2021

Integrating Assistive Technology into Outpatient Rehabilitation Programs to Increase Independent Living in Older Adults: A Critically Appraised Topic (CAT)

Josie Anhorn

Kenadee Eyre

Tiana Griffith

Integrating Assistive Technology into Outpatient Rehabilitation Programs to Increase Independent Living in Older Adults: A Critically Appraised Topic (CAT)

Josie Anhorn, OTS, Kenadee Eyre, OTS & Tiana Griffith, OTS

Department of Occupational Therapy, University of North Dakota, Grand Forks, North Dakota, United States

Please direct correspondence to Kenadee Eyre at kenadee.eyre@und.edu

***This resource was written by doctoral-level students in fulfillment of the requirements of the Occupational Therapy course "OT 403 - Clinical Research Methods in Occupational Therapy" at the University of North Dakota School of Medicine and Health Sciences, under the advisement of Professor/Course Director Anne Haskins, Ph.D., OTR/L, Assistant Professor Breann Lamborn, EdD, MPA, Professor Emeritus Gail Bass Ph.D., OTR/L, and Research and Education Librarian Devon Olson Lambert, MLIS.

Focus Question

Does assistive technology, integrated into occupational therapy services, have an effect on the independent living skills of adults age 60 and older in the outpatient rehabilitation day program?

Clinical Scenario

In the United States, older adults account for about "16% of the population" (Administration on Aging, 2020, p.5). Older adults are defined as anyone aged 60 and older. There has been a steady increase in the number of older adults living in the United States, and that number is expected to continue growing at a rapid rate as it is predicted that by 2040, older adults will make up approximately "21.6% of the population" (Administration on Aging, 2020, p. 5-6). The majority of this population does not reside in assisted living facilities or nursing homes but instead lives in the community (Administration on Aging, 2020, p.7). Of those adults that reside in the community and are living independently, "21.9% are aged 65 to 74, 31.2% of are aged 75 to 84, and 38.7% of adults aged 85 and older live by themselves" (Song & van der Cammen, 2019, p.50). It is important that older adults are able to maintain their independence while living alone, especially since they face more difficulties than other age groups. Some of these difficulties include physical problems such as decreased muscle tone and greater susceptibility to falls, mental problems such as anxiety or cognitive impairments, and social problems such as loneliness and decreased social interaction (Song & van der Cammen, 2019). Technology can assist older adults with addressing these problems and can allow them to remain independent for a longer time.

Independent living skills include activities of daily living (ADLs) and instrumental activities of daily living (IADLs). ADLs are defined as, "activities oriented toward taking care of one's own body and completed on a routine basis" (American Occupational Therapy Association, 2020, p. 30). There are many categories associated with ADLs, but this critically appraised topic pertains to dressing, eating and swallowing, feeding, functional mobility, personal hygiene and grooming. IADLs are defined as, "activities to support daily life within the home and community" (American Occupational Therapy Association, 2020, p. 31). This critically appraised topic includes communication management, community mobility, financial management, home management, meal preparation and cleanup, safety and emergency maintenance, and shopping. When considering individuals aged 60 and over, "around 20% of men and 30% of women in this age group currently need help with at least one Activity of Daily Living (ADL)" and that number is projected to increase over time (Abdi et al., 2019, p. 2). With that being said, "50% of older people who have difficulty with an ADL received no formal or informal support" (Abdi et al., 2019, p. 2). There is an evident need to create a solution that allows older adults to complete ADLs and IADLs independently. Technology is a resource that can be incorporated into occupational therapy intervention via outpatient rehabilitation day programs. Technology can improve older adults' independence in ADLs and IADLs.

The American Occupational Therapy Association defines an assistive technology device as "any item, piece of equipment, or product system, whether acquired commercially, modified, or customized, that is used to increase, maintain, or improve the functional capabilities of individuals with disabilities." (Goodrich & Garza, 2015). Technology such as mobile phones,

computers, tablets, and other technologies are becoming more widely used among the public, including older adults. These technologies are shown to be important to independent living and enable these individuals to perform daily tasks, communicate with others, and stay physically active (Peek et al., 2016). Integrating technology into occupational therapy services can give clients and their families the resources they need after discharge, creating opportunities to further independence. Technology can be a means to freedom for clients as it gives them an opportunity to take a walk on their own, setting alarms and reminders so they may not forget to take medications or to take food out of the oven, and even dictation features can be used to write messages to loved one's. (Marawaa et al., 2020). One occupational therapist stated, "...it [technology] is a great part of people's lives today and people are depending on it today. By integrating it we can train something useful" (Marwaa et al. 2020). Assistive technology has the ability to improve older adults' independence in their living skills by widening their performance range, and occupational therapists have the ability to train their clients on the best ways to use technology. It is important for occupational therapists to consider the cultural aspect of older adults when implementing technology into a program. Older adults have varying levels of self-efficacy and "the degree to which they are technology-minded" differs. Some may even view technology as stigmatizing (Haufe et al., 2019). This could influence older adults' willingness to participate in technology-based interventions.

The use of technology in outpatient rehabilitation programs in order to improve older adults' independent living skills was looked at through the lens of the ecology of human performance model (EHP). "EHP allows occupational therapists to look at the person, the occupational environment, and the interaction of the two" (Dunn, 2017, p. 209). EHP views the person as having a unique set of variables, including past experiences, personal values and interests, and sensorimotor, cognitive, and psychosocial skills (Dunn, 2017). In addition to the person, EHP also emphasizes the tasks a person can perform, the person's overall performance range, and the effect of contextual factors on the person's overall performance range. "Tasks allow an individual to accomplish a goal" (Dunn, 2017, p. 211). The context of EHP includes the temporal context, the physical context, social contexts, and cultural contexts (Dunn, 2017). The performance range considers the factors of the person and the factors of the context and how they interact to create a number of different tasks (Dunn, 2017). "The ultimate goal of each intervention approach within EHP is to support performance needs and interests of people" (Dunn, 2017, p. 215). Through this lens, occupational therapists can look at their client, the effect of technology on the client's environment, and how the interaction between the client and technology has an effect on the overall task performance.

Purpose Statement

The purpose of this review is to assist occupational therapy practitioners by giving them the materials needed to make evidence-based decisions for integrating technology into outpatient rehabilitation programs to support independent living for older adults 60 and over. Older adults tend to have less experience with technology, and with technology becoming a popular way of living, it is important for occupational therapy practitioners to educate older adults about technology. It is a useful tool that allows these individuals to continue to live independently.

Summary of Key Findings

Search Strategy Methods

The total number of articles that were initially reviewed was 30 before narrowing down to 5 articles to critically review based on inclusion criteria, as indicated below. Articles were obtained through the University of North Dakota (UND) library, PubMed, and CINAHL. After a review of the five articles, three articles on this topic are qualitative studies that supported technology integration within the older adult population. Of the 5 articles reviewed, there were two level I articles including a systematic review (Song & van der Cammen, 2019) and a scoping review (Abdi et al., 2019). Along with three level NA articles including a participatory action study (Haufe et al., 2019), a grounded theory study (Marwaa et al., 2020), and a longitudinal qualitative field study (Peek et al., 2016).

Inclusion and Exclusion Criteria for Articles

Inclusion criteria of this critically appraised topic included: older adults (aged 60 and older) who wish to continue living independently, articles published within the past five years, and the use of assistive technology to maintain or improve independent living skills. Exclusion criteria included: participants under the age of 60 who were not living independently or in the community, inpatient rehab, and articles published over five years ago.

Level N/A Studies

Three level N/A qualitative articles examined the use of technology as an intervention for the older adult population (Haufe et al., 2019; Marwaa et al., 2020; Peek et al., 2016). Haufe et al. (2019) used a participatory action research (PAR) methodology to develop a gerontechnology matchmaking tool (GTM). This tool uses a series of questions to match various technologies to the needs of older adults. Technology consultants and community builders were approached and researchers provided verbal and written information concerning the study. Two technology consultants and three community builders agreed to participate. Purposive sampling was used to recruit older adults. In order to be included in the study, older adults needed to live independently at home, be sixty years or older, and be open to discussing gerontechnology. The sample included nineteen participants with an average age of seventy-four. The study consisted of understanding the current matchmaking service and developing a matchmaking tool through co-creation. In the first phase, researchers observed different instances of gerontechnology matchmaking with technology consultants and independent living older adults. Interviews were then conducted to gain a better understanding of the current matchmaking services. In the second phase, researchers and technology consultants worked together over the course of four sessions to create tools and try them in practice. Then, researchers and consultants participated in two action research cycles. These cycles included five stages: diagnosing, action planning, action taking, evaluating, and specifying learning. Issues regarding current matchmaking services were discovered. Additionally, a GTM was created during this study (Haufe et al., 2019).

Peek et al. (2016) conducted a level N/A qualitative exploratory field study. It highlighted the variety of technologies that older adults use in order to remain independent. This study consisted of 53 older adults. Criteria for inclusion were: community-dwelling, aged 70 or older, born in the Netherlands, and not cognitively impaired. Participants were recruited from a medium-sized town and purposive sampling was used. In the study, home visits were made to each participant. The home visits began with gathering background information such as

education level, civil status, living arrangement, level of care, chronic conditions, frailty, and cognitive functioning. The participants were then asked whether they had experienced life events that were meaningful to them in the last twelve months Researchers then asked the participants to take the researchers on a tour through their homes to gather information about what types of technologies they used and how often they used them. In the second part of the home visit, participants were interviewed on reasons for their level of use of three different technologies; the technologies that were discussed depended on the preferences of the participants and the amount of use. Thematic analysis was used to analyze the transcripts from the interviews (Peek et al., 2016). Information regarding the type of technology and the amount of use of these technologies emerged.

The final N/A article, Marwaa et al. (2020) conducted two focus group interviews, and a grounded theory approach was used throughout the study. Qualitative semi-structured interviews were carried out to capture the experiences and perspectives of physical therapists (PTs) and occupational therapists (OTs). The inclusion criteria were PTs and OTs working in various phases of stroke rehabilitation. The participants were recruited from two regional hospitals and from two rural municipalities in the region of South Denmark. A purposeful sampling strategy was used to ensure a variation in participants, including the area of employment and education. The focus group interviews were a method to gain in-depth information on information and communication technology (ICT) from the OT's and PT's perspectives. The focus group interviews were audio-recorded and transcribed verbatim. The transcribed interviews were then analyzed using a grounded theory approach. Subcategories regarding OT and PT perspectives on ICT were identified.

Level I Studies

Two level one studies were chosen based on the task performance of the older adult population, living within the community, showing how technology supports independence (Abdi et al., 2019; Song & van der Cammen, 2019). Abdi et al. (2019) conducted a level IA2b scoping review that included an analysis of 32 pieces of academic literature and 8 pieces of grey literature. Literature was selected through title screening, abstract screening, and full-article screening. The inclusion criteria for the studies selected were older adults with chronic conditions living at home in the United Kingdom and whether the literature selected described their care and support needs. (Abdi et al., 2019). The exclusion criteria included articles that did not focus on older adults living at home in the United Kingdom (UK) and articles that were not published in English or where the full text was not available (Abdi et al., 2019). After a review of these pieces of literature, it was determined that older adults faced many challenges in areas such as social activities and relationships, psychological health, and activities related to self-care, mobility, and domestic life (Abdi et al., 2019). Older adults have the desire to remain living independently, however, factors such as lack of professional advice on self-care skills, poor communication and coordination of services, and lack of knowledge about different services inhibit their ability to do so (Abdi et al., 2019).

Song and van der Cammen (2019) conducted a level IB2b systematic review of 16 studies. The inclusion criteria for this study included academic and peer-reviewed journals, cohort studies with older adults (60+) who were living alone, and electronic assistive technology (EAT) as a monitoring tool. The exclusion criteria included older adults who lived in social or sheltered housing and mechanical assistive devices in which intelligent functions were not embedded (Song & van der Cammen, 2019). The articles and grey literature were selected using

three steps: title screening, abstract screening, and full-article screening. The results of the study showed the EAT technology improved the independence or self-care skills of those living alone, however, improvements in social participation within this population were not seen. Themes were built from the results of the study, grouping information based on different factors that had an influence on occupational performance and participation. The overall aim of this study was to identify the care and support needs of older adults, focusing on those living at home with chronic conditions in the United Kingdom (Song & van der Cammen, 2019).

Strengths and Limitations

All of the articles looked at the use of various assistive technologies in maintaining and developing independent living skills, but not all of them looked at a single specific technology. Peek et al. (2016) stated this as one of the weaknesses because the authors were not able to differentiate between the types of technology used in the study. Another limitation mentioned by all the articles was the inability to generalize the findings to a larger population due to small sample sizes or homogenous samples (Abdi et al., 2019; Haufe et al., 2019; Marwaa et al., 2020; Peek et al., 2016; Song & van der Cammen, 2019). A weakness of the study by Song and van der Cammen (2019) was technological failures.

A strength of all the articles was that they were all published within the past five years (Abdi et al., 2019; Haufe et al., 2019; Marwaa et al., 2020; Peek et al., 2016; Song & van der Cammen, 2019). This ensures that we are including the most recent evidence on the topic. A strength noted by Marwaa et al. (2020) and Abdi et al. (2019) was that patients were selected from a variety of therapies instead of just one, which increases the credibility of the study. The results of these studies indicate that the technologies studied had a positive impact on the lives of older adults who are living independently (Abdi et al., 2019; Haufe et al., 2019; Marwaa et al., 2020; Peek et al., 2016; Song & van der Cammen, 2019).

Synthesis of Evidence

Older Adults and Independent Living

Technology is an emerging tool in today's society; it is important to educate older adults about the technology tools that can be used for independent living. Many older adults wish to remain in their own homes and continue living independently (Peek et al., 2016). However, the literature indicates that older adults who live alone encounter various physical, mental, and social problems (Song & van der Cammen, 2019; Abdi et al., 2019). These factors lead to difficulties in completing tasks such as ADLs and IADLs which include social participation, moving around the house easily, and cooking. Despite these factors, living independently has shown to be extremely beneficial to this population. As long as they are still living in the community, they are able to retain their social networks and they are more likely to engage in social participation because there are more opportunities available within the community (Peek et al., 2016). In addition to this, continuing to live in the context of the community independently can give the person a sense of purpose and can lead to a better overall quality of life (Song & van der Cammen, 2019; Peek et al., 2016). Older adults are at a high risk of feeling lonely, depressed, or socially isolated, and being able to live independently and remain in their community and home can play a large role in preventing these issues (Song & van der Cammen, 2019).

Older adults have reported that they are aware that technology can be important to independent living which includes the ability to perform daily tasks, communicate with others,

and stay physically active (Peek et al., 2016). However, many are still unsure about using these technologies themselves or they do not feel that they have any use for the technologies in order to continue living independently (Peek et al., 2016). Even though many are hesitant to try new technologies, they will if it means that they are able to remain in their home and live independently for longer (Haufe et al., 2019). The use of technology has the potential to increase a person's performance range, which will in turn allow them to remain in the context of living independently for a longer period of time.

Importance of Technology in Day Rehabilitation Programs

Integrating technology into outpatient rehabilitation programs can support independent living for older adults 60 and over. When incorporating technology into these programs, it is important to consider an individual's contexts such as temporal, physical, social, and cultural. These contexts are unique to each individual, thus the need to match technologies to individual needs. The use of resources such as the GTM can be helpful. The GTM is a client-centered approach that allows intermediaries to match an older adult to a certain technology that would best suit their needs. The GTM creates an overview of an individual and determines whether the technology would be beneficial, which type of technology would be the most useful, and additionally addresses what type of support may be needed for technology use (Haufe et al., 2019). Although there is a small amount of evidence regarding the GTM, the current evidence shows that the tool is useful for practitioners and is successful in helping older adults. Further research is needed for matchmaking tools used in this population.

Electronic assistive technology (EAT) is a commonly used type of technology. It includes a range of devices. The majority of devices are home and personal care appliances (Peek et al., 2016). EATs are designed to improve physical health, wellbeing, and the overall ability to live independently. Although independent living is the focus, social wellbeing is an aspect that is still important for these individuals. There is little evidence suggesting that EAT improves social wellbeing (Song & van der Cammen, 2019). But, information and communication technology (ICT) is widely used to enhance social wellbeing. This includes mobile phones, computers, and tablets. ICT is integrated into society and the majority of people's lives (Marwaa et al., 2020). Once an individual is able to live independently, they will be able to create and maintain social connections with the help of technology. It would be beneficial to have older adults participate in a program that teaches them how to use EATs to promote independent living and later incorporate ICT to enhance social wellbeing. This education will allow them to improve their performance range and increase the number of tasks they are able to complete. The combination of these two technology types can increase social well-being and the overall ability for older adults to live independently.

It is important to include technology in day rehabilitation programs. Technology devices are becoming more frequently owned (Marwaa et al., 2020). An in-depth training that explains how to use these various technologies and addresses concerns does create a smooth user experience (Song & van der Cammen, 2019). However, technology is considered a luxury and older adults may or may not be willing or able to spend money on technology devices. This is a factor that needs to be considered. The high cost of technology is a major barrier (Song & van der Cammen, 2019). In addition, it is important to keep in mind that older adults' perception of technology is dependent on their temporal, physical, social, and cultural contexts. The older adult population is a very heterogeneous group and, "a one-size-fits-all approach is unlikely to succeed" (Peek et al., 2016, p. 235).

Clinical Practice Applicability

The use of technology in outpatient rehabilitation day programs has been shown to have a positive impact on improving independent living in the older adult population. Evidence has shown that older adults, 60+, have a desire to live independently, however it is not often possible because of factors that impact task performance and risk the safety of the individual. With the use of assistive technology, these older adults have the capacity to live independently, in a safe way. Technology has been shown to have a positive impact on older adults' ability to perform ADL and IADL tasks independently (Marwaa et al., 2020). Research has also shown the benefits of independently living on adults as they are able to remain in a community setting that is familiar to them. In a familiar context, older adults' performance range is increased and they are able to remain independent in their homes. As older adults are allowed to stay in their homes, research has shown an increase in social participation as they are able to utilize the connections they have made with those in their neighborhood or larger communities. Statistically, older adults are at a higher risk for feeling depressed, lonely, and socially isolated (Abdi et al., 2019). To prevent this, occupational therapists and other healthcare providers strive to assist older adults as they live in their homes through adaptations of the context by integrating EAT and ICT to improve independence and positively impact social participation.

The integration of assistive technologies into outpatient rehabilitation day programs allows older adults a chance to learn how to use technology and understand what technological devices would best improve the individual's performance range. Integration of electronic assistive technologies (EAT) as well as information and communication technologies (ICT) have been shown to improve older adults' independence in different ways. EAT has been shown to be used to improve in areas of physical health, wellbeing, and overall independence. ICT has been shown to improve in areas of social wellbeing. As older adults combine EAT and ICT, their performance range will increase, allowing them to independently complete more tasks. While useful in clinical settings, it has been shown that technology is not a universal adaptation to clients' lives and the integration of technology into the independent living of community-dwelling adults needs to be done on a client-centered basis. The technology chosen must be suitable for and readily available to the client in the context of their home (Haufe et al., 2019; Peek et al., 2016). The research has shown the importance of understanding the type of technology readily available within their clients' homes as occupational therapists do not want to use technologies that will not be available to the client when they return home. There is an insufficient amount of evidence on the role of occupational therapists when using technology to improve independent living in older adults. Through the evidence, it has been shown that occupational therapists lack the training needed to aid older adults in learning about technology (Song & van der Cammen, 2019). Potential cultural bias could be seen in a setting where there is improper training, having an impact on clients' task performance. When looking at the cultural aspect, it is important for occupational therapists to consider generational trends before integrating technology into outpatient rehab day programs and into the lives of older adults. The research has shown older adults have a difficult time accepting and integrating technology into their daily lives (Peek et al., 2016). Technology is perceived as having a greater effect on the newer generation as they are more familiar with the use of electronic devices. Along with generational aspects, the cost of the technology, in relation to socioeconomic standing, is another factor to consider when looking to integrate assistive devices into older adult's lives. The

financial aspect of technology can have an impact on the type of assistance older adults are receiving. While integrating assistive technology can be difficult based on the different cultural factors, the benefits of doing so have been shown to outweigh the difficulties encountered. Assistive technology including electronic assistive technologies (EAT) and information and communication technologies (ICT) has been proven to have a positive impact on the independent living skills of the older adult community, allowing individuals 60+ to live independently longer.

References

Abdi, S., Spann, A., Borilovic, J., de Witte, L., & Hawley, M. (2019). Understanding the care and support needs of older people: a scoping review and categorization using the WHO international classification of functioning, disability and health framework (ICF). *BMC Geriatrics*, *19*(1), 195. https://doi-org.ezproxylr.med.und.edu/10.1186/s12877-019-1189-9

Administration on Aging. (2020). *2019 profile of older Americans.* Administration on Aging, U.S. Department of Health and Human Services. https://acl.gov/sites/default/files/Aging%20and%20Disability%20in%20America/2019ProfileOlderAmericans508.pdf

American Occupational Therapy Association. (2020). Occupational therapy practice framework: Domain and process (4th ed.). *American Journal of Occupational Therapy*, 74 (Supplement 2). Advance online publication.

Dunn, W. (2017). The ecological model of occupation. Hinojoso, J., Kramer, P. & Royeen, C. B. (Eds.), *Perspectives on human occupation: Theories underlying practice* (pp. 207-234). F.A. Davis Company.

Goodrich, B., & Garza, E. (2015). The role of occupational therapy in providing assistive technology devices and services. Retrieved March 23, 2021, from: https://www.aota.org/About-Occupational-Therapy/Professionals/RDP/assistive-technology.aspx

Haufe, M., Peek, S., & Luijkx, K. G. (2019). Matching gerontechnologies to independent-living seniors' individual needs: development of the GTM tool. *BMC Health Services Research*, *19*(1), 26. https://doi-org.ezproxylr.med.und.edu/10.1186/s12913-018-3848-5

Marwaa, M. N., Kristensen, H. K., Guidetti, S., & Ytterberg, C. (2020). Physiotherapists' and occupational therapists' perspectives on information and communication technology in stroke rehabilitation. *PLOS ONE, 15*(8). Doi: 10.1371/journal.pone.0236831

Peek, S. T., Luijkx, K. G., Rijnaard, M. D., Nieboer, M. E., van der Voort, C. S., Aarts, S., van Hoof, J., Vrijhoef, H. J., & Wouters, E. J. (2016). Older adults' reasons for using technology while aging in place. *Gerontology*, *62*(2), 226–237. https://doi-org.ezproxylr.med.und.edu/10.1159/000430949

Song, Y., & van der Cammen, T. J. M. (2019). Electronic assistive technology for community-dwelling solo-living older adults: A systematic review. *Maturitas, 125* 50-56. https://doi.org/10.1016/j.maturitas.2019.04.211