complete the questionnaire later. No one chose to schedule a second meeting among the study sample.

Data analysis

The data were analyzed by using descriptive statistics to describe the sample, and by multiple regression to examine the predictors of MAD non-adherence using SPSS software. To make sure that all the data were ready for analysis, some essential steps were taken. For example, linearity, residual independency, homoscedasticity, multicollinearity, outliers, and skewness in distribution were checked, and the results of these procedures are presented in Chapter 4. Missing data were also handled to make sure that the data were ready for analysis. These analyses were done in two steps, as follows.

1) **Preparing the Data**

Before analysing the data, first, a check for missing data was performed. The raw data in the returned questionnaires were investigated before exporting them to an Excel file. The principal investigator reviewed the participants' answers, and incomplete ones were removed. Then, the data were converted from questionnaires to an Excel file, and then rechecked for any other incomplete cases. Finally, the data were imported to SPSS software for further analysis.

2) **Regression assumptions**

Before performing the regression analysis, a check for all the regression assumptions using the SPSS software was done, as follows:

- Linearity was assessed by partial regression plots and a plot of studentized residuals against the predicted values.
- Residual independency was assessed by specific tests (i.e., Durbin-Watson statistic).
- Homoscedasticity was assessed by visual inspection of a plot of the studentized residuals versus the unstandardized predicted values.

- Multicollinearity was assessed by tolerance values greater than 0.1.
- Normality was assessed by Q-Q Plot.

To examine Research Question 1, “What role do the psychosocial variables play in predicting non-adherence to prescribed MADs among community-dwelling older adults?”, linear regression models were conducted using SPSS For Windows to examine the role of these variables in the prediction of MAD non-adherence. The outcome variable was non-adherence, and the predictor variable was psychosocial factors (i.e., Competence, Adaptability, and Self-esteem).

To examine Research Question 2, “What role does the demographic variable of sex play in the prediction of non-adherence to MADs use among community-dwelling older adults?”, the same linear regression that was utilized for Research Question 1 was applied in order to explore whether sex variable could be considered as a predictor for MAD non-adherence.

To examine Research Question 3, “What is the influence of social support in predicting non-adherence to MADs among community-dwelling older adults?”, the same linear regression that was utilized for Research Question 1 was applied in order to explore whether social support could be considered as a predictor for MAD non-adherence. The outcome variable was non-adherence, and the predictor variable was social support.

There are various types of regression analyses, such as linear regression, logistic regression, and Cox regression, to mention a few. The regression model used in this study is the multiple linear regression model. This regression model was chosen based on the type and the distribution of the outcome variables (in statistics called the Y variable). Since the outcome variables in this current study are treated as continuous (see the regression assumptions in

chapter 4 and appendix 10) and are approximately normally distributed, the linear regression model was used. This modelling helps to predict the outcome variables (Y) based on values of a set of predictor variables (Xi) (Draper & Smith, 1998).

Generally, it is not recommended in multiple linear regression to throw in all the predictor variables at a time and start minimizing the error function (Ratner, 2010). Instead, a selection of the best possible predictor variables that contribute well to the outcome variables should be made (Ratner, 2010). For this, a correlational analysis for all the predictor variables and the outcome variables was performed first. Then, only the correlated predictor variables were taken in decreasing order of correlation value, and the regression model was performed to estimate the coefficients (Dang et al., 2020). Thus, the first essential step is to pick the necessary variables among the complete list of variables by excluding both irrelevant ones (variables that do not affect the outcome variable) and redundant ones (variables that do not add anything to the outcome variable) (Dash & Liu, 1997). After identification of the significant predictor variables, the selection of the appropriate modelling procedure is next.

There are several methods for performing multiple linear regression modelling. The selection of a specific method depends on how the predictor variables are entered into the analysis. In this research project, the forward method was used in which the variables were entered in the block one at a time. There is a recommendation in the literature to start with the forward method as it is simpler than the backward or stepwise methods of modelling (Alexopoulos, 2010). In the forward method, building the model starts by assuming a simple model (i.e., a straight line ($Y = a + bX$ or $Y = b_0 + b_1X$). Then, the best estimate of the assumed model is created. If the model does not fit the data, more complicated methods are considered.

In other words, the SPSS software in the forward method looks at all the selected predictor variables one after another and picks the one that predicts the most on the outcome variable. This process continues until adding predictor variables does not add anything significant to the model, and the final model is then finalized. The advantages of the forward method are that it starts with small models, and the method is less susceptible to collinearity (very high intercorrelations or inter-associations among predictor variables) (Chowdhury & Turin, 2020).

Results

Descriptive Statistics

1) Baseline characteristics

Out of a total of 96 residents who were invited to participate in the study, 49 gave their consent to participate with a response rate of 51%. Of this number, 48 residents completed the study. The data from 48 residents (26 females and 22 males), with a mean age of 86.8 (Standard Deviation (SD) =10.2, age range= 66 - 101), were available for analysis. Most of the participants were non-veterans (79.17%). The most common reported mobility limitations were due to balance problems and leg weakness (29.17% for each). The most common device used was walker (47.92%), followed by a manual wheelchair (33.33%). The baseline characteristics are presented in Table 3**.**

Table 3. The baseline characteristics of the overall population

Variables		All	Males	Females	P-value*
Age	Mean	86.8	87.96	85.89	0.488
	Standard Deviation (SD)	10.2	11.06	9.44	
	Median	91	94	88.5	
	Inter Quartile Range (IQR)	14	7.75	13.5	

	Range (in years)	66 - 101	66 - 98	67 - 101	
Sex, N (%)			22 (45.8%)	26 (54.2%)	
Occupation, N (%)	Veteran	10 (20.8%)	6 (27.3%)	4 (15.4%)	0.31
	Nonveteran	38 (79.17%)	16 (72.73%)	22 (84.62%)	
Education, N (%)	No formal education	1 (2.08%)	1 (4.55%)	0 (0%)	0.29
	Grade school	6 (12.5%)	2 (9.09%)	4 (15.39%)	
	High school	18 (37.5%)	6 (27.27%)	12 (46.15%)	
	College or university	23 (47.92%)	13 (59.09%)	10 (38.46%)	
Disability, N (%)	Balance problem	14 (29.17%)	6 (27.27%)	8 (30.77%)	0.76
	Legs weakness	14 (29.17%)	8 (36.36%)	6 (23.08%)	
	Leg amputation	2 (4.17%)	1 (4.55%)	1 (3.85%)	
	Fall injury	7 (14.58%)	4 (18.18%)	3 (11.54%)	
	Stroke	3 (6.25%)	1 (4.55%)	2 (7.69%)	
	Respiratory problem	2 (4.17%)	0 (0%)	2 (7.69%)	
	Knees Osteoarthritis	6 (12.5%)	2 (9.09%)	4 (15.39%)	
Device type, N (%)	Cane	4 (8.33%)	2 (9.09%)	2 (7.69%)	0.54
	Walker	23 (47.92%)	12 (54.55%)	11 (42.31%)	
	Manual Wheelchair	16 (33.33%)	5 (22.73%)	11 (42.31%)	
	Powered Wheelchair	5 (10.42%)	3 (13.64%)	2 (7.69%)	
	Scooters	0 (0%)	0 (0%)	0 (0%)	
	Other	0 (0%)	0 (0%)	0 (0%)	
Marital status, N (%)	Married or common-law	16 (33.33%)	8 (36.36%)	8 (30.77%)	0.05
	Separated or divorced	6 (12.5%)	4 (18.18%)	2 (7.69%)	
	Widowed	20 (41.67%)	5 (22.73%)	15 (57.69%)	
	Single or never married	6 (12.5%)	5 (22.73%)	1 (3.85%)	
Living condition, N (%)	Long-term care unit	48 (100%)	22 (45.8%)	26 (54.2%)	0.89
	Independent-living apartment	0 (0%)	0 (0%)	0 (0%)	

2) Frequency, duration, and intention of device use

Frequency of device use was assessed by asking the following question: “on a typical day, how often the (most frequent used) device is being used? The respondents had to choose one from the following options: 1) never, 2) sometimes, 3) usually, 4) often, or 5) always. The duration of device use is defined as the amount of time the user spent interacting (i.e., using) with the device at the time of answering the questionnaire. The respondent had to choose one from the following options: 1) none of the time, 2) a little of the time, 3) some of the time, 4) most of the time, or 5) all the time.

Although the frequency and duration of device use may seem similar, the two concepts indeed measure different outcomes per the definitions cited in the CATOR framework (Jutai et al., 2005). For frequency of device use, the question was (how often?) and for the duration of device use, the question was about the amount of time a participant spent interacting with the device. Furthermore, during the data collection, there was no indication that the participants were confused by these concepts.

The intention to device use was measured by asking a question about the likelihood of device use in future with following responses: 1) extremely unlikely, 2) unlikely, 3) neutral, 4) likely, 5) extremely likely. The overall frequency of device use had Mean= 3.79 and SD= 1.18; duration of device use had Mean= 3.73 and SD= 1.047, and the intention to device use had Mean= 3.48 and SD= 1.52. Figures 4, 5 & 6, and Table 4.

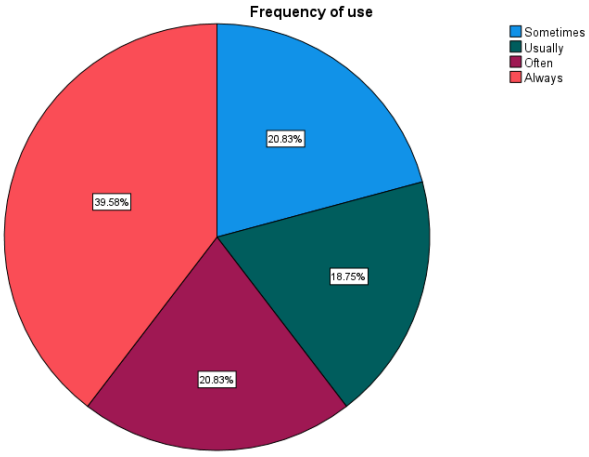

Figure 4. Pie chart of the frequency of device use (Never = 1, Sometimes = 2, Usually = 3, Often = 4, Always = 5)

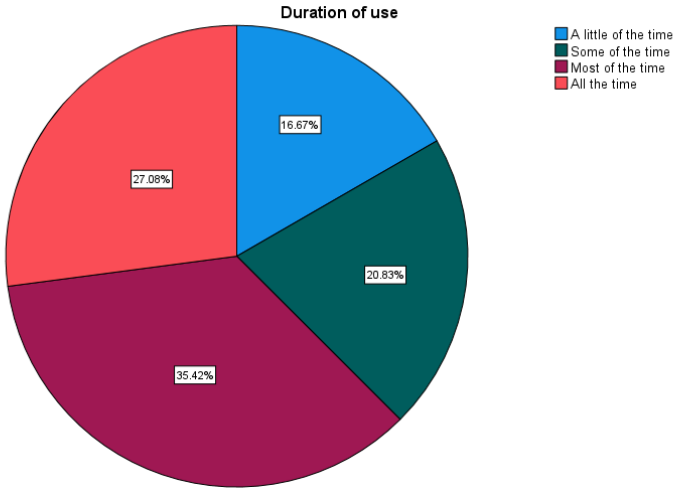

Figure 5. Pie chart of the duration of use (None of the time = 1, A little of the time = 2, Some of the time = 3, Most of the time = 4, All the time =5)

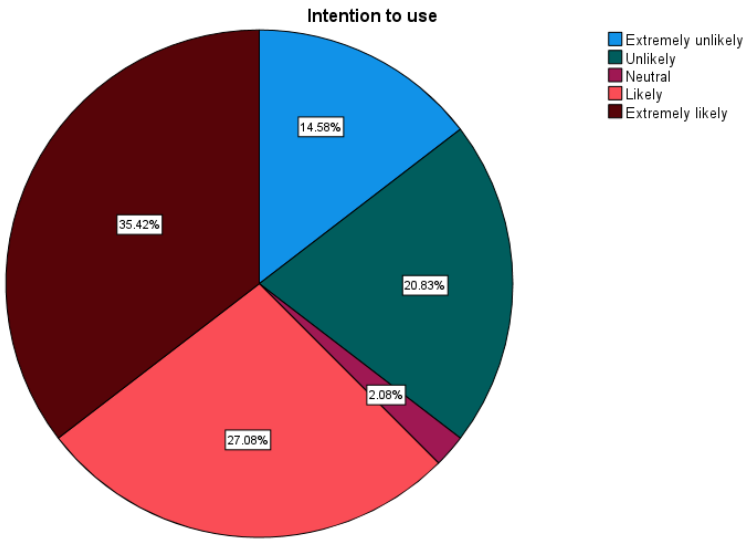

Figure 6. Pie chart of the intention to use (Extremely unlikely = 1, Unlikely = 2, Neutral = 3, Likely = 4, Extremely likely = 5)

3) Descriptive results of the PIADS

To examine the PIADS scores against some of the demographic variables, the PIADS subscale mean scores were plotted (using SE bars) as a function of the response options for device type and medical diagnosis. Figure 7 shows the mean scores of the PIADS subscales divided by different types of MADs used by respondents. Figure 8 presents the mean scores of the PIADS subscales divided by the medical diagnosis (or the disability type) of participants.

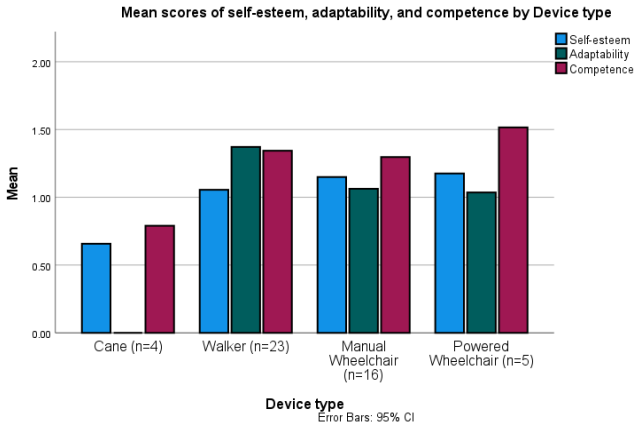

Figure 7. Mean scores of Self-esteem, Adaptability, and Competence by device type

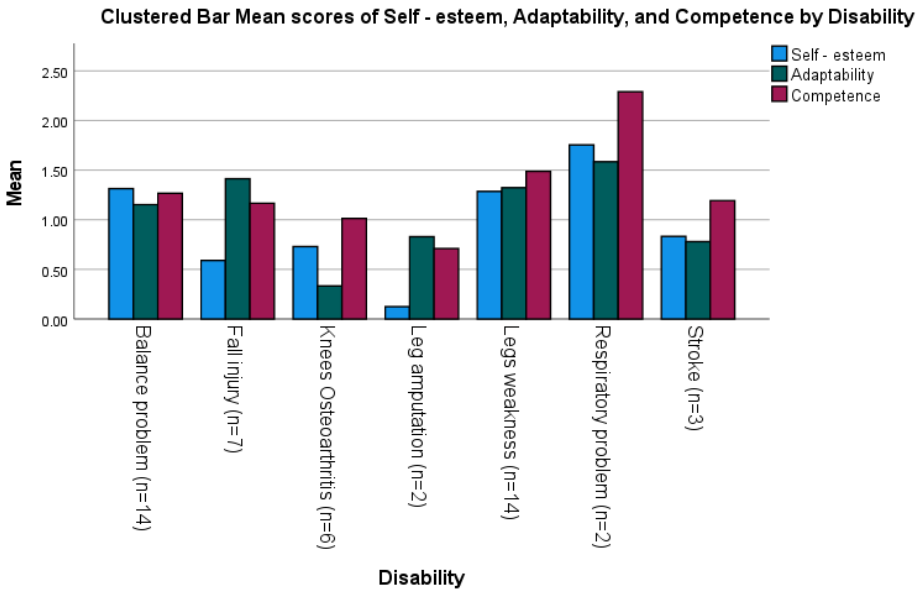

Figure 8. Mean scores of Self-esteem, adaptability, and competence by Medical Diagnosis

Sex-based Analysis

Sex-based analysis was conducted to see if there are any significant differences between study variables based on sex. In the overall study sample, females made up 54.2% (n=26). No significant differences were found in all study variables (all P≥0.05). No statistical difference was found between both sex groups in the outcome variables; frequency, duration, and intention to device use (all P >0.05). (See Table 4, and Figures 9, 10, & 11). Similarly, no significant difference was reported in the predictor variables: Competence, Adaptability, Self-esteem, and social support (all P >0.05). (See Table 5 and Figure 12).

Table 4. Frequency, duration, and intention to device use among both sex groups

		Mean	SD	Median	Interquartile Range (IQR)	Minimum	Maximum	P-value
Frequency of use	All	3.79	1.18	4	2	2	5	
	Male	3.86	1.17	4	2	2	5	0.703
	Female	3.73	1.22	4	2	2	5	
Duration of use	All	3.73	1.047	4	2	2	5	
	Male	3.82	0.91	4	1	2	5	0.593
	Female	3.65	1.16	4	2	2	5	
Intention to use	All	3.48	1.52	4	3	1	5	
	Male	3.27	1.49	4	2.75	1	5	0.391
	Female	3.65	1.55	4	3	1	5	

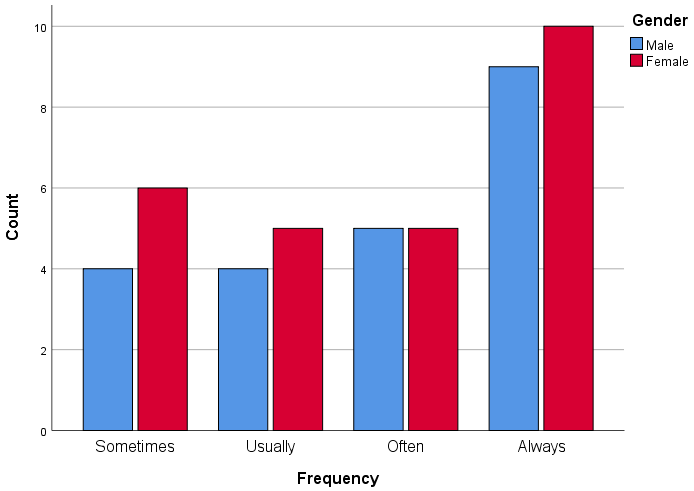

Figure 9. Frequency of device use stratified by sex

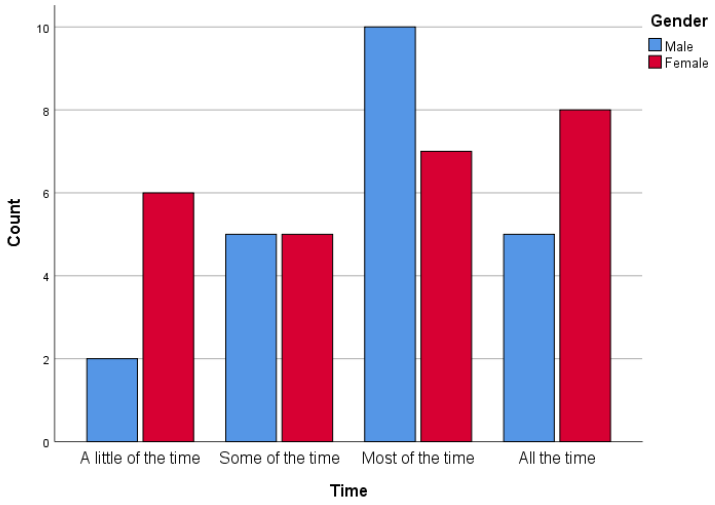

Figure 10. Duration of device use stratified by sex

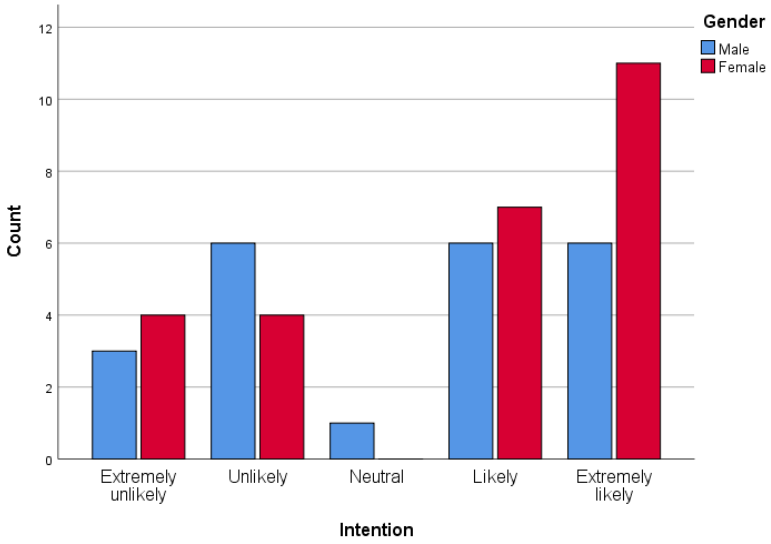

Figure 11. Intention to device use stratified by sex

The results of the PIADS and mMOS-SS

The psychosocial variables were assessed by the Psychosocial Impact of Assistive Devices Scale (PIADS). PIADS captures the constructs of perceived Competency, Adaptability, and Self-esteem in three separate subscales. The Competence subscale had a mean of 1.351 (SD=0.699); the Adaptability subscale had a mean of 1.108 (SD= 1.305), Self-esteem subscale had a mean of 1.021 (SD=1.578). PIADS subscale scores higher than 1.0 indicate a positive psychosocial impact and likelihood that an assistive device will be retained.

Social support was measured by the modified version of the Medical Outcomes Study Social Support Survey (mMOS-SS), with a mean of 16.167 (SD= 3.8). No statistically difference was reported for both sex groups (p= 0.57). The complete results of PIADS subscale scores and social support of both sexes are presented in Table 5 and Figure 12.

Table 5. Sex differences on study variables; PIADS subscales, and mMOS-SS

Variables		Mean	SD	Median	IQR	Minimum	Maximum	P-value
Competence	All	1.35	1.06	1.58	1.48	-1.42	3.25	
	Male	1.19	1.07	1.42	1.38	-1.42	2.42	0.348
	Female	1.48	1.05	1.79	1.6	-0.92	3.25	
Adaptability	All	1.11	1.31	1.42	1.54	-3	2.67	
	Male	1.18	1.48	2	1.75	-2.33	2.67	0.721
	Female	1.05	1.16	1.33	1.13	-3	2.5	
Self-esteem	All	1.02	1.58	1.44	2.91	-1.88	3	
	Male	1.07	1.61	1.63	2.97	-1.5	3	0.833
	Female	0.98	1.59	1.38	2.84	-1.88	3	
Social support	All	16.17	3.8	17	5	6	20	
	Male	15.82	3.96	17	5	6	20	0.565
	Female	16.46	3.71	17	3.75	7	20	

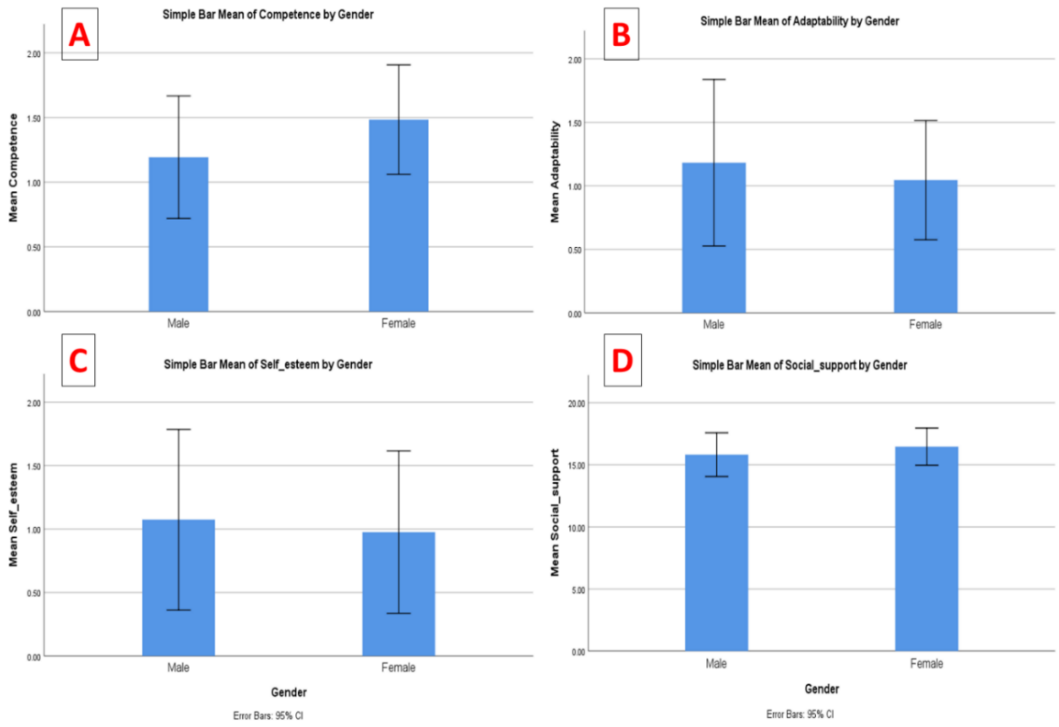

Figure 12. The PIADS subscale scores and social support among both sex groups; (A) Competence, (B) Adaptability, (C) Self-esteem, and (D) Social support.

Correlational Analysis

The results of Pearson Correlations are presented in Table 6. Frequency of device use was positively correlated with Duration of use, Intention to use, Competence, Adaptability, Self-esteem, and social support [all $p < .05$]. Duration of device use was positively correlated with Intention to use, Competence, Adaptability, Self-esteem, and social support [all $p < .05$]. Intention to use was positively correlated with Competence, Adaptability, Self-esteem, and social support, and age [all $p < .05$].

In statistics, a positive correlation means there is a relationship between two variables that tend to move in the same direction (Mukaka, 2012). The pairwise table of the Pearson correlations is shown in Appendix 9. The bivariate scatterplots of Competence, Adaptability, Self-esteem, and Social support can be found in Appendix 11 (Figures 1, 2, & 3).

Table 6. The Pearson Correlations

Pearson Correlations									
		Age	**Sex**	**Competence**	**Adaptability**	**Self-esteem**	**Social support**	**Frequency of use**	**Duration of use**
Competence	r	0.072	0.139	—					
	p-value	0.628	0.348	—					
Adaptability	r	0.161	-0.053	0.73	—				
	p-value	0.274	0.721	< .001	—				
Self-esteem	r	0.248	-0.031	0.79	0.74	—			
	p-value	0.089	0.833	< .001	< .001	—			
Social support	r	0.307	0.085	0.502	0.363	0.412	—		
	p-value	0.034	0.565	< .001	0.011	0.004	—		
Frequency of	r	0.169	-0.056	0.609	0.575	0.714	0.372	—	
use	p-value	0.252	0.703	< .001	< .001	< .001	0.009	—	
Duration of	r	0.252	-0.079	0.57	0.52	0.694	0.29	0.881	—
use	p-value	0.084	0.593	< .001	< .001	< .001	0.046	< .001	—
Intention to	r	0.413	0.127	0.594	0.558	0.725	0.392	0.649	0.701
use	p-value	0.004	0.391	< .001	< .001	< .001	0.006	< .001	< .001

Regression analysis

Regression assumptions

The regression analysis method was determined based on the outcome variables (frequency of use, duration of use, and intention to use). These variables were treated as continuous scales. In literature, there is a discussion among statisticians on considering the Likert scale as ordinal or continuous variables. Researchers who believe that the Likert scale should be

treated as a continuous variable, based on two facts: (1) the ordinal with more than four options and with more than one Likert type item can be considered as a continuous variable, and (2) there is an underlying measurement sequence (Laerd, 2015; Robitzsch, 2020). The data included in this study was treated as a continuous variable because Likert scale with five options was used.

The included variables in the multiple regression analysis were the statistically significant correlated variables. The predictor variables were the PIADS three subscales (***Competence***, ***Adaptability***, and ***Self-esteem***), the ***Social support***, and ***Age***. (See pages 82-83 for the full description of the modelling procedure).

All of the regression assumptions were checked before running the regression analysis **(see *Assumptions #1 to #8 in Appendix 10).*** Linearity was detected with the help of partial regression plots and a plot of studentized residuals against the predicted values. The partial regression plots and a plot of studentized residuals against the predicted values, showed linearity. By the visual inspection of a plot of studentized residuals versus unstandardized predicted values, there was homoscedasticity. This study found a Durbin-Watson statistic of 1.878, 0.149, and 2.109 for the three outcome variables, which means that residuals were independent. No multicollinearity was detected based on tolerance values greater than 0.1; no studentized residual deleted residuals greater than +/-3 standard deviations (SD); no leverage values greater than 0.2, and values for Cook's distance above 1 **(see *Assumption #7 in Appendix 10***). The normality assumption was detected using the Q-Q Plot.

To examine Research Question 1, "What role do the psychosocial variables play in predicting non-adherence to prescribed MADs among community-dwelling older adults?", linear regression models were conducted using SPSS version 26 for Windows to examine the role of the

psychosocial variables in the prediction of MAD non-adherence. The outcome variables were the frequency of use, duration of use and intention to use, and the predictor variables were the psychosocial variables. The psychosocial variables were measured using the PIADS, which consists of three subscales: Competence, Adaptability, and Self-esteem scales. Steps were taken to check if any of the three subscales is correlated with the outcome variable (i.e., non-adherence). No correlations were found between the three subscales of the PIADS.

To examine Research Question 2, "What role does the demographic variable of sex play in the prediction of non-adherence to MADs use among community-dwelling older adults?" linear regression models were conducted using SPSS to explore the role of each variable in prediction non-adherence to MADs.

To examine Research Question 3, "What is the influence of social support in predicting non-adherence to MADs among community-dwelling older adults?", the same linear regression that was utilized for research question 1 was used to explore if social support can be considered as a predictor for MAD non-adherence. The outcome variable was non-adherence, and the predictor variable was the social support.

Frequency of device use

In terms of the frequency of device use, the overall regression model was statistically significant for prediction of the frequency of device use ($F\ [5,42] = 11.589$, $p < .001$, $R^2 = 0.58$, Adjusted $R^2 = 0.53$). The Self-esteem subscale predicted the frequency of device use (Unstandardized $B = 0.489$, $SE = 0.135$, $p < .001$). Competence, Adaptability, and social support did not predict the frequency of device use. (See Tables 7, 8, & 9).

Table 7. The model summary of frequency of device use

									Durbin-Watson		
R	R^2	Adjusted R^2	RMSE	R^2 Change	F Change	df1	df2	p	Auto correlation	Statistic	p
0.761	0.58	0.53	0.812	0.58	11.589	5	42	< .001	-0.078	2.133	0.741

Predictors: (Constant), Competence, Adaptability, Self-esteem, and social support. Outcome variable: Frequency of use.

Table 8. The ANOVA analysis of frequency of device use

	Sum of Squares	df	Mean Square	F	p
Regression	38.216	5	7.643	11.589	< .001
Residual	27.701	42	0.66		
Total	65.917	47			

Predictors: (Constant), Competence, Adaptability, Self-esteem, and social support. Outcome variable: Frequency of use.

Table 9. The multiple regression analyses to predict the frequency of use

	Unstandardized B	SE of B	Standardized B	t	p-value*
(Intercept)	1.764	0.688		2.566	0.014
Competence	-0.05	0.21	-0.045	-0.238	0.813
Adaptability	0.049	0.145	0.054	0.337	0.738
Self-esteem	0.489	0.135	0.652	3.631	**< .001**
Social support	0.032	0.036	0.104	0.89	0.378

* Significant p-value; Predictors: (Intercept), Competence, Adaptability, Self-esteem, and social support. Outcome variable: Frequency of use.

Duration of device use

The duration of device use is defined as the amount of time the user spent interacting with the device at the time of answering the questionnaire. The overall regression model was statistically significant for prediction of the duration of device use ($F [4,43] = 10.05$, $p < .001$, $R^2=$

0.483, Adjusted R^2= 0.435). Only the Self-esteem subscale predicted the duration of device use (Unstandardized B= 0.431, SE= 0.129, p=0.002). The Self-esteem subscale accounted for 43.5% of the variance in the duration of device use. See Tables 10,11, & 12.

Table 10. The Model Summary of duration of device use

									Durbin-Watson		
R	R^2	Adjusted R^2	RMSE	R^2 Change	F Change	df1	df2	p	Auto correlation	Statistic	p
0.695	0.483	0.435	0.787	0.483	10.05	4	43	< .001	0.152	1.676	0.203

Predictors: (Constant), Competence, Adaptability, Self-esteem, social support. Outcome variable: Duration of use.

Table 11. The ANOVA analysis of duration of device use

	Sum of Squares	df	Mean Square	F	p
Regression	24.873	4	6.218	10.05	< .001
Residual	26.606	43	0.619		
Total	51.479	47			

Predictors: (Constant), Competence, Adaptability, Self-esteem, social support. Outcome variable: Duration of use.

Table 12. The multiple regression analyses to predict the duration of use

	Unstandardized B	SE of B	Standardized B	t	p-value
(Intercept)	3.245	0.521		6.231	< .001
Competence	0.063	0.199	0.064	0.319	0.751
Adaptability	-0.004	0.14	-0.005	-0.027	0.978
Self-esteem	0.431	0.129	0.651	3.349	**0.002***
Social support	-0.002	0.035	-0.009	-0.067	0.947

* Significant p-value; Predictors: (Intercept), Competence, Adaptability, Self-esteem, social support. Outcome variable: Duration of use.

Intention to device use

In terms of the intention to device use, which was measured by asking a question about the likelihood of device use in future with responses ranging from 1 (Extremely unlikely) to 5

(Extremely likely), the overall regression model was statistically significant for prediction of the intention to device use (F [5,42] = 12.15, p < .001, R^2= 0.591, Adjusted R^2= 0.543). The Self-esteem subscale predicted the intention to use (Unstandardized B= 0.518, SE= 0.175, p=0.005). See Tables 13,14, & 15.

Table 13. The Model Summary of intention to device use

									Durbin-Watson		
R	R^2	Adjusted R^2	RMSE	R^2 Change	F Change	df1	df2	p	Auto correlation	Statistic	p
0.769	0.591	0.543	1.025	0.591	12.15	5	42	< .001	0.015	1.967	0.793

Predictors: (Constant), Age, Competence, Adaptability, Self-esteem, social support.
Outcome variable: Intention to use.

Table 14. The ANOVA analysis of intention to device use

	Sum of Squares	df	Mean Square	F	p
Regression	63.841	5	12.768	12.15	< .001
Residual	44.138	42	1.051		
Total	107.979	47			

Predictors: (Constant), Age, Competence, Adaptability, Self-esteem, social support.
Outcome variable: Intention to use.

Table 15. The multiple regression analyses to predict the intention to use

	Unstandardized B	SE of B	Standardized B	t	p-value
(Intercept)	-0.828	1.403		-0.59	0.558
Age	0.039	0.016	0.261	2.368	0.023*
Competence	0.18	0.272	0.125	0.661	0.512
Adaptability	0.02	0.182	0.017	0.11	0.913
Self-esteem	0.518	0.175	0.54	2.964	**0.005***
Social support	0.008	0.048	0.02	0.17	0.866

* Significant p-value; Predictors: (Intercept), age, Competence, Adaptability, Self-esteem, social support. Outcome variable: Intention to use.

The final model

The purpose of this study was to develop a model to predict non-adherence to prescribed MADs among community-dwelling older adults based on the psychosocial variables. Results of this study showed that Self-esteem subscale was a significant predictor of the three outcome variables: namely, frequency of device use ($p<0.001$), duration of device use ($p= 0.002$), and intention to device use ($p= 0.005$). Figure 16 summarizes the results of the regression analyses.

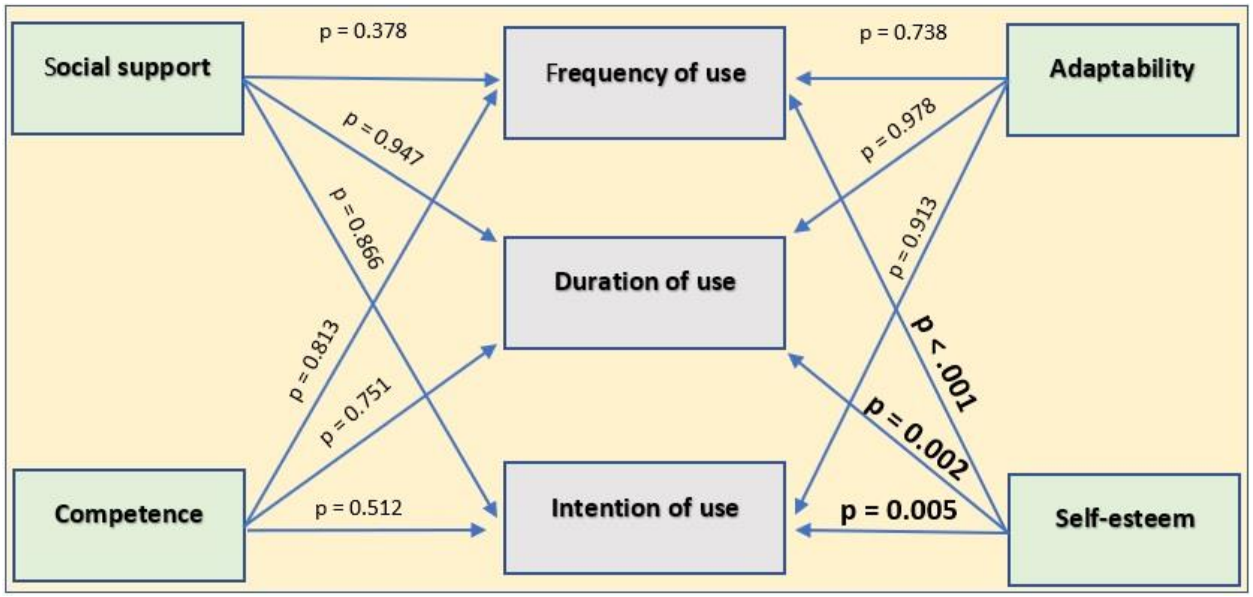

Figure 13. An overview of the model with the included psychosocial variables

Individuals with higher Self-esteem scores reported higher frequency of device use, more duration of device use, and higher intention to device use in the future, and the opposite is also true. The Self-esteem accounted for 53% of the variance in the frequency of device use, 43.5% of the variance in the duration of device use, and 54.3% of the variance in the intention to device use. For each increase of score of 1 on the Self-esteem subscale, there was an increase of score of 1 on the non-adherence measures.

Discussion

The main findings

To answer the first research question, the role of psychosocial variables in the prediction of MADs non-adherence among community-dwelling older adults was assessed using the Psychosocial Impact of Assistive Devices Scale (PIADS), which captures the constructs of perceived Competency, Adaptability, and Self-esteem in three separate subscales.

The descriptive results of PIADS indicate that the Self-esteem mean scores were lower than the Competence and Adaptability mean scores, which is similar to the findings reported by Harada et al. (2014) and Devitt et al. (2004)

In Harada et al.'s (2014) study, adherence to cane use was investigated by using the PIADS with a sample of 53 older adults with knee osteoarthritis, and lower Self-esteem mean scores compared to the Adaptability and Competence mean scores were found. The low Self-esteem scores may be because canes are usually prescribed as the first MADs in the mobility decline trajectory (Auger et al., 2010; Jutai et al., 2007), which may induce a feeling of social pressure and stigma that negatively affects their users' self-image and self-esteem (McGrath et al., 2019). Also, the Harada et al.'s sample comprised only people who had been newly prescribed canes and measured their psychosocial impact at the baseline only, which may indicate that the participants were still in the introductory phase, when social pressure and stigma may be most felt (Larsen et al., 2019; Resnik et al., 2009). In the current research project, although the participants had been using MADs for at least six months, the Self-esteem scores were lower compared to the Adaptability and Competence scores among the included sample of older adults, similar to the findings of Harada et al. (2014).

Devitt et al. (2004) used the PIADS to investigate the psychosocial impact of prescribed wheelchair use with a sample of 16 adults and older adults with neurodegenerative disorders. This study also examined the PIADS scores as a function of the type of device being used. Devitt et al. reported lower Self-esteem scores among the studied sample compared to the Adaptability and Competence mean scores. They also found that Self-esteem mean scores were sensitive to the type of the device being used, reporting a slight difference in the Self-esteem mean scores between manual wheelchair users and motorized wheelchair users, although the difference did not reach statistical significance (Devitt et al., 2004).

In the current research project, it is posited that the low Self-esteem mean scores may be attributable to the type of device used by individual participants, as wheelchair users tend to have lower Self-esteem scores possibly due to the stigma and negative connotations attached to these devices (Devitt et al., 2004; Orellano-Colón et al., 2015). In the current research project, nearly half of the participants had manual or motorized wheelchairs as their main mobility devices, which might have influenced the scores of the Self-esteem subscale.

It should be mentioned that all participants of the study sample in this research project were residents in a long-term care unit; yet the results showed lower Self-esteem scores among wheelchair users compared to those using other forms of MADs. As discussed before, lower Self-esteem scores may be attributable to the feeling of stigma associated with wheelchair use among participants. This finding challenges the common belief that institutionalized older adults are less stigmatized because residents in such facilities are less exposed to social stigma, as accessibility is maintained by the institution and the majority of residents use the same kinds of MADs (Groger, 1995; Zimmerman et al., 2003). Although research in this area is scarce, there is some qualitative evidence suggesting that the feeling of stigma exists among residents of long-

term care institutions (Dobbs et al., 2008; Zimmerman et al., 2016). There is a need for further exploration of stigma issues in long-term care facilities in future research to modify care and reduce such stigma.

Out of all the psychosocial factors identified as having a potential impact on MADs non-adherence, only Self-esteem was found as being sufficient to predict non-adherence behavior. It is interesting to note that neither Adaptability, Competence, sex, nor social support were significant predictors of non-adherence according to the proposed model. In line with these findings, Nordström et al. (2014) conducted a study on individuals who had received a standing device using the PIADS questionnaire and observed higher Self-esteem scores among those who used the device often compared to those who were non-adherent to device use.

Since this research project used outcome measures that were rating scales ranging from poor to good adherence, the proposed model predicts adherence and non-adherence at the same time (i.e., it does not predict the status of participants at some point in time (i.e., adherent versus non-adherent.). Therefore, the Self-esteem subscale can predict adherence and non-adherence based on the total score of this scale (i.e., higher Self-esteem scores indicate adherence, and lower scores indicate non-adherence). As mentioned earlier, the Self-esteem subscale does not merely measure self-esteem. It also represents other factors related to the identity of the users, such as self-confidence, sense of control, self-image, frustration, and embarrassment.

The role of identity in older adults' decision-making about MADs adherence/non-adherence has been widely discussed in the literature. For example, Astell et al. (2020) conducted a scoping literature review that included 49 articles about the influence of identity in older adults' decision-making about assistive device adoption, and identified identity-related themes that seemed to influence older adults' decisions regarding uptake of assistive devices,

namely: (1) resisting the negative identity of aging and/or disability; (2) the key role of sense of independence and control; and (3) the effect of device appearance on usability (Astell et al., 2020). Astell et al.'s findings highlight that older adults' preference to portray an identity consistent with independence, self-reliance, and competence has a significant role in their decision-making regarding assistive device adoption.

It has been suggested that adherence to a plan for using an assistive device largely depends on whether or not the users accept their new identity (Jarl et al., 2019). In other words, if these devices undermine the identity and self-image of the users, non-adherence is likely to occur. In line with this argument, Resnik et al. (2009) conducted 12 focus groups with 61 community-dwelling older adults with MADs and found that individuals who felt shame regarding being viewed as "old" or "disabled" were non-adherent. Similarly, Peek et al. (2014) conducted a systematic review of the factors that influence acceptance of several forms of assistive technologies, including MADs, and found that the psychological and social costs of using these devices are barriers older adults face when considering these devices.

Gitlin et al. (1998), in their study examining non-adherence to MADs in a sample of stroke survivors, found that participants who expressed concerns about self-identity and social acceptance of MADs were less adherent despite viewing these devices as helpful tools in providing functional independence. Other researchers have commented that factors such as the attitudes of others and stigmatization were significant factors in MADs adherence/non-adherence decisions because these factors affect self-image and self-identity (Cott & Gignac, 1999; Peek et al., 2014; Rush & Ouellet, 1997).

The Identity Theory explains the role of identity and self-image in the older adults' decisions regarding MADs. It posits that a person's identity is highly framed by their behavior,

thoughts, feelings, or emotions (Stets & Burke, 2000). Based on this theory, individuals are reflexive in that they can categorize or classify themselves in a specific way in relation to other social contexts (Hornsey, 2008). This self-categorization has a significant impact on several behaviors, including non-adherence to MADs. Self-categorization happens when older adults try to resist or distance themselves from stereotypes of "being old" or "disabled" and all other negative identities related to using MADs (Astell et al., 2020). Therefore, this current research project found that Self-esteem, as measured using the PIADS, is a significant factor in prediction of non-adherence among the studied sample of older adults. Older adults often resist the aging stereotypes because they try to portray an identity that aligns with notions of independence, competence and self-confidence (Dionigi, 2015; Hurd, 1999; Nemmers, 2005; Spafford et al., 2010). Thus, they chose not to be adherent due to these emotional reactions. The findings of this current research project complement the previous studies and suggest that identity and self-image play a significant role in older adults' decision-making about adherence to MADs.

The second research question addressed in this project was whether the demographic variable of sex contributes to the prediction of MADs non-adherence among community-dwelling older adults. The results of the linear regression analysis suggested that the sex variable could not predict non-adherence to MADs among older adults, as there was no statistical difference between males and females regarding any of the study variables.

The role of sex in relation to MADs non-adherence has been discussed to some extent in the literature, with inconclusive results. For example, Jiménez-Arberas et al. (2021) examined the psychosocial impact for MADs discontinuance in a mixed sample of adults and older adults with neurological conditions in Spain. They found no significant influence of sex on the outcomes being studied (Jiménez-Arberas & Ordóñez-Fernández, 2021). Similarly, Sakakibara et

al. (2014) investigated adherence to wheelchair use among the older adult population and reported similar patterns between male and female participants as measured by the time in hours each group spent in the device each day.

On the other hand, Gell et al. (2015) examined the patterns of MADs use among a national sample of older adults in the U.S. and found that women owned and used more MADs compared to men. Similarly, a study in Canada found that MADs were used most often by older females (Ishigami et al., 2021).

However, the studies by Gell et al. (2015) and Ishigami et al (2021), mentioned above, did not investigate MADs non-adherence per se, and rather they investigated device use/non-use, which is conceptually different from non-adherence as previously discussed. Device use/non-use is usually measured using one outcome of a person-device interaction (use vs. non-use), and questions applied in this regard are usually yes/no questions, while in this study, non-adherence was measured using three questions about the frequency of device use, duration of device use, and intention to device use in future. Since this research relied on the psychosocial impact of MADs as a predictor of device non-adherence, one possible explanation for this finding is that the perceived psychosocial impact of MADs on older male and female adults may be similar. Thus, sex does not play a significant role in the prediction of non-adherence to MADs. This finding is also consistent with a study by Saladin and Hansmann (2008) which investigated non-adherence to other forms of assistive technologies and found no significant influence of sex on device non-adherence. This assumption is further supported by the Rogers' (2003) model of diffusion, in which sex cannot generally predict adoption of innovations such as MADs .

The third research question addressed in this project was about the role of social support in the prediction of MADs non-adherence among community-dwelling older adults. Social

support was assessed by the modified version of the Medical Outcomes Study Social Support Survey (mMOS-SS), which measures instrumental social support. It was hypothesized that social support would play a significant role in the prediction of non-adherence among the studied sample of older adults residing in the long-term care units. The construct of social support was included in several theories and models (e.g., UTAUT, CATOR, and HAAT models) and was suggested as a significant factor to consider when studying MADs adoption outcomes.

Contrary to expectations, the results of this study indicated that social support did not predict MADs non-adherence among community-dwelling older adults. In line with this finding, Riemer-Reiss (1999) conducted a correlational study to examine the association between social support and discontinuance of assistive devices and reported no significant role of social support in prediction of MADs discontinuance. Social support has also been reported as significant predictor of activity and participation among older adult population (Arai et al., 2008). Escobar-Bravo et al. (2012) argue that the loss of autonomy among older adults is not only due to the natural aging process, but also due to the characteristics of the social environment. They also found in a large sample of Spanish older adults that the social support provided by family members had a significant influence on both the prevalence and the incidence of disability (Escobar-Bravo et al., 2012). Likewise, a study found a significant association between social support and Life-space mobility in a sample of Japanese older adults with orthopedic problems (Suzuki et al., 2014). Wielandt and Strong (2000) in their review found that the users' social environment sometimes discourages device use. Family members or friends may provide conditions that make it easy for older adults to move without the devices. Thus, MADs are often replaced by human assistance (Wielandt & Strong, 2000).

These inconsistencies in the results of previous research may reflect the complexity of studying social support as a predictor variable. There are several aspects of social support (e.g., functional, emotional, and instrumental) that may influence non-adherence behaviors among older adults. In this current study, however, the focus was placed on the instrumental social support that includes questions about the availability of someone to prepare meals or to take the participant to their doctor's appointment. Since all the participants were residents in long-term care units, the instrumental social support was replaced by the staff. The staff is available for everyone to provide assistance at the same level. This may explain the high mean score of the social support reported in this study.

Study limitations

Several limitations to this research should be noted. First, the proposed model is limited to predicting non-adherence to prescribed MADs, and thus, it may not represent all forms of assistive devices or technologies, nor does it consider MADs that were obtained or purchased without professional supervision.

Another limitation of this research project might be the relatively small sample size. Although the minimum required sample size was achieved, the findings of this research stemmed solely from a small number of responses from residents in the long-term care unit of Perley Health. It had been planned to recruit both residents in the long-term care units and individuals who were in the independent living department of the Perley Health facility; however, the closure of the data collection site due to the pandemic, prevented the researcher from including a more diverse range of older adult MADs users. However, the minimum sample size was achieved, and it was statistically sufficient to proceed to the data analysis phase, as outlined in the methods section. It is important to note that residents in long-term care facilities represent

only one segment of the community-dwelling older adult population. Community-dwelling older adults in this research project were those who were living anywhere in the community such as their homes, residents, or long-term care facilities, and who are not hospitalized due to a health condition that requires close medical attention (Olanrewaju et al., 2016; Steultjens et al., 2004). Older adults who live independently in the community (e.g., in their own homes) may experience different psychosocial circumstances than those who are supported by staff in long-term care units. Since this research project included only older adults from the long-term care facility, therefore the findings may not represent all the segments of the community-dwelling older adult population. This limitation makes the findings not representative of all community-dwelling older adults, and therefore, interpretations of the results should be cautious due to this limitation.

Also, this research project only took a brief look at issues that relate to sex, conducting some sex-based analyses to examine the differences between males and females regarding the study variables. In the context of this research project, sex refers to "… the biological and physiological characteristics that distinguish males from females", and gender refers to "… socially constructed roles, relationships, behaviours, relative power, and other traits that societies ascribe to women and men" (Canadian Institutes of Health Research, 2015). This research project acknowledges that these two terms are interrelated but different, and thus, it is important to distinguish between them. In this research, the focus was only given to the sex differences (i.e., males vs. females) in regard to study variables. It is possible that there may have been gender-based influences on some of the findings, but gender differences were not specifically examined in this research project.

In addition, although this research project acknowledges the importance of associating the relationship between the client and healthcare professionals with the definition of non-adherence,

the study questionnaire did not ask participants specific questions about their relationships with the healthcare professional who prescribed the device. However, to be eligible to participate in this study, individuals had to confirm that their device was a prescribed item to ensure that they had some kind of relationship with the prescriber.

Since the forward modelling method was used to develop the proposed model, there is a drawback of this procedure that might influence the results. As highlighted by Chowdhury and Turin (2020), the forward method may produce a chance of missing some important variables in the model and the inclusion of predictor variables one after the other may make an existing variable in the model non-significant. This may explain why only Self-esteem was found to be a significant predictor of non-adherence. Still, not the Adaptability nor the Competence subscales, although all of which were statistically correlated with non-adherence measures. Another possible explanation is that because the three subscales are intercorrelated, the regression model used in this study emphasized Self-esteem. This would suggest that the PIADS score generally is a good predictor of MAD non-adherence.

Lastly, the results of this research may have been influenced by a sampling bias. A convenience sample of the residents in Perley Health facility in Ottawa was suggested by the healthcare staff and invited to participate in this study. Therefore, it is possible that individuals who agreed to participate in this study may have been more motivated and adherent toward the use of MADs than those who declined. Thus, the participants may have demonstrated a higher psychosocial impact of the devices and consequently lower non-adherence rates than the general population. In fact, this unavoidable bias has been frequently discussed in previous research as a limitation (de Boer et al., 2009; Tuazon et al., 2018). Therefore, this limitation should be considered when interpreting the findings of this and other similar studies.

Conclusion

This study recruited a sample of older adults residing in long-term care facilities to examine the role of psychosocial factors and sex in the prediction of non-adherence to MADs. The results suggested that the Self-esteem construct, which includes several concepts related to emotional wellbeing, was the only significant predictor of non-adherence among the study sample. The proposed model in this study shows a good predictive validity of the Self-esteem subscale in explaining non-adherence behaviour among the studied sample of older adults. The theoretical and clinical implications of these findings are discussed in the following chapter.

Chapter 5 – Discussion and Implications

Summary of the main findings

This doctoral project aimed to develop a model to predict non-adherence to prescribed mobility assistive devices (MADs) among older adults living in the community. To do so, a comprehensive literature search using scoping review and narrative review methods was conducted under the guidance of the CATOR framework to understand the concept of MADs non-adherence and the psychosocial factors that may potentially predict it. Understanding which psychosocial factors could predict non-adherence would suggest new avenues for MADs prescription that can potentially minimize non-adherence rates and consequently improve older adults' quality of life. The findings of the literature search revealed several literature gaps and highlighted the importance of psychosocial factors, especially those related to self-image, self-esteem, self-efficacy, and social stigma, in the prediction of MADs non-adherence among older adults.

Next, an empirical study that included a sample (n=48) of older adult residents in the long-term care unit at the Perley Health Centre was conducted. In this study, valid scales, namely the PIADS and the mMOS-SS and a demographic questionnaire were used to collect the data. The results of this research suggest that the Self-esteem construct, which includes factors related to emotional well-being, was the only predictor of MADs non-adherence among the studied sample of older adults. Neither sex nor social support was found significant predictors of non-adherence to MADs. The findings of this doctoral research project have significant theoretical and clinical implications, and these implications as well as suggested future research avenues are discussed in the following section.

Implications of the findings

Theoretical implications of the findings

The main theoretical contribution of this study is the proposed model for the prediction of non-adherence to MADs among older adults (see figure 16). In the assistive technology literature, conceptual models can take one of three forms: descriptive, explanatory (mechanisms), or predictive. Predictive models are the most powerful because they forecast outcomes based on knowledge of some key factors (Lenker & Paquet, 2003; Shmueli, 2010).

Consistent with the CATOR framework, the development of the proposed model was guided by the principle that non-adherence was viewed as a client-centred outcome that embraces the user's perspective. In this sense, assessing non-adherence reflects the goals and objectives of MADs that are negotiated between the end-user and the prescriber, and that this subjective assessment allows evaluation of the impact of MADs on a user's quality of life (Jutai et al., 2005). With these principles in mind, the proposed model has the potential to predict non-adherence from a psychosocial perspective.

In other words, this model is proposed for assessing the likelihood of non-adherence to prescribed MADs based on the user's psychosocial characteristics. By doing so, the model promotes a client-centred approach in the prescription and follow-up of MADs for older adults. In the last few decades, the prescription of MADs has seemed problematic. Mortenson et al. (2015), after conducting a series of qualitative interviews with 13 older adult power wheelchair users in Canada, clearly highlighted the need to change the relationship between prescribers and device users to enable more effective device recommendations.

As discussed above, the proposed model shows a good predictive validity of the Self-esteem subscale in explaining non-adherence behaviour among the study sample. In terms of other variables such as sex and social support, this model did not find these variables to be

predictive of MADs non-adherence, keeping in mind that the data used to develop this predictive model came from a cross-sectional study using correlations, and that it was not a prospective study of causation.

The proposed model has several unique features that are worth discussing here. First, the model was developed with older adult users in mind and intended to predict non-adherence behaviour specifically among community-dwelling older adults. Multiple models have been developed over the past decades to describe factors that influence MADs non-use, abandonment, or discontinuance by end-users (Fuhrer et al., 2003; Heerink et al., 2010; Venkatesh & Davis, 2000). However, these models do not specifically address factors associated with older populations (Berkowsky et al., 2018). As stated by Chen and Chan (2011), previous models of assistive technology usage shared a common limitation in that they did not pay sufficient attention to age-specific or age-related factors (Chen & Chan, 2011).

Research shows that older adults possess psychosocial characteristics that differ from other segments of the population (Charles & Carstensen, 2010). Not only this, but there are psychosocial variations even within the older adult population. It has been argued that because this age group includes five decades of older adults that possess significant psychosocial differences, these variations may be even greater than those differences observed in younger age groups (American Psychological Association, 2017). Therefore, it is imperative to consider a client-centred approach to include these variations in models that assess health-related interventions such as MADs. Thus, the proposed model attempts to fill this literature gap, and presents a model based on empirical findings from a sample of older adult MADs users.

Also, the proposed model brings together three outcomes related to non-adherence of MADs that are rarely observed together in the assistive technology literature: namely, (1) the

frequency of device use, (2) duration of device use, and (3) intention to use a device. The frequency of device use and the duration of device use outcomes are well-described in the CATOR framework (Jutai et al., 2005), the conceptual guide for this research project.

Collectively, there is a strong recommendation in the literature to use the intention to use a device as an indicator of the actual use of assistive devices. In this research project, frequency of use, duration of use, and intention to use were applied to understand non-adherence behaviour among a study sample based on their psychosocial experiences.

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Since non-adherence is a clinically oriented term, it is imperative to use the three outcomes together, as they look at slightly different and useful outcomes, as discussed in Chapter 3.

The intention to use a device is an important concept that has received attention by several assistive technology researchers as a promising element in behaviour prediction. For example, Davis's (1989) technology acceptance model (TAM) suggests that the behavioural intention to use a device or technology is determined by personal beliefs, values, and attitudes towards the technology. According to TAM model, the intention to use can predict actual usage of a given device (Davis, 1989). Similarly, the theory of planned behavior suggests that an intention to use a device or technology can be predicted by personal attitudes (e.g., personal motivation), subjective norms (e.g., perceived social pressure), and perceived behavioral control (Ajzen & Fishbein, 1980).

Venkatesh et al. (2003) developed the unified theory of acceptance and use of technology (UTAUT) model as a merger of eight models: namely, the theory of reasoned action; the technology acceptance model; the motivational model; the theory of planned behavior; a model combining the technology acceptance model and the theory of planned behavior; the model of PC utilization; the innovation diffusion theory; and social cognitive theory. The UTAUT model explains technology use according to users' intention to use, which can be influenced by variables related to functional evaluation, like perceived usefulness, perceived ease of use, and other variables that relate to social interactions (Venkatesh et al., 2003).

It is also important to look at the device usage plan (or rehabilitation plan) if possible, to understand the manner of device use as prescribed by healthcare professionals. In this research, however, access to prescription and rehabilitation plans was not possible, as almost none of the participants had a specific and reliable written MADs use plan. To be included in this research project, participants had to have their MADs prescribed by a qualified healthcare professionals to ensure at least a minimal social interaction between the prescriber and the client. This also includes those individuals who had received their MADs from other sources, but they had a rehabilitation professional in the training and follow up stages of device adoption.

All in all, the significant contribution of the proposed model in this research project is that MADs are not 'one size fits all', but rather involve highly personalized interventions and the inclusion of person-related factors included in the Self-esteem subscale, which not only influence device usage but also predict and explain nearly 50% of the variance in non-adherence behaviours among older adult users.

It is worth noting that the explained variance (also called explained variation) is used to measure the discrepancy between a model and the actual data. In other words, it is the part of the

model's total variance that is explained by factors that are actually present and is not due to error variance. Higher percentages of explained variance indicates a stronger strength of association; and consequently, better predictions be made (Rosenthal, 2011).

Typically, predictive models do not explain all the variation that exists in the response variable. Still, there is some theoretically random variation left over that selected covariates can not explain; the residual sum of squares (RSS). Hence there is some unexplained variance. Statisticians highlighted two major reasons why it can be just fine to have low R-squared values. In some fields, it is entirely expected that the R-squared values will be low. For example, any field that attempts to predict human behavior, such as psychology or social sciences, typically has R-squared values lower than 50%. Humans are simply harder to predict than, say, physical processes. Furthermore, if the R-squared value is low but there are statistically significant predictors, it still possible to draw important conclusions about how changes in the predictor values are associated with changes in the response value. Regardless of the R-squared, the significant coefficients still represent the mean change in the response for one unit of change in the predictor while holding other predictors in the model constant (Warner, 2013). Obviously, this type of information can be extremely valuable.

Another relevant observation that comes up from this research project lies in the long list of concepts used by researchers to refer to similar yet different scenarios without clear and consistent definitions. This is a valid concern because such inconsistency in the use of these different terms may hinder the development of the field.

This research project attempted to clarify some of that confusion, and to accomplish this, a conceptual distinction was made between the various terms, and operational definitions were provided based on published theories and models (e.g., the CATOR framework and Roger's

theory of diffusion). The straightforward recommendation to other researchers is to provide clear definitions based on the context of their study to help advance the field.

Additionally, MADs outcomes such as adherence/non-adherence are highly influenced by the user's psychosocial dimensions. In this research, the construct of Self-esteem – which entails factors related to emotional wellbeing –predicted non-adherence to MADs. This finding is important because it highlights the value of including variables such as happiness, self-esteem, self-confidence, and sense of control into theories and models that describe and explain MADs outcomes. Taking these factors into account is important for researchers to better understand not only the technological or functional factors that influence MADs non-adherence, but also the psychological and social dimensions, as described in the social models of rehabilitation and the ICF model of the World Health Organization (World Health Organization, 2001).

It is interesting to note that the participants in this research project were experienced users (or late adopters) because this study only included older adults who have been using their MADs for six months or more. According to Rogers' theory of diffusion, adoption is a "decision to make full use of an innovation as the best course of action" (Rogers, 2003, p.21). Based on Rogers' definition, the adoption decision is a process through which individuals go through a categorical continuum, in terms of time, from the initial stage of device recommendation all the way until the late decision of adherence or non-adherence (Rogers, 2003). This process of device adoption is also described in Gitlin's Career model, in which early users (1-6 months), experienced users (7-12 months), and expert users are those who have used their device for more than one year (Gitlin, 1998). Thus, the same set of psychosocial factors may or may not apply to all these categories of MADs users.

Although this research was not meant to test the CATOR framework (Jutai et al., 2005), the findings highlight the value of using this framework in understanding complex outcomes such as MADs non-adherence. Several researchers have relied on a one-outcome measure (use vs. non-use) in examining assistive device non-adherence; however, this does not apply to measure non-adherence, as discussed previously. In this regard, the CATOR framework provides helpful details on the outcomes that should be addressed when examining non-adherence, such as frequency of use, duration of use, and intention to use, which have been proven in this research to be meaningful for measuring non-adherence to MADs.

Clinical implications of the findings

This research also has clinical implications. The proposed model suggests that Self-esteem can explain nearly 50% of the variance in the prediction of non-adherence to MADs. This is important findings because examining Self-esteem contributes to understanding the impact of adherence/non-adherence to MADs on the users' self-image, self-confidence, and other emotional variables. In other words, the higher the Self-esteem score, the more likely the client is to be adherent, and vice-versa. This is important for clinicians because it helps them determine and predict who will be adherent and who will need further attention. According to the proposed model, for each increase of score of 1 on the Self-esteem subscale, there was an increase of score of 1 on the adherence measure. This estimation could especially be relevant for clinical interpretation of the results. By working with a client to address psychosocial concerns about an MAD, a healthcare professional has the potential to move a client from a position of poor adherence to one of good adherence.

Knowing the Self-esteem score can enrich the discussion on psychosocial factors and identify problematic areas yet to be addressed. For example, suppose a particular type of device

(e.g., a manual wheelchair) had a negative impact on aspects of quality of life. In that case, alternative MAD options (e.g., a motor wheelchair or a scooter) could be discussed, and potential device non-adherence may be avoided. In this context, if a client feels less confident in operating a manual wheelchair, and he/she requires frequent assistant from others, which sometimes embarrassing, a motor wheelchair or a scooter may be discussed, and non-adherence may be avoided. This kind of discussions can help establish a relationship between a clinician and a client, which is foundational for adherence. For example, after administering the model, a clinician can discuss with a client the reasons why they may have given some items a low rating. Doing so might help refine a device recommendation and enhance adherence (Devitt et al., 2004; Traversoni et al., 2018). Clinicians may also benefit from the proposed model and refer those clients who obtained low scores on the Self-esteem subscale to someone who has been in a similar situation, or to someone who has been using the same device or who may belong to a larger peer support group of some kind that may help clients to adapt to these devices and overcome their psychosocial concerns.

Although only the Self-esteem subscale was significant in the final predictive model (based on the multivariate regression analysis), it is recommended that the PIADS' three subscales be used together in clinical settings for several reasons.

First, the three subscales showed statistically significant positive correlations with non-adherence (with P-value less than 0.001), which indicates strong correlations with the outcome variable of non-adherence. In other words, the higher the scores on the PIADS' subscales, the better adherence can be expected, and the opposite is also true.

Second, the PIADS can also be used to assess the anticipated psychosocial impact of a mobility device (e.g., for someone who is a candidate for a device but has never used one).

Previous research shows that the expected benefit prior to device use is similar to that of the attained benefit after using a device for a longer period of time (Saunders & Jutai, 2004). The psychosocial impact does not only reflect the actual use of a mobility device, but also is an important factor of how individuals perceive and expect the benefit of these devices to their quality of life. In line with this assumption, Jutai et al. (2000) compared the perceived psychosocial impact of electronic aids to daily living in a sample of device users with the expected impact of the same devices among those who are on the waiting list to receive these devices (i.e., non-users). They found that these devices could produce similar degrees of positive impact on users and positive perceptions of anticipated impact on non-users (Jutai et al., 2000). That is, the perceived benefits of these devices to the psychological well-being and quality of life are similar for both users and non-users which highlights the clinical utility of the PIADS.

The PIADS has been shown to be a predictor of early adoption as measured in accordance with Rogers's (2003) theory of diffusion of innovation (Saladin & Hansmann, 2008). An ability to discriminate adopter categories may help better identify older individuals who will readily adopt an MAD or those who will need greater support and help foster a smooth transition from their current device to future devices. Also, research evidence suggests that assistive device users who reported having training on using their devices were more likely to have higher scores on the PIADS (Saladin and Hansmann, 2008). The findings of this current research of non-adherence help confirm the utility of the PIADS in enabling more efficient and meaningful MAD acquisition.

Although the PIADS is not meant to measure quality of life per se, understanding the scores for the Competence, Adaptability, and Self-esteem subscales provides important information about the actual impact of MADs on different aspects of a user's quality of life. The

impact of MADs on users' quality of life is also important for assistive device designers and service planners to better understand the psychosocial factors that lead to non-adherence so that they can improve device designs and related services. Furthermore, the three PIADS subscales are incorporated in one short questionnaire that is simple to use, takes 5 minutes to complete, and whose scoring is quite easy, making it applicable in many clinical settings.

Overall, the findings of this research project support the use of the PIADS in clinical practice and service delivery as a means of building a relationship between the user and a professional. An effective relationship between the prescriber and the client is essential in enhancing the client's self-efficacy for device adherence and promoting other psychosocial factors. This research project suggests that the relationship between prescribers and clients should be considered in defining non-adherence, and therefore the included participants had to have had their MADs prescribed to them by qualified healthcare professionals. This eligibility criterion was applied to ensure at least a minimal degree of cooperation and communication between clients and healthcare professionals. In fact, the PIADS does a great job in enriching discussions with prescribers and promoting the social model of MADs service delivery. Previous research on other populations and other forms of assistive technology devices recommended using the PIADS during the prescription and follow up processes (Arberas et al., 2019; Devitt et al., 2004; Nordström et al., 2014). This research project adds to the previous work and applies the PIADS to examine non-adherence to prescribed MADs in a sample of community-dwelling older adults and showed outstanding results.

Although not examined in this research project, the PIADS can also be used as a follow-up tool to monitor changes in the impact on users' quality of life over time (Devitt et al., 2004). Jutai et al. (2008), in a longitudinal cohort study, included a sample of patients who had received

their MADs in various clinical settings, and examined whether PIADS scores could reliably distinguish between continuers or abandoners of their MADs. After taking PIADS scores at baseline and at 6, 12, and 24 months, it was found that the abandonment group was more likely to have lower PIADS scores compared to those who continued using their devices (Jutai et al., 2008). This current research project encourages the use of the PIADS in the prescription and assessment processes in several ways. For instance, including the PIADS in the prescription and follow-up evaluations would promote client-centered practice by focusing on essential quality of life outcomes, in addition to traditional assessment components such as functional (e.g., activity and participation), technological (e.g., device dimensions), or medical (e.g., strength and balance).

Since psychosocial determinants of MADs are considered a missing piece of the puzzle for many clinicians and healthcare providers concerned with the prescription of such devices to the public, this doctoral project presented a predictive model that has the potential to give older adults a better quality of life by minimizing negative influences that are related to MAD non-adherence. The findings of this research can also pave the road for effective recommendation of MADs for a wide variety of older adults and inform the scientific community on how to successfully implement new technologies for healthy aging in ways that accommodate important psychological, and social considerations.

Future research direction

This research project attempted to provide evidence on the psychosocial factors that predict non-adherence to MADs in older adults; however, further research is needed to confirm its findings and to take the results to the next level. For example, since these findings were based on a sample of older adults who were residents in the long-term care units, future studies should

include other segments of the older adult population such as those who are independent in their homes to allow for comparisons and to increase the generalizability of the findings.

Since this research project employed a cross-sectional research design which collected data at one point in time, it would be helpful for future studies to consider a longitudinal observational research design to examine whether the psychosocial factors represented in the PIADS such as Self-esteem are predictive of MADs non-adherence among older adults.

Although the role of social support did not show significant predictive results in this research project, there is still an impression that it has a role in adherence/non-adherence decisions among older adults. The behaviour of adherence/non-adherence may also be 'infectious' among social circles. Social support in its simplest definition is the amount of support an individual gets through interactions with others (Lakey & Cohen, 2000, pp. 29–52). This support can be emotional (e.g., empathy), practical (also called tangible), or informational (Fleury et al., 2009). Consideration should also be given to the emergence of online social support networks, which have increased in popularity among older adults (Kelly et al., 2017) and may have an influence on physical health and psychological well-being (Wright, 2016). This complexity and diversity of social support is reflected in the number of conceptual frameworks and definitions which have been suggested to describe this subjective phenomenon (Dambi et al., 2018). Thus, it would be helpful for assistive device researchers to examine the influence of social support using a broader lens that may include family members, caregivers, peers, and health-care professionals, to mention a few. Social support provided by healthcare professionals is extremely important and relevant when examining adherence/no-adherence behaviours, as discussed before. Furthermore, since current social support tools are general measures that assess health-related aspects that may or may not apply to the scenario of adherence/non-adherence

among older adult MADs users, there may be a need to develop tools that specifically measure social support in relation to assistive device use among the older population.

Another relevant question yet to be examined is about whether adherence and non-adherence are symmetrical concepts. That is, are the factors that predict adherence necessarily the same as those that predict non-adherence? Or do these factors carry the same weight in predicting adherence as they do in predicting non-adherence?

On the other hand, the findings of this current research project regarding the role of a user's perceived functional control would suggest that this same set of factors is at work. That is, a person will continue to use a MAD as prescribed if it fits their values, needs, and preferences, and they will stop using a mobility device if it no longer does. However, the issue is more complex than one can imagine, and more research is needed to shed further light on these concepts to improve our understanding of the predictors of adherence/non-adherence among the older adult population.

Knowledge Dissemination

As noted, the findings of this research project have both theoretical and clinical implications, and these implications may benefit researchers, clinicians, and others to better understand the psychosocial factors that predict MADs non-adherence by community-dwelling older adults. Therefore, the results of this project will be disseminated through publication in relevant peer-reviewed journals and through discussions at workshops, seminars, and other venues with all parties interested in MADs adoption by older adults in long-term care facilities in Canada and elsewhere.

Conclusion

This research project examined the role of psychosocial factors as well as sex in the prediction of non-adherence to prescribed MADs among a sample of community-dwelling older adults living in long-term care units. The study revealed that the Self-esteem construct, which includes several concepts related to psychological wellbeing, was the only significant predictor of non-adherence behaviour among the studied sample of older adults. Neither sex nor social support could predict non-adherence to MADs. The findings of this research support the use of the PIADS in clinical settings as a promising tool that has the potential to predict non-adherence among older adults. Given the significance role of Self-esteem in predicting non-adherence to MADs among older adults, it is necessary for clinicians to work closely with the older adult MADs users to improve their Self-esteem and consequently minimize prescribed device non-adherence rates.

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Appendices

Appendix 1 : E-mail request for recruitment of study participants

E-mail Subject Line: Assistance with study participant recruitment: older adults using mobility assistive devices.

Dear Perley Health Centre,

My name is Alhadi M. Jahan, and I am a doctoral student from the school of rehabilitation sciences at the University of Ottawa. I am contacting you to request your help with recruiting participants for my research study entitled, "Psychosocial Predictors of Non-Adherence to Prescribed Mobility Assistive Devices Among Community-Dwelling Older Adults: Development of a Predictive Model."

The overall goal of this research is to find out about the views of older adults who have difficulties with mobility and who use mobility assistive devices. Examples of these devices include canes, walkers, wheelchairs, and scooters. I would like to find out how these devices are used in everyday life activities (such as banking, shopping …etc.), social life activities (such as connecting with friends and family), and how they might impact older adults' quality of life.

In this research, I am specifically interested in exploring the psychosocial factors that may influence non-adherence to healthcare recommendations about using mobility assistive devices by older adults who are 65 years and older with mobility limitations. The findings of this research may shed light on the psychosocial predictors of non-adherence to mobility assistive devices use, which can be used to improve services and inform policies for these user groups.

The recruitment flyer is attached to this email. It details the basic information about the study, what is involved, who may be eligible to participate, and whom to contact for more information. I hope that you will be able to assist me by posting the recruitment flyers at your organization, posting the recruitment flyer in your newsletter, sharing the recruitment flyer via social media, advising on how I may be able to recruit participants from your organization.

The principal investigator will be more than happy to set up a time to discuss the study with the staff or with potential study participants.

Thank you for your time and consideration.

Sincerely,

Alhadi M. Jahan

Appendix 2 : Information letter

Hello,

I am a doctoral student in rehabilitation sciences at the university of Ottawa. I am seeking your cooperation in a research project titled "Psychosocial Predictors of Non-Adherence to Prescribed Mobility Assistive Devices Among Community-Dwelling Older Adults: Development of a Predictive Model."

My study focuses on the views of older adults who have difficulties with mobility and who use mobility assistive devices. Examples of these devices include canes, walkers, wheelchairs, and scooters. I would like to find out how these devices are used in everyday life activities (such as banking, shopping …etc.), social life activities (such as connecting with friends and family), and how they might impact older adults' quality of life.

In this research, I am specifically interested in exploring the psychological and social factors that may influence inappropriate use (or non-adherence) of mobility assistive devices by older adults who are 65 years and older. The findings of this study will hopefully lead to increased knowledge about factors that predict inappropriate use of mobility assistive devices, which can be used to improve services and inform policies for older adult users.

Individuals are eligible to participate if they are:

- Resident of the Perley and Rideau Veteran's Health Centre.
- Able to speak and understand English.
- 65 years of age or older.
- Experiencing concerns with mobility that effects how they participate in daily or social activities.
- Currently using prescribed or recommended (by healthcare professionals) mobility assistive devices, such as canes, crutches, walkers, wheelchairs, and scooters.
- Able to provide informed consent.
- Able to answer questions about their mobility device use.

The participation consists of answering a short questionnaire about their use of mobility assistive devices and the impact they may have on their daily activities and social life. They will need between 20 to 30 minutes to answer the questionnaire. They will be asked to answer the questionnaire only once.

The participation in this study is completely voluntary. They may refuse to participate, withdraw at any time, and decline to answer any question without negative consequences. They may notify the researcher that they wish to withdraw from the study at any point. I it is important to note that the study is independent from the Perley Health Centre and that refusal to participate

will have no effect on the services they receive. If anyone decides to withdraw, they may choose to have any data collected from them not to be used in the study and destroyed.

If anyone is interested in this project, or if you or anyone else have any questions or need additional information, please do not hesitate to contact the principal investigator or study supervisors as follows:

Principal Investigator:
Alhadi M. Jahan, PhD student
University of Ottawa
School of Rehabilitation Sciences
Faculty of Health Sciences

Study Supervisor:
Professor Jeffrey W. Jutai
University of Ottawa
Interdisciplinary School of Health Sciences
Faculty of Health Sciences

Study Co-supervisor:
Professor Paulette Guitard
University of Ottawa
School of Rehabilitation Sciences
Faculty of Health Sciences

Thank you for taking the time to read this and I am looking forward to meeting you!

Appendix 3: Certificate of ethics approval

04/12/2019

Université d'Ottawa
Bureau d'éthique et d'intégrité de la recherche

University of Ottawa
Office of Research Ethics and Integrity

CERTIFICAT D'APPROBATION ÉTHIQUE | CERTIFICATE OF ETHICS APPROVAL

Numéro du dossier / Ethics File Number	H-08-19-4850
Titre du projet / Project Title	Psychosocial Predictors of Non-Adherence to Prescribed Mobility Assistive Devices Among Community-Dwelling Seniors: Development of a Predictive Model
Type de projet / Project Type	Thèse de doctorat / Doctoral thesis
Statut du projet / Project Status	Approuvé / Approved
Date d'approbation (jj/mm/aaaa) / Approval Date (dd/mm/yyyy)	04/12/2019
Date d'expiration (jj/mm/aaaa) / Expiry Date (dd/mm/yyyy)	03/12/2020

Équipe de recherche / Research Team

Chercheur / Researcher	Affiliation	Role
Alhadi JAHAN	École des sciences de la réadaptation / School of Rehabilitation Sciences	Chercheur Principal / Principal Investigator
Jeffrey JUTAI	École interdisciplinaire des sciences de la santé / Interdisciplinary School of Health Sciences	Superviseur / Supervisor
Paulette GUITARD	École des sciences de la réadaptation / School of Rehabilitation Sciences	Co-superviseur / Co-supervisor

Conditions spéciales ou commentaires / Special conditions or comments

550, rue Cumberland, pièce 154 Ottawa (Ontario) K1N 6N5 Canada
550 Cumberland Street, Room 154 Ottawa, Ontario K1N 6N5 Canada

613-562-5387 • 613-562-5338 • ethique@uOttawa.ca / ethics@uOttawa.ca
www.recherche.uottawa.ca/deontologie | www.recherche.uottawa.ca/ethics

Université d'Ottawa
Bureau d'éthique et d'intégrité de la recherche

University of Ottawa
Office of Research Ethics and Integrity

Le Comité d'éthique de la recherche (CÉR) de l'Université d'Ottawa, opérant conformément à l'*Énoncé de politique des Trois conseils* (2014) et toutes autres lois et tous règlements applicables, a examiné et approuvé la demande d'éthique du projet de recherche ci-nommé.

L'approbation est valide pour la durée indiquée plus haut et est sujette aux conditions énumérées dans la section intitulée "Conditions Spéciales ou Commentaires". Le formulaire « Renouvellement ou Fermeture de Projet » doit être complété quatre semaines avant la date d'échéance indiquée ci-haut afin de demander un renouvellement de cette approbation éthique ou afin de fermer le dossier.

Toutes modifications apportées au projet doivent être approuvées par le CÉR avant leur mise en place, sauf si le participant doit être retiré en raison d'un danger immédiat ou s'il s'agit d'un changement ayant trait à des éléments administratifs ou logistiques du projet. Les chercheurs doivent aviser le CÉR dans les plus brefs délais de tout changement pouvant augmenter le niveau de risque aux participants ou pouvant affecter considérablement le déroulement du projet, rapporter tout évènement imprévu ou indésirable et soumettre toute nouvelle information pouvant nuire à la conduite du projet ou à la sécurité des participants.

The University of Ottawa Research Ethics Board, which operates in accordance with the *Tri-Council Policy Statement* (2014) and other applicable laws and regulations, has examined and approved the ethics application for the above-named research project.

Ethics approval is valid for the period indicated above and is subject to the conditions listed in the section entitled "Special Conditions or Comments". The "Renewal/Project Closure" form must be completedfour weeks before the above-referenced expiry date to request a renewal of this ethics approval or closure of the file.

Any changes made to the project must be approved by the REB before being implemented, except when necessary to remove participants from immediate endangerment or when the modification(s) only pertain to administrative or logistical components of the project. Investigators must also promptly alert the REB of any changes that increase the risk to participant(s), any changes that considerably affect the conduct of the project, all unanticipated and harmful events that occur, and new information that may negatively affect the conduct of the project or the safety of the participant(s).

Germain ZONGO
Responsable d'éthique en recherche / Protocol Officer
Pour/For **Daniel LAGAREC** Président(e) du/ Chair of the **Comité d'éthique de la recherche en sciences de la santé et sciences / Health Sciences and Sciences Research Ethics Board**

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Appendix 4 : Approval letter from Pearly Health Centre

CENTRE OF EXCELLENCE IN FRAILTY-INFORMED CARE™

Perley Rideau
The Perley and Rideau Veterans' Health Centre

March 4, 2021

Subject: ***Psychosocial Predictors of Non-Adherence to Prescribed Mobility Assistive Devices Among Community-Dwelling Seniors: Development of a Predictive Model***

To whom it may concern,

It is my pleasure to write a letter for Mr. Alhadi Jahan, regarding the study titled: *Psychosocial Predictors of Non-Adherence to Prescribed Mobility Assistive Devices Among Community-Dwelling Seniors: Development of a Predictive Model*.

Mr. Jahan was granted approval to use The Perley and Rideau Veterans' Health Centre (Perley Rideau) as a recruitment site where data collection took place from January 10, 2020 to March 17, 2020. Mr. Jahan's project followed all policies and procedures required by Perley Rideau.

Sincerely,

Danielle Sinden

Director, Centre of Excellence and Research Operations
The Perley and Rideau Veterans' Health Centre
1750 Russell Road
Ottawa ON K1G 5Z6

1

Appendix 5: Recruitment Flyer

DO YOU USE A CANE, A WALKER, OR A WHEELCHAIR IN

DAILY ACTIVITIES AND SOCIAL LIFE?

YOU MAY BE ELIGIBLE TO PARTICIPATE IN A RESEARCH STUDY

We would like to find out about the views of older adults on mobility assistive devices such as canes, walkers, and wheelchairs. We are interested in how these devices are used or can be used in daily activities (such as banking, and shopping), and social life (such as connecting with friends and family), and how using such devices may impact older adults' quality of life.

If you participate, you will be asked questions in a session lasting about 20 minutes (The entire session may take up to 30 minutes). The session will be located at your room or in a conference room in the Perley and Rideau Veteran's Health Centre.

YOU ARE ELIGIBLE IF YOU ARE:

- Resident of the Perley and Rideau Veteran's Health Centre.
- Able to speak and understand English.
- 65 years of age or older.
- Experiencing concerns with your mobility that effects how you participate in daily or social activities.
- Currently using prescribed or recommended (by healthcare professionals) mobility assistive devices, such as canes, crutches, walkers, wheelchairs, and scooters.
- Able to provide informed consent.
- Able to answer questions about your mobility device use.

FOR MORE INFORMATION, PLEASE CONTACT THE PRINCIPAL INVESTIGATOR

For confidentially, please do not reply directly on twitter or any other social media sites. Please use contact information above. Please note that the security of email messages is not guaranteed. Messages may be forged, forwarded, kept indefinitely, or seen by others using the internet. Do not use email to discuss sensitive information. Do not use email in an emergency since email may be delayed.

Appendix 6 : Demographics form

Please tell us the following information about yourself:

1. What is your age? ……
2. What is your sex:
   Male □ Female □ Other □
3. What is your previous occupation? …….
4. What is your highest educational level?
   1. No formal education □
   2. Grade school □
   3. High school □
   4. College / University □
5. What type of disability (limitation) that affects your mobility?
   ……..
6. Which one/more of these mobility assistive devices do you currently use?
   1. Cane.
   2. Crutches.
   3. Walkers.
   4. Manual Wheelchair.
   5. Powered Wheelchair.
   6. Scooters.
   7. Other (please specify): ……..

7. Among the devices listed above, which one/or more than one do you use more often compared with others? ……..

8. On a typical day, how often the (most frequent used) device is being used?

   1- Never.

   2 - Sometimes.

   3 - Usually.

   4 - Often.

   5 - Always.

9. The amount of time you spent interacting (i.e. using) with the device at the time of answering the questionnaire is:

   1- None of the time.

   2 - A little of the time.

   3 - Some of the time.

   4 - Most of the time.

5 - All the time.

10. How likely will you use your (most frequent used) device for the next 1 year?

    1- Extremely Unlikely.

    2 - Unlikely.

    3 - Neutral.

    4 - Likely.

    5- Extremely likely.

11. What is your marital status?
    a. Married / common-law
    b. Separated / divorced
    c. Widowed
    d. Never married

12. What is your current living arrangement?
    a. Long-term care unit
    b. Independent-living apartment

13. People sometimes look to others for companionship, assistance, or other types of support. How often are the following supports available to you if you need it? Circle one number on each line.

    a. Someone to help you if you were confined to bed.

        1- None of the time.

        2 - A little of the time.

        3 - Some of the time.

        4 - Most of the time.

        5 - All the time.

    b. Someone to take you to the doctor if you needed it.

        1- None of the time.

        2 - A little of the time.

        3 - Some of the time.

        4 - Most of the time.

5 - All the time.

c. Someone to prepare your meals if you were unable to do it yourself.

1- None of the time.

2 - A little of the time.

3 - Some of the time.

4 - Most of the time.

5 - All the time.

d. Someone to help with daily chores if you were sick.

1- None of the time.

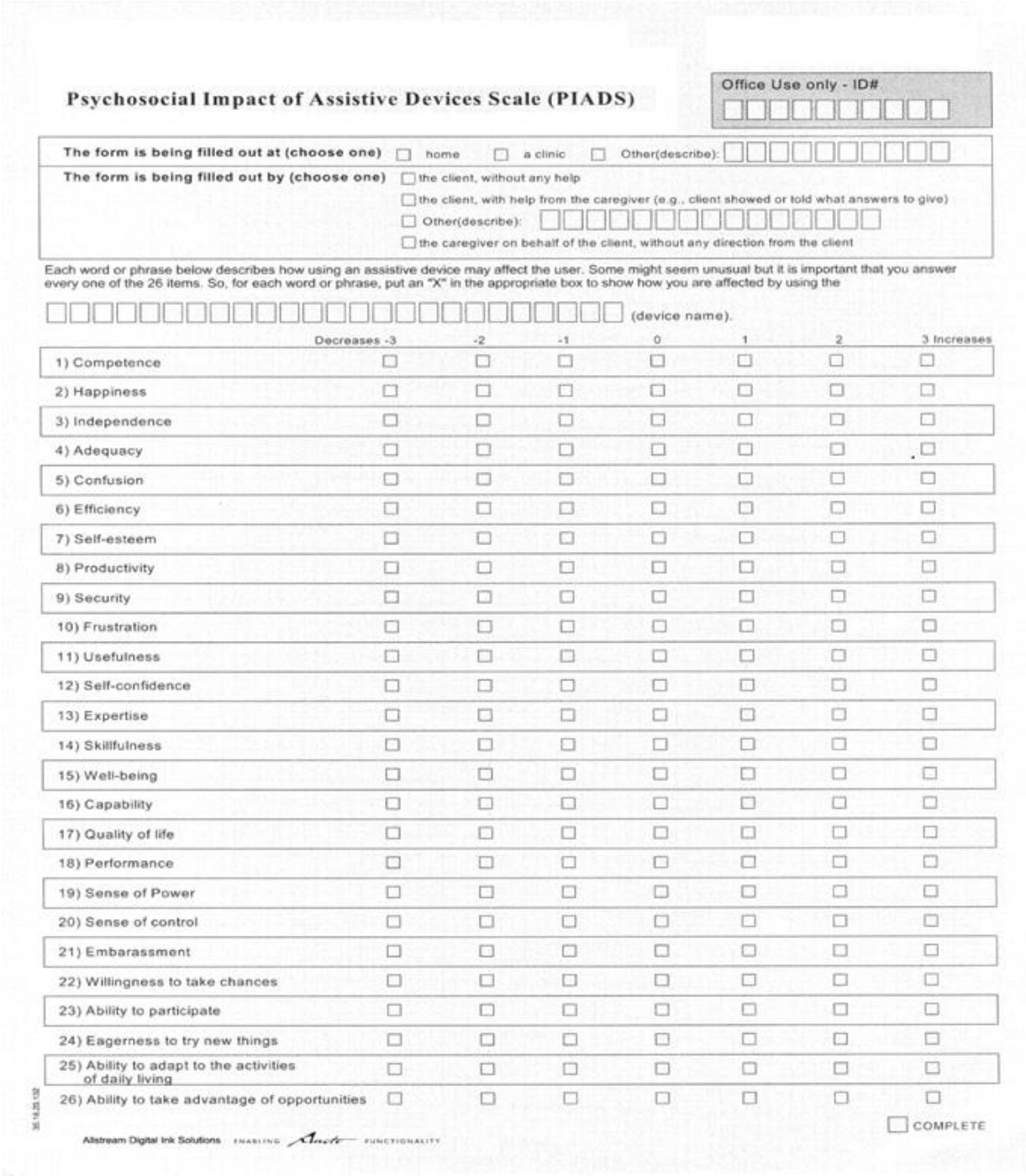
2 - A little of the time.

3 - Some of the time.

4 - Most of the time.

5 - All the time

Appendix 7 : The PIADS



Psychosocial Impact of Assistive Devices Scale (PIADS)

Office Use only - ID#

The form is being filled out at (choose one) ☐ home ☐ a clinic ☐ Other(describe):

The form is being filled out by (choose one)
- ☐ the client, without any help
- ☐ the client, with help from the caregiver (e.g., client showed or told what answers to give)
- ☐ Other(describe):
- ☐ the caregiver on behalf of the client, without any direction from the client

Each word or phrase below describes how using an assistive device may affect the user. Some might seem unusual but it is important that you answer every one of the 26 items. So, for each word or phrase, put an "X" in the appropriate box to show how you are affected by using the

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐ (device name).

	Decreases -3	-2	-1	0	1	2	3 Increases
1) Competence	☐	☐	☐	☐	☐	☐	☐
2) Happiness	☐	☐	☐	☐	☐	☐	☐
3) Independence	☐	☐	☐	☐	☐	☐	☐
4) Adequacy	☐	☐	☐	☐	☐	☐	☐
5) Confusion	☐	☐	☐	☐	☐	☐	☐
6) Efficiency	☐	☐	☐	☐	☐	☐	☐
7) Self-esteem	☐	☐	☐	☐	☐	☐	☐
8) Productivity	☐	☐	☐	☐	☐	☐	☐
9) Security	☐	☐	☐	☐	☐	☐	☐
10) Frustration	☐	☐	☐	☐	☐	☐	☐
11) Usefulness	☐	☐	☐	☐	☐	☐	☐
12) Self-confidence	☐	☐	☐	☐	☐	☐	☐
13) Expertise	☐	☐	☐	☐	☐	☐	☐
14) Skillfulness	☐	☐	☐	☐	☐	☐	☐
15) Well-being	☐	☐	☐	☐	☐	☐	☐
16) Capability	☐	☐	☐	☐	☐	☐	☐
17) Quality of life	☐	☐	☐	☐	☐	☐	☐
18) Performance	☐	☐	☐	☐	☐	☐	☐
19) Sense of Power	☐	☐	☐	☐	☐	☐	☐
20) Sense of control	☐	☐	☐	☐	☐	☐	☐
21) Embarassment	☐	☐	☐	☐	☐	☐	☐
22) Willingness to take chances	☐	☐	☐	☐	☐	☐	☐
23) Ability to participate	☐	☐	☐	☐	☐	☐	☐
24) Eagerness to try new things	☐	☐	☐	☐	☐	☐	☐
25) Ability to adapt to the activities of daily living	☐	☐	☐	☐	☐	☐	☐
26) Ability to take advantage of opportunities	☐	☐	☐	☐	☐	☐	☐

☐ COMPLETE

Allstream Digital Ink Solutions ENABLING FUNCTIONALITY

Appendix 8 : Consent form

uOttawa

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Faculté des sciences de la santé
École des sciences de la réadaptation

University of Ottawa
Faculty of Health Sciences
School of Rehabilitation Sciences

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CONSENT FORM

Study Title: "Psychosocial Predictors of Non-Adherence to Prescribed Mobility Assistive Devices Among Community-Dwelling Seniors: Development of a Predictive Model".

Principal Investigator:
Alhadi Jahan, PhD Candidate
University of Ottawa
School of Rehabilitation Sciences
Faculty of Health Sciences

Study Supervisor:
Professor Jeffrey W. Jutai
University of Ottawa
Interdisciplinary School of Health Sciences
Faculty of Health Sciences

Study Co-supervisor:
Professor Paulette Guitard
University of Ottawa
School of Rehabilitation Sciences
Faculty of Health Sciences

Purpose:
The overall goal of this research is to find out about the views of seniors who have difficulties with mobility and who use mobility assistive devices. Examples of these devices include canes, walkers, wheelchairs, and scooters. I would like to find out how these devices are used in everyday life activities (such as banking, shopping …etc.), social life activities (such as connecting with friends and family), and how they might impact seniors' quality of life.

In this research, I am specifically interested in exploring the psychosocial factors that may influence non-adherence to healthcare recommendations about using mobility assistive devices by seniors who are 65 years and older with mobility limitations. The findings of this

research may shed light on the psychosocial predictors of non-adherence to mobility assistive devices use, which can be used to improve services and inform policies for these user groups.

Invitation:
You are invited to participate in this study and answer a short questionnaire about your use of mobility assistive devices and the impact they may have on your daily activities and social life.

You are invited to participate in the study because you are:

1. Able to speak and understand English.
2. 65 years of age or older.
3. Able to provide informed consent (or providing consent as a substitute decision-maker)
4. Experiencing mobility concerns such as with self-care, shopping, banking, visiting friends or family members, or attending any social events.
5. Currently using a prescribed or recommended mobility assistive device, such as a cane, crutches, walker, wheelchair, and scooter for 6 months or more.
6. Able to answer questions about mobility devices use.
7. Living in residential care in Ottawa.

Procedure:
First, I will give you the consent form. You need to read, understand, and sign the consent form. After you sign the consent form, I will give you the study questionnaire. You will need between 20 to 30 minutes to complete the questionnaire (under normal conditions). You will be asked to complete the questionnaire only once. The questionnaire has two parts. Part 1 contains basic information about yourself and your living situation, such as age, gender, disability type, the type of mobility assistive devices you currently use, and the availability of social support from significant others. Part 2 of the questionnaire called the PIADS. The PIADS lets you rate the effects of your mobility assistive device on your functions and feelings.

Conditions for Participation:
Your participation in this study is completely voluntary. Please note that this study is independent from the Perley and Rideau Veteran' s Health Centre and that refusal to participate will have no effect on the services you receive. You may refuse to participate, withdraw at any time, and decline to answer any question without negative consequences. You may notify the researcher that you wish to withdraw from the study at any point. If you decide to withdraw, you may choose to have any data collected from you not to be used in the study and destroyed.

Risk:
There is a possibility that you become emotionally upset if thinking about changes you experience such as in your indoor mobility or other mobility-related activities. You may experience discomfort, anxiety or frustration recalling information about devices that you may be unfamiliar with or if you feel social pressure to use them. If this occurs, the researcher will take a break from the questionnaire. The researcher will not continue the session unless you agree.

In order to mitigate the risk of discomfort that may occur during this research project, please keep in mind:

a. You can withdraw at any time of the study and that you may choose not to answer any questions you wish.
b. Before I give you the questionnaire, I will describe the types of questions, topics or situations where risk of discomfort is higher, so that you have a sense of the risk and thus be better able to judge whether or not you want to participate, or to emotionally prepare for it.
c. Remember that the staff of the Perley and Rideau Veteran's Health Centre will be available, and I can call them in case you would like them to be present for any reason, or if I note that you are experiencing unexpected emotional distress.
d. You may choose to have the session accompanied by someone you trust and who can assist you if need be (a relative, a friend, etc.).

Benefits:
You may indirectly benefit from participating in this study by being able to share your experiences with others regarding your daily activities and social activities, how mobility assistive devices may or may not be used and how using such devices impacted your life. You can also help others like you by sharing your experiences so that healthcare providers can learn how to improve services related to mobility assistive devices.

Confidentiality:
All information obtained during the study will be treated confidentially. You will be assigned a code number which will be used in the data files. A list linking the code number with your name will be kept in a secured place, separate from your data files. Documents that include your name and contact information, including the signed consent form and the screening form will be kept in a secured locked office at the researchers' institutions. If the results of the study are published, your name will not be used. All information obtained in this study will be used for research purposes only.

Dissemination of Findings:
You may request a copy of the study results at the end of the study by contacting the researcher. If you would like to receive a copy of the study report, you may indicate by making a check mark here:

_____

Rights of Participants:
You may choose not to participate or refuse to answer any question. By accepting to take part in this study, you do not waive any of your legal rights nor do you release the investigators, the sponsor, or the institution where this research study is being conducted from their civil and professional responsibilities.

This study will be reviewed by the Research Ethics Board (REB) at the University of Ottawa. The REB is responsible for ensuring that participants are informed of the risks associated with the research, and that participants are free to decide if participation is right for them.

Contact Person:
If you would like to discuss any aspect of the study, please feel free to contact:
Principal Investigator.

Your Rights in Research:

If you have any questions regarding the ethical conduct of this study, you may contact the Protocol Officer for Ethics in Research, University of Ottawa, Tabaret Hall, 550 Cumberland Street, Room 154, Ottawa, ON K1N 6N5

Understanding of my rights in research

Please circle YES or NO		
I read the letter about this study.	**YES**	**NO**
I decided that I want to be in this study.	**YES**	**NO**
I know that I do not need to be in this study if I do not want to.	**YES**	**NO**
I will participate in this study. The interview may last 20 to 30 minutes.	**YES**	**NO**
I can stop my participation when I want.	**YES**	**NO**
It is okay for the researchers to use my answers when they tell people about their research.	**YES**	**NO**
I know that they will not tell anybody my name.	**YES**	**NO**
It is okay for the researchers to ask me again if I want to continue participating in the study.	**YES**	**NO**

Participant:

I had an opportunity to discuss this study, and any questions that I have asked have been answered to my satisfaction. I voluntarily consent to participate in the study "Psychosocial Predictors of Non-Adherence to Prescribed Mobility Assistive Devices Among Community-Dwelling Seniors: Development of a Predictive Model". I understand that I will receive a signed copy of this form.

_____	_____	_____
Participant's Name (Print)	Participant's Signature	Date

By marking my initials here, I agree to allow the researchers to contact me at a later time if they would like me to clarify any information._____

Legally Authorized Representative: (If participant unable to sign for themselves)

I have read the preceding information thoroughly. I have had an opportunity to ask questions and all of my questions have been answered to my satisfaction. I understand that I will receive a signed copy of this form.

I give my permission for _____ to participate in this study.

_____ _____ _____

Name, Relationship to Participant Signature Date

By marking my initials here, I agree to allow the researchers to contact the participant at a later time, if the participant is willing, in order to clarify any information._____

Person obtaining consent:

I have discussed this study in detail with the participant. I believe the participant understands what is involved in this study.

_____ _____ _____

Researcher's Name (Print) Researcher's Signature Date

Appendix 9 : The pairwise table of the Pearson correlations

		r		p	
Frequency	Duration	0.881	***	< .001	There is a statistically significant positive correlation.
	Intention	0.649	***	< .001	There is a statistically significant positive correlation.
	Competence	0.609	***	< .001	There is a statistically significant positive correlation.
	Adaptability	0.575	***	< .001	There is a statistically significant positive correlation.
	Self-esteem	0.714	***	< .001	There is a statistically significant positive correlation.
	Social support	0.372	**	0.009	There is a statistically significant positive correlation.
	Age	0.169		0.252	
	Sex	-0.056		0.703	
Duration	Intention	0.701	***	< .001	There is a statistically significant positive correlation.
	Competence	0.57	***	< .001	There is a statistically significant positive correlation.
	Adaptability	0.52	***	< .001	There is a statistically significant positive correlation.
	Self-esteem	0.694	***	< .001	There is a statistically significant positive correlation.
	Social support	0.29	*	0.046	There is a statistically significant positive correlation.
	Age	0.252		0.084	
	Sex	-0.079		0.593	
Intention	Competence	0.594	***	< .001	There is a statistically significant positive correlation.
	Adaptability	0.558	***	< .001	There is a statistically significant positive correlation.
	Self-esteem	0.725	***	< .001	There is a statistically significant positive correlation.
	Social support	0.392	**	0.006	There is a statistically significant positive correlation.
	Age	0.413	**	0.004	There is a statistically significant positive correlation.
	Sex	0.127		0.391	
Competence	Adaptability	0.73	***	< .001	There is a statistically significant positive correlation.
	Self-esteem	0.79	***	< .001	There is a statistically significant positive correlation.
	Social support	0.502	***	< .001	There is a statistically significant positive correlation.
	Age	0.072		0.628	
	Sex	0.139		0.348	
Adaptability	Self-esteem	0.74	***	< .001	There is a statistically significant positive correlation.
	Social support	0.363	*	0.011	There is a statistically significant positive correlation.
	Age	0.161		0.274	
	Sex	-0.053		0.721	
Self-esteem	Social support	0.412	**	0.004	There is a statistically significant positive correlation.
	Age	0.248		0.089	
	Sex	-0.031		0.833	
Social support	Age	0.307	*	0.034	There is a statistically significant positive correlation.
	Sex	0.085		0.565	
Strength of Association: Small (0.1 to 0.3); Medium (0.3 to 0.5); Large (0.5 to 1.0)					

Appendix 10: Regression test assumptions

According to (Laerd Statistics, 2015), eight assumptions should be considered before running the multiple linear regression.

Assumption #1

In this study, the outcome variable was device non-adherence, and it was measured by evaluating the actual use of a prescribed device(s). Device utilization was measured by the frequency of use (participants were asked to choose from a 5-point Likert scale with responses ranging from 1 (Never) to 5 (Always) to determine the frequency of device use), the duration of use (participants were asked to choose from a 5-point Likert scale with responses ranging from 1 (none of the time) to 5 (all of the time) to determine interacting time with their device). The intention to use a MAD in the future was measured by asking a question about the likelihood of device use in the future with responses ranging from 1 (Extremely unlikely) to 5 (Extremely likely). A debate has been discussed among statisticians whether the Likert scale can be considered as ordinal or continuous variables. Researchers who believe that the Likert scale should be treated as a continuous variable, based on two facts (1) The ordinal with more than four options and with more than one Likert type item can be considered as a continuous variable, and (2) There is an underlying measurement sequence. The data included in this study was treated as a continuous because it used a Likert scale with five options.

Assumption #2

Two or more predictor (or independent) variables should be used. In this study, four predictor variables were used; psychosocial variables (competence, adaptability, and self-esteem) and social support.

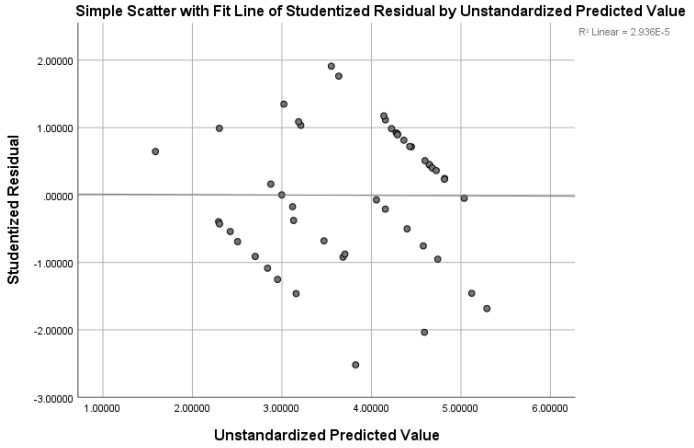
Assumption #3

To assess the independence of observations (residuals), the Durbin-Watson statistic (ranges between 0 and 4, with an acceptable value of up to 2) was used to detect if there is a correlation between residuals. Residuals were independent, as assessed by a Durbin-Watson statistic of 1.878, 0.149, and 2.109 for the three outcome (or dependent) variables. Thus, observations (especially, their errors) are not related.

Assumption #4

A linear relationship between the dependent variables and the independent variables as a whole should be present, as well as the linear relationship between the dependent variable and every independent variable. To test the linear relationship between the dependent variables and the independent variables as a whole, this study used nthe scatterplot of the studentized residuals (SRE) against the unstandardized predicted value (PRE). Since the residuals formed the horizontal band, the relationship between the dependent variables and independent variables is likely to be linear **(see #4-1).**

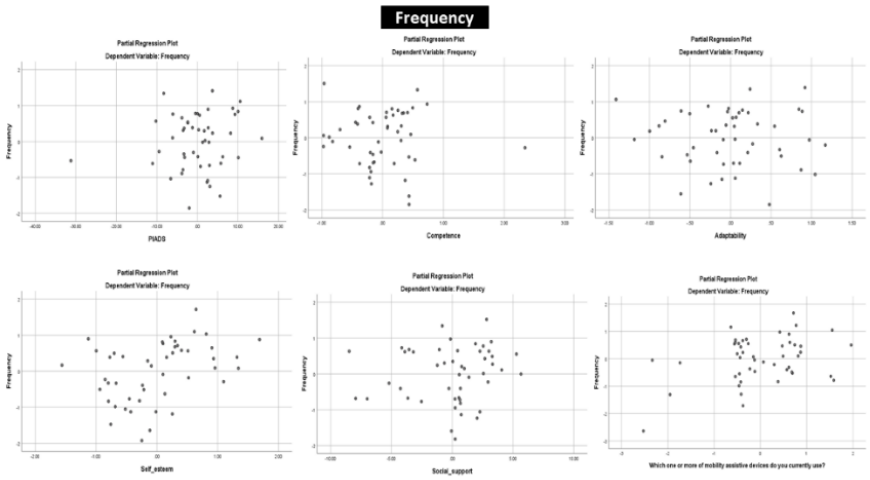
#4-1



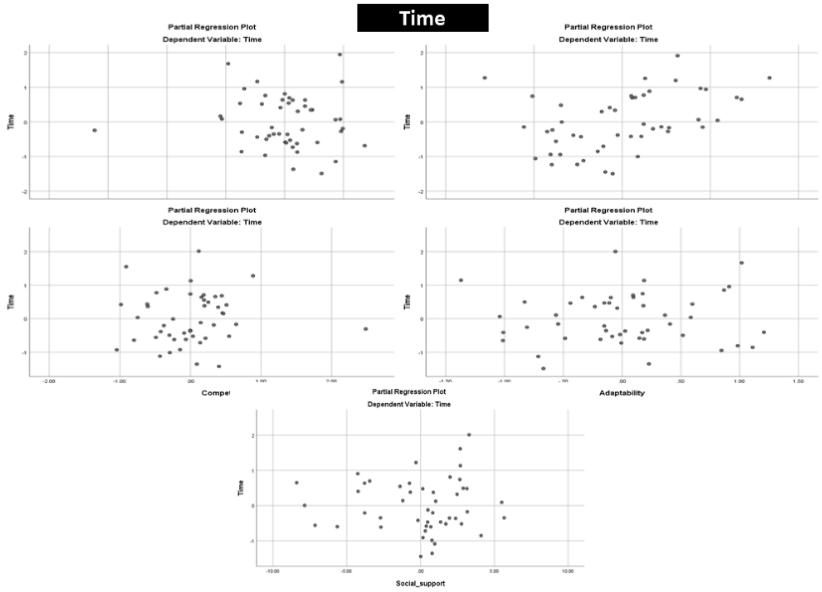
To test the linear relationship between the dependent variable and every independent variable, this study employed partial regression plots between “each” independent variable and the dependent

variable. The partial regression plots showed an approximately linear relationship. These scatterplots would pass the assumption of linearity **(#4-2 A to C**).

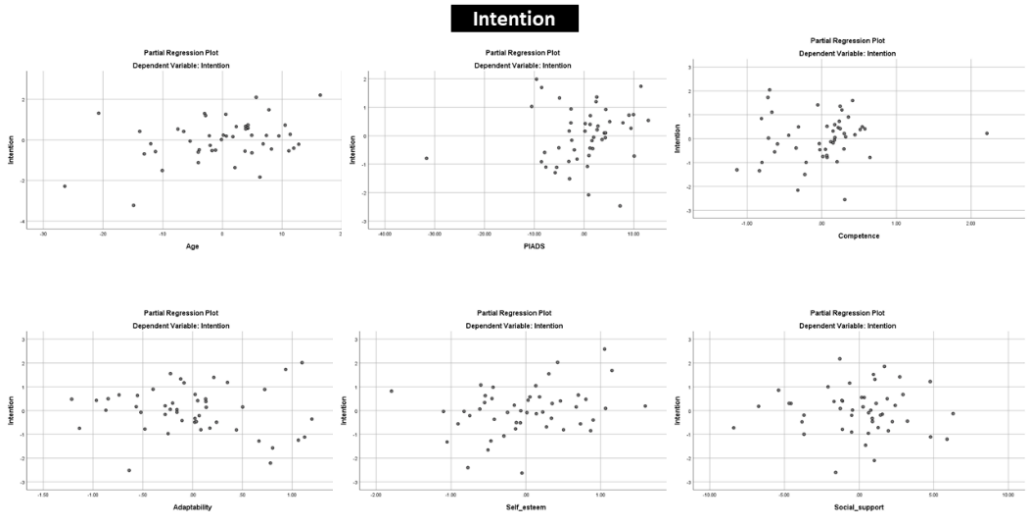
#4-2 A



#4-2 B



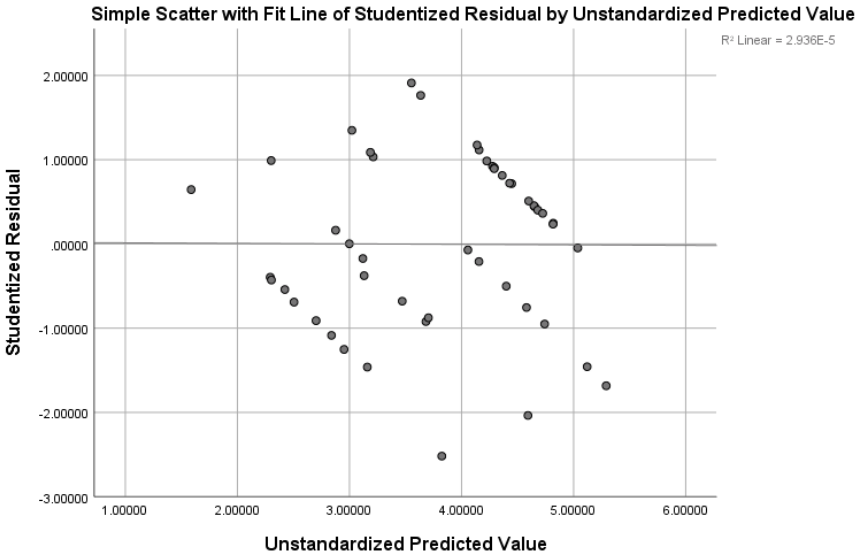
#4-2 C



Assumption #5

As shown in **(#5)**, the same plot that was created to check the linearity between studentized residuals against the unstandardized predicted values was used to check the homoscedasticity.

#5



Assumption #6

No multicollinearity was detected among the independent variables based on correlation coefficient and tolerance/VIF values. All correlation coefficients were lower than 0.75, all tolerance values were more than 0.1, and all VIF values were less than 1.

Assumption #7

In order to detect the outliers, the Casewise diagnostics (standardized residuals) **(#7)** and studentized deleted residuals were used. An outlier is detected if the case's standardized residual is greater than +/-3 standard deviation (SD). In this study, all of the cases had standardized residuals less than +/-3. The leverage points (LEV columns in the SPSS file) were calculated and checked. The leverage values less than 0.2 as safe, 0.2 to less than 0.5 as risky, and above as dangerous. In this study, the detected value was less than 0.2 in all cases. Then, the Cook's Distance values was assessed to check for the influential points. Any Cook's Distance values above one should be investigated (Cook & Weisberg, 1982). In this study, there was no value above 1, which means there are no influential points.

#7

	Frequency				**Duration**				**Intention**			
Case Number	Std. Residual	Predicted Value	Residual	Cook's Distance	Std. Residual	Predicted Value	Residual	Cook's Distance	Std. Residual	Predicted Value	Residual	Cook's Distance
1	0.923	4.276	0.724	0.01	0.831	4.363	0.637	0.008	0.293	4.715	0.285	0.001
2	0.715	4.447	0.553	0.008	1.457	3.868	1.132	0.016	1.419	3.576	1.424	0.013
3	-0.922	3.682	-0.682	0.026	-1.43	4.087	-1.087	0.031	0.563	4.449	0.551	0.004
4	1.033	3.212	0.788	0.022	1.086	3.191	0.809	0.027	-2.193	3.098	-2.098	0.103
5	1.087	3.187	0.813	0.032	2.751	2.992	2.008	0.232	1.685	3.479	1.521	0.119
6	1.911	3.553	1.447	0.083	2.17	3.388	1.612	0.112	1.948	3.138	1.862	0.083
7	-0.048	5.036	-0.036	0	-0.777	4.586	-0.586	0.011	0.161	4.843	0.157	0
8	0.246	4.818	0.182	0.002	0.658	4.521	0.479	0.014	-0.465	4.436	-0.436	0.006

9	0.441	4.652	0.348	0.002	0.62	4.523	0.477	0.004	0.019	4.981	0.019	0
10	0.454	4.646	0.354	0.003	-0.686	4.523	-0.523	0.007	0.227	4.777	0.223	0.001
11	-2.036	4.592	-1.592	0.052	-1.898	4.447	-1.447	0.05	-0.155	4.149	-0.149	0
12	-0.691	2.505	-0.505	0.017	-0.777	2.557	-0.557	0.023	0.915	1.16	0.84	0.03
13	-1.252	2.952	-0.952	0.034	-1.23	2.912	-0.912	0.037	-1	1.956	-0.956	0.022
14	1.116	4.157	0.843	0.029	1.231	4.092	0.908	0.04	2.445	2.827	2.173	0.286
15	-0.395	2.293	-0.293	0.005	0.561	2.595	0.405	0.011	1.096	1.008	0.992	0.049
16	1.174	4.138	0.862	0.046	0.912	4.345	0.655	0.031	0.173	3.84	0.16	0.001
17	-0.679	3.47	-0.47	0.026	0.014	3.99	0.01	0	-0.884	3.751	-0.751	0.051
18	-0.501	4.399	-0.399	0.002	-0.542	4.421	-0.421	0.002	-0.8	4.795	-0.795	0.006
19	-0.754	4.579	-0.579	0.01	-0.277	4.208	-0.208	0.002	-2.779	3.608	-2.608	0.216
20	-0.428	2.303	-0.303	0.009	0.709	2.511	0.489	0.027	-0.954	1.847	-0.847	0.044
21	0.984	4.225	0.775	0.01	0.908	4.301	0.699	0.009	-0.492	4.486	-0.486	0.003
22	0.51	4.599	0.401	0.003	-0.232	4.179	-0.179	0.001	-1.332	3.189	-1.189	0.082
23	0.813	4.363	0.637	0.008	-0.164	4.126	-0.126	0	0.561	4.446	0.554	0.004
24	-2.519	3.824	-1.824	0.244	-1.76	4.358	-1.358	0.03	-0.458	4.457	-0.457	0.002
25	0.904	4.293	0.707	0.01	0.183	3.86	0.14	0	0.082	3.919	0.081	0
26	0.721	4.428	0.572	0.004	-0.473	4.366	-0.366	0.002	-0.459	4.459	-0.459	0.002
27	-0.876	3.704	-0.704	0.003	-0.922	3.723	-0.723	0.004	1.147	3.847	1.153	0.008
28	0.163	2.876	0.124	0.001	0.164	2.878	0.122	0.001	-0.968	2.908	-0.908	0.026
29	1.763	3.635	1.365	0.049	0.501	3.62	0.38	0.004	0.405	3.604	0.396	0.002
30	-1.085	2.839	-0.839	0.019	-1.311	2.99	-0.99	0.03	-1.494	2.458	-1.458	0.034
31	0.989	2.301	0.699	0.046	-0.465	3.347	-0.347	0.005	-1.061	3.005	-1.005	0.028
32	-0.072	4.056	-0.056	0	0.415	3.681	0.319	0.002	0.692	3.318	0.682	0.006
33	-0.209	4.156	-0.156	0.001	0.12	3.912	0.088	0	1.302	3.768	1.232	0.043
34	0.893	4.291	0.709	0.007	0.952	4.263	0.737	0.008	0.504	4.496	0.504	0.002
35	0.002	2.999	0.001	0	-1.226	2.858	-0.858	0.072	-1.232	2.095	-1.095	0.073
36	-1.462	3.159	-1.159	0.018	-0.268	3.207	-0.207	0.001	1.315	2.687	1.313	0.014
37	0.401	4.68	0.32	0.001	0.814	4.367	0.633	0.005	0.422	4.577	0.423	0.001
38	-1.683	5.29	-1.29	0.053	-0.678	4.523	-0.523	0.004	-0.093	5.092	-0.092	0
39	-0.95	4.741	-0.741	0.012	-0.616	4.471	-0.471	0.005	-0.332	4.327	-0.327	0.001
40	0.235	4.816	0.184	0.001	0.488	4.627	0.373	0.003	0.017	4.983	0.017	0
41	-0.377	3.131	-0.131	0.092	-1.387	3.468	-0.468	0.456	-0.433	2.188	-0.188	0.123
42	-0.173	3.119	-0.119	0.002	-0.83	2.594	-0.594	0.026	0.314	1.709	0.291	0.003

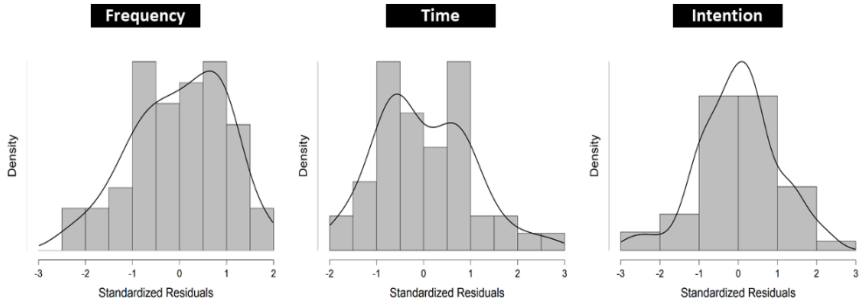
43	1.349	3.022	0.978	0.068	1.715	2.778	1.222	0.118	0.339	1.695	0.305	0.005
44	0.363	4.724	0.276	0.003	0.731	4.455	0.545	0.012	0.392	4.623	0.377	0.003
45	-0.541	2.423	-0.423	0.004	-0.794	2.605	-0.605	0.009	-0.208	2.202	-0.202	0.001
46	-1.457	5.12	-1.12	0.038	-0.464	4.358	-0.358	0.002	-0.718	4.715	-0.715	0.005
47	-0.91	2.702	-0.702	0.014	-0.809	2.611	-0.611	0.012	-0.213	2.204	-0.204	0.001
48	0.645	1.587	0.413	0.037	-0.537	2.354	-0.354	0.022	-0.134	1.111	-0.111	0.001

Assumption #8

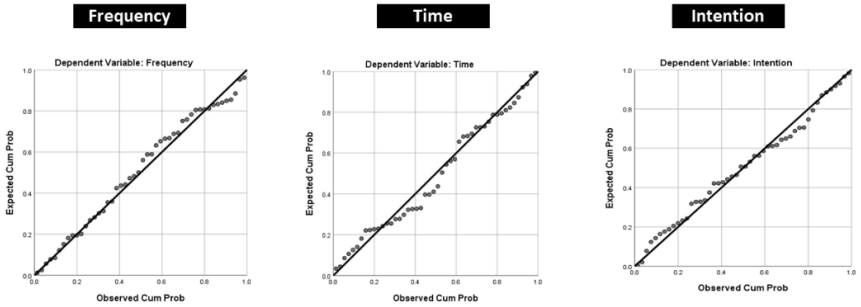
To check if the residuals (errors) are approximately normally distributed, the researcher performed two common methods to check for the assumption of normality of the residuals:

1. A histogram with the superimposed normal curve as well as a P-P Plot was performed **(#8-1 A and B**). By inspection of the histogram, the standardized residuals appear to be approximately normally distributed, and the points on the P-P Plot are almost aligned along the diagonal line. Although they are not perfectly aligned, they are close enough to indicate that the residuals are close enough to normal for the analysis to proceed.

#8-1 (A)

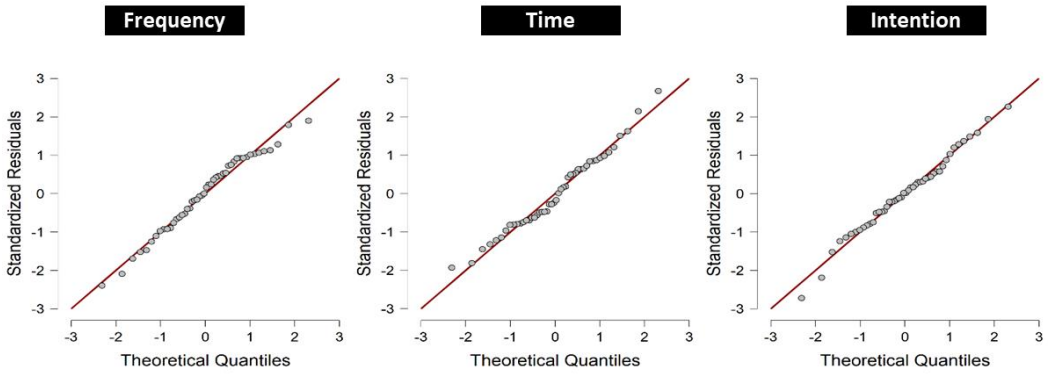


#8-1 (B)



2. A normal Q-Q Plot of the studentized residuals was also performed **(#8-2).** The points on the Q-Q Plot are almost aligned along the diagonal line. Although they are not perfectly aligned, they are close enough to indicate that the residuals are close enough to normal for the analysis to proceed.

#8-2



Appendix 11. The bivariate scatterplots of Competence, Adaptability, Self-esteem, and Social support

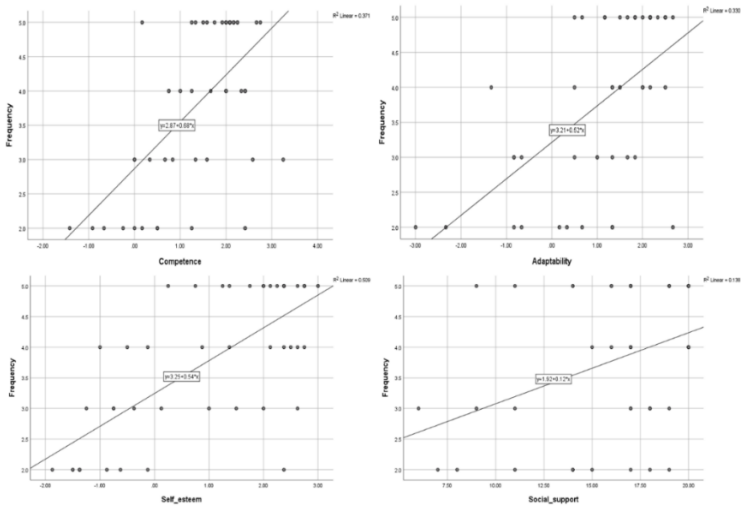


Figure 1. The bivariate scatterplots of intention to use, Competence, Self-esteem, Adaptability, and Social support

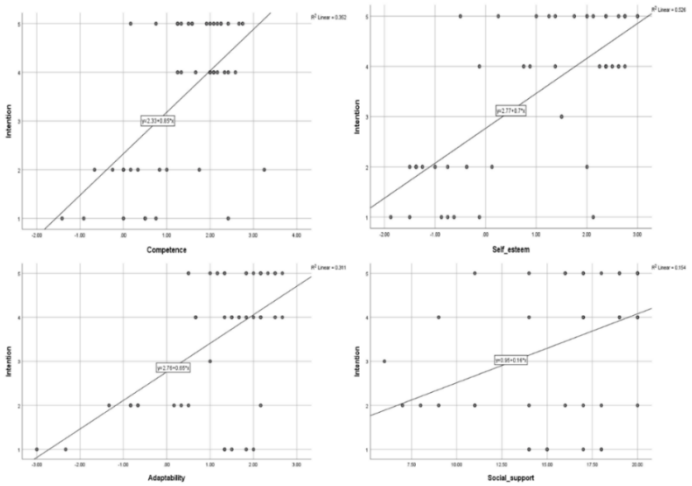


Figure 2 The bivariate scatterplots of frequency of use and Competence, Adaptability, Self-esteem, and Social support

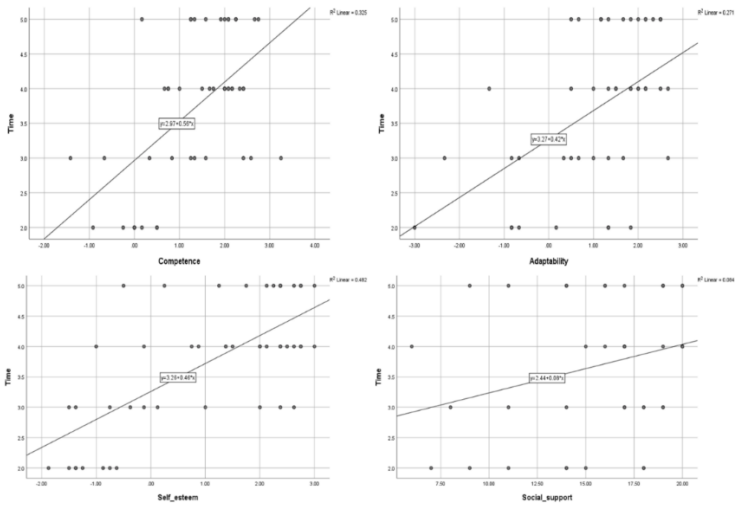


Figure 3. The bivariate scatterplots of duration of use and Competence, Adaptability, Self-esteem, and Social support