The impact of assistive technology on independent living for adults with intellectual and developmental disabilities: A scoping review.

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Abstract

Background: Intellectual and developmental disabilities (IDD) affect many aspects of a person's daily living skills and limit functional independence. These limitations in functional independence may decrease access to independent or community living and increase caregiver burden. Access to and training on assistive technology can facilitate independent living skills for adults with IDD.

Question/Purpose: The purpose of this scoping review is to explore the types of assistive technology that facilitate independent living for individuals with IDD. This scoping review addresses the following research question: what is the impact of assistive technology on independent living skills for adults with IDD?

Methods: A scoping review was conducted to retrieve current research to answer the proposed research question. Inclusion criteria consists of articles from 2010-2024 that are focused on assistive technology for individuals ages 17 and older with IDD. Articles that were not peer reviewed or written in English were excluded. Four databases were searched from February to March 2024 and articles were downloaded, sorted, and screened utilizing PRISMA guidelines to determine eligibility.

Results: A total of 436 articles were initially found and reviewed for duplication and inclusion criteria, with 9 articles being included in the final review. These 9 articles were grouped and analyzed according to the following themes: the type of assistive technology, functional living skills, living environment, and caregiver burden.

Conclusion: The findings of this scoping review have significant implications for occupational therapy practice and opportunities for future research have been identified.

Introduction

Intellectual and developmental disabilities (IDD) are conditions that are typically present at birth and can affect a person's physical, intellectual, and emotional development (NIH, 2021). Some common examples of IDD include Down syndrome, cerebral palsy, Fragile X syndrome, autism spectrum disorder, and fetal alcohol spectrum disorder (NIH, 2021). IDD may affect many aspects of a person's daily living skills and limit functional independence. Functional independence is required to participate in preferred occupations that a person needs and wants to do. When a person lacks functional independence skills, they may have deficits performing activities of daily living (ADLs) and instrumental activities of daily living (IADLs). ADLs are geared towards taking care of one's own body, while IADLs enable a person to perform more complex skills for functioning in home and community settings (AOTA, 2020).

Individuals with IDD often have difficulty performing ADLs and IADLs independently, which makes them less likely to live independently compared to typically developing adults (Golisz et al., 2018). The negative aspects of not living independently may also increase caregiver burden on aging parents who continue to support their child living at home (Golisz et al., 2018; Xu et al., 2022). This disparity in independent living for individuals with IDD may be due to limited resources, or a lack of knowledge about available assistive technology for independent living.

Assistive technology for independent living may include any items, equipment, programs, or product systems that can be used to promote functional capabilities for individuals with IDD. Examples of assistive technology commonly used for independent living for individuals with IDD are smartphones, iPads, speakers, and smart appliances such as video doorbells, fridges, ovens, and thermostats. Because assistive technology in independent living for

individuals with IDD is a developing field, a scoping review is necessary to understand the existing research. The purpose of this scoping review is to explore the available assistive technology that facilitates independent living for people with disabilities. This paper addresses the following research question: what assistive technology is being used to increase independent living skills for individuals with IDD?

Methods

Because assistive technology to promote independent living for individuals with IDD is still a developing area, a scoping review was conducted. This scoping review was completed following the Joanna Briggs Institute (JBI) methodology for scoping reviews (Peters et al., 2020). The Preferred Reporting Items for Systematic Reviews and Meta-Analysis Scoping Review Extension [PRISMA-ScR] was also utilized for this review (Tricco et al., 2018). A protocol for this scoping review was also created and registered with Open Science Framework (Sullivan & Dunn, 2024). The complete scoping review protocol can be found in Appendix B. The primary focus of the scoping review is identifying the assistive technology being used to facilitate independent or community living for individuals with IDD.

Searches were conducted from February-March 2024 to identify studies relevant to the scoping review topic. The databases included ERIC, MEDLINE with Full Text, CINAHL Plus with Full Text, and Health Source: Nursing/Academic Edition. All databases were searched through the EBSCO platform. Searches were refined through peer discussion and trials.

To be included in this study, articles needed to focus on the use of assistive technology in individuals ages 17 and older who have an intellectual and developmental disability (IDD). The articles were also required to be written in English and peer reviewed. Articles were excluded if

they did not include a form of assistive technology or a type of IDD. Articles were also excluded if the only form of assistive technology utilized were mobility devices.

The search strategy was created based on the target population, intervention, and outcomes related to assistive technology for independent living. Keywords including "assistive technology, AT, smart home, developmental disability, intellectual and developmental disability, IDD, independent living, community living, and independence" were utilized for successful searches with articles meeting inclusion criteria. The searches involved combinations of the keywords and expanders for similar terms. Boolean operators including "AND," "OR," and "NOT" were utilized to refine the search and generate articles answering the research question. Articles were limited to 2010-2024 to determine the current assistive technologies being implemented and utilized. Table 1 indicates the full search strands used for each database.

Table 1.

Search Strategy

Search Name (as saved on EBSCO)	**Database**	**Date**	**Search Terms**	**Total Results**
CINAHL 2/22	CINAHL	2/22/24	(assistive tech or assistive technology or assistive technologies or adaptive technology or adaptive technologies or smart home or smart house or assistive devices or assistive device) AND (developmental disability or developmental disabilities or intellectual disability or intellectual disabilities or "intellectual and developmental disabilities" or IDD) AND (independent living or independence or community living or community dwelling)	18
CINAHL (not w/ independence) 2/22	CINAHL	2/22/24	(assistive tech or assistive technology or assistive technologies or adaptive technology or adaptive technologies or smart home or smart house or assistive devices or assistive device) AND (developmental disability or developmental disabilities or intellectual disability or	130

			intellectual disabilities or “intellectual and developmental disabilities” or IDD) NOT (dementia or alzheimer’s or cognitive impairment)	
Health Source 2/29	Health Source: Nursing/ Academic Edition	2/29/24	(assistive tech or assistive technology or assistive technologies or adaptive technology or adaptive technologies or smart home or smart house or assistive devices or assistive device) AND (developmental disability or developmental disabilities or intellectual disability or intellectual disabilities or “intellectual and developmental disabilities” or IDD) AND (independent living or independence or community living or community dwelling)	12
Health Source (not with independence) 2/29	Health Source: Nursing/ Academic Edition	2/29/24	(assistive tech or assistive technology or assistive technologies or adaptive technology or adaptive technologies or smart home or smart house or assistive devices or assistive device) AND (developmental disability or developmental disabilities or intellectual disability or intellectual disabilities or “intellectual and developmental disabilities” or IDD) NOT (dementia or alzheimer’s or cognitive impairment)	78
Medline 2/29	MEDLINE	2/29/24	(assistive tech or assistive technology or assistive technologies or adaptive technology or adaptive technologies or smart home or smart house or assistive devices or assistive device) AND (developmental disability or developmental disabilities or intellectual disability or intellectual disabilities or “intellectual and developmental disabilities” or IDD) AND (independent living or independence or community living or community dwelling)	18
Medline (not w/ independence) 2/29	MEDLINE	2/29/24	(assistive tech or assistive technology or assistive technologies or adaptive technology or adaptive technologies or smart home or smart house or assistive devices or assistive device) AND (developmental disability or developmental disabilities or intellectual disability or intellectual disabilities or “intellectual and developmental disabilities” or IDD) NOT (	104

			dementia or alzheimer's or cognitive impairment)	
ERIC 3/1	ERIC	3/1/24	(assistive tech or assistive technology or assistive technologies or adaptive technology or adaptive technologies or smart home or smart house or assistive devices or assistive device) AND (developmental disability or developmental disabilities or intellectual disability or intellectual disabilities or "intellectual and developmental disabilities" or IDD) AND (independent living or independence or community living or community dwelling)	18
ERIC (not w/ independence) 3/1	ERIC	3/1/24	(assistive tech or assistive technology or assistive technologies or adaptive technology or adaptive technologies or smart home or smart house or assistive devices or assistive device) AND (developmental disability or developmental disabilities or intellectual disability or intellectual disabilities or "intellectual and developmental disabilities" or IDD) NOT (dementia or alzheimer's or cognitive impairment)	58

Following the searches, articles were downloaded and sorted on Rayyan software for further review, screening, and evidence selection (Ouzzani et al., 2016). A preliminary screening was completed to remove any duplicate articles. The article titles and abstracts were then screened by two independent reviewers. Once the articles were selected, full texts were retrieved, and articles were read to determine if they meet the inclusion and exclusion criteria. A second reviewer was involved in this study to avoid selection bias and ensure articles selected met the inclusion and exclusion criteria. The second reviewer independently screened the same articles as the primary reviewer following PRISMA guidelines. Differences of opinions were resolved by both reviewers through full text reviews, discussion, and consensus.

Following the screenings, the primary reviewer created a data chart to extract essential information from the studies based on the research aim and question. Data extraction categories included: citation, aim/purpose of the study, population, findings/results, type of assistive technology, assistance required with assistive technology, functional independence level, and current living environment. A sample of the data extraction chart is shown in Table 2, and the results of this data extraction chart are listed in Appendix A.

Table 2.

Sample Data Extraction Chart.

Citation (Author(s), year)	**Aim / Purpose of study**	**Population**	**Findings/ Results**	**Type of AT**	**Functional Independence Level**	**Living Environment**

Results

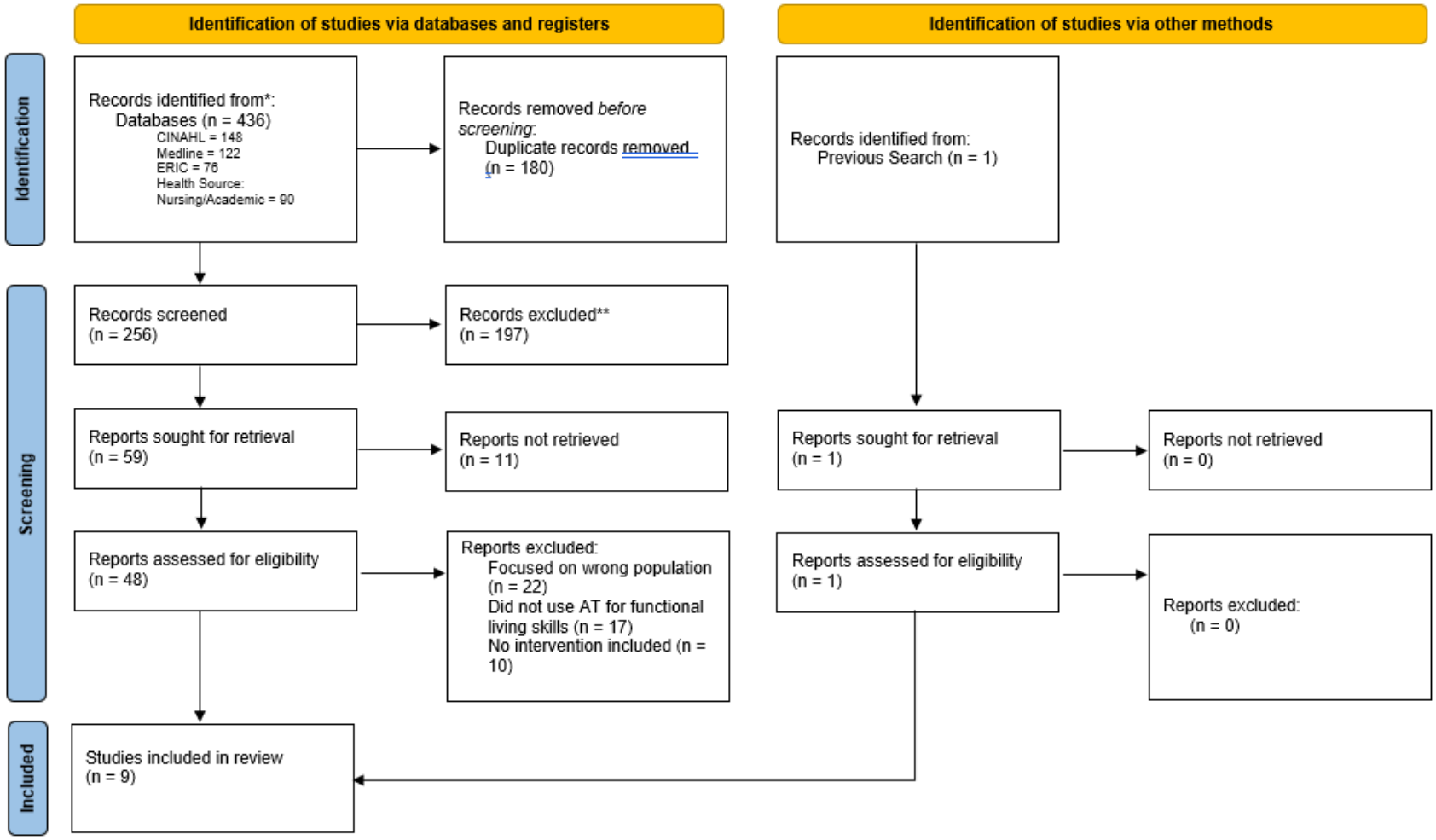
The search strategies utilized in this study retrieved 436 articles across all databases. These articles dated from 2010-2023. Once duplicates were removed, 256 article titles and abstracts were screened by the authors, applying the inclusion and exclusion criteria. After this screening, 197 articles were excluded. The primary author then read the full texts of 48 articles resulting in eight articles in the study given the inclusion and exclusion criteria (Cullen et al., 2017; Lancioni et al., 2018; Lancioni et al., 2020; Maich et al., 2019; McDonnell et al., 2021; Resta et al, 2021; Smith et al, 2023; Tasse et al., 2020). The countries that these studies were conducted in include the United States (n = 3), Italy (n = 2), Canada (n = 1), Switzerland (n = 1), and England (n = 1). One more study was included from a previous search for a literature review, which met inclusion and exclusion criteria. This study was included because it provided essential information on tablet-based apps to increase independent living skills and decrease caregiver burden (Janson et al., 2020). Additional information on these included studies can be found in the

data extraction chart included in Appendix A. Specific information on the identification of studies is listed in the PRISMA flow diagram in Figure 1.

After analyzing the nine included articles, information from these sources was synthesized and sorted into the data extraction chart to answer the research question on what assistive technology is being used to increase independent living skills in individuals with IDD. Because many of the articles used handheld assistive technology, such as smartphones and tablets, as the primary intervention, the specific type of smartphone, tablet, or app was listed for comparison. The level of functional independence in the participants required an in-depth analysis and understanding of the participant's current level of functioning and assistance required. Each research article was looking at a different skill in the participants, so comparing functional independence level in the individuals required a uniform approach to analysis. To guide this analysis, AOTA's *Occupational Therapy Practice Framework: Domain and Process – Fourth Edition* was used to compare performance skills, client factors, and level of independence in the participants. The final aspect of the data extraction chart that required comparison for analysis was the living environment. Participants varied in what setting they were currently living in, how many individuals they lived with, and what kind of support from caregivers they were provided in their living environment. These factors were analyzed to provide a deeper understanding of the support that the participants received for completing ADLs and IADLs. Information on this comparison and analysis can be found within the data extraction chart in Appendix A.

Figure 1.

PRISMA Flow Diagram.



(Tricco et al., 2018)

Discussion

This scoping review was conducted to understand what assistive technology is currently being used by individuals with IDD to facilitate independent living. Data from nine research articles were synthesized, showing that several different forms of assistive technology are utilized to support independent living skills in individuals with IDD. Four themes were determined after synthesis of articles, including type of assistive technology, functional living skills, living environment, and caregiver burden.

Type of assistive technology

Seven out of nine articles included in this study used smartphones, tablets, computers, iPads, or watches as the main form of assistive technology for individuals with IDD to facilitate functional independence skills (Cullen et al., 2017; Janson et al., 2020; Lancioni et al., 2018; Lancioni et al., 2020; Maich et al., 2019; McDonnell et al., 2021; Resta et al, 2021). The type of smartphone or handheld device varied across interventions, including iPhone, Android, and Google devices. Many of these smart devices utilized common applications, such as YouTube or navigation apps, or specialized applications targeted towards individuals with IDD. One article researched the effects of smart speakers, such as Amazon Alexa and Google Home, on independent living skills (Smith et al., 2023). The remaining article used remote support technologies for home safety and in-home care in community living homes for individuals with IDD (Tasse et al., 2020). This remote support technology is a system that allows outside support personnel to monitor health, safety, and communication needs without requiring onsite, 24-hour support staff (Tasse et al., 2020).

Functional living skills

Assistive technology was proven to be beneficial for all participants in the included studies in varying amounts for improvements in functional independence. Even if functional independence skills were not specifically improved in these studies, all participants reported satisfaction with one of the following categories: independence, motivation, autonomy, occupational engagement, or quality of life (Cullen et al., 2017; Janson et al., 2020; Lancioni et al., 2018; Lancioni et al., 2020; Maich et al., 2019; McDonnell et al., 2021; Resta et al, 2021; Smith et al., 2023; Tasse et al., 2020). A critical outcome of many participants' functional independence skills was the ability to initiate performance of and conversations on ADLs and IADLs (Jason et al., 2020; Resta et al., 2021).

While assistive technology enabled independent performance of ADLs, IADLs, and leisure activities in many individuals with IDD, some individuals required continued cues and support for functional living activities. When using smart speakers, such as Amazon Echo and Google Home, the participants had not previously utilized these for daily living activities. This lack of prior knowledge required continued support and training throughout the intervention for functional use (Smith et al., 2023). Other individuals could perform functional living skills independently on tablets, but their attention span limited their performance to shorter periods of time, such as 10-20 minutes of leisure engagement (Lancioni et al., 2020).

Living environment

The types of assistive technology utilized in these studies also depended on the environment that the participants were living in. Many of the participants were already living in a supervised independent household that provided support workers for assistance with some daily needs (Cullen et al., 2017; Janson et al., 2020; Lancioni et al., 2020; Maich et al., 2019; Smith et al., 2023). Assistance in these supported living facilities is often focused on increasing

competency in decision-making for health and safety concerns and generalizing existing skills to complete more tasks independently (Cullen et al., 2017; Janson et al., 2020). However, some individuals living in these settings require external support to enrich daily living, provide opportunities for social engagement, and encourage participation in leisure activities (Lancioni et al., 2020; Maich et al., 2019; Smith et al., 2023).

Other studies provided assistive technology interventions and training programs to individuals who are living with caregivers. Many individuals with IDD in these studies required support for ADLs, IADLs, leisure, or work, so they continued to live with caregivers for continued support (Lancioni et al., 2018; Lancioni et al., 2020; McDonnell et al., 2021; Resta et al., 2021). The remaining participants in these studies lived in group homes with other individuals with IDD (McDonnell et al., 2021; Tasse et al., 2020). The specific amount of external support provided in the group homes was not specified, but all participants still had some form of supervision (McDonnell et al., 2021; Tasse et al., 2020).

Caregiver burden

The final theme that was determined after completing this scoping review was the effects of assistive technology usage on caregiver burden. Several articles found that using forms of assistive technology decreased overall caregiver burden or reliance on caregivers in some activities (Cullen et al., 2017; Lancioni et al., 2018; Maich et al., 2019; McDonnell et al., 2021). Gaining skills and general knowledge on handheld smart devices helped decrease the need for caregiver support in many individuals (Cullen et al., 2017; McDonnell et al., 2021). Another main outcome in caregiver burden was the decreased reliance on caregivers for initiating tasks, such as engaging in preferred leisure activities or preparing a meal (Janson et al., 2020; Resta et al., 2021). Not only did this decrease the need for caregivers to constantly support individuals

with IDD in each step of an activity, but it also enabled individuals with IDD to be more active participants in conversations about their own wellbeing (Janson et al., 2020).

While many of the studies showed a decreased reliance on caregivers, some of the participants in these research articles still required significant support from their caregivers. Many of the participants in one research study still required significant caregiver support to enable community or independent living, but still increased their safety awareness through remote support technologies (Tasse et al., 2020). Other individuals with IDD could use assistive technology without caregiver support for a certain length of time, but then required redirection or caregiver intervention (Lancioni, 2020). Some participants still required caregiver support after intervention due to their lack of knowledge on the assistive technology (Smith et al., 2023). Even though they required continued caregiver support to engage in the intervention, these individuals still showed improvements with independence, social interaction skills, and improved quality of life (Smith et al., 2023).

Implications for Occupational Therapy

The findings from this scoping review support the importance of assistive technology to increase functional independence skills in individuals with IDD. While it is important for occupational therapy practitioners to help individuals increase independence without relying on assistive technology, it is not always feasible. Individuals with IDD often require extra support for performing ADLs and IADLs, whether it is from a caregiver, staff, and assistive technology. Providing proper training on different types of assistive technology can increase independent performance of essential daily living skills and decrease reliance on caregivers and staff. Having this training and comfort using assistive technology independently can increase an individual with IDD's likelihood to move out of their caregiver's home to live independently or in a

community setting. After completing this scoping review, the role for occupational therapists within this population has been recognized. It is well within occupational therapy's scope of practice to assess an individual with IDD's needs and strengths and use this information to determine what assistive technology will best increase their independent living skills.

Limitations and Future Research

There were several limitations of this scoping review. The search strategy was limited to the past 14 years, which may limit the information and evidence from earlier publications. The authors were interested in the most current research, so articles before 2010 were deemed less relevant for this scoping review. The primary author completed the initial screening of articles given inclusion and exclusion criteria, followed by the second author. To settle disputes, the authors had discussions on the questionable articles, which may have increased risk of potential bias. A final limitation of this study is that the databases chosen may not have yielded the most comprehensive results and research. Further research should be completed to assess the effects of training programs on assistive technology for independent living, and its effects on functional independence in individuals with IDD.

Conclusion

This scoping review highlights current evidence on assistive technology being used to increase independent living skills in individuals with IDD. Upon completion of this review, it is evident that handheld technology, such as smartphones, watches, and tablets, are often used to enhance participation in ADLs and IADLs. Proper education on apps, software, and accessibility features of assistive technology devices can increase an individual with IDD's independence with assistive technology, self-efficacy, and motivation. Other forms of assistive technology also have benefits for independent living skills, such as smart speakers and remote support services. With

all these forms of assistive technology, it is imperative to have proper education and continued support to increase generalization and retention of these skills. Utilizing assistive technology not only increases independence and self-determination in individuals with IDD, but it has the potential to decrease caregiver burden and extra support needed from outside staff. Occupational therapy practitioners must determine what form of assistive technology best meets the needs of individuals with IDD and continue to explore the barriers and strengths of using assistive technology for independent living.

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Appendix A.

Citation (Author(s), year)	**Aim / Purpose of study**	**Population**	**Findings/ Results**	**Type of AT**	**Functional Independence Level**	**Living Environment**
Janson, A., Moen, A., & Aure, C. (2020). Introducing a nutritional app in supervised residences for independent living: Experiences of individuals with intellectual disabilities and their caregivers. *Journal of Applied Research in Developmental Disabilities, 34*(1), 55-64. https://doi.org/10.1111/jar.12784	Explore the feasibility of an app about nutrition among individuals with intellectual disabilities and their caregivers	4 caregivers of adults with intellectual disabilities and managers of 6 residences. Individuals with IDD must have decision-making competence & in risk of obesity	Using the app resulted in behavioral changes and better decisions about food	Tablet based app	Using apps for food related decisions increases autonomy and allows individuals with IDD to be active in conversations with caregivers	Supervised, independent residences
Resta, E., Brunone, L., D'Amico, F., & Desideri, L. (2021). Evaluating a low-cost technology to enable people with intellectual disability or psychiatric disorders to initiate and perform functional daily activities. *International Journal of Environmental Research and Public Health, 18*. https://doi.org/10.3390/ijerph18189659	Can adults diagnosed with mild to moderate intellectual disability or psychiatric disorders with cognitive dysfunctions use a commercially available smartphone to	2 females with intellectual disability ages 25-40	Participants were able to use the smartphones to initiate and carryout the scheduled activities with high accuracy	Samsung Galaxy A3 smartphone with YouTube application and audio files.	Smartphone assistive technology can increase independence of the users. Users required assistance for initiation prior to intervention, increased skills for adherence throughout	Live with caregivers

	independently initiate and perform functional daily activities?				intervention phase.	
Tasse, M., Wagner, J., & Kim, M. (2020). Using technology and remote support services to promote independent living of adults with intellectual disability and related developmental disabilities. *Journal of Applied Research in Intellectual Disabilities, 33*(3), 640-647. https://doi.org/10.1111/jar.12709	Determine barriers to using remote support services and improve the usage of services in individuals with intellectual and developmental disabilities	56 individuals with IDD, ages 21 to 74	Benefits to using remote services include increased security and home safety, which can decrease the need for outside assistance.	Remote support technologies	32 respondents required caregivers to complete questionnaires and interviews for them, all required significant support needs to live independently in the community	24 participants were in community-based homes with significant support, 32 lived with parents or guardians
Cullen, J., Simmons-Reed, E., & Weaver, L. (2017). Using 21st century video prompting technology to facilitate the independence of individuals with intellectual and developmental disabilities. *Psychology in the Schools, 54*(9), 965-978. https://doi.org/10.1002/pits.22056	Understand the effects of video-prompting to increase independence in young adults with IDD, and how these skills are acquired and generalized for cleaning tasks.	3 adult males ages 20-24 years old with an IDD	Video prompting helped all participants complete cleaning tasks, improving navigation.	iPad 4 standard size with the app MyPicsTalk for video prompting	Improved daily living skills for generalization, socialization, and employment.	Participants were all in a postsecondary program living in supported living or an apartment away from guardians
McDonnell, A., Benham, S., Fleming, C., & Raphael, A. (2021). Community-based public transportation training with the integration of	Understand if a transportation training	10 individuals with IDD	AT may be beneficial for individuals	Visual social story, individualized	All participants required parent,	9 participants lived in parent's

assistive technology: A pilot program for young adults with intellectual disability. *Technology & Disability, 33*(2), 109-121. http://dx.doi.org/10.3233/TAD-200306	program with assistive technology decreased the amount of travel assistance required for individuals with IDD.	over the age of 21	with IDD to use in a community-based setting for improved transportation skills	Google Map, smartphone navigation app, Google maps app, transportation authority apps in smart phones.	guardian, or staff support for some aspects of daily living.	home, 1 participant lived in a group home
Lancioni, G. E., Singh, N. N., O'Reilly, M. F., Sigafoos, J., Alberti, G., Perilli, V., Zimbaro, C., Chiariello, V., & Campodonico, F. (2018). Supporting leisure and functional activity engagement in people with multiple disabilities via a technology-aided program. *Technology and Disability, 29*(4), 173-181. http://dx.doi.org/10.3233/TAD-170182	Assessing two different version of a technology program for adults with IDD to support leisure and functional activity engagement	7 adults with IDD. Ages 17-50	Utilizing computer programs increased independent leisure engagement. Combining leisure with functional activities increased positive engagement and decreased supervision.	Laptop computer with sound amplifier, microswitch, and basic software	Unable to independently access and perform leisure before intervention, required decreased supervision after intervention.	Not explicitly listed, but all participants required a guardian or legal representative to sign consent forms for their participation.
Lancioni, G. E., Singh, N. N., O'Reilly, M. F., Sigafoos, J., Alberti, G., Perilli, V., Chiariello, V., Grillo, G., & Turi, C. (2020). Case series of technology-aided interventions to support leisure and communication in extensive disabilities. *International Journal of Developmental Disabilities, 66*(3), 180-189. https://doi.org/10.1080/20473869.2018.1533062	Using a technology-aided program to support independent leisure and communication engagement	6 adults with intellectual and motor or sensory-motor disabilities, ages 23 to 62	The program successfully implemented independent leisure and communication engagement, and individuals could use it independently	Samsung Galaxy Tab S2 LTE tablet with Android 6.0 Operating System and WhatsApp	All participants require rehabilitation and care centers to increase support for independent occupational engagement	Dependent on staff and/or caregivers for leisure occupations, not living independently

			for extended periods of time.		and communication	
Maich, K., Rutherford, C., & Bishop, C. (2019). Phones, watches, and apps: Engaging everyday mobile assistive technology for adults with intellectual and/or developmental disabilities. *Exceptionality Education International, 29*(1), 116-135.	To determine if a smartphone and smartwatch will improve skills and independent task completion for adults with IDD living in semi-independent residential settings, and the socio-economic impact	12 participants with IDD, ages 19-62	All participants had varied levels of success, increasing everyday task completion, independence, motivation, and overall engagement with skill areas.	Smartphones, smart watches, and apps on devices	Levels of prompting was not included in the study, but individuals required some functional support from program coordinators	All individuals living in semi-independent residential setting
Smith, E., Sumner, P., Hedge, C., & Powell, G. (2023). Smart-speaker technology and intellectual disabilities: Agency and wellbeing. *Disability and Rehabilitation: Assistive Technology, 18*(4), 432-442. https://doi.org/10.1080/17483107.2020.1864670	Determine the effects of providing mainstream smart speakers to individuals with IDD to enrich daily life	22 individuals with IDD in control group, and 22 individuals in intervention group with IDD, ages 22-69	Individuals reported that using smart speakers improved their quality of life, social interactions, and enabled more independence. However, a barrier to use was speech intelligibility	Smart speaker technology, including Amazon Echo and Google Home	Individuals required continued support and ongoing training to use the devices throughout the intervention	Lived in semi-independent households with support workers

			and phrasing when talking to the speakers.			

Appendix B.

The Impact of Assistive Technology on Independent Living for Adults with Intellectual and Developmental Disabilities: A Scoping Review Protocol.

Administrative Information

The principal investigator for this study is Maggie Sullivan, OT/S. Her email is sullivanm30@xavier.edu. The second reviewer is Madison Wittekind, OT/S, who can be reached at wittekindm@xavier.edu. The third reviewer will be Dr. Leah Dunn, EdD, OTR/L, who can be reached at dunnl3@xavier.edu. No funding was provided for this review. This review will be completed in partial fulfillment of a doctoral degree in occupational therapy through Xavier University.

Introduction

Intellectual and developmental disabilities (IDD) are conditions that are typically present at birth and can affect a person's physical, intellectual, and emotional development (NIH, 2021). Some common examples of IDD include Down syndrome, cerebral palsy, Fragile X syndrome, autism spectrum disorder, and fetal alcohol spectrum disorder (NIH, 2021). IDD may affect many aspects of a person's daily living skills and limit functional independence. Functional independence is required to participate in preferred occupations that a person needs and wants to do. When a person lacks functional independence skills, they may have deficits performing activities of daily living (ADLs) and instrumental activities of daily living (IADLs). ADLs are geared towards taking care of one's own body, while IADLs enable a person to perform more complex skills for functioning in home and community settings (AOTA, 2020).

Individuals with IDD often have difficulty performing ADLs and IADLs independently, which makes them less likely to live independently compared to typically developing adults (Golisz et al., 2018). The negative aspects of not living independently may also increase

caregiver burden on aging parents who continue to support their child living at home (Golisz et al., 2018; Xu et al., 2022). This disparity in independent living for individuals with IDD may be due to limited resources, or a lack of knowledge about available assistive technology for independent living.

Assistive technology for independent living may include any items, equipment, programs, or product systems that can be used to promote functional capabilities for individuals with IDD. Examples of assistive technology commonly used for independent living for individuals with IDD are smartphones, iPads, speakers, and smart appliances such as video doorbells, fridges, ovens, and thermostats. Because assistive technology in independent living for individuals with IDD is a developing field, a scoping review is necessary to understand the existing research. The purpose of this scoping review will be to explore the available assistive technology that facilitates independent living for people with disabilities. This paper will address the following research question: what assistive technology increases independent living skills for individuals with IDD?

Methods

Because assistive technology to promote independent living for individuals with IDD is still a developing area, a scoping review was conducted. This scoping review will be completed following the Joanna Briggs Institute (JBI) methodology for scoping reviews (Peters et al., 2020). The Preferred Reporting Items for Systematic Reviews and Meta-Analysis Scoping Review Extension [PRISMA-ScR] will also be utilized for this review (Tricco et al., 2018). The primary focus of the scoping review is identifying the assistive technology being used to facilitate independent or community living for individuals with IDD.

Searches will be conducted from February-March 2024 to identify studies relevant to the scoping review topic. The databases that will be searched include ERIC, MEDLINE with Full Text, CINAHL Plus with Full Text, and Health Source: Nursing/Academic Edition. All databases will be searched through the EBSCO platform. Searches will then be refined through peer discussion and trials.

To be included in this study, articles must focus on the use of assistive technology in individuals ages 17 and older who have an intellectual and developmental disability (IDD). The articles were also must be written in English and peer reviewed. Articles will be excluded if they do not include a form of assistive technology or a type of IDD. Articles will also be excluded if the only form of assistive technology utilized in the study are mobility devices.

The search strategy will be created based on the target population, intervention, and outcomes related to assistive technology for independent living. Keywords including “assistive technology, AT, smart home, developmental disability, intellectual and developmental disability, IDD, independent living, community living, and independence” will be utilized to retrieve successful searches with articles meeting inclusion criteria. The searches will involve combinations of keywords and expanders for similar terms. Boolean operators including “AND,” “OR,” and “NOT” will be utilized to refine the search and generate articles answering the research question. Articles will be limited to 2010-2024 to determine the current assistive technologies being implemented and utilized. Table 1 indicates the search strategy that will be used for each database search.

Table 1.

Search Strategy

Search Name (as saved on EBSCO)	Database	Date	Search Terms	Total Results

Following the searches, articles will be downloaded and sorted on Rayyan software for further review, screening, and evidence selection (Ouzzani et al., 2016). A preliminary screening will be completed to remove any duplicate articles. The article titles and abstracts will then be screened by two independent reviewers. Once the articles are selected, full texts will be retrieved, and articles will be read to determine if they meet the inclusion and exclusion criteria. A second reviewer will be involved in this study to avoid selection bias and ensure articles selected meet the inclusion and exclusion criteria. The second reviewer will independently screen the same articles as the primary reviewer following PRISMA guidelines. Differences of opinions will be resolved by both reviewers through full text reviews, discussion, and consensus.

Following the screenings, the primary reviewer will complete a data extraction chart to draw out essential information from the studies based on the research aim and question. Data extraction categories will include the citation, aim/purpose of the study, population, findings/results, type of assistive technology, assistance required with assistive technology, functional independence level, and current living environment. A sample of the data extraction chart that will be used to sort the results is found in Table 2. After examining the data extraction chart, results will be analyzed to determine common themes of the research articles and assistive technology utilized.

Table 2.

Sample Data Extraction Chart.

Citation (Author(s), year)	**Aim / Purpose of study**	**Population**	**Findings/ Results**	**Type of AT**	**Functional Independence Level**	**Living Environment**

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