

**The role of assistive devices and technologies in
residents' quality of life and staff care practices in
long-term care facilities: A narrative synthesis of the
literature**

**by
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Abstract

There is scarce research on the importance of Assistive devices and technologies (ATDs) in supporting residents' functioning and staff care practices in Long Term Care (LTC) settings. Much of the present literature focuses on how ATDs can promote independence and support older adults to age in their homes. Though LTC facilities provide personal assistance to residents, fostering their autonomy should not be overlooked. ATDs can lead to benefits for both residents and staff when implemented adequately. This literature review addressed a gap in the literature by considering the implementation of ATDs for older adults living in institutional settings and the facilitators, barriers, and other relevant contributors to the implementation of ATDs in LTC. The aim of this study was to conduct a literature review of the use of ATDs in LTC, and synthesize the evidence on how they can promote resident autonomy, independence, and self-efficacy, while providing relief for staff. A narrative review of older adults use of ATDs was conducted across AgeLine, MEDLINE, PsycInfo, and CINAHL. Thirty four peer-reviewed articles met inclusion criteria. Five themes were identified: types of assistive devices, benefits of assistive devices, barriers and facilitators to ATD implementation, and the substitution of personal assistance for ATDs. The findings revealed that while ATDs may not eliminate the need for personal assistance, they can allow older adults to exercise their autonomy, and provide caregiver relief and reduce burden. Future research should look further at the interconnectedness of residents and staff in ATD implementation, and the psychosocial impacts of ATD implementation in LTC.

Keywords: assistive device; assistive technology; long term care; older adult; personal assistance; technological assistance

Dedication

I dedicate this work to all of the wonderful older adults that I have met and had the pleasure of working with in my career and academic journey. I am so grateful to have met each and every one of you. You have shown me that age is just a number. I am forever in awe of your stories, experiences, and wisdom. I do what I do because of you.

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List of Acronyms

ATD	Assistive Technology Devices
LTC	Long Term Care

Glossary

Assistive Device	Items used by individuals with functional deficits as alternative ways of performing tasks, actions, and activities.
Assistive Technology	Any device or system that is used to maintain or improve an individual's physical functioning.
Disability	The limitation of an individual in carrying out socially defined tasks or roles ranging from employment duties to self-care.
High Technology	High-tech devices are more complex to operate, are typically electrically powered or feature electronic components, they may serve multiple functions that can be defined by the user, are more difficult to obtain, and cost more to build, purchase, and maintain. Some examples of high-tech devices include powered wheelchairs, speech devices, monitoring devices, and electronic aides to daily living.
Low Technology	Low-tech devices are simple to operate, relatively easy to obtain, and are typically less expensive than high tech devices. They do not have mechanical or complex features. Some examples of low-tech devices include grab bars, adapted eating utensils or tools, reacher tools, and button hooking tools.
Mid Technology	Mid-tech devices are more complicated than low-tech devices. They typically have a digital component and may require batteries or another power source. Some examples may be a self-stabilizing utensil, electronic bidets, and specialized remotes.
Personal Assistance	Personal assistance includes any assistance that an individual receives from others, including but not limited to spouses, children, friends, or paid workers.
Self-care	The practice of actively participating in one's own well-being. Caring for oneself.
Technological Assistance	Technological assistance can be accessed through the use of assistive devices, assistive technologies, and adaptive devices. These pieces of equipment or technology can be bought commercially, a generic model can be modified, or devices may be custom designed for a specific user.

Chapter 1.

Introduction

Canada now has more citizens over the age of 65 than under the age of 14, making it crucial to examine the many aspects that can impact the quality of life of the aging population (Statistics Canada, 2017). In 2016, 2.2% (770,780 people) of the Canadian population was made up of individuals aged 85 and over (Statistics Canada, 2017). The number of individuals aged 85 and older increased by 19.4% between 2011 and 2016 (Statistics Canada, 2017). In this same period, the number of centenarians grew by 41.3%, making it the fastest growing age cohort during this time (Statistics Canada, 2017). In 2016, nearly one third of individuals aged 85 and older, and two thirds of centenarians lived in collective dwellings such as residential care facilities, nursing homes, and seniors' residences (Statistics Canada, 2017). Based on these projections, it is estimated that the number of individuals requiring some level of long-term care in a congregate seniors' housing/care facility will increase significantly in the foreseeable future. As such, it is critical to examine the quality of life of individuals living in these facilities and provide them with the proper care and resources that can support them to experience the best quality of life possible.

While many older adults are able to maintain independence in self-care well into late life, that is not everyone's reality. Frailty, arthritis, stroke, vision or hearing problems, cognitive decline (De-Rosende-Celeiro, et al., 2019), and injury caused by falls are a few of the challenges that older adults may face as they age. In British Columbia, 51% of older adults aged 75 and older are living with some form of disability (Wister, O'Dea, Fyffe, & Wagner, 2019). The term disability can vary slightly in its definition. For the purpose of this paper we will use the definition described by Nagi (1991) as the limitation of an individual in carrying out socially defined roles or tasks varying from employment and leisure activities, to self-care activities. Higher disability rates among older individuals relate to compounding morbidities that can occur throughout the lifespan. Regardless of one's level of disability, access to appropriate resources of coping with disability is considered a human rights issue (WHO, 2011). The first general principle of the rights of persons with disabilities is the "respect for inherent dignity, individual autonomy including the right to make one's own choices, and independence of persons"

(United Nations, 2006). In order to honour this right and allow individuals experiencing disability to maintain autonomy, it is essential that they are provided with the proper resources and tools to maintain as much function as possible to cope with the challenges caused by functional limitations.

Age and morbidity related challenges can contribute to the decline of functional ability that may lead to the need for external assistance in completing ones' activities of daily living (ADLs). When an individual is unable to complete these activities independently, they may turn to external assistance. External assistance includes both personal and technological assistance. Activities of daily living, a term first coined by Sidney Katz in 1950, describes the fundamental functions required for an individual to independently care for themselves. These include the abilities to ambulate, feed, dress, perform hygiene activities, toileting and continence (Katz, 1983). When one's functioning declines to a level where they can no longer carry out their ADLs independently, there are two modes of coping with the disablement process, personal assistance and technological assistance (Hoenig, Taylor, & Sloan, 2003). Personal assistance includes any assistance that an individual receives from others, including but not limited to spouses, children, friends, or paid workers (Hoenig, et al., 2003). In contrast, technological assistance is offered by a particular piece of equipment or technology that enables an individual to function well enough to perform an activity independently (Hoenig, et al., 2003).

Technological assistance can be accessed through the use of assistive devices, assistive technologies, and adaptive devices. These pieces of equipment or technology can be prescribed by clinicians, bought commercially, a generic model can be modified, or devices may be custom designed for a specific user. The term assistive device (AD) is described as items used by individuals with functional deficits as alternative ways of performing tasks, actions, and activities (Pressler, & Ferraro, 2010). Assistive technology (AT) is defined as any device or system that is used to maintain or improve an individual's physical functioning (Scott, et al., 2018). The category of assistive technologies includes devices ranging from low-tech to high-tech. Low-tech devices are simple to operate, relatively easy to obtain, and are typically less expensive than high tech devices. Examples of low-tech devices include grab bars, adapted eating utensils or tools, reacher tools, and button hooking tools. They can also include mobility devices such as canes, walkers, and manual wheelchairs. For the purpose of this paper, we will

not be focusing on mobility devices as there has been extensive research in this area and while mobility plays an important role in all self-care activities, these devices are already widely used and studied in the LTC context (Clarke, Chan, Santaguida & Colantoino, 2009). In contrast, high-tech devices are more complex to operate, are typically electrically powered or feature electronic components, they may serve multiple functions that can be defined by the user, are more difficult to obtain, and cost more to build, purchase, and maintain. Examples of high-tech devices include powered wheelchairs, speech devices, monitoring devices, and electronic aides to daily living. While an increasing number of high-tech devices continue to be developed as technology advances, they are typically not as accessible, are often more expensive, and can be complicated to implement, purchase and maintain. Training in their use is often more complex as well. Mid-tech devices fall somewhere in the middle. They may feature electric, or battery operated components and are slightly more mechanically complex than low-tech devices. For the purpose of this paper, I will focus mainly on low and mid-tech devices, as these will likely be more easily, and cost effectively incorporated into long-term care environments. Another reason for focusing on lower-tech devices is that older adults have been shown to be significantly more likely to use low-tech than high-tech devices (Kaye, Yeager, & Reed, 2008).

In 2011, 7.1% of Canadian older adults aged 65 and older lived in a congregate care setting providing special care to older adults (Statistics Canada, 2011). As age increases, the likelihood of utilizing a long-term care facility increases. For instance, among individuals aged 85-94 living in Canada in 2016, 16.3% lived in an LTC or were living in an acute care bed awaiting a spot in an LTC (Gibbard, 2017). Despite many individuals' desire to age at home, LTC will continue to be the major option for those needing higher levels of care as an ongoing basis. Moving to an LTC setting allows for the availability of 24/7 personal assistance provided by staff. While it is often assumed by LTC residents and their families that there will always be care staff readily available to provide assistance whenever needed, this is not always the case. Short staffing and high resident-to-staff ratios can lead to longer wait times for care. The required hours of care per resident, per day varies from province to province due to differing provincial staffing standards. Hours of care per resident per day range from 0.5 to 3.5 depending on the level of care and this includes all supports from medication management and bathing to recreational activities and dining services (Harrington, et al., 2012). As of March 2021,

there are 2076 long-term care homes in Canada (Canadian Institute for Health Information, 2021). This number will likely increase in the coming years as more Baby Boomers enter into advanced ages and require personal assistance in their ADLs. As care staff often have a high number of residents to assist, those with more extensive care needs tend to receive more direct care than those with some level of independent functioning (Mitchell, 2013). Therefore, residents who have less critical need for assistance may be forced to spend more time waiting for self-care assistance. Providing capable and willing residents with the proper ATD may better equip them to carry out some daily activities independently, therefore allowing them to spend less time waiting for personal assistance, while also fostering resident autonomy and independence.

Even when personal assistance is immediately available, dependency on a caregiver can be a negative outcome of receiving personal assistance (Coudin, & Alexopoulos, 2010). It is not uncommon for care staff to rush residents through ADLs in order to have enough time to care for every resident. This can lead residents to depend on the more efficient care of staff, thereby forgoing their own participation in these activities. Learned helplessness may also lead older adults to rely on external help resulting in a loss of autonomy (Abramson et al., 1978). As older adults living in LTC realize that staff can accomplish their ADLs more efficiently, they may give up on attempting to perform these activities independently. Busy staff may also deny residents the opportunity to perform tasks independently based on their remaining abilities, especially if they require more time to do so (Myers & Huddy, 1985). Incorporating self-care assistive technologies and devices (ATDs) can allow willing individuals to complete functional activities independently and at their own pace. ATDs may also improve individual well-being by fostering independence (Agree, 2014). Enabling autonomy through environmental tools and technologies may produce safety risks if the devices are not introduced or used correctly, therefore, it is essential that users are assessed, trained and supported by qualified staff to ensure that the devices provided are appropriate and beneficial.

Use of ATDs has been shown to result in fewer hours of formal care required in long term care facilities (Agree, Freedman, Cornman, Wolf, & Marcotte, 2005; Hoenig, et al., 2003). However, it is important to emphasize that the use of ATDs in long-term care facilities should not eliminate the need or availability of personal assistance from care staff. Rather, the use of ATDs should be introduced for individuals who are capable and

willing to exercise a level of independence with the aid of appropriate ATDs. ATDs can offer benefits to both residents and staff in LTC environments. They may also provide relief for informal caregivers as well. Residents using ATDs report less difficulty with ADLs than individuals relying solely on personal assistance (Agree, & Freedman, 2011). Also, they have been shown to experience slower functional declines (Bateni, & Maki, 2005). Mobility devices have been shown to improve the caregiving experience of informal caregivers as the devices can provide relief from the demands of care (Demers, et al., 2009). By introducing the proper ATDs into LTC environments, the amount of time needed for staff to perform direct care needs can potentially be reduced, which may allow them to spend more time engaging with residents in more meaningful ways that do not solely involve bed-and-body care. Modifying environments with ATDs can assist older adults in maintaining their independence and supporting their agency, while improving their quality of life and increasing self-efficacy, simultaneously decreasing the work burden of staff.

1.1. Purpose of Study

Purpose of Study

This study aims to review and synthesize peer-reviewed literature exploring ATDs in LTC and examine how they are used in these environments for the benefit of residents and staff. Further, individual and organizational barriers will be identified and strategies to facilitate the implementation of ATDs in LTC will be recommended. Much of the literature on ATDs for older adults is related to assistive device use in the home environment placing emphasis on the aging in place movement. Much of the current literature looking at ATDs in LTC focuses on devices used to aid staff in their caregiving duties, rather than supporting resident independence (Noble & Sweeney, 2018). This study will address this gap in the literature by specifically looking at how ATDs can benefit older adults who require the support and safety of an LTC environment, while supporting their autonomy and independence, as much as possible, in their self-care activities.

The use of ATDs in LTC was analyzed through the conceptual lens of Lawton and Nahemow's (1973) Environmental Press Theory which can assist in highlighting how the proper modifications implemented in one's environment can lead to improved

behavioural and affective outcomes (Lawton & Nahemow, 1973). In addition, Cook and Hussey's (1995) and Cook and Miller Polgar's (2008) Human, Activity, Assistive Technology (H-A-AT) model will also be used to clearly outline the approach by which these technologies must be implemented (Cook & Hussey, 1995; Cook & Miller Polgar, 2008). We will also discuss 3 disablement models as, before we can recommend and discuss the use of ATDs, it is essential to have an understanding of how one may reach a point where they are experiencing disability.

This chapter introduces the topic of ATD use in LTC and highlights the benefits of their use in this type of environment. Chapter 2 will describe the methods used in conducting the literature review, including key words, and databases used, and inclusion and exclusion criteria. Chapter 3 will provide an overview of the theories related to the disablement process, the need for ATD through three models that elaborate on the process from an illness to disability (Nagi, 1991; Berbrugge & Jette, 1994; WHO, 2001). I will also examine the impacts and implementation of ATD, specifically using, Lawton and Nahemow's (1973) Environmental Press Theory as well as Cook and Hussey's (1995) Human Activity Assistive Technology (H-A-AT) model (Lawton & Nahemow, 1973; Cook & Hussey, 1995; Cook & Miller Polgar, 2008). These theories, among others, will be used to outline the need for ATDs in LTC and to indicate how to best incorporate these ATDs into the LTC environment. Chapter 4 will use descriptive and evidence-based literature to provide a narrative synthesis to examine the appropriateness of the use of ATD in LTC. Chapter 5 will discuss the findings of the review, outline the future research directions proposed in the literature reviewed, address gaps in the literature, make recommendations to address these gaps, and offer concluding statements.

The literature review is guided by three research questions:

1. What are the types of assistive devices and technologies available for use in long-term care environments and how can they be used?
2. What is the impact of these assistive devices and technologies in improving safety, autonomy, and independence for residents in long-term care?
3. What are the organizational and individual barriers and facilitators to incorporate ATDs into long-term care environments?

Chapter 2.

Methodology

The present chapter will outline the methods used in gathering literature for the narrative synthesis. First, the search strategy and processes will be discussed. Next, inclusion and exclusion criteria will be noted. Then, a description of the types of peer reviewed sources will be outlined. Finally, the narrative synthesis methodology and process will be described.

2.1. Search Strategy

A literature review was conducted focused on the selected topic and guided by the research questions. Using a narrative synthesis methodology, I provide an overview of the state of research around ATDs in LTC and investigate the implementation, utilization, and benefit of these devices in institutional settings. Through a review of the relevant theories and conceptual frameworks, empirical literature, and an analysis of current gaps in literature, this project aims to provide a well-rounded scope of assistive device use for self-care in a long-term care setting, the barriers and facilitators to its utilization, and the benefits it may lead to for staff and residents.

Guided by the research questions mentioned in Chapter One, relevant empirical studies were identified by conducting a broad-scoped search of multiple databases including, AgeLine, MEDLINE, PsycInfo, and CINAHL. Utilizing Google Scholar, and the Simon Fraser University Library catalogue to source articles. All peer reviewed articles published before May 2022 were eligible for inclusion. Two separate searches of these databases were done using varying key word combinations. The first search utilized the key words “assistive devices OR assistive technology OR aid OR helping tool or adaptive devices” AND “long-term care OR nursing home OR residential care” AND “self-care OR self-care OR self-management OR self-management”. This search yielded 156 results. The second search of the same databases utilized the key words “assistive devices OR aid OR helping tool or adaptive devices OR assistive technology” AND “home health care OR home care OR home nursing” AND “self-care OR self-care OR self-management OR self-management”. This search yielded 261 results. The term “self-

care” was used rather than “activities of daily living” in order to pinpoint the participation of the individual in the activity.

Due to overlapping definitions of assistive devices, and assistive technologies, both terms were included, however, studies that looked at low tech devices, used by the user not on the user, were included. While the focus of the study is on the use of devices in long-term care facilities, due to the limited number of studies in this setting, literature that examined assistive device use of older adults in the community was also examined, while considering that the experience in LTC and in the community differs in many aspects. This will be addressed further in the discussion.

2.2. Inclusion and Exclusion Criteria

The guiding research questions listed in the introduction framed the scope of the review. Titles and abstracts were screened to identify relevant articles. Reference lists of relevant articles were also reviewed for potential resources. The inclusion criteria for studies selected in this review are: (1) items published in English, (2) articles had to include the use of low or mid-tech assistive devices utilized by an older adult resident in long term care, (3) literature that mentioned caregiver implementation of ATD. If home-based studies were generalizable enough to an LTC population, they were included. Sources were excluded if they were not in English language, if they could not be found via the Simon Fraser University Library, and/or interlibrary loan, if they were not related to self-care activities, and if they did not explicitly mention the terminologies: assistive device, or assistive technology. Articles were found generalizable if they examined older adults (aged 65+) utilizing ATDs to aid in their self-care activities.

A total of 34 articles were reviewed for this narrative synthesis. Of these publications, the majority (n=21) used a quantitative design, five were qualitative, two were mixed methods, and six were literature reviews. Most publications were authored in the United States (n=18), Canada (n=5), Belgium (n=4), and Luxembourg (n=1), Sweden (n=1), Finland (n=1), Norway (n=1), Spain (n=1), Denmark (n=1) and China (n=1). Just 3 of the publications took place in an LTC setting, with most looking at ATD use in the community emphasizing the need for future research looking at ATDs in LTC.

The flow chart below outlines the identification, and elimination process of the literature search.

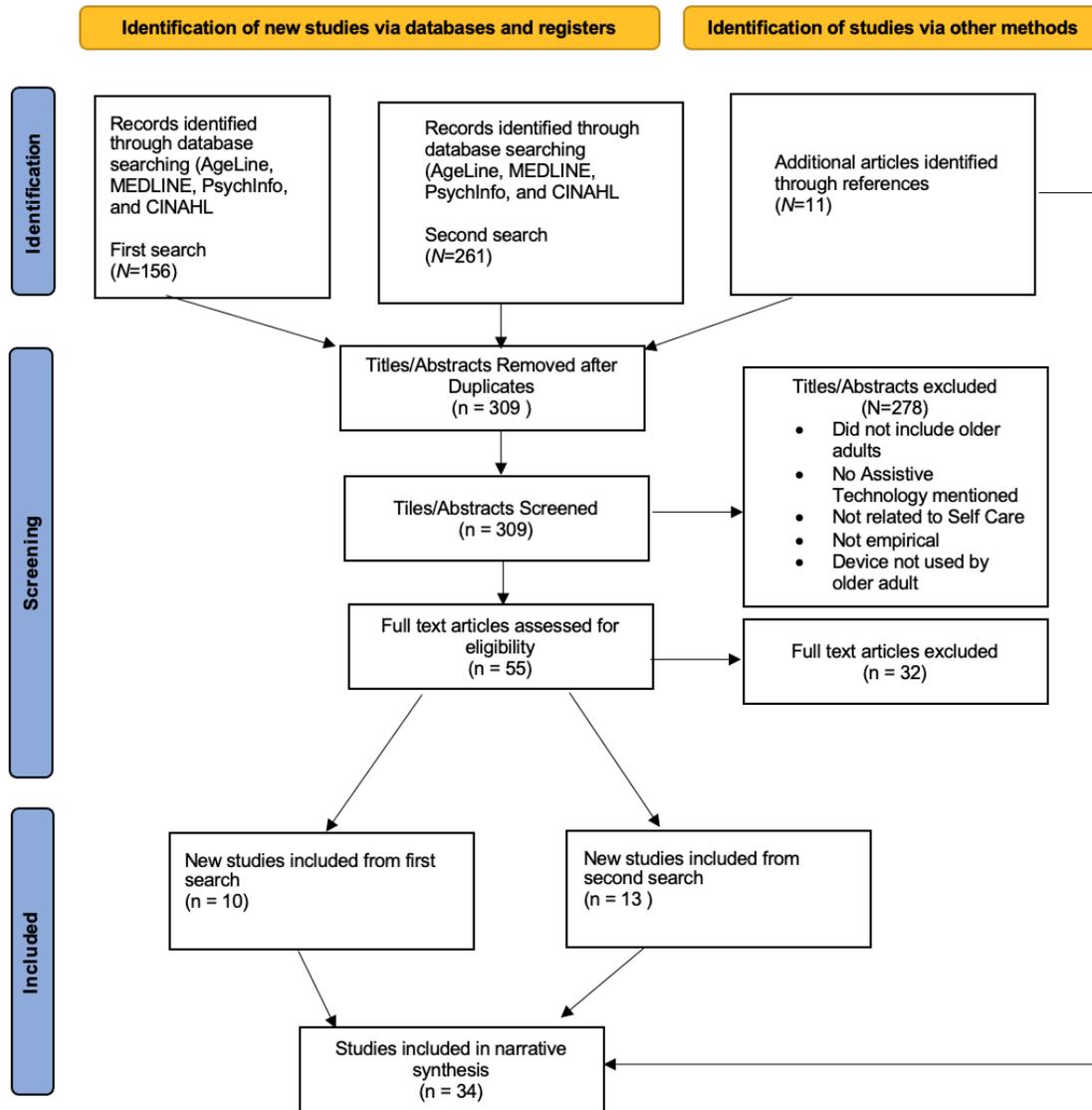


Figure 1. Literature Search PRISMA Flow Chart

2.3. Data Extraction

Data was extracted with a standardised form developed for this review. Extracted data included author(s), title of article, date of publication, country of study, study aim/research questions, sample demographics, methodology, measures, key findings, and limitations. Key articles were compiled in an annotated summary table for ease of data collection, and analysis. Qualitative, quantitative, mixed method, and systematic review articles were included in the summary table. Empirical articles refer to sources that, through qualitative or quantitative methodology, are evidence based. Non-empirical articles included may be theoretical/conceptual, books, or grey literature. An example of the summary of findings table is illustrated below.

Table 1. Annotated Summary Review Table Example

Authors, Year, & Location	List of authors of the study in APA format and study location
Article Title	The title of the study
Focus of Study	Highlights the study objective
Study Design/Type of Analysis	Details the research design, and methodology
Method	Provides sample information
Key Findings	Summarizes main results, and highlights important points of the study relevant to the topic
Study Limitations	Lists any shortcomings in the research, and findings as well as areas that the study could have been improved upon

This method was utilized for effective management of data. The research questions and inclusion and exclusion criteria guided the search and narrowed down the relevant data. The annotated summary table displays included articles for the reader to understand its importance and applicability in the overall findings and discussion.

2.4. Data Analysis and Synthesis

As a majority of the studies were based on either qualitative or mixed-method research methods, data were analysed through a narrative synthesis utilizing thematic analysis (Popay et al., 2006). A narrative synthesis is a text-based approach to systematically review and synthesize findings (Popay et al., 2006). While narrative syntheses may include findings from both qualitative, and quantitative studies (Barnett-Page & Thomas, 2009). Typically, they present a summary of findings from a review of qualitative studies (Popay, et al., 2006). In the case of this paper, mixed-methods, qualitative, quantitative, and systematic reviews were analysed. Popay et al. (2006) notes that the defining characteristic of a narrative synthesis is that a textual approach is utilized to tell the story of the findings in the included studies. It produces a summary of the present state of knowledge in relation to a specific question (Popay, et al., 2006). Popay and colleagues (2006) highlight four main features of the narrative synthesis: developing a theory about why an intervention works, providing a primary synthesis of findings of included literature, exploring relationships within the data, and assessing the vigour of the synthesis (Popay, et. al., 2006).

Methodological rigour is evaluated in narrative syntheses. Due to the fact that studies in the area of the topic of this narrative synthesis were limited, I chose to not exclude any studies based on their methodological quality. However, if any studies had been identified as inadequate they would have been excluded from the analysis. Study limitations are discussed in the annotated summary table. From the included studies, codes were first extracted from the data and were categorized into themes related to the use of ATD use and implications. Microsoft Word and NVivo 12 were utilized to organize the data.. Synthesis involved aggregating and integrating findings from multiple studies into broader, more robust themes.

Chapter 3.

Theoretical Approaches

This chapter will outline relevant theoretical approaches that shed light on the process of the disablement experience, how this impacts the individual's ability to function, and how the discrepancy between the individual and environmental demands can be addressed and remedied.

3.1. Disability Models

Before discussing ways by which older adults may use ATDs cope with their functional deficits, it is essential to understand the reasoning that may lead older adults to require assistance in their self-care. Regarding disability, especially in late life, it is important to note that many individuals experience chronic, or acute conditions, in conjunction with common age-related changes, all of which can compound to impact their level of functioning. Physiological impairments, environmental stresses, and social factors interact to result in an impact on an individual's ability to adequately function in their environment (Agree, 1999). The definition of disability has evolved greatly over the past decades. Presently, the World Health Organization recognizes disability as an umbrella term for impairments, activity limitations, and restrictions in participation regarding the negative aspects of the interaction between an individual with a health condition and the contextual factors, both environmental and personal, that surround them (WHO, 2011). Many models of the progression to disablement have been created to describe the impacts of disease and injury on individuals' ability to function. Over time, these ideas of disability have shifted from a pathology-centered approach, focused on treating the disease or injury, toward a more patient-centered focus analyzing how the disease or injury impacts the individual's life.

3.1.1. Nagi Scheme (1991)

One of the most well-known conceptual models of the disablement process is the Nagi Scheme created for the Institute of Medicine (Nagi, 1991). This model describes four steps along the way as a pathology leads to an individual's disablement. The first

concept outlined in Nagi's Scheme (1991) is active pathology which is described as the body's attempt to regain equilibrium after an infection, trauma, degenerative disease process, or other illness (Nagi, 1991). Pathologies are changes on a cellular, or tissue level and may be acute or chronic. Nagi states that pathologies result in an interruption to an individual's normal processes (Nagi, 1991). For instance, a pathology common in older adults is osteoarthritis in which the cartilage between joint bones wears down over time (Anderson & Loeser, 2010). These pathologies may lead an individual to function differently as the body reacts to the deficits resulting from the physiological changes. As a result of a particular pathology, impairment may follow (Nagi, 1991).

Impairment is described by Nagi as an abnormality, deficit, or loss of physiological, psychological, anatomical, or emotional nature (Nagi, 1991). Impairments may remain even after the active pathology has been controlled or cured, and they may vary in terms of severity (Nagi, 1991). Nagi (1991) also emphasizes that factors such as the level of visibility, social stigma, predictability of the pathology's course, severity of limitations imposed, and the point in the lifecycle that the pathology arises can all impact the degree of impairment.

The third step in Nagi's (1991) model is functional limitations. This cannot be separated from impairment as they are interrelated, however, where they differ is that functional limitations describe the level at which the limitations are exhibited meaning that the functional limitation dictates what activities an individual can and cannot complete without external support. Functional limitations are the means by which impairments may cause disability and are measured in terms of performance on a particular activity.

Lastly, disability is defined by Nagi (1991) as the limitation of an individual in carrying out socially defined tasks or roles ranging from employment duties, to self-care activities. Individuals with identical functional limitations may experience disability in different manners depending on their socially defined roles and the supports that are available to them. Further, an individual's reactions to, or understanding of the circumstances surrounding their impairment can impact their level of disability. This is also true for the opinions of others, especially those who have a significant relationship to the individual, and the way that the social environment is constructed. For instance, an individual requiring adapted devices for eating may have a more difficult time eating

at a restaurant where these tools are unavailable than they would at home with the proper equipment, therefore, they have differed levels of disability depending on the environment that they are in and the resources accessible to them. In the context of institutional settings, an older adult may desire to complete a task such as getting dressed independently, but if caregivers are not aware of, or supportive of this goal, they may receive more personal assistance than is ideal.

Nagi's Scheme (1991) provides a foundational view of how an individual may arrive at a place where they experience difficulties completing ADLs. It is important to note that, while it is not explicitly outlined in this particular model of disability, many individuals experiencing disability have both internal and external factors playing into how their disability is realized and coped with.

3.1.2. Disablement Process Model (1994)

Verbrugge and Jette's (1994) disablement process model is one of the most widely used models to describe the progression from pathology to disability. This model is particularly notable in the context of this paper as it was developed through a gerontological lens. The Disablement Process model (1994) sets itself apart as it covers all that is mentioned in the Nagi Scheme (1991), but places much of its focus on internal and external factors that can speed up or slow down the movement from pathology to disability (Verbrugge & Jette, 1994).

Verbrugge and Jette (1994) state that the term "disablement" relates to the impacts of acute and chronic conditions on the function of particular body systems, thus impacting one's abilities to act in typical, necessary, predictable, and personally preferred ways in society (Verbrugge & Jette, 1994). They describe disablement as a process which is dynamic and changing its functional consequences over time and variable in direction, pace, and pattern of development (Verbrugge & Jette, 1994).

In their disablement process model Verbrugge and Jette (1994) explain the progression from pathology to disability as "the main pathway" which is similar to the four components of the Nagi Scheme (1991). However, where they differ is in Verbrugge and Jette's addition of factors impacting the progression of this pathway.

Firstly, they indicate that certain “risk factors”, or “predisposing characteristics” such as demographical, societal, lifestyle, behavioural, environmental, psychological and biological factors that can greatly impact how the process of disability is coped with by the individual and those around them (Verbrugge & Jette, 1994). The authors also describe “extra-individual factors” that can impact the progression along the main pathway. The first factor mentioned is “medical care and rehabilitation” which includes surgery, physical and speech therapies, counselling, health education and other interventions that may be implemented in attempt a regain function (Verbrugge & Jette, 1994). “Medications and other therapeutic regimens” described as drugs, recreational therapy, meditation, rest, and other means to counteract the symptoms of a pathology (Verbrugge & Jette, 1994). “External supports” such as personal assistance, specially designed equipment and devices, respite care, or any other form of external assistance are also extra-individual factors that can impact an individual’s level of difficulty with certain activities (Verbrugge & Jette, 1994). Lastly, “built, physical, and social environmental factors” such as structural modifications, access to transportation and buildings, health insurance, access to the proper medical care, and laws and regulations all impact disablement process (Verbrugge & Jette, 1994).

There are also “intra-individual factors” that come into play such as lifestyle and behaviour changes that are calculated and done with the goal to alter disease activity and impact (Verbrugge & Jette, 1994). Also, “psychosocial attributes and coping measures” like a positive mindset, peer support, prayer, and locus of control among others (Verbrugge & Jette, 1994). Finally, activity accommodations can be put in place by individuals including changes in types of activities, procedures of completing activities, and the length of time doing activities or the frequency of those activities (Verbrugge & Jette, 1994). This model is useful in seeing the bigger picture of the process of disablement when recommending ATDs to empower older adults living in LTC to pursue independence as it considers barriers and facilitators of independent functioning.

Verbrugge and Jette (1994) also mention the differences between lifelong and late-life disablement. They compare the processes of a gradual progression into disablement where older adults have the choice of which supports to adopt and when versus when an individual’s ability to function is suddenly negatively impacted to an extreme amount making the adjustment considerably more difficult. For instance, an

individual experiencing the slow progression of a degenerative disease, such as arthritis, may be able to introduce supports over time as they are needed. However, an individual that has experienced a stroke, but was previously independent, may have a more difficult time rehabilitating, and adjusting to the sudden need for external supports. It is important to also view this while not forgetting that intrinsic and extrinsic factors will impact how an individual views and copes with their disability.

Another key point made by Verbrugge & Jette (1994) is the distinction between intrinsic and actual disability. Personal and technological assistance are common coping methods used by individuals with disabilities to reduce the impact of functional limitations. The distinction between intrinsic and actual disability is that intrinsic ability is the difficulty doing an activity without personal or technological assistance while actual disability is the difficulty while using personal or technological assistance (Verbrugge & Jette, 1994). This is also described by Agree (1999) as underlying disability, which is the amount of disability experienced without the use of modifications or adjustments, and residual disability, the degree of disablement left despite the use of personal and technological assistance (Agree, 1999). In this paper we will be looking at how the residual disability after using personal assistance may be able to be further decreased by incorporating technological assistance.

3.1.3. International Classification of Functioning, Disability, and Health (2001)

Following the Nagi Scheme (1991) and the Disablement Process model (1994) the World Health Organization developed the International Classification of Functioning, Disability, and Health (ICF) (2001). This framework incorporates the patient-centered movement by expanding on how contextual factors, both personal, and environmental, affect individuals' activity. The ICF model (2001) refers to functioning as all functions, activities, and participations and disability as an all-encompassing term for activity limitations, impairments, and participation limitations (WHO, 2001). This tool was developed to be used on an individual level to assess and evaluate functioning, on an institutional level to provide the best service with optimal outcomes at the most ideal cost, and on a social level to address impaired individuals' needs on a macro level. The key concepts in the ICF (2001) are more social in nature, as is the Nagi (1991) Scheme. Where they differ is in the ICF's (2001) emphasis that disability and function are seen as

outcomes of interactions between the individuals' health conditions and contextual factors including extrinsic and intrinsic influence. Notably, this model includes strategies suggesting interventions to improve an individual's ability to engage in an activity (positive impacts) and what remains limited (negative impacts). The term "disability" is excluded from the model completely. Instead, it focuses on how a health condition can impact an individual's body structures and functions (impairment), activity (and the limitations of activity), and participation (restrictions) (WHO, 2001). Simultaneously, how contextual factors, both environmental and personal can impact an individual's impairments, activity, and participation (WHO, 2001).

3.2. Built Environment and its Role in Functioning

For residents with functional deficits living in LTC environments, the environments do not always facilitate independence. The need for ATDs is rooted in the necessity for individuals with functional decline to function in a physical environment that is unsupportive. Much of the research in this area have been influenced by the work of Lewin (1933) on environmental press theory. Lawton and Nahemow's (1973) and Lawton's (1977 & 1985) work began to look at how older adults can function in their physical environments. Lawton & Nahemow's (1973) Ecological Theory of Aging analyzes stress and competence where adaptive functioning in a particular environment depends on the interactions between social, and environmental stimuli, and an individual's competence in meeting these demands. Environmental press can range from weak to strong, with weak being not enough stimuli to challenge an individual, and strong, indicating factors that are too challenging for an individual to cope without assistance. Competence ranges from low to high, with low being severe difficulty with physical, and/or cognitive functioning and impaired perceptual abilities.

The premise of Lawton and Nahemow's (1973) model is that there is an ideal range, or adaptive level, for each individual where they will function optimally and experience positive affect as well as exhibit adaptive behaviour. Within this area is a zone of maximum comfort, where an individual can function with lower press, affording them a high quality of life. In contrast, there is also a zone of maximum performance potential where an individual can function with slightly higher press, which can improve performance. However, where competence is too low and press is too high, the interaction will likely lead to negative affect and maladaptive behaviour.

For instance, if an older person struggles to feed themselves with normal utensils due to a tremor, they may start eating less, and losing weight, or depend on personal assistance to eat. Modified utensils would change the environmental press, leading to the individuals' improved eating, despite their actual disability. Further, when environmental press is low and competence high, individuals will also experience negative affect, and maladaptive behaviour. For instance, if an individual experiencing the beginning stages of sarcopenia, and is still able to walk, but is encouraged to use a wheelchair to prevent falls, this could lead to further loss of muscle mass and strength, further contributing to impairment. As this model relates to older adults in LTC, a well-designed supportive physical environment including incorporation of ATDs can compensate for the low competence of the individual and foster the individual to carry out daily activities with less dependence on others. It is essential to find the ideal fit to ensure a person is challenged enough to not lead to functional declines, but not so much as to severely limit their abilities. With the introduction of ATDs as part of the environment, a resident in LTC can equip themselves to function better. By decreasing the environmental press that will compensate for the lowered competence of the person, despite diverse needs and impairments, they would likely be able to reach the adaptive behavioural level.

Chaudhury and Oswald (2019) take the model a step further by incorporating individual characteristics, the social factors, the physical environment, and technological systems and exploring the outcomes of the individuals' identity and autonomy (Chaudhury & Oswald, 2019). Further emphasizing that an individual's exchange with their environment is dynamic and influenced by complex individual, interpersonal, and societal components. This will be further explored in the next section related to ATD implementation and the associated factors.

3.3. Implementation of Assistive Devices and Technologies

To effectively implement ATDs for individuals in any setting, it is important to have a thorough understanding of the needs, desires, goals, and factors that impact the user. Cook and Hussey's (1995) and Cook and Miller Polgar's (2008) Human Activity Assistive Technology (H-A-AT) models are important resources for the practical implementation of ADTs. For this paper we will be utilizing Cook and Miller Polgar's (2008) version of the H-A-AT as it is the most recent version and is most

comprehensive. The H-A-AT Model (2008) proposes a framework for understanding the place of ATDs in the lives of individuals living with disabilities. The H-A-AT Model (2008) contains four main components all including factors to consider when prescribing ATDs to individuals.

The first component of the model is the Human. In the context of this model, the Human is the individual operating the assistive technology “system”, this could be an individual utilizing a piece of equipment for caregiving purposes, such as a Hoyer lift, or an individual using a piece of equipment for their own function such as a piece of mobility equipment. For the purpose of this study, the “human” being considered is the older adult utilizing the ATD. In the Human category, there are four main components to consider. First, the physical abilities of the ATD user. This includes their strength, coordination, range of motion, balance, among other physical properties. The second component of the human to consider is the individual’s cognitive abilities. Including their attention, judgement, problem-solving abilities, concentration, and alertness. The next aspect of the human is their effective/emotional abilities which includes their motivations, value of the activity, and their own internal opinions of themselves, and the use of the device. The fourth component of the human to consider is whether they are a novice or expert in the use of ATDs, whether they have used ATDs before, and what kinds, and how long they have experienced disability. When considering the “human” it is essential to accurately match the ATD user’s needs, abilities, and demands of the technology to ensure effective use.

The second category of the H-A-AT model is the Activity. This pinpoints what the device will be used for, and in what areas of the user’s life will it have impact. Cook & Miller Polgar (2008) identify 3 performance areas. The first is “Activities of Daily Living” which encompasses all aspects of self-care. This will be the area that we are focusing on in this paper. These Activities of Daily Living include dressing, hygiene, bathing, eating, personal care, communication, health maintenance, socialization, and mobility, among others. Essentially, everything that one would do to take care of themselves to maintain quality of life. The next performance area is “Productive Activities” which includes home management activities, educational activities, vocational activities, and care of others. The final performance area is “Leisure Activities” which includes activities related to self-expression, enjoyment, recreation, or relaxation.

The third component of the H-A-AT model (2008) is Assistive Technology. When considering which assistive technology to recommend there are four factors to consider. The human-technology interface describes how the human interacts with the technology. This could include postural support devices, control, or switch interfaces, or displays. This is more applicable in high-tech devices. Activity outputs describe the function of the device. This can be for: communication, such as voice synthesis, visual displays, or print; manipulation of objects such as a modified spoon; ambulation; or performing cognitive activities with ATDs such as memory aids, sensors, or software. Finally, the environmental interface is the link between the device and the external world that takes in information from the outside world, such as sound and light, and makes it useable to the user. The Assistive Technology component of the model essentially describes the function and purpose of the device.

Lastly, the interaction of each component of the H-A-AT model all exist in the four Contexts. The first being the Physical Context which describes attributes that enable or hinder the performance of activities, and how the device interacts with the environment. Social Context describes the individuals that interact with the AT user. This can be either positive in that they support the use of the device, or negative if there are stigmas associated with the devices, or if caregivers do not enable the use of devices. At times, attitudes of others may be more of a barrier to AT use than the physical environment. It is important to acknowledge stigmas associated with the use of ATDs. The Cultural Context can be an enabling or discouraging factor for the use of ATDs. Cultural lenses influence the way individuals view various activities, tasks, and life-roles. Lastly Institutional Contexts play a substantial role in implementing ATDs as larger organizations within society are responsible for policies and procedures that can greatly impact the ability for individuals to obtain and effectively utilize ATDs. In the case of LTC, the facility as a whole, along with all caregivers need to be supportive of the use of these devices and empower users to effectively utilize the technologies available to them to the extent that they choose.

It is important to consider each of these aspects of the H-A-AT model when recommending ATDs to individuals. Ensuring a comprehensive assessment of the person's physical functioning needs, cognitive status, psychological attitudes, and emotions associated with activities is essential in providing the user with a device that can effectively address their functional deficits and provide them with the appropriate

support. Further, contextual barriers and facilitators must be recognized and addressed to ensure effective implementation. In the context of LTC, as caregivers play such a significant role in the day-to-day lives of the ATD users, it is imperative to involve them in the implementation of the device to ensure that they encourage and support the older adult user in their self-care activities.

Chapter 4.

Results

This chapter will present the themes and constituting subthemes identified from the review of the articles included in this narrative synthesis. An analysis of the identified publications exhibited several factors that influence the use of ATDs, their benefits and challenges, and barriers and facilitators of the utilization of ATDs in LTC. Despite the need for assistance in LTC environments, there are limited studies focusing on the use of ATDs in LTC environments. Much of the literature available focused on ATDs and their contribution to supporting individuals' aging in place in the home. However, in terms of enabling individuals living in LTC facilities to engage in their own self-care the literature is lacking. The discrepancies and differences are indicated in the results section of each theme.

Five major themes were identified from the literature review which were further broken down into 19 subthemes, under the appropriate theme. The themes were: a) Types of Assistive Devices Used in Self Care, b) Benefits of Assistive Devices, c) Substitution of Care for Assistive Devices, d) Barriers to Incorporating Assistive Devices In Long Term Care Environments, and e) Facilitators to Incorporating Assistive Devices In Long Term Care Environments. In LTC environments, residents, and their care providers are inherently interconnected, therefore the themes are divided into subthemes that relate specifically to staff/care providers, or specifically to residents. Several subthemes gathered from the literature overlap and can be discussed within multiple themes. Therefore, a decision was made to discuss these subtopics within the most closely aligned general theme. Table 2. illustrates the identified themes and related subthemes.

Table 2. Summary of Themes and Corresponding Subthemes

Themes	Description	Subthemes
Types of Assistive Devices Used in Self Care	The types of self-care assistive devices used for various activities of daily living are broken down	<ul style="list-style-type: none"> • Dressing • Feeding • Bathing • Toileting • Transferring
Benefits of Assistive Devices	Describes the benefits of assistive devices for both residents and staff	<ul style="list-style-type: none"> • Benefits to Residents • Benefits to staff
Substitution of Care for Assistive Devices	Examines how ATD use can replace, or supplement the use of personal assistance	
Barriers to incorporating Assistive Devices in Long Term Care Environments	Details the barriers to implementation of ATDs in LTC on individual and institutional levels	<ul style="list-style-type: none"> • Individual Attitudes Toward ATDs • High Levels of Disability • Cost of ATDs • Inadequate Access • Inadequate ATDs • Learned Helplessness • Limited Resources • Staff Attitudes Toward ATDs
Facilitators to incorporating Assistive Devices in Long Term Care Environments	Details the facilitators for implementation of ATDs in LTC on individual and institutional levels	<ul style="list-style-type: none"> • Situation of Need • Individual Acceptance of ATDs • Collaboration Between Staff and Residents in ATD Implementation • Educated Staff

4.1. Theme 1: Types of Assistive Devices used in Self Care

As previously discussed in the introduction section, this narrative synthesis focuses on devices that enable residents to participate in their self-care. Specifically in line with the Katz Index of Independence in Activities of Daily Living (1970), the literature examined various devices for bathing (Abrilahij & Boll, 2018; Guay, Gagnon, Ruest, & Bourget, 2016; Verbrugge & Sevak, 2002; Agree & Freedman, 2000; Anderson & Wiener, 2015; Gill, Han, & Allore, 2007), dressing (Agree & Freedman, 2000; Verbrugge & Sevak, 2002; Abrilahij & Boll, 2018), toileting (Agree & Freedman, 2000; Cohen-Mansfield & Biddison., 2005), transferring (De-Rosende-Celeiro, et al., 2019; Anderson & Wiener, 2015; Verbrugge & Sevak, 2002), and feeding (Porter, Franklin, Pieninck, Springer, & Holm, 2001; McGrath & Astell, 2016; Verbrugge & Sevak, 2002). Continence was the only one of Katz's (1970) ADLs that was not examined in the present review as the only treatments for incontinence are medical, or surgical. The use of ATDs varies significantly and is dependent on the task, or severity of disability.

4.1.1. Bathing

Bathing is an important area to examine in the incorporation of ATDs in LTC environments. Bathing can be a dangerous task and the risk of falls can be high without the proper supports, either through personal or technological assistance. Considering the danger of risk during bathing activities, it can be expected that individuals may lean more toward personal assistance, rather than technological assistance in bathing care. Verbrugge and Sevak (2002) found that in their sample of community dwelling older adults, a majority of those using assistance for bathing used personal assistance (55%) and those that used equipment only (22.2%), and personal and technological assistance (22.4%) did not differ much (Verbrugge & Sevak, 2002). Agree & Freedman (2000) found that the proportion of the participants in their study using any personal care is comparable to individuals who use no ATDs and those who use simple ATDs. They found that of the sample that reported difficulty in bathing, about half report using a bath seat or a rail (Agree & Freedman, 2000). Abrilahij and Boll (2018) reference a study from Sonn and Grimby (1994) in which they found for 21% of the sample that bathing or showering ATDs contributed to an increased level of independence in bathing. Therefore, while personal assistance can be beneficial during bathing tasks, ATDs are

also useful, and may be used to support individual autonomy, while receiving personal assistance.

Proper assessment is essential when determining the ideal supports in bathing. Guay and colleagues (2016) examined the interrater reliability of an assessment tool used by non-occupational therapist care staff in recommending ATDs for use in the bathrooms of community-dwelling older adults. Participants recommended ATDs such as bath seats, and non-slip mats, among other items to support with bathing (Guay, et al., 2016). This assessment tool considered older adults' preferences in bathing (Guay, et al., 2016). For instance, if they felt safer sitting down, seats and tools introduced would be conducive to this preference. This reiterates the importance of including the user in the process of device selection. In Abrilahij and Boll's (2018) systematic review, all of the ATDs they examined were low tech such as a bathtub or shower chair, tub stool, grab bars, hand-held shower head, rubber mat, and bath rail (Abrilahij & Boll, 2018). Other devices included long-handled brushes or sponges (Gill, et al., 2007). Anderson and Wiener's (2015) study found that self-reported use of ATDs in bathing was significantly linked to lower total hours of personal assistance. However, bathing ATDs were not significantly related to formal care hours per week, therefore concluding that the reduction in care hours is not reflected in formal care (Anderson & Wiener, 2015). In contrast, Gill and colleagues (2007) found that the use of aids for bathing, with the exception of non-skid mats, or abrasive strips, did not predict further bathing disability. It is important to note that it is expected that community-dwelling older adults will very likely have higher functional abilities than individuals residing in LTC residences, therefore, these results cannot be directly applied for LTC environments.

4.1.2. Dressing

The ability to dress oneself is an important ADL, not only in supporting privacy, but also for autonomy and self-expression. In their study looking at community-dwelling older adults, Agree and Freedman (2000) examined the use of devices for dressing such as adapted clothing, specialized fasteners, cord, or zipper pulls, and orthopaedic shoes. They found that less than 10 percent of participants used equipment to aid with dressing (Agree & Freedman, 2000). They also found that the proportion of participants using personal care is similar for individuals who use simple ATDs, or do not use any equipment at all (Agree & Freedman, 2000). Compared to individuals using no ATD,

those using simple devices are less likely to use informal care, and more likely to use formal care (Agree & Freedman, 2000). This may be due to the fact that individuals that use ATDs for dressing experience greater disablement and need more support. However, the findings indicate that regarding basic care activities, simple devices have the potential to substitute for informal care, and supplement formal care (Agree & Freedman, 2000). Therefore, in an LTC setting, individuals who are able, and willing should be provided access to devices that can support their independence in dressing whether technological assistance be a replacement, or complementary to personal assistance. In their study examining the type, use, and efficacy of ATDs utilized by community-dwelling older adults, Verbrugge and Sevak (2002) found that for dressing, 98 percent of participants used either personal assistance by itself, or in combination with ATDs. A significant majority of those using assistance for dressing used personal assistance (94%) with only 2 percent using equipment only, and 4 percent using both personal and technological assistance (Verbrugge & Sevak, 2002).

Verbrugge and Sevak (2002) noticed that personal assistance alone, or in tandem with technological assistance, dominated for tasks related to upper or lower extremity focused tasks. As dressing is dominated by upper extremity strength or ability, it explains the need for assistance to compensate. In their systematic review, Abrilahij and Boll (2018) note that while devices such as hand reachers, stocking aids, and shoehorns can aid in the physical component of dressing (i.e. putting on/taking off clothing and foot ware), they cannot assist with the more cognitive, or social aspects of dressing such as “choosing appropriate clothing”, or “following implicit or explicit dress codes and conventions of the society or culture” or “appropriate dressing with climactic conditions” (Abrilahij and Boll, 2018, p. 290). In sum, depending on the severity and nature of an individual’s disability, ATD alone may not eliminate the need for personal assistance. However, it can relieve caregivers of some burden, while fostering independence and autonomy for the user.

4.1.3. Toileting

Toileting is another important area to look at when introducing ATDs in LTC environments to foster independence. The use of ATDs in toileting can contribute to factors of privacy, autonomy, and dignity. In their sample of community-dwelling older adults, Agree and Freedman (2000) found that over 60% who have difficulty toileting,

report using one or more types of ATD. This finding raises the possibility that tasks for which privacy is a paramount concern may be most conducive to substitution. Agree and Freedman (2000) found that during toileting activities, simple devices such as canes, walkers, or railings appear to be potential substitutes for personal care. In their study looking at the application of wash-and-dry toilets in nursing home environments, Cohen-Mansfield and Biddison (2005) note that toileting care in care environments can be complex, as the task of toileting is influenced by not only incontinence, but also mobility, dexterity, and cognition. Cohen-Mansfield and Biddison reference a study done by Yu, Johnson, Kaltreider, Hu, Brannon & Ory (1991) in which they found that just 50% of nursing staff report feeling comfortable working with patients with urinary incontinence, and 63% felt frustrated by the task (Yu, et al., 1991). Cohen-Mansfield and Biddison (2005) found that the wash-and-dry toilets provided some relief in physical or mental stress of residents or staff. Yet, as the device was not as thorough as personal assistance in cleaning of the resident after using the toilet, nursing staff was still required to participate to ensure that the job was finished. Therefore, privacy was not often increased as it was still necessary for nursing staff to be in the bathroom to assist with transferring or operating the toilet (Cohen-Mansfield & Biddison., 2005). Depending on level of impairment, in some cases, the residual disability from using the wash-and-dry toilet may be resolved with the introduction of further assistive devices such as long-reach wiping handles, or toilet safety rails. In contrast, Agree and Freedman (2000) found that in their sample of community-dwelling older adults, individuals with difficulty toileting utilizing simple ATDs are consistently less-likely to require personal care regardless of type of care and level of disability. Again, it is important to note that it can be assumed that a majority of older adults living in LTC require more care than those living in the community.

4.1.4. Transferring

Enabling transferring is an important part of completing any task independently. In order to toilet, or bathe, or feed oneself, they must be able to get to the area in which they will complete this task. While the current study focuses more on self-care specific activities rather than mobility, it is important to be able to get around in order to complete one's ADLs. Of their sample of community-dwelling older adults in Spain, De-Rosende-Celeiro and colleagues (2019) found a significant association between the use of ATDs

and independent performance in shower and bath transfer. They noted five personal factors that were significantly associated with functional independence in shower and bath transfer: cognition status, sensory function, lower limb mobility, stroke, and recent (in the last two years) rehabilitative intervention (De-Rosende-Celeiro, et al., 2019). They also found that there was no significant association between categories of ATDs used in toilet transfer, and independent performance of toileting (De-Rosende-Celeiro, et al., 2019). Anderson & Wiener (2015) found that in their sample of community-dwelling older adults, ATDs for bed transfer, resulted in about 8 hours of decreased care per week. Anderson and Wiener (2015) also found that ATDs for bed transfers were associated with higher formal care hours in their sample, however, they noted that this may be confounded by higher functional impairment. Therefore, in some cases, transferring equipment can be seen as a supplement to, not a replacement of personal assistance. Verbrugge and Sevak (2002) found that among their sample of assistance users, personal assistance only was used to transfer for about 65% of the sample with both those using only ADT and those using ATD and personal assistance being used by 17% of participants. Transferring is an important component in almost all of the other ADLs, therefore, it is essential to enable independent transferring wherever possible.

4.1.5. Feeding

Feeding may be one of the most important of the ADLs. Without the ability to feed oneself their survival depends completely on external personal assistance. Therefore, enabling independence in feeding can greatly impact individual's health. There are many environmental modifications that can be made to enable residents to feed themselves independently. Even simple items such as using a coloured plate for eating can help individuals with vision loss maintain independence in feeding (McGrath, & Astell, 2016).

In their study looking at feeding interventions in LTC environments, Porter et al. (2001) reference Shinnar's (1983) study that found that LTC residents improved upon or became completely independent in self-feeding with the introduction of ATDs for residents, the introduction of mealtime volunteers, and education of nursing staff. Shinnar (1983) also emphasized the impact of ATDs on cost of care as when residents became able to feed themselves independently, it freed up nursing staff to do work in other capacities rather than spending their time feeding residents. Porter, et al. (2001)

also referenced Van Ort & Philips's (1995) work where they found that ATDs in conjunction with environmental modifications (i.e., reduction of noise and interruptions) and proper positioning can also increase self-feeding. Porter and colleagues (2001) assessed residents during their midday meal looking at follow-through of occupational therapist recommendations for residents. This included use of adaptive equipment, positioning, environmental adaptation, or set up recommendations. Some of the recommended ATDs included plate guards, built-up utensils, skid mats, and various specialized drinking cups. They found that there was low follow-through from staff, indicating that while proper recommendations can be suggested, their efficacy is considerably impacted if care teams cannot ensure that recommendations are followed (Porter, et al., 2001). This will be discussed further in the barriers section of this chapter. Verbrugge and Sevak (2002) found that, just like dressing, less than 10% of their sample of community-dwelling older adults used equipment to aid in eating. They also found that personal assistance is virtually the sole type of assistance used for eating with 89% of participants utilizing personal assistance (Verbrugge & Sevak, 2002). Eating is an essential component of survival, and regardless of an individual's ability, without the support of the whole care team, self-feeding can be greatly limited, which can lead to negative impacts on not only the resident, but staff as well.

4.2. Theme 2: Benefits of Assistive Devices

In an LTC environment, staff and residents are inherently connected. Factors that impact staff ultimately effect residents and vice versa. For instance, if staff are encouraged to promote and facilitate the use of ATDs, rather than solely offering personal assistance, it could lead to increased independence and autonomy for residents, which in turn would likely lead to less time spent by staff providing care. This theme is divided up into subthemes related to benefits to the resident, and benefits to staff.

4.2.1. Benefits to Residents

Roelands and colleagues (2002) found that in their sample of community living older adults, the use of ATDs increased feelings of safety. They found that a majority of attitudes toward ATDs were primarily positive and the use of ATDs did not make the

participants feel less healthy or more like a patient (Roelands, et al., 2002). In Gitlin et al.'s (2017) study looking at compensatory strategies and their impact on physical functioning and well-being found that changing the frequency of performing an activity was associated with greater depressed mood and lower feelings of mastery. They found that through compensatory strategies, introducing ATDs can enable older adults to continue participation to maintain well-being (Gitlin et al., 2017). They noted that relying on personal assistance did not have a negative impact on mood, which suggests that regardless of the approach, continued engagement is the biggest factor in well-being (Gitlin, et al., 2017). Vik and Eide (2013) found that assistive devices were shown to be facilitators in participation. Lien and colleagues (2015) found that a major motivator for the use of ATDs was to maintain independence (Lien, Steggell, & Iwarsson, 2015). This emphasizes the importance of enabling individuals to participate in their care. As mentioned previously it is an individual's right to have access to coping mechanisms that foster independence. In order to provide quality care independence should be facilitated and maintained wherever possible.

In their systematic review, Larsen and colleagues (2019) found that being competent enough to perform daily activities independently, or with little help enhanced older adults' confidence and self-worth, that the AT supported performance in daily activities, and that users felt a sense of comfort having the ATD around (Linqvist, Nygard, & Borell, 2013; Gooberman-Hill & Ebrahim, 2007; Gramstad, Storli, & Hamran, 2014; May, Garrett, & Ballantyne, 2010, as cited in Larsen, et al., 2019). They also found that the subsequent increased confidence and self-worth, lead to greater security in instructing others in how to assist them when using the ATD, or confidence in assisting other older adults in becoming users of ATD by sharing their knowledge or letting others use their ATD (Copolillo, 2001; Copolillo & Teitelman, 2005; Gramstad, Storli, & Hamran, 2014, as cited in Larsen, et al. 2019). Mortenson and colleagues (2013) found that older adult ATD users' perceived difficulties with specific tasks was reduced with the introduction of ATDs, and sense of accomplishment increased (Mortenson, Demers, Fuhrer, Jutai, Lenker & DeRuyter, 2013). McGrath and Astell's (2017) study looking at older adults with age related vision loss found that ATDs were imperative in maintaining autonomy, and control in one's own life which allowed them to maintain independence. Participants expressed a fear of becoming a burden to friends and family, and believed

that ATDs supported them in maintaining their functional independence (McGrath & Astell, 2017).

In their study examining the process of getting used to ATDs, Skymne and colleagues (2012) found that in their sample of community-dwelling, frail, older adults' assistive devices initially were a relief as they provided the means to do things one wanted to do independently (Skymne, Dahlin-Ivanoff, Claesson, & Eklund, 2012). They also found that participants reported that the ATD enabled them to save energy, despite the device possibly taking up space within the home, or causing them to take longer to do a task (Skymne, et al., 2012). Verbrugge and Sevak (2002) found that feelings of mastery and self-efficacy were higher for individuals using only, or mainly ATDs than for those using only, or mainly personal assistance. Users of ATD routinely reported that ATD increases their confidence, control, and independence (Verbrugge & Sevak, 2002). In contrast, relying on personal assistance for daily activities has been associated with low-self efficacy, further emphasizing the importance of the opportunity of ATDs to complete tasks as independently as possible (Verbrugge & Sevak, 2002). Another benefit of ATD is that it is on hand when needed, which is not always the case for personal assistance (Verbrugge & Sevak, 2002). Further, use of technological assistance maintains an individual's self-efficacy and can foster pride, and perceptions of task improvements (Verbrugge & Sevak, 2002). Agree and Freedman (2000) reference a study by Mann and colleagues (1999) that showed the use of ATDs as contributing to a slower decline in functioning (Mann, Ottenbacher, Fraas, Tomita, & Granger, 1999, as cited in Agree & Freedman, 2000). In their systematic review, McWilliam and colleagues (2000) reference a survey report from the US National Council on Disability (1993) found that 80% of individuals aged 65 and older reported a reduction in dependence with the use of ATDs (National Council on Disability, 1993, as cited in McWilliam, Diehl-Jones, Jutai, & Tadrissi, 2000). Safety and autonomy are highly valued as important ATD outcomes, as were autonomy, efficiency, ATDs as care substitution, as well as feeling better, less anxious, and happier (Roelands, et al., 2002, Roelands, Van Oost, et al., 2002).

In their study assessing the incorporation of wash-and-dry toilets in nursing homes, Cohen-Mansfield and Biddison (2005) found that the toilets provided residents relief from the mental or physical stress of toileting. De-Rosende-Celeiro and colleagues (2019) found that while the use of assistive devices in transferring to the toilet and

tub/shower can reduce levels of difficulty in completing the task, that doesn't necessarily mean the need for help is eliminated. However, they found that those who used more categories of ATDs were less likely to receive personal help and were more likely to contribute to functional independence (De-Rosende-Celeiro, et al., 2019). In conclusion, there is a wide range of benefits to older adult users of ATDs. It can be expected that either not as many or differing types of ATDs would be used in LTC settings rather than in the home due to high levels of care needed at the LTC level. However, due to the wide range of aforementioned benefits to older adults, ATDs should be introduced wherever appropriate.

4.2.2. Benefits to Staff

As noted in the previous subtheme, ATDs can increase older adult independence, in turn, reducing at least some of the need for personal assistance. The incorporation of ATDs in LTC settings can positively impact staff as well in terms of a reduction in care time. Hoenig and colleagues (2003) found that in their study looking at substituting care for ATD in community-dwelling older adults, the use of ATDs for either some or all their basic ADLs required 3.8 fewer hours of help per week (Hoenig, Taylor, & Sloan, 2003). In contrast, those who used no ATDs, and relied solely on personal assistance required 4.1 more hours of help per week than those who used ATDs (Hoenig et al., 2003). Agree and colleagues (2005) found that depending on the severity of an individual's disability, ATD may not be enough to eliminate disability and that personal assistance may be required in conjunction to eliminate residual disability (Agree, et al., 2005). Anderson and Wiener (2015) found that most ATDs resulted only in a reduction of informal care hours, but not formal care hours. Agree and Freedman (2003) found that for individuals using ATDs with no personal assistance are consistently less likely to proclaim that they need any personal assistance at levels as low, or lower than for those who receive no assistance at all. This may be explained by the desire for independence. In contrast, Anderson and Wiener (2015) found that in their study ATDs did not contribute to reduced hours of paid care.

This narrative review emphasises the benefits to staff in order to highlight the benefits to staff to encourage their promotion of ATD use for residents. If staff for not find any benefit to themselves in ATD implementation it is unlikely they will facilitate their use (Porter, et al., 2001; Cohen-Mansfield & Biddison, 2005). However, as much of the

reviewed literature does focus on home-based ATD use, there were multiple studies that mentioned the benefit of decreased burden to informal caregivers (Mortenson, et al., 2013; McWilliam, et al., 2000; Agree & Freedman, 2000). When an individual moves to LTC, that does not necessarily mean staff will be taking over 100% of the caregiving duties. Families are still involved, therefore it is important to justify the benefit of the ATD to the families as well

The use of ATDs by residents can also provide a relief of burden on staff. With fewer care hours required, there will be time freed up to have meaningful interactions with residents that do not involve ADL care, as well as provide opportunity to complete other work. Mortenson et al. (2013) found that the use of ATD increases users' perceived difficulty which lead to decreased burden on informal caregivers. While the utilization of ATDs may not result in less hours of paid care, that does not necessarily mean that it would not decrease burden (Anderson & Wiener, 2015, Cohen-Mansfield & Biddison, 2005). Anderson and Wiener (2015) suggest that ATDs can "make the job of formal caregivers easier even if it modestly increases formal care hours" (Anderson & Wiener, 2015, p. 431). ATDs may also reduce the demands of formal care activities (Anderson & Wiener, 2015). As levels of disability are typically high in individuals living in LTC facilities, it can be expected that ATDs will not eliminate the need for personal assistance, however, if it can promote independence, and provide some relief for caregivers, it is worth incorporating into the care environment.

4.3. Theme 3: Substitution of Care for Assistive Devices

As mentioned in the previous theme, it is shown that the use of ATDs in individuals with high care needs may not result in complete elimination of the need of personal assistance for any given task. In their sample of community-dwelling older adults, Agree and Freedman (2000) found that a majority of the sample (55%) manage their disability with no personal care. Of these individuals, roughly 57% rely exclusively on ATDs, and 43% utilize no special assistance whatsoever, and 86% of those using ATDs utilize formal care as a supplement (Agree & Freedman, 2000). They found that for all activities, older adults are more likely to utilize ATDs if they receive any formal care for that activity, however this was not found to be significant for bathing or dressing (Agree & Freedman, 2000). Thus, indicating that the provision of formal care can lead to the supply of ATDs. This is likely due to the fact that care professionals may be more

likely to suggest or prescribe certain ATDs to supplement their formal care than an informal caregiver would.

Agree et al. (2005) found that ATD users received more personal care than nonusers. This is likely due to the fact that individuals likely seek out formal supports when they are no longer able to manage their care with ATDs alone. These findings suggest more of a supplementary relationship between technological and personal assistance. Roelands and colleagues (2002) found that in their sample of community-dwelling older adults it was expected that ATDs were merely a supplement to personal care allowing them to be less dependent on others. Verbrugge and Sevak (2002) suggest hierarchies of levels of care. For individuals with poor overall health and disability status, their probability of assistance use, both personal and technological, and personal rather than equipment only is increased (Verbrugge & Sevak, 2002). Poor overall health and disability lessens one's chance of reducing or resolving task difficulties (Verbrugge & Sevak, 2002). Individuals with moderate to severe disability have a higher chance of reducing difficulty through the use of assistance than those with mild disability, but their chances of reaching resolution are worse (Verbrugge & Sevak, 2002). The impacts on level of difficulty that assistance can afford will be more noticeable. They found that individuals with mild disability there is little room to improve other than completely resolving the disability (Verbrugge & Sevak, 2002). Therefore, those with higher levels of disability have more room for improvement with the use of ATDs than those with very low levels of disability do. Anderson and Wiener (2015) note that while the introduction of ATDs have been shown to decrease formal care hours only modestly, they still can complement formal care in that without the device they would have been providing even more care.

In general, it should not be assumed that the introduction of ATDs will eliminate the need for personal assistance, especially for those with higher levels of disability. Rather, technological and personal assistance should be seen as partners in care by enabling independence while ensuring that all residual disability is remedied. Further, it is always essential to consider the desires of the older adult in the situation. ATDs should not be forced upon them, even if there are many proven benefits. It is essential that care providers approach the implementation of ATDs through a Person-Centred Care perspective and take into account each individual's preferences in their care.

4.4. Theme 4: Barriers to Incorporating Assistive Devices in Long Term Care Environments

There are numerous factors that can aid or inhibit the process of ATD implementation in an LTC environment. This theme will discuss the barriers that were identified from the literature that can impact the acceptance, and the efficacy of ATDs.

4.4.1. Individual Attitudes toward ATDs

The first step in employing any ATD is to ensure that the user is willing to participate. An individual's attitudes toward ATD will impact their willingness to consider an ATD, as well as their use of the ATD. McGrath and Astell's (2017) study looking at assistive devices with age related vision loss found that participants reported a fear of being taken advantage of due to their disability. This resulted in participants avoiding the use of ATDs that marked the individual as disabled (McGrath & Astell, 2017). Participants reported fears of being exploited, or being made an easy target if they made their disability clear to others out in the community (McGrath & Astell, 2017). While this may be the case in the community, it may not translate entirely to an LTC setting as it is clear that individuals living in LTC have at least some level of disability. Participants also expressed resistance of ATDs as a way to preserve desired self-image (McGrath & Astell, 2017). They did not want to be seen as old or disabled as it brings on perceptions of helplessness, dependence, and incompetence (McGrath & Astell, 2017). Resistance of ATD use can be motivated by the desire to avoid being pitied, marginalized, or discriminated against (McGrath & Astell, 2017). Sutton, et al. (2002) found that feelings that ATD users were treated differently, were only expressed by non-users. Vik and Eide (2013) found that the participants in their sample of community-dwelling older adults often waited too late to apply for assistive services. They state that it may be due to the generational attitudes of not asking for help or assistance (Vik and Eide, 2013).

Negative attitudes toward the device itself, also can contribute to the resistance of ATD. ATDs can be seen as obstacles, taking up space, being in the way, and increasing time to complete a task (Skymne, et al., 2012). Resistance to ATDs can also be related to fears of becoming dependent on the device itself, as if the user is giving up their opportunity to accomplish something with no assistance, and fear that they have reached the stage in life where ATDs are something that may be necessary (Skymne,

2012). In contrast, Roelands and colleagues (2002) did not find that ATD use made users feel handicapped. Rather, that intention to use ATD was considerably determined by attitudes toward the ATD and by believed norms associated with ATDs (Roelands, et al., 2002). Motivation to use ATD was also associated with self-efficacy regarding the use of ATDs, which emphasizes the importance of education and training when introducing an ATD to a user (Roelands, et al., 2002). Perhaps, even individuals with low self-efficacy in the beginning can be coached and motivated to have more confidence in their abilities. While it may not be as prevalent in LTC environment, Anderson and Wiener (2015) note that resistance to ATD adaptation may be motivated by a fear that it will decrease personal interaction with caregivers. Roelands et al. (2002) found that while some agreed that ATDs can foster loneliness, nearly as many disagreed with this notion. Verbrugge & Sevak (2002) found that personal assistance is higher for individuals of non-Caucasian race which can likely be associated with cultural norms of caring for their elders. However, this is not necessarily generalizable to formal care supports provided in LTC. Psychological factors can also play a part in the use of ATD. In their systematic review Abrijahij and Boll (2018) referenced De Klerk and colleagues (1997) study which reported that older adults who suffer from feelings of loneliness were less likely to use ATDs (de Klerk, Huijsman, & McDonnell, 1997 as cited in Abrijahij and Boll, 2018). This may be related to low self-efficacy as well.

The attitudes of one's social circle can also impact their view of ATDs. Skymne et al. (2012) found that while relatives understood the need for ATDs, they were still questioning of the devices and had strong opinions on how they should be used. They found that attitudes of less-significant people in their social circle are not as important as the attitudes of relatives, but still were shown to be important to a degree (Skymne, 2012). While resident families may not be as involved when they have the support of an LTC team, many families are still very involved and if they are not supportive of an ATD's use it can contribute to negative attitudes that trickle down to the resident. In their systematic review Larsen and colleagues (2019) found that attitudes of society regarding ATDs played a role in an individual's willingness to adopt them. They described feelings of stigmatization, which negatively influenced the process of ATD adoption (Pettersson, Appelros, & Ahlstrom, 2007; Hedberg-Kristensson, Ivanoff, & Iwarsson, 2007; Porter, Benson & Matsuda, 2011; May, Garrett, & Ballantyne, 2010; Haggblom Kronlof, & Sonn, 1999; Aminzadeh & Edwards, 1998 as cited in Larsen, et al. 2019). In contrast, they

found that some felt that ATDs were accepted by society (Barker, Reid, & Cott, 2004; Haggblom Kronlof, & Sonn, 1999 as cited in Larsen et al., 2019). Assistive devices may be seen as a bother, not worth the trouble, and can seem inaccessible due to lack of widespread information (Sutton, Gignac, & Cott, 2002). ATDs can also be seen as awkward to use, make one feel old, and dependent, and that they are treated differently by others when using ATDs (Sutton, et al., 2002). Negative attitudes toward ATDs can be warranted if they do not perform as expected, however, this is likely due to improper fit of the particular device (Cohen-Mansfield & Biddison, 2005). This emphasizes the importance of communication between ATD providers and the user to ensure that the device is performing adequately. If one device does not work, there are typically other options that may be more suitable.

4.4.2. High Levels of Disability

An individual's level of disability can greatly impact their ability to utilize certain ATDs. Severe cognitive impairments can impact the ATD acquisition process in terms of training (Cohen-Mansfield & Biddison, 2005). Individuals with severe cognitive impairments are less likely to use technological assistance for all of their activities, and more likely to use it for some or none (Hoenig et al., 2003, Agree et al., 2005, De-Rosende-Celeiro, et al., 2019). Thus, individuals with more ADL impairments require more hours of personal assistance (Hoenig, et al., 2003). Verbrugge and Sevak (2002) found the opposite, that individuals with greater severity of disability use equipment only more than personal assistance only. They explain this with the idea that those with more severe disabilities utilize ATDs as an attempt to take back some control of their care (Verbrugge & Sevak, 2002). Individuals who were less severely disabled were found to be able to use ATDs more effectively to support most, or all of their functional needs (Anderson & Wiener, 2015).

Physical impairment is also a factor in limiting the use of some ATDs. Individuals who are unable to complete a task independently are less likely to completely resolve disability with assistance (either personal or technological) than those experiencing only some difficulty (Verbrugge & Sevak, 2002). Further, individuals experiencing great difficulty completely resolve disability less often than those with only some difficulty (Verbrugge & Sevak, 2002). This relates back Verbrugge and Jette's (1994) Disablement Process model in that with greater intrinsic disability, there is more

opportunity to reduce it through the use of ATDs alone or in conjunction with personal assistance therefore leaving either no, or limited actual disability.

4.4.3. Cost of ATDs

The cost, and coverage of ATDs in regard to health care provisions varies dependent on many factors. Hoenig and colleagues (2003) found that in the United States, individuals who used Medicaid were more likely to use no ATDs, or only some ATDs. As only a portion of ATDs that are deemed necessary are covered, they may still be unaffordable, or inaccessible due to large co-payments (McGrath & Astell, 2017, Agree & Freedman, 2000). In contrast, in countries such as Sweden assistive devices are publicly financed through their health care system (Skymne, et al., 2012). Roelands and colleagues (2002) found that while a majority of individuals were willing to pay for ATDs, some were prevented from ATD access due to financial means. Li and colleagues (2020) found that individuals with a low monthly income were less likely to adapt one's environment to support disability. They found that in low-income households, individuals were more likely to spend their money on dietary needs and medication rather than support adaptations to aging (Li, et al., 2020). Mathieson et al. (2002) found that subjective income measures had more of an impact on ATD use than did specific income level, in that those who held the opinion that "income takes care of basic needs" may be more important than actual income level. Another important note is that simple, low technology ATDs are often considered self-help devices rather than necessities, thus, are not covered under Medicare or insurance. Typically, these devices are not nearly as costly as high-tech devices, however, whether an item is "expensive" or not is all relative related to an individual's disposable income. While this may make them more accessible for some, depending on an individual's level of disposable income, they may be unaffordable, especially if they require multiple ATDs. Costs of ATD may be different in an LTC setting as the facility may have a stock of ATDs that they can loan residents to test, or use. However, that would depend on the residence and the resources that they have available to them.

4.4.4. Inadequate Access

For individuals to have the potential to utilize ATDs they must first have the opportunity of access. In their sample of community-dwelling older adults in the United

States Chong et al. (2022) report that 80% of users expressed unmet need for assistive technologies or home modifications. Awareness of ATDs can also play a role in access to ATDs. Mann and colleagues (1995) found that many older adults have ideas of ATDs that would be useful, but they were unaware that they had already been invented and are available for purchase. It is essential to have properly trained staff, and appropriate disciplines involved that are aware of a range of technologies as well as newly developed technologies for varying disabilities (Roelands, et al., 2002). Access to proper resources to obtain ATDs may be limited for those who live in the community in rural areas. Geography should not be a barrier to access in LTC as these health care institutions are linked to numerous resources to obtain devices. In contrast, there may be barriers from ATD providers such as insurance companies. In Belgium, health insurance is mandatory for every resident. ATDs are decentralized, and can be accessed in every town from various services. Typically, these providers are run by health insurance companies, but are also open to non-members (Roelands, et al., 2002). This is not the case in every country, and insurance may not cover ATDs for everyone that needs them. There are programs in the United States that advise older adults in selecting, and obtaining ATD, however, budget, instability in funding resources, and uneven coverage in many regions leads to many individuals needing to pay out of pocket (Lien, Steggell, & Iwarsson, 2015). Physical access, and social access to ATDs can both be great barriers in obtaining technological assistance.

4.4.5. Inadequate ATDs

Even when one has access to ATDs, that does not necessarily mean they will be effective or used to their full potential. Roelands et al. (2002) found that non-use of devices varied greatly from one ATD to another. They found that both inexpensive helping devices, but also expensive high-tech devices were being abandoned (Roelands, et al., 2002). This emphasizes the importance of follow-up in the ATD process. It is essential to investigate why these devices are not being used and provide alternatives that may be a better fit. An ATD provider's work is not done when an individual has been trained and provided the device. As an individual's needs and impairments change, ATDs will likely need to be adapted, or swapped out for ones that meet their current needs (Porter, et al., 2001). One ATD may not necessarily be a forever-solution to an individual's disability. As we know from disablement theories, the

disablement process is not linear and as needs change and fluctuate so should the ATDs. Not only will needs change, but individual goals may will as well. Devices that are seen as too complicated, non-user friendly, and if the challenges outweigh perceived benefits, can also impact use and lead to technology abandonment (McGrath & Astell, 2017). All of these points emphasize the importance of proper assessment, training, implementation, and follow up to ensure that resources are being used effectively, and individuals' needs are being met.

4.4.6. Learned Helplessness

While many individuals welcome the assistance of ATDs to accomplish everyday tasks this may not be the case for everyone. Receiving personal assistance, using improper assistive devices, and changing frequency of task performance can inadvertently compromise the amount of physical exertion an individual must expend during an activity, therefore, resulting in reduced physical capacity over time, leading to further decline (Gitlin, et al., 2017). Some individuals may prefer personal assistance over technological assistance (Vik & Eide, 2013). Care providers also may feel that they are being helpful when they offer personal assistance rather than encouraging technological assistance to foster independence. Verbrugge and Sevak (2002) found that co-residence (such as with a spouse, child, or family member) contributes to the use of both personal and technological assistance, rather than technological assistance alone. Further, co-residence was positively associated with the receipt of personal help, but negatively associated with efficacy indicating that too much personal assistance can lead to functional decline (Verbrugge & Sevak, 2002). While this study focused on a community-based population, and informal caregivers, it can likely be generalized somewhat to an LTC setting. Having personal assistance readily available may lead individuals to lean on the support of others rather than attempting tasks independently. When nursing staff is completing a task for an individual, it undermines their ability to function independently. Suhonen, Karppinen, Rodriguez and Stolt (2019) emphasize the importance of a shift in nursing culture to support a more restorative care approach rather than a task-oriented approach. Staff must recognize the importance of patience, support, and facilitating self-management and independence, rather than “doing for” which enforces dependence. Suhonen et al. (2019) note that there are many ATDs used by staff in LTC environments that assist staff, but not necessarily residents as they

become reliant on them. Completing care tasks independently, even with the use of ATDs will cause an individual to exert more energy, thus leading to completing tasks independently resulting in feelings of tiredness (Agree & Freedman, 2003). While not specifically ATD related, Lien and colleagues (2015) note a theme in their study that participants felt that some physical challenge was beneficial in maintaining strength. This clearly demonstrates the concept of person-environment fit and the zones of maximum comfort and maximum performance potential (Lawton & Nahemow, 1973). If an individual relies solely on personal assistance, the lack of environmental press they are experiencing will push them into maladaptive behaviour. Therefore, it is important to encourage and enable older adults in the use of ATDs, even if they do not completely replace personal assistance.

4.4.7. Limited Resources

Institutional barriers also play a role in the implementation of ATDs. Proactive implementation of ATDs before impairment progresses into severe may not always be a possibility due to limited staffing resources (Vik & Eide, 2013). Implementation, installation, and modifications to equipment are also time consuming and need to be provided by specialized staff as well (Cohen-Mansfield & Bidden, 2005). To mitigate this lack of specialized staff, Guay et al. (2016) suggest the importance of supporting extended roles or cross-skilling within interdisciplinary teams. For instance, in an LTC setting Health Care Aides, who have frequent one-on-one interactions with residents, and have the opportunity to observe their challenges in functioning should be made aware of basic ATDs, and their uses. When they notice an impairment that one may be able to lessen with an ATD, they can recommend an OT assessment, and provide their input to streamline the implementation process.

Time can also be a significant factor in the encouragement of independence through ATDs. Porter et al. (2001) found that a lack of follow through with feeding recommendation was greatly attributed to the time that it took to set the resident up with the proper equipment, and positioning to self-feed. While this initial set up may take longer than if no set up was done, they were freed up while the individual was self-feeding rather than having to assist them with eating (Porter, et al, 2001).

Communication between care providers can also be a barrier in ATD implementation. If the whole interdisciplinary care team is not made aware of the individual's goals of independence, they cannot be expected to support them adequately (Porter, et al., 2001). Further, occupational therapists making ATD recommendations must also understand the impact of the ATD on the care team and consider their needs and opinions in the implementation as well as they will be the ones facilitating its acquisition and use.

4.4.8. Staff Attitudes Toward ATDs

Care staff play an integral role in supporting the older adult user of ATD in their independence. Without staff acknowledging the importance of enabling and encouraging ATD use, they are likely to dismiss resident goals and the benefits that ATD can bring. Suhonen et al. (2019) express a need for culture change within care staff from a “dutiful approach to one that supports individual residents personally” regarding understanding their goals and desire for restorative care. McWilliam and colleagues (2000) cite McWilliam, Belle Brown, Carmichael and Lehman (2004) as they note inadequate attention to and lack of clarity of an older adults' goals and sense of purpose in life; caregiver paternalistic attitudes; and ageism from caregivers, and the older adult themselves, all as factors that undermine an older adults' independence. Nursing staff may find it easier to employ personal assistance than to support technological assistance (Cohen-Mansfield & Biddison, 2005). Training regarding the importance and benefits for ATDs, as well as ATDs that are available may be beneficial to enable a culture change within care staff towards a more supportive provision of care.

Time also plays a role in supporting the care goals of older adults, it can be time consuming to assist or supervise while the ATD user completes their task, also as they adjust to the use of a new device, however, as time goes on and both staff and the resident become more familiar with the device, the time commitment will likely decrease (Roelands, et al., 2004). Setting up and allowing a resident to participate in their own care can be a time-consuming task (Porter, et al., 2001). The lack of high-quality person-centred-care provision can also be a barrier in providing customized support for an individual including implementing ATDs (Chong, et al., 2022).

Interdepartmental staff cooperation also plays a role in if and how ATDs are implemented (Roelands et al., 2006; Porter et al., 2001). Suhonen et al. (2019) note that organizational barriers can play a role in limiting resident independence. Whether that be with care procedures, or hospital-like practices, an emphasis on person-centred-care is essential in facilitating independent functioning. Ensuring staff are aware of an individuals' goals and desires is essential in facilitating independence through ATDs. All care staff in various departments need to support recommendations and occupational therapy interventions in order for an ATD to be implemented adequately. In their study looking at feeding recommendations Porter and colleagues (2001) found that only 41% of the recommendations had complete follow through. Without complete follow through for all recommendations staff deny residents the ability to benefit from occupational therapy services (Porter, et al., 2001). Thus, staff buy in is essential. This can be supported through leadership, policies, and education (Suhonen et al., 2019).

In this context it is also important for family care partners to buy into the use of ATDs. Social support is an important factor in ATD implementation (De-Rosende-Celeiro, et al., 2019). Skymne, and colleagues (2012) found that relatives of ATD users were understanding of the need for ATDs, but became overprotective and would offer personal assistance, or limiting activity rather than letting the ATD user complete the activity themselves. Skymne and colleagues (2012) also found that the opinions of relatives regarding ATDs were more important to the user than opinions of those outside of close family relationships, making it all the more important to include family in the process of ATD implementation whenever possible.

4.5. Theme 5: Facilitators to Incorporating Assistive Devices in Long Term Care Environments

Just as there are factors that can negatively impact ATD implementation, there are also factors that enable better ATD implementation and use. Often, the facilitators of ATD implementation, are contrary to the barriers. This theme will discuss the facilitators that were identified from the literature that can positively impact the acceptance, and the efficacy of ATDs.

4.5.1. Situation of Need

Likely the most prevalent theme throughout all of the reviewed literature was that all ATDs were introduced, or used based on a situation of need (Abrilahiji & Boll, 2018; Roelands et al., 2002; Larsen, et al., 2019). Verbrugge and Sevak (2002) note that assistance (either personal or technological) is significantly linked to disability severity. Agree and Freedman (2000) found that a majority of their disabled older-adult sample did not use any personal care, 57% of that proportion used only ATDs, and 43% used no assistance whatsoever. Further, 65% of their sample that experienced difficulty in one or more ADLs reported the use of ATDs to meet their needs (Agree & Freedman, 2000). Roelands and colleagues (2004) found that their sample of community-dwelling older adults experiencing disability did not own an ATDs to assist them with their tasks. This was especially true for dressing, home maintenance, eating, meal preparation, and washing (Roelands, et al., 2004). Hastings Krakowsky and Finlayson (2000) note that the need for ATD typically increases with age and disability severity. Note that this may be associated with the lack of access to ATD services out in the community, thus, may not be generalizable to the LTC environment. Interaction with formal health care supports have been associated with more awareness of, and access to a wider range of ATDs (Agree & Freedman, 2000; Anderson & Wiener, 2015). Still, it is warranted to say, that greater disability (up to a certain point) is a contributing factor to an increased need for ATDs.

4.5.2. Individual Acceptance of ATDs

One of the most important aspects of introducing ATD is to ensure that the user is accepting of the idea of ATD use. Identifying an impairment and working toward a goal of mitigating it with ATD must consider an individuals' opinions on the idea of ATDs. In Roelands and colleague's (2002) study they found that of their sample of community-dwelling older adults it was believe that ATDs offered partial care substitution, would make someone less dependent on personal assistance, and is a solution to the scarcity of care providers. An individual's attitudes toward their condition, especially the perception that their goals had changed, and perceptions of reduced independence played a major role in device use (Sutton, et al., 2002). Use of the H-A-AT Model (2008) when implementing ATDs is an important way to identify an individual's attitudes toward ATDs (Cook & Miller Polgar, 2008). Specifically, the "Human" component of the model

due to the fact that without the user understanding, and appreciating the benefits that a device can bring them, they will not feel justified in its use. The first step in implementation of ATD starts with the individual. The cognitive and emotional components of the H-A-AT model are the first step in the process. ATD providers must identify and acknowledge an individual's attitudes toward ATDs in general, as well as specific ATDs that might be appropriate. If an individual has positive attitudes towards ATDs, this can enable implementation. In contrast, if an individual has negative attitudes toward ATDs, these feelings must be identified, addressed, and either mitigated, or worked around.

4.5.3. Collaboration Between Staff and Residents in ATD Implementation

When implementing ATDs, taking the user's ideas, and opinions into consideration is essential. No one knows their challenges as well as they do, therefore, occupational therapists and other care providers must do everything possible to make the ATD acquisition process a collaborative experience. Positive interactions with service providers of ATD can make or break a user's experience. Assessment for, and provision of ATDs is not a standardized package, each individual is unique as are their experiences, beliefs and goals. Scherer and colleagues (2007) propose a framework which details how the ATD selection process occurs within a broad context and environment which is impacted by personal factors of the ATD user, and provider (Scherer, et al., 2007). Together, they meet for the sole purpose of decision-making and device selection (Scherer, et al., 2007). They each bring varying resources, levels of knowledge, preferences, expectations, and priorities which impact the assessment of ATD need in objective and subjective aspects (Scherer, et al., 2007). Thus, it is essential to recognize each of these unique experiences and work together collaboratively to ensure that the needs of the user are met, and the selection rationale of the ATD provider are voiced.

Roelands et al. (2004) suggest that caregivers can enable self-determination for older adults by helping them explore their ideas of ATD and involve them in the decision-making process. Trust in the ATD provider also plays an integral role in effective ATD implementation. Skymne et al., (2012) explain that it is important that ATD users have confidence that they are being provided with correct information, and the necessary

assistive devices, without having to question the prescription. Therefore, communication through the whole process from assessment to evaluation and follow-up is important in keeping the ATD user informed and comfortable that they are being supported adequately. Skymne and colleagues (2012) also suggest that information regarding ATDs should be available to general practitioners, care staff, and pharmacists to provide information on existing ATDs before the need becomes dire. As much as possible, clients should be encouraged to direct service providers in what they need, not service providers telling them what they need (Vik & Eide, 2013). That is, they should show how they are able, or unable, to complete tasks and a care plan involving ATDs developed from, that, not the care plan first and needing to work around a care plan. It should be a deductive, rather than an inductive approach. It is of great importance of older adults to be involved in the ATD selection process (Larsen, et al., 2019; Roelands, et al., 2004). Supporting an ATD user and believing them when they indicate that a particular device is not working for them is imperative (Skymne, et al., 2012). While there may just need to be more training involved, people tend to know what is best for them. Therefore, a mutual trust and respect between care provider and receiver is a must. One suggestion may be to ask the individual if they could think of a device that would help them to implement more of a deductive, than inductive ATD recommendation process. Mann and colleagues (1995) found that of their sample, a third, offered suggestions for new devices, but were unaware that many of these desired devices already exist. If care providers ask an individual what they need, and match that with an exact, or similar device, they can be an important part of the selection process. Roelands and colleagues (2004) suggest utilizing the consumer-driven model of care delivery in which the ATD provider educates the client about the options they have and facilitates decision-making by the client (Reed, Fried, & Rhoades, 1995 as cited in Roelands, et al., 2004). The person-centred model has been shown to be effective (Szanton, Leff, Wolff, Roberts, & Gitlin, 2016). The implementation of ATDs should be a collaborative process where occupational therapists work with the resident's care team, and the resident themselves, to match an appropriate ATD or multiple ATDs to the individual considering their abilities, needs, goals, and desires.

4.5.4. Educated Staff

Ensuring that educated staff are providing recommendations is essential. Not only will this result in more effective ATD outcomes, but also ensure that instruction and evaluation are adequate. These experts are skilled in assessing need for ATDs and knowing which would be most suitable (Skymne, et al., 2012; Anderson & Wiener, 2015). Staff should be well trained, know expectations, and have self-efficacy in selecting, and introducing ATDs in varying situations (Roelands, et al., 2006). Having appropriately trained staff of an occupational therapy discipline is necessary (Roelands, et al., 2002; Gitlin et al., 2017). However, it can also be beneficial to cross-train staff of other disciplines to know what to be aware of so that impairments can be identified early, properly assessed, and ATD incorporated where necessary (Guay, et al., 2016). It also must be recognized that the disablement process is not necessarily linear, and ATDs that once helped an individual to function independently, may not be effective as pathologies progress, or health factors change. Once an ATD is prescribed that does not mean the individual is permanently supported. It is an iterative process. Effective ATD implementation depends on continued evaluation to ensure devices are working and being used as prescribed.

Training in the use of ATD is an essential component of the prescription process. Abrilahiji and Boll (2018) cite Chiu and Mann's (2004) randomized control study looking at how training can impact use of ATDs. They found participants that were only trained in the device use in hospital only 56% of them continued to use their device, however those that has home visits and home training program had a 97% use rate (Chiu & Mann, 2004). Failure to provide adequate ATD instruction can lead to non-use (McGrath & Astell, 2017). In order for ATDs to be effective, they should be provided to the user, only after they have been properly assessed and trained (Gitlin & Levine, 1992; as cited in Mann et al., 1995). This will ensure proper implementation, and use, which will reduce injury and risk of technology abandonment.

As many low-tech, self-care devices don't need prescription from an OT, staff, family, and even other residents can recommend ATDs where they see fit. Normalizing the use of ATDs in LTC environments can help to facilitate their use.

Ensuring that proper practices and implementation procedures are followed is important to the efficacy of the intervention. Roelands and colleagues (2006) found that home nurses were at times skipping steps of the ATD introduction processes. While interventions must be customized to the individual, there are best practices in place for a reason, and when used correctly they can lead to better device selection, and consistency in recommendations between different ATD providers (Roelands et al., 2006; Guay, et al., 2016). Clarity of instructions for the whole care team to support ATD use is imperative to ensure consistency, supporting of resident goals, and proper follow through with resident care plans (Porter, et al., 2001). Especially when ATD is a supplement to personal assistance, which will almost always be the case in an LTC environment, it is important that all staff that are interacting with a resident around a specific ADL are aware of the resident's care plan and goals in order to best support their ADT use and independence.

Chapter 5.

Discussion and Conclusion

This chapter will provide a summary of the findings of the narrative review, future research directions, limitations of the review, and concluding statements.

5.1. Discussion

This narrative synthesis provides an overview of the use of ATDs for older adults in care settings. While much of the literature reviewed pertained to community-dwelling older adults, some of the conclusions of their research can be generalized to an LTC population as well. In fact, individuals that have close contact with formal care supports are more likely to use ATDs (Agree & Freedman, 2000). There is a wide variety of low-technology devices that can be used for every type of ADL. From assistance transferring, to bathing, dressing, using the toilet, and eating, there are thousands of ATDs that can be purchased, designed, or modified to fit nearly any user's needs. While ATD use was typically not found to be a complete replacement of formal care, incorporation of ATDs can still bring many benefits to both staff and residents (Verbrugge & Sevak, 2002; Anderson & Wiener, 2015; Roelands, et al., 2002).

ATDs can provide an increased sense of safety, well-being, self-efficacy, comfort, independence and participation for residents in LTC (Roelands et al., 2002; Larsen et al., 2019; Gitlin et al., 2017; Lien et al., 2015; Vik and Eide, 2013). However, despite these benefits, older adults may still have their reservations about ATD use. For some, the use of ATD brings out feelings of weakness, and the desire to preserve their image (McGrath & Astell, 2017). Devices may be seen as cumbersome, or they increase the time of completing a task (Skymne, et al., 2012). Depending on the amount of residual disability is left after the use of an ATD, using a device can provide older adults with the means to complete tasks independently (Skymne, et al., 2012). Waiting for care in LTC can be a frustrating and anxiety inducing experience (Mitchell, Pilkington, Jonas-Simpson, Aiken, Carson, Fisher, & Lyon, 2005). However, in certain circumstances, if ATD is on hand when needed, and if an individual is able to utilize it

independently, there is no need to wait for personal assistance from care staff (Verbrugge & Sevak, 2002).

While it can be assumed that individuals living in LTC environments have higher care needs than those living out in the community, ATDs can still afford users these benefits, even if they do not completely replace personal assistance. All of these factors speak to the importance of involving the ATD user in the process of ATD selection in order to ensure that their goals, wants, and needs are understood, and that the ATD is matched to these requirements. ATDs are an important component that contributes to quality care. Grant and colleagues (1996) found that the facilitating of resident self-determination was an indicator of good quality of care in LTC as were the provision of equipment and supplies (Grant, et al., 1996).

ATD use in LTC can also provide benefits to the staff. ATD use, leading to increased independence can provide some relief of demand, and in some cases, a total elimination in the need for personal assistance with some activities (Hoenig, et al., 2003). Depending on the user's level of disability, ATD may not negate the need for personal assistance, however, it can still relieve burden of the task and allow for some caregiver relief (Cohen-Mansfield & Biddison, 2005; Anderson & Wiener, 2015). However, staff attitudes must align with the support of ATD implementation and use, especially in cases where personal and technological assistance need to work in tandem. Without staff buy-in, ATD recommendations and goals will not be adequately carried out, resulting in decreased efficacy of the intervention (Porter, et al., 2001; Suhonen, et al., 2019). Adequate staffing resources must also be in place to effectively incorporate ATDs in LTC settings. Firstly, access to properly qualified staff, such as trained occupational therapists, is essential (Fritz, et al., 2019). The support of ancillary staff is also essential as they all have a part to play in the care plans of ATD users (Porter, et al., 2001). Care staff at other levels may also be trained to complete primary assessments and identify the need for ATDs (Guay, et al., 2016). The implementation of ATDs can be time consuming (Cohen-Mansfield & Biddison, 2005; Porter, et al., 2001; Vik & Eide, 2013). Without staff buy-in, ATD users will not be adequately supported to exercise independence in their self-care activities (Suhonen, et al., 2019). While staff may also be afforded many benefits resulting from resident ATD use, there must be an understanding of why the use of ATDs is so important and beneficial. Training, and

management support are essential in promoting this shift in culture change in LTC environments.

5.2. Ethical Considerations

There are several ethical aspects to consider when implementing ATD interventions to promote independence in LTC residents. The first being related to individuals who have access to these devices. Specifically for low-technology devices that may be considered self-help devices and may not be covered by insurance, not everyone has the financial, or physical, means to acquire them. This will differ based on insurance coverage and geographical location; however, it is important to note regarding equity and access to ATDs. Further, as indicated in the barriers section of this paper, individuals with severe cognitive deficits can be difficult to train to use devices due to lack of recall of information, and information processing challenges. In these cases, the use of ATDs that are used on the resident, rather than by the resident may be preferred. Typically, these may include monitoring technologies, and sensors. However, these can come with their own ethical challenges as well (Godwin, 2012). In the case of individuals with severe cognitive, and physical impairments, it can be expected that ATD will be a partner in a care provider's care practices rather than a replacement. In the case of individuals with high care needs, for which ATD use may become too complicated, time consuming, tiresome, and challenging. This raises the question: at what point should the ATD be forfeited, and personal assistance take over? As ATD implementation should be a collaborative process between the user, and care provider, a conversation needs to take place between those two parties and other involved care partners. Above all else, the wishes, and needs of the older adult should be the final determinant.

Another concern is related to the need for ATD, versus the want for ATD. We recognize the many benefits of ATD use in older adults, but there may be individuals who prefer personal assistance over technological assistance. This could be for a variety of reasons. These objections should all be noted and addressed during the assessment process of ATD implementation. Presumptions of ATDs should be noted, and potential users be informed about their options, uses, and benefits. If then they still decide that the ATD is not something they are interested in, according to person-centred care, their wishes should be honoured.

Just as every individual is unique, so are their disablement processes, attitudes, wishes, goals, and needs. ATDs provide an important opportunity to allow individuals living in LTC to maintain, or regain some portion of their independence. It is imperative that the individual be as involved as possible in the selection of their ATDs as only they know how they feel, and what support they want. With the guidance of well-trained, and considerate staff, ATDs can provide many benefits to both the user, and the care team surrounding them.

5.3. Review Limitations

This review has a few limitations. No grey literature was included; therefore, other relevant research may have been missed. Many studies included in this synthesis examined ATD use in the home environment. Therefore, we were not able to explore factors that contribute to the application of ATDs in an LTC setting. Due to the organizational factors, though, wherever possible, I did attempt to note when barriers and facilitators may differ in community environment versus an LTC environment.

According to the Canadian Institute for Health Information 69 percent of LTC residents are living with dementia (CIHC, n.d.). While there is a large body of research looking at ATD use for individuals with dementia, much of it relates to high-tech devices such as monitoring devices, electronic devices such as electronic pill boxes, or picture phones. Because individuals with dementia make up such a large portion of the LTC population, it is important to look further in how simple ATDs, can be implemented to facilitate their self-care. It may be the case that rather than training with the device, that the device is introduced and modeled every time it is used. Regardless of the practical method of use it is important that individuals with dementia are given the same opportunities for independence as those that are more cognitively functional.

Further, I reviewed studies looking at low and mid-technology devices used by the resident, as low-technology devices are notably more easily implemented, cost effective, and easier to train individuals to use. While high-technology devices can be useful for monitoring, and assisting caregivers in providing care, the focus of this synthesis was to look at how ATDs can foster individual autonomy and empower the user to be more independent in their care. While high-technology devices can be beneficial, they come with their own set of practical and ethical challenges. However,

they still have an important role to play in resident autonomy and as we move toward a more technologically advanced health care system and these ATDs would also be important to explore.

5.4. Future Research Directions

Several studies found in the literature review examined ATD in the community, therefore, their future research recommendations looked to further understandings of ATDs and their use in the community. However, some of these recommendations can be generalized, or applied in an LTC setting as well. For instance, Agree and Freedman (2000) acknowledge the limits of their dataset and suggest that future research investigate the impacts that ATD have on the number of hours of personal assistance. Further, they suggest a deeper examination of caregiver dynamics, insurance/income, and physical and psychological factors (Agree & Freedman, 2000). A study using longitudinal design would be able to explore how ATD use progresses and changes over time (Agree & Freedman, 2000; Larsen, et al., 2010). De-Rosende-Clerio and colleagues (2019) recommend a closer examination into socio-familial factors and their impact on the use of ATDs.

In future research in this area, it would be useful to examine attitudes of both the residents, and their caregivers. Gitlin and colleagues (2017) recommend future research looking at individuals with varying disabilities and of varying demographic groups. Fritz and colleagues (2019) recommend looking into how occupational therapy interventions, such as the use of ATDs, can positively impact social participation, depressive symptoms, self-management of chronic conditions, and the development of frailty. While these factors have been examined, it is important to look at how ATD use impacts an individual on a psychological, and social, as well as on the physical functioning and health levels. Verbrugge and Sevak (2002) note that disability is not a medical phenomenon, but a human experience, thus it must be understood from an individual's perspective. Goals, and attitudes should also be considered (Verbrugge & Sevak, 2002). As for caregivers, Suhonen and colleagues (2019) recommend an observational approach to assess nurses' behaviours towards ATDs. Overall, there is an emphasis on the importance of exploring individuals' subjective experiences and perspectives on ATD over time. Due to the interconnectedness of caregivers, and residents in LTC, it is

equally important to look at their interactions and opinions around ATDs and their implementation.

5.5. Conclusion

The findings presented in this narrative synthesis contribute to a greater understanding of ATD implementation in LTC. Despite the availability of personal assistance in LTC environments, ATDs offer notable benefits to both staff and residents. The review presented in this paper offers an analysis of the process of ATD implementation in LTC and the factors that influence its' use. These facilitators and barriers are important to recognize to ensure that ATD is implemented properly. A critical finding of this narrative synthesis is the recognition that ATD use in LTC exhibits the interconnectedness of residents and care staff in terms of ATD use. For residents to be best equipped and supported in the use of ATDs, care staff must be provided with the proper training, and understand the purpose of the ATD in relation to the residents' goals. Staff must shift from a "doing for" approach, to a more supportive and encouraging role.

There is much to be done in future research in the area of self-care ATDs in LTC. Though individuals living in LTC residences typically need high levels of care, this should not hinder them from the potential to maintain as much independence as possible. Future research in this area must include both residents and staff as they both play an integral role in the effective implementation of ATDs.

The findings presented in this narrative synthesis indicate that there is much to be done to ensure that LTC residents are supported to remain as independent as possible in their care. Simple, low-technology ATDs, are a cost effective, and relatively easy to implement solution to the press that older adults experiencing impairments can use to foster a sense of independence and maintain some control in their care. LTC staff, in all departments must work together to enable resident independence and autonomy, while also providing relief to staff. In conclusion, ATDs are a worth-while addition to the care of long-term care residents and the culture of these residences must support their implementation wherever.

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Appendix A. Summary Review Table of Empirical Literature

Authors, Year, & Location	Article Title	Study Focus	Study Design/Type of Analysis	Method	Key Findings	Study Limitations
Abrilahiji & Boll (2018) Luxembourg	A systematic review of self-care assistive technologies for aging population.	This review aimed to look at current literature examining self-care assistive technologies	Systematic review	Based on systematic literature searches in PsycINFO, MEDLINE, and Google Scholar databases 203 papers were identified. Twelve were included according to selection criteria.	They found that self-care ATs have been shown to be efficient in reducing care hours and increasing independence. Use of ATs was associated with contextual, personal, and device factors. They identified a lack of randomized control studies and gaps in literature for many domains of self-care activities.	Limited number of studies included in review.

<p>Agree & Freedman (2002) USA</p>	<p>Incorporating assistive devices into community-based long-term care.</p>	<p>Examined the use of assistive devices as a component of long term care arrangements of community dwelling older Americans.</p>	<p>Quantitative</p>	<p>Uses data from the US 1994-1995 National Health Interview Survey Phase 2 Disability Supplements.</p>	<p>The degree to which assistive devices can substitute or supplement personal care is highly task specific. It is dependent on characteristics of devices and care providers. They found that those using simple devices are less likely to use informal care, and those using complex devices are more likely to use formal care services.</p>	<p>Cross-sectional data limits understanding of the disablement and technology acquisition process. If devices were not included in the NHIS-D2 they were not included in the study, thus adaptations, and modifying environments to compensate for disablement were not examined. Only looked at substitution in terms of the inclusion or exclusion of types of personal caregivers in the long-term care network. Sample size limitations and cross-tabular analyses do not allow for distinctions between disability levels. Cannot assess disability associated with comorbidities.</p>
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<p>Agree & Freedman (2003) USA</p>	<p>A comparison of assistive technology and personal care in alleviating disability and unmet need</p>	<p>Examined difference in residual disability and needs unmet by assistive technology or personal care.</p>	<p>Quantitative</p>	<p>Uses samples from the US 1994-1995 National Health Interview Survey Phase 2 Disability Supplements. Included adults with limitations in bathing, transferring, walking, and getting outside.</p>	<p>Despite accounting for differences in underlying ability, assistive technology appears to offer no additional benefit in the three areas of residual disability. AT users equally or more often report tasks to be tiring, painful, or time consuming despite use of assistance. AT users still do not report a desire for personal assistance.</p>	<p>Unable to compare efficacy of care arrangements for the most severely disabled. Only able to explore complete elimination of disability, not reduction. Due to cross-sectional data they were unable to explore the acquisition process</p>
<p>Agree, Freedman, Cornman, Wolf & Marcotte (2005) USA</p>	<p>Reconsidering Substitution in Long-Term Care: When Does Assistive Technology Take the Place of Personal Care?</p>	<p>Examined the trade-offs between the use of AT and reliance on personal care, with attention to factors that may influence those relationships</p>	<p>Quantitative</p>	<p>Uses data from the US 1994-1995 National Health Interview Survey Phase 2 Disability Supplements.</p>	<p>Found that AT use was associated with reduced informal care, but supplemental to formal care. Individuals with cognitive impairment were least likely to substitute AT with either type of care.</p>	<p>Cross-sectional data does not allow for detailed examination of order of AT adoption. Unable to distinguish between types of devices.</p>

Anderson & Wiener (2015) USA	The impact of assistive technologies on formal and informal home care.	Aim was to assess which categories of assistive technologies were complementary to personal assistance by differentiating between total and formal personal assistance hours.	Quantitative	Study used the 2004 National Long-Term care Survey looking at community dwelling respondents receiving assistance with ADLs.	Assistive devices for indoor and outdoor mobility, bed transfer, and bathing were found to substitute total personal assistance services.	Potential inadequacy of case mix control variables. Self-reported data can be biased. Cross-sectional data does not allow for detection of changes in personal assistance over time. Could not address needs for services.
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<p>Chong, Akobirshoev, Caldwell, Kaye, & Mitra (2022) USA</p>	<p>The relationship between unmet need for home and community- based services and health and community living outcomes</p>	<p>Examined the association between unmet need for home and community based services and their outcomes in a multi-state, multi-program sample of Medicaid users.</p>	<p>Quantitative.</p>	<p>Utilized data from the 2017-2018 National Core Indicators-Aging and Disability (NCI-AD) survey. Sample included older adults and adults with physical disabilities who were receiving Medicaid Home and community-based services across 13 states (N =10,263). Descriptive analyses on demographic, functional, and health characteristics of the sample, and analyzed the prevalence of unmet need in 5 domains (assistance with daily activities, assistive technology, home modifications, transportation, and sufficiency of services meeting user needs and goals).</p>	<p>Over the five domains, prevalence of unmet need ranged from 21% (unmet need for assistance with self-care or other daily activities) to 54% (unmet need for assistive technology). Individuals experiencing unmet need showed worse health and community living outcomes than those who reported no unmet need. Unmet need for home and community-based services was shown to be consistently and significantly associated with poor health and community living outcomes among participants.</p>	<p>Cross-sectional design limits ability to make causal inferences between unmet need and outcomes of participants. Not all states had identical sampling strategies, therefore limiting generalizability of findings. Medicaid delivery differs across states, so participants may have had differing service options.</p>
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<p>Cohen-Mansfield & Biddison (2005) USA</p>	<p>The potential of wash-and-dry toilets to improve the toileting experience for nursing home residents.</p>	<p>Examined the feasibility of using wash-and-dry toilets in a nursing home setting</p>	<p>Mixed-Methods</p>	<p>They utilized a controlled comparison baseline-versus-treatment design. Measurements included staff and resident toilet experiences and toilet reaction questionnaires, utilization logs, Minimum Data Set information, Mini-Mental State Examination scores, and urine cultures. Study included 22 female nursing home residents aged 75+ in a 562 bed not-for-profit nursing home</p>	<p>About half of residents and staff participants reported the device to have a positive effect on toileting. Nursing staff reported that the toilet functions cleaned the residents, but not completely. Bacterial content of urine decreased in the experimental group, and increased in the comparison group. Toilet installation process was complex.</p>	<p>Use of the device did not eliminate the need for caregiver intervention as they still needed to assist with transfers or to finish the job of the toilet. Did not address the facilitators/barriers to use of device (i.e. How was it to clean, to upkeep, can it be modified for use for anyone). All participants were female, therefore the experience of a man is entirely omitted from the study</p>
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<p>De-Rosende-Celeiro, Torres, Seoane-Bouzas, & Avila (2019) Spain</p>	<p>Exploring the use of assistive products to promote functional independence in self-care activities in the bathroom</p>	<p>The goal was to examine the relationship between the use of assistive devices, and independence in transferring in the washroom. They also aimed to determine environmental factors that impact the implementation of bathroom adaptations.</p>	<p>Quantitative</p>	<p>Descriptive study utilizing cross-sectional design. The sample was comprised of 193 community dwelling older adults with disabilities. sample of community-living older adults requesting public long-term care services at the regional government office of Coruña, in north-western Spain.</p>	<p>They found that the number of categories of assistive devices was not significantly correlated with the independent performance of the task. The number of categories of assistive products used in transferring was positively associated with independent performance. They found that social functioning was significantly associated with bathroom adaptation and social risk was lower for those that made the adaptation.</p>	<p>Non-probability convenience sample could lead to non-representative sample. Cross-sectional data cannot determine causal association of variables.</p>
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<p>Fritz, Seidarabi, Barbour & Vohbehren, (2019) USA</p>	<p>Occupational therapy intervention to improve outcomes among frail older adults: A scoping review.</p>	<p>This review aimed to explore current literature on occupational therapy interventions to improve outcomes for community-dwelling older adults experiencing frailty</p>	<p>Scoping Review. Looked at peer-reviewed literature regarding occupational therapy interventions and frailty published between 1996 and 2016</p>	<p>A systematic search was done using the databases Cochrane Database of Systematic Reviews, CINAHL Complete, PsycINFO, Scopus, PubMed Central, MEDLINE, and the Web of Science. After removing duplicates and filtering 10 studies met inclusion criteria.</p>	<p>Treatments focused on recommendations and training for the use of adaptive devices or assistive technologies, performance of self-care, and recommendations for home modifications.</p>	<p>Only looked at studies including community-dwelling older adults. Limited number of studies in review.</p>
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<p>Gill, Han, & Allore (2007) USA</p>	<p>Bath Aids and the Subsequent Development of Bathing Disability in Community-Living Older Persons</p>	<p>The study aimed to determine whether the availability of bath aids may forestall the subsequent development of bathing disability.</p>	<p>Quantitative. Prospective cohort study.</p>	<p>Sample of 501 community dwelling, independent older adults. Initially a home assessment was done to determine the availability of 5 bath aids. Participants then took part in monthly telephone interviews to determine onset of persistent disability in bathing tasks. After 18 months, - participants were evaluated for disability in bathing tasks.</p>	<p>Presence of a bath seat, grab bars, handheld shower head, and long handled sponge, was associated with persistent disability in each bathing task. Non-skid mats was associated with a lower risk of persistent bathing disability.</p>	<p>Utilization of previously collected data did not allow for exploration of psychosocial impacts. Data cannot fully account for the effects of self-selection, therefore, clinical trials may be necessary to demonstrate device value.</p>
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<p>Gitlin, Winter & Stanley (2017) USA</p>	<p>Compensatory Strategies: Prevalence of Use and Relationship to Physical Function and Well-Being</p>	<p>Study purpose was to examine the prevalence of compensatory strategies (assistive devices, receiving help, changing frequency, and method of performance) and how they impact well-being.</p>	<p>Quantitative.</p>	<p>Participants were initially interviewed at baseline, then following randomization to the intervention (ABLE) or no-treatment control group, were reinterviewed at 6 and 12 months. N=319.</p>	<p>For 17 everyday activities, changing method of performance was most frequently used, followed by changing frequency, assistive devices, and receiving help. Using each strategy type was associated with functional difficulties at baseline, whereas each strategy type except changing method predicted functional decline 12 months later. Changing frequency of performing activities was associated with depressed mood and poor mastery at baseline and 12 months. Findings suggest that strategy type may be differentially associated with functional decline and well-being although reciprocal causality and the role of other</p>	<p>There is possibility of self-report bias. The use of the compensatory strategies were not monitored, so they may not have been used to their full potential. Individuals with no, or severe limitations were excluded which limits generalizability. Sample is mostly female.</p>
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					factors in these outcomes cannot be determined from this study.	
Guay, Gagnon, Ruest, & Bourget (2016) Canada	Interrater reliability of Algo used by non-occupational therapist members of homecare interdisciplinary teams.	The aim of the study was to determine if non-occupational therapists using Algo (a clinical algorithm for recommending bathroom modifications) for community-dwelling elders in “straightforward” situations, will make equivalent recommendations for clients.	Quantitative	Sample consisted of eight non-OTs (three social workers, two physical rehabilitation therapists, two homecare aides and one auxiliary nurse) were trained to use Algo and implemented it with six standardized clients. Bathroom adaptations recommended (one of nine options) by non-OTs were compared to assess interrater agreement using Fleiss adapted kappa.	Non-OTs using Algo in the same simulated clinical scenarios recommend clinically equivalent bathroom adaptations. This shows that there is interrater reliability of Algo used by non- OT members of homecare interdisciplinary teams.	Algo tool is only related to bath-devices. The tool does not provide guidance on implementation such as training of device use. May have been communication between participants that influenced their judgement.

<p>Hoening, Taylor & Sloan (2003) USA</p>	<p>Does Assistive Technology Substitute for Personal Assistance Among the Disabled Elderly?</p>	<p>Examined the use of technological assistance to cope with disability and if it was associated with fewer hours of personal assistance</p>	<p>Quantitative. Cross-sectional design</p>	<p>Cross-sectional study of 2,368 community dwelling older than 65 years with 1 or more limitations in ADLs from the 1994 National Long Term Care Survey.</p>	<p>Of those with ADL limitations, multivariate models showed a strong correlation between technological and personal assistance where use of ATDs were associated with fewer hours of help.</p>	<p>Because persons with limitations in basic or instrumental ADLs were oversampled, the sample was more disabled than a random sample of the US population older than 65 years would be expected to be. Data were cross-sectional so study cannot speak to causality. The relation between personal and technological assistance is bidirectional and the analysis examined only 1 side of the relationship.</p>
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<p>Hastings Krakowsky, & Finlayson, (2001) USA</p>	<p>Factors Affecting Older Adults' Use of Adaptive Equipment: Review of the Literature</p>	<p>This review aimed to identify the major findings of published research on the factors influencing older adults' use of adaptive equipment.</p>	<p>Systematic Review</p>	<p>Fourteen studies were identified and the results were compared to determine common factors influencing older adults' use of adaptive equipment.</p>	<p>They found that . Between 47% and 82% of prescribed equipment continues to be used by older adults, with use decreasing over time. Studies show that equipment suitability, adequate training, and pre-prescription home visits contribute to these rates of use. Lack of fit among the person, his or her environment, and the equipment was the primary reason identified for non-use.</p>	<p>Small sample size of included studies.</p>
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<p>Larsen, Mortensen, Kristensen & Hounsgaard (2019) Denmark</p>	<p>Older adults' perspectives on the process of becoming users of assistive technology: a qualitative systematic review and meta-synthesis</p>	<p>The review's goal was identify, synthesize, and evaluate current literature regarding the process of becoming a user of assistive technology (AT).</p>	<p>Systematic Review</p>	<p>Systematic literature search was conducted using relevant databases and key words. Seventeen out of 4645 articles were included.</p>	<p>Five phases emerged regarding to the process of becoming an AT user: phase A (evaluating need), phase B (acknowledging need), phase C (incorporating the AT into daily life), phase D (Using the AT) and phase E (Future use). Three transitions, describing factors essential to moving from one phase to the next, were identified; from phase A–B: Valued activities are threatened, from phase B–C: Obtaining the AT and from phase C–D: Trust in the AT. No transition was identified from phase D–E.</p>	<p>Study selection was carried out by only one author.</p>
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<p>Lien, Steggell & Iwarsson (2015) USA</p>	<p>Adaptive strategies and person-environment fit among functionally limited older adults aging in place: A mixed methods approach</p>	<p>The study explored the accessibility and usability of the home environment to gain a deeper understanding of adaptive environmental behaviors.</p>	<p>Mixed methods.</p>	<p>Used objective and perceived indicators of P-E fit among 12 older adults living in community-dwelling housing. Quantitative data described objective P-E fit in terms of accessibility, while qualitative data explored perceived P-E fit in terms of usability. Participants from city centre and rural surrounding areas of a small area of the Pacific North West in USA.</p>	<p>Found 3 major themes (adjusting of behaviour or attitudes to maintain/regulate P-E Fit, Increasing functional or environmental support to enhance P-E Fit, and counteracting losses in functional or environmental support to achieve P-E Fit). A closer examination of the P-E interaction suggests that objective accessibility does not always stipulate perceived usability, which appears to be malleable with age, self-perception, and functional competency.</p>	<p>Small sample size. Participants were all functionally capable without formal support. Participants lived in a relatively homogenous, affluent, and highly educated smaller-urban region in one specific area of the U.S. data was collected using a cross-sectional design, which cannot capture variations of adaptive behaviors over time. WEIRD Sample</p>
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<p>Li, Sun, Yu, Dong, Zhao & Ying (2020) China</p>	<p>The needs of older adults with disabilities with regard to adaptation to aging and home care: Questionnaire study.</p>	<p>Study aimed to examine the needs of older adults with disabilities with respect to adaptation to aging, and to analyze associations of individual factors and dysfunction with those needs.</p>	<p>Quantitative</p>	<p>Questionnaire surveys were administered to 400 (370 completed) older adults with disabilities from 10 communities in Ningbo City, Zhejiang Province, China. The survey was conducted from August 2018 to February 2019. Used the Demographic Data Questionnaire, the Activity of Daily Living Scale, and the Questionnaire on Needs for Adaptation to Aging questionnaires.</p>	<p>The care needs of older adults with extremely mild and mild dysfunction pertained primarily to resting, a supportive environment, and transformation of indoor activity spaces. Care needs of older adults with moderate dysfunction pertained primarily to resting and renovation of washrooms. Factors influencing the needs of older adults with disabilities were dysfunction, age, monthly income, and living conditions.</p>	<p>Used convenience sampling. The sample was obtained only from the South of China, limiting generalizability of the findings.</p>
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Porter, Franklin, Pieninck, Springer & Holm (2001) USA	Quality of Follow-Through with Feeding Interventions for Long-Term Care Facility Residents.	Examines follow-through with occupational therapist feeding recommendations (postural, use of adaptive equipment, environmental adaptations, and set up) of 30 residents living in Long Term Care facilities at midday meal	Quasi-experimental, single-group time series design.	N=30, 25 women, 5 men. Ages ranged from 65 to 96. A total of 85 feeding recommendations were made by occupational therapists for the 30 proxy participants.	A significantly lower follow-through rate was found between the number of recommendations documented and recommendations that were implemented completely by staff. The found rate of follow-through was just 41%.	Convenience sampling may not be representative. Observation days were randomly selected and may have not been reflective of staffing present during training. As resident needs change, their care plan may not have been updated frequently enough to result in best results. Lack of communication and unclear instruction for staff. Test was done when they were highly staffed (mid-day meal). What happens for other meals? Primarily female sample
Mann, Hurren, & Tomita (1995) USA	Assistive devices used by home-based Elderly persons with Arthritis	This article examines assistive device use by home-based elderly persons with arthritis	Mixed Methods.	This study was part of a larger longitudinal study. Sixty-six participants were interviewed for the	Participants in the severe arthritis group had	Authors noted that survey data in elderly has been shown to not achieve a random sample.

				<p>State University of New York at Buffalo Rehabilitation Engineering Research Center Consumer Assessment Study.</p>	<p>more chronic diseases, more pain, and a lower level of independence in self-care activities than subjects in the moderate arthritis group. Both groups had relatively poor health, high rate of medication use, depression, use of a high number of assistive devices (about 10 per person), and an expressed need for additional devices. Generally, there was a high rate of satisfaction with the assistive devices used. Most subjects missed being able to participate in at least one activity; most of these activities were active and related to leisure. Findings revealed that participants</p>	
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					had inadequate information on assistive devices, suggesting the importance of more occupational therapy involvement in selecting devices.	
Mathieson, Kronenfeld, & Keith (2002) USA	Maintaining functional independence in elderly adults: the roles of health status and financial resources in predicting home modifications and use of mobility equipment	Study investigated whether health status (i.e., need characteristics) and financial resources (i.e., enabling characteristics) were important predictors of two types of functional adaptations among elderly adults: home modifications or ADLs	Quantitative	Participants were identified from the National Survey of Self-Care and Aging (n=3,485), a nationally representative sample of noninstitutionalized U.S. adults aged 65 and older. Need and enabling characteristics were used to predict home modifications and equipment use.	Although several need variables had significant, direct effects on functional adaptations, the effects of ADL limitations diminished at higher levels of impairment. Subjective income measures and supplemental insurance had significant, direct effects on functional adaptations.	Missing data for the income variables. Cross sectional data cannot observe changes over time.

<p>McGrath & Astell (2017) Canada</p>	<p>The benefits and barriers to technology acquisition: Understanding the decision-making processes of older adults with age-related vision loss (ARVL)</p>	<p>The objective was to explore the decision-making processes of older adults with ARVL, relating to their acquisition and use of low vision assistive devices to facilitate occupational engagement.</p>	<p>Qualitative critical ethnography.</p>	<p>The sample included 10 older adults with age-related vision loss. They participated in narrative interviews, participant observation sessions, and semi-structured in-depth interviews.</p>	<p>They determined benefits and barriers to technology acquisition and use. Benefits of technology acquisition included: enhanced occupational engagement; independence; safety; insurance; and validation of the disability. Barriers to technology acquisition included: cost; training; usability; lack of awareness of low vision rehabilitation services; fear of being taken advantage of; and desire to preserve a preferred self-image.</p>	<p>Small sample size. Activities observed were chosen by participants so there may have been bias there.</p>
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<p>McWilliam, Diehl-Jones, Jutai, & Tadrissi (2000) Canada</p>	<p>Care delivery approaches and seniors' independence</p>	<p>Looked to gain an understanding of the care approaches that enable independence for seniors.</p>	<p>Systematic Review</p>	<p>Reviewed 65 studies on care delivery approaches promoting independence on older adults.</p>	<p>Findings indicate the need for more attention to policy on assistive devices, and the need for more research on the effectiveness of public health programming, on strategies to enhance preventive medical care, and psychosocial factors which affect seniors' self-efficacy.</p>	<p>No breakdown between community-dwelling older adults and older adults in congregate care.</p>
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<p>Mortenson, Demers, Fuhrer, Jutai, Lenker & DeRuyter (2013) Canada</p>	<p>Effects of an assistive technology intervention on older adults with disabilities and their informal caregivers: An exploratory randomized controlled trial</p>	<p>The study aim was to demonstrate that an assistive technology (AT) intervention improves older AT users' activity performance and satisfaction with activity performance and decreases their caregivers' sense of burden.</p>	<p>Quantitative</p>	<p>This study was a delayed intervention, randomized control trial. Baseline data were collected from 44 community-dwelling AT user-caregiver dyads in Vancouver and Montreal.</p>	<p>After the intervention, assistance users in the intervention group reported significantly increased satisfaction with activity performance and improved accomplishment scores. Informal caregivers in the intervention group experienced significantly decreased burden with their identified problematic activity. Participants in the delayed intervention group experienced similar benefits after the intervention. Improvements for both groups were mostly maintained 4 months after the conclusion of the intervention.</p>	<p>Randomization was based on a larger estimated sample size. Lack of blinding and subjective nature of outcome measures may have contributed to social desirability bias. Follow up after 4 months is not that long to determine lasting effects.</p>
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<p>Roelands, Van Oost, Buysse, & Depoorter. (2002) Belgium</p>	<p>Awareness among community-dwelling elderly of assistive devices for mobility and self-care and attitudes towards their use</p>	<p>Examined older adults receiving home nursing care to investigate the extent of their awareness and perceptions of assistive devices for mobility and self-care.</p>	<p>Qualitative. Interview.</p>	<p>Sample consisted of 117 individuals 75+ receiving nursing care in their home in Belgium</p>	<p>Large gaps in awareness were identified, however, participants expressed positive attitudes regarding the possibility of using these devices as a complement to personal care. Most participants were already using some Ads. Linear regression revealed the possession of devices is correlated with increased need for care.</p>	<p>Study excluded individuals with cognitive or severe sensory impairments.</p>
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<p>Roelands, Van Oost, Depoorter & Buysse (2002) Belgium</p>	<p>A Social–Cognitive Model to Predict the Use of Assistive Devices for Mobility and Self-Care in Elderly People</p>	<p>Goal was to provide insight into the impact of psychological variables in understanding the use or non-use of assistive devices for self-care and mobility</p>	<p>Quantitative</p>	<p>Utilized survey data. Sample of 491 community-dwelling older adults in Flanders, Belgium.</p>	<p>Found that there were 32 ADs possessed and used by participants. found to be bivariately related to intention to use ADs, awareness of ADs, attitude toward AD use, subjective norm regarding AD use, self-efficacy concerning AD use, and socio-demographic characteristics. In regression analyses the intention to use ADs was found to be related to self-efficacy concerning AD use, attitude toward AD use, and subjective norm regarding AD use.</p>	<p>Sample may not be completely representative as there were more men than women. Women typically have more disability. Disability was self-reported. Many instruments were developed for this study, therefore their reliability and validity has not been thoroughly examined.</p>
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<p>Roelands, Van Oost, Stevens, Depoorter & Buysse (2004) Belgium</p>	<p>Clinical practice guidelines to improve shared decision-making.</p>	<p>This study examines how clinical practice guidelines for the introduction of assistive devices in home care improve shared decision-making about assistive device use and modify its social-cognitive influences.</p>	<p>Quantitative</p>	<p>One hundred sixteen home nurses and home care workers and their 140 clients with disabilities completed questionnaires. Client questionnaire consisted of questions regarding the possession of assistive devices, and the formal caregiver's practice as perceived by the client. The caregiver questionnaire consisted of questions exploring current practice of introducing ADs. Quasi-experimental design. MANOVA and t-tests were used to analyze data.</p>	<p>Significant differences between intervention and control groups revealed that implementation of clinical practice guidelines improved home nurses' and home care workers' self-reported practice: the number of intervention methods they applied increased, and the methods were applied with increased intensity. Nurse attitudes towards introducing ADs in a shared decision-making process decreased in the intervention group and control groups across time. Clients' reports about caregivers' practice showed a minor concurrence with the reports of the caregivers themselves. The complexity of the clinical practice</p>	<p>Self-reported measures may result in bias. Small sample of clients. Nurses were selected by superiors and there may have been sampling bias. The impact of informal caregivers on the process of AD implementation was not looked into.</p>
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					guidelines and substantial time investment were revealed as the main barriers to involving clients in shared decision-making.	
Roelands, Van Oost, Depoorter. Buysse & Stevens (2005) Belgium	Introduction of assistive devices: home nurses' practices and beliefs.	Examines home nurses' practices for introducing assistive devices, and analyzing whether their practice is related to attitudes, subjective norms, and self efficacy.	Quantitative.	Cross-sectional study. Participants completed a self-administered questionnaire.	Participants had positive attitudes and high levels of intention, and self efficacy toward most steps of the decision process of introducing assistive devices. Multiple linear regression revealed attitude and self-efficacy predicted intention to introduce assistive devices. Intention was correlated to current practices.	Participants were selected by the nursing department, and likely produced a biased sample. Self-reported behavior can lead to more positively skewed results.

<p>Scherer, Jutai, Fuhrer, Demers & Deruyter. (2007) USA</p>	<p>A framework for modelling the selection of assistive technology devices (ATDs)</p>	<p>A model is proposed indicating factors influencing consumer dispositions and provider practices related to obtaining ATDs</p>	<p>Peer-reviewed literature review.</p>	<p>The relevant literature on a variety of factors that influence specific ATD selection is summarized.</p>	<p>The conclusion that a particular ATD is appropriate for an individual and their needs is influenced by society which in turn, impacts consumer and care provider perspectives in choosing these ATDs</p>	<p>Not systematic review.</p>
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<p>Skymne, Dahlin-Ivanoff, Claesson & Eklund (2012) Sweden</p>	<p>Getting used to assistive devices: Ambivalent experiences by frail elderly persons</p>	<p>The study aimed to learn how frail older adults experienced becoming assistive device users and how assistive devices impacted their independence in daily activities.</p>	<p>Qualitative study utilizing focus group data.</p>	<p>Five group discussions were conducted with a total of 18 people including 14 women and four men. Two major themes were extracted from the data.</p>	<p>Two major themes were found. 1) Confidence in knowledge with sub themes trust the expert and trust yourself, and to have confidence in having the right information about assistive devices. 2) Experience and getting used to assistive devices in daily activities with five sub themes of ambivalent experiences when using assistive devices in daily activities: creates opportunities and limitations; provides security but also raises concerns; the need is seen as transient or permanent; the social environment both encourages and restricts; the physical environment both</p>	<p>Sample was disproportionately female. Small size of focus group may have hindered dynamic discussion. Focus-group methodology is qualitative; therefore, one cannot make general conclusions.</p>
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					facilitates and complicates.	
Suhonen, Karpainen, Martín & Stolt, (2019) Finland	Nurse managers' perceptions of care environment supporting older people's ability to function in nursing homes.	The study's aim was to describe nurse manager's perceptions of nursing home care environments and to hear their insights on how resident functional ability can be improved	Qualitative. Utilized focus groups.	Sample was comprised of 14 nurse managers from 6 nursing homes in Southern Finland. Exploratory, descriptive, qualitative study consisting of focus groups. Data analyzed through content analysis.	Physical environment permits self-management using design of internal structures and assistive devices. The social environment enables through the provision of private and communal spaces to encourage personal privacy and autonomy and supporting communal involvement. Symbolic environment supports personal culture, care culture, and connecting care perspectives while recognizing individual variations in care.	Small sample size. Focus group size was impacted by work duties of participants. All participants were female.

<p>Sutton, Gignac & Cott (2002) Canada</p>	<p>Medical and everyday assistive device use among older adults with arthritis.</p>	<p>This study compared older adults' use of medical assistive devices with their use of everyday assistive devices as a means of managing chronic physical disability. It also examined whether predisposing, need, and enabling factors were associated with device use in three domains of activity: personal care / in-home mobility, household activities, and community mobility.</p>	<p>Qualitative. Structured interview.</p>	<p>A sample of 248 participants aged 55 years and older experiencing disability due to osteoarthritis were administered an in-depth, structured questionnaire, as part of a larger study examining older adults' independence and adaptation to chronic physical illness.</p>	<p>Results showed that participants actively adapted to their disabilities utilizing a wide range of medical and everyday devices, with everyday devices being reported more than twice as often as medical ADs and the fewest devices overall being reported for community mobility. Medical devices were used when subjective and objective need for ADs was considerable. Everyday devices were reported earlier in the trajectory of disease, at mild and moderate disability levels, and were associated with a adaptation including planning to avoid problems, exercise, and pacing activities.</p>	<p>Utilized a convenience sample, limiting generalizability. Sample was primarily female. Did not assess disability over time. Using cross-sectional, correlational data does not allow the opportunity to draw causal inferences.</p>
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<p>Szanton, Leff, Wolff, Roberts, & Gitlin (2016) USA</p>	<p>Home-Based Care Program Reduces Disability And Promotes Aging In Place</p>	<p>Purpose of the study was to evaluate the outcomes of participants using the Community Aging in Place, Advancing Better Living for Elders (CAPABLE) program</p>	<p>Quantitative</p>	<p>Study consisted of 281 participants, 234 after attrition. Examined changes in ADL and IADL limitations and depression from baseline to follow-up using multivariate linear regression models. Paired t-tests were used to compare outcomes for participants who had been hospitalized in the previous year and those who had not. Baseline measures compared to 5 month follow up.</p>	<p>Results showed that the CAPABLE program did contribute to a reduction in disability for participants. Difficulty was reduced among 75 percent of participants during the five-month CAPABLE program. They found a a 49 percent improvement in physical functioning. Difficulties with IADLs decreased in 65 percent of participants and depressive symptoms improved 53 percent. Home hazards were reduced. Participants benefited equally from the CAPABLE program regardless of if they had been hospitalized in the previous year or not.</p>	<p>There was no control group, therefore it cannot be determined whether the CAPABLE program specifically was the reason for positive outcomes. A high percentage were women, and African American, may limit generalizability.</p>
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Verbrugge & Sevak (2002) USA	Use, Type, and Efficacy of Assistance for Disability	This study predicts use of assistance, type of assistance, and its efficacy (improvement with assistance) for disabilities in personal care and household management tasks.	Quantitative	U.S. community-dwellers aged 55+ were studied using the 1994–1995 National Health Interview Survey Disability Supplement. Considered 3 types of assistance: Personal Only, Equipment Only, and Both. Efficacy was measured by comparing the degree of difficulty doing a task with versus without assistance.	Severe disability in a task and poor overall health/disability status increase use of assistance, especially for both types rather than one. For people using one type of assistance, poor health/disability status is linked with personal help, but high severity is linked with equipment use.	Quantitative data cannot analyze the psychosocial components or user's options of ATD use.
Vik & Eide (2013) Norway	Older adults who receive home-based services, on the verge of passivity: the perspective of service providers	This study aimed to explore service providers' perception and understanding of the conditions for participation of older adults who receive home-based care.	Qualitative. Grounded theory.	Six focus groups containing 4 to 6 participants were conducted. The sample included 30 service providers (assistant nurses, nurses, physiotherapists, occupational therapists, social educators and social workers)	They found that four different conditions (timing of application for services, older adult/family expectations about participation, external factors, barriers in service delivery) influenced opportunities for participation, or leaned toward passivity.	Focus groups may lead to participants not wanting to give their real opinion in a group, therefore, certain aspects may be left out.

				participated, ranging from 20 to 67 years of age having working experiences ranging from 1 year to 30.		
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