

# Home Modification Assessments for Accessibility and Aesthetics: A Rapid Review

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## Abstract

**Purpose:** The purpose of this study was to identify assessments used to evaluate the homes of people with disabilities in terms of accessibility, usability, activities, comfort/satisfaction, and aesthetics. **Background:** The home is increasingly becoming an environment for healthcare as more people desire to age in place. Research indicates home environmental modifications to be beneficial to promote a better person–environment fit, especially when using a standardized assessment approach. There is not a comprehensive list of assessments that address home modifications, adaptations, or interior designs for people with disabilities. **Method:** Researchers conducted a rapid review of articles, with data collection scales, instruments, and procedures for home modifications published between 2000 and 2017. **Results:** A total of 26 articles met the inclusion criteria, resulting in the identification of 33 distinct assessments, including 18 assessments evaluating the accessibility of home modifications, 3 assessments examining usability, 15 assessments addressing activities of daily living or functional activities, and 5 assessments addressing comfort and/or satisfaction. No assessments for aesthetics were located. **Conclusion:** Researchers developed a list of assessments that could be used for research or practice. Further research is needed to address the lack of assessments focusing on the aesthetics or attractiveness of home modifications, as well as more assessments tailored to specific diagnoses and population groups.

## Keywords

architectural accessibility, independent living, housing, rehabilitation research, built environment, review

## Background

Accessibility in housing is increasingly becoming more important as the majority of people with and without disabilities desire to remain in their homes (Cho et al., 2016). This is especially true in the United States (Ahn et al., 2017; Gitlin et al., 2002) where healthcare at home can involve medical type equipment and multiple caregivers such as family members or professional healthcare

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workers (e.g., therapists and nurses). Homes need to be accessible for all persons wanting to age in place, especially for people who may need health-care in the home, including the potential use of equipment such as specialized beds, wheelchairs, walkers, and other devices. Additionally, accessibility changes that promote usability, participation in activities, and that are both comfortable and attractive are needed via home modifications (Gitlin et al., 2002). This article presents the use and findings of a rapid review that identified assessments for home modifications.

The home environmental modification process should start with a thorough assessment of the person's needs and fit within their current home environment. Research shows that home environmental modifications are beneficial to promote a better person–environment fit, as described by the person–environment–occupation (PEO) model (Law et al., 1996). The PEO model approaches an individual's occupational performance with a holistic view taking into consideration the person (e.g., their motor, sensory, and cognitive abilities), the environment (e.g., the home), and the occupation (e.g., cooking or cleaning). Modifications in the home that support persons with disabilities can range from rearranging furniture to remodeling bathrooms to redesigning the flow of the home.

Attention to accessibility, usability, activities, comfort/satisfaction, and aesthetics can make home modifications more effective for people. Steinfeld et al. (1998) define accessibility as the design of the home environment to allow physical access to areas of the home. Usability is considered to be the ease of access to areas and fixtures in the home for participation in activities of daily living (ADLs). Accessibility and usability are similar, but one of the distinctions is that usability relies on more subjective evaluations related to how the person uses the home modifications (Fänge & Iwarsson, 2003). Activities referred to tasks completed in the home such as dressing, bathing, ambulation, cooking, and housekeeping. These activities are described in the literature as functional activities and/or ADLs. The terms comfort and satisfaction encompass emotion and connectedness to the space through aspects such as privacy (Corcoran & Gitlin, 1991; Van et al.,

2010). Finally, aesthetics is the subjective viewpoint of an individual on the attractiveness of a home modification. Attractiveness can be particularly important to people within their home environment (Tanner et al., 2008). A comprehensive list of high-quality assessments that address home modifications for people with disabilities is needed within the home modification process to evaluate a person's abilities and needs.

Standardized assessments with proven psychometrics that deliver a systematic approach to addressing the environmental needs of persons with disabilities are considered high quality (Patry et al., 2019). A few literature reviews exist that identify the use of standardized assessments in the home environment (Chase et al., 2012; Cho et al., 2016; MacLachlan et al., 2016; Struckmeyer & Pickens, 2016). Chase et al. (2012) suggest that researchers use standardized outcome measures to consistently measure functional abilities in the home environment and emphasize the importance of tailoring interventions to populations. Cho et al. (2016) focused on interventions and identified numerous psychometric outcome measures used to determine the results of home modifications. No mention of which specific measures were included in the review. Struckmeyer and Pickens (2016) reviewed the literature for home modifications, specifically for persons with Alzheimer's disease, and found that researchers did not typically use standardized assessments. These few literature reviews identified a lack of standardized assessments and the need for a systematic approach to home assessment.

Without a systematic approach to address home environmental needs, issues such as accessibility may not be identified or they may be limited in scope to accessibility needs of persons with particular conditions (e.g., wheelchair users). Healthcare professionals such as occupational therapists, physical therapists, and nurses, as well as nonhealthcare workers such as architects and builders, might benefit from having a systematic approach with a variety of assessments available to guide the evaluation and process of home modifications. Furthermore, for the field to identify assessments that are comprehensive, inclusive, and targeted to specific living

conditions, an inventory of what is currently available—and used—is needed as a benchmark.

The purpose of this study was to identify assessments used to evaluate home modifications, adaptations, or interior designs for people with disabilities in terms of accessibility, usability, activities, comfort/satisfaction, and aesthetics. Specifically, we sought to identify standardized assessments that could inform practice and research. Broadening our search to a larger constellation of constructs related to accessibility (Sanford, 2012; Steinfeld & Danford, 2007) allowed us to embrace lived experiences meaningful to persons with disabilities as they move, act, and identify with their home environments (Boys, 2014). Therefore, the research questions asked are as follows:

*The purpose of this study was to identify assessments used to evaluate home modifications, adaptations, or interior designs for people with disabilities in terms of accessibility, usability, activities, comfort/satisfaction, and aesthetics.*

**Research Question 1:** Which data collection scales, instruments, and procedures have been used to assess home modifications, adaptations, or interior designs for people with disabilities in terms of (1) accessibility, (2) use, usability, (3) activities (functional activities, ADLs), (4) comfort, satisfaction, and (5) aesthetics?

**Research Question 2:** For which specific disabilities are these scales, instruments, or procedures targeted?

## Method

The researchers utilized a rapid review methodology (Haby et al., 2016). The systematic process involved (1) developing the research question with the multidisciplinary project team, (2) term harvesting with a health sciences librarian and the project team, (3) database and key word term testing, (4) a team meeting to confirm search terms, database selections, and protocol development, (5) peer review of the search strategy by a

second health sciences librarian, (6) the literature search, and (7) screening the search results using predefined inclusion and exclusion criteria. A rapid review methodology was chosen as this literature review was to be Phase 1 of a multiphase project that needed to identify high-quality standardized assessments in a timely manner to inform the next phases of the larger project.

A rapid review is a method of knowledge synthesis (Tricco et al., 2015). Much like a systematic review or a scoping review, a rapid review uses a systematic and closely documented search and screening process, informed by Preferred Reporting Items for Systematic Reviews and Meta-Analyses-Rapid Reviews (PRISMA-RR) guidelines (Stevens et al., 2018), in order to provide a comprehensive summary of existing evidence to date on a specific research question. Unlike systematic reviews, rapid reviews are conducted swiftly to gather evidence in a short time frame to inform decision making.

The health sciences librarian developed and conducted the literature search which was closely informed by the rapid review methodological recommendations of Harker and Kleijnen (2012), Khangura et al. (2012), Rodgers et al. (2016), and Tricco et al. (2015). Preliminary database searching occurred through *CINAHL* and *PubMed*. The databases used during the final search were EBSCO Host's *Academic Search Premier*, *AgeLine*, *Art and Architecture Source*, *CINAHL*, *PsycINFO*, ProQuest's *Avery Index to Architectural Periodicals*, *PubMed* (NCBI), and *Web of Science*. The team selected these databases due to their comprehensive topic coverage of architecture, art, and health sciences. The search strategy was developed through the PICO framework based on the research questions. Search strategies were adapted for each database by the reference librarian.

**Population:** Young adults, adults, and older people with disabilities

**Interventions:** Accessibility, activities, usability, and aesthetics in relation to the design and modification of residential housing

**Comparators:** Not applicable

**Outcomes:** Aging in place, comfort, functional independence, health, quality of life, safety, satisfaction, well-being, and wellness

Key word searching was limited to the title field only to keep the search as focused as possible and truncation and phrase-searching functionalities were used where appropriate for example, (adult[ti] OR adults[ti] OR “older people”[ti]) AND (“vision disorder”[ti] OR “vision disorders”[ti] OR alzheimer\*[ti]). Relevant CINAHL and MeSH subject headings were applied, for example, “Disabled Persons”[Mesh: noexp] AND “Independent Living”[Mesh]), alongside language (English) and publication date (2000–2017) limits. Preliminary searching indicated that key words and subject headings pertaining to measurement and assessment narrowed the search too far by removing potentially relevant literature. Following the team agreement, these terms were omitted from the final database searches. The full *PubMed* search strategy is provided in Table 1, and search strategies for the other databases are available from the librarian.

### *Inclusion and Exclusion Criteria*

The inclusion criteria used during the search and screening process were peer-reviewed journal articles, published in English between 2000 and 2017, referring to people with at least one disability, and discussing or using any assessments relating to (1) accessibility, (2) usability, (3) activities including functional activities and ADLs, (4) comfort, (5) satisfaction, and/or (6) aesthetics. An initial search of literature from the past 10 years was limited in scope, resulting in the research librarian recommending extending the search to 17 years. Seventeen years is frequently cited as the length of time it takes for research to result in changes in practice (Morris et al., 2011). The research team excluded references if they were not a research article, not a research review, did not include a measurement/evaluation tool, focused on the outdoor environment, or about children (under 18 years).

### *Screening*

After the initial title and abstract screening, conducted by the occupational therapist researcher and librarian, the same exclusion criteria were employed during the second round of screening

that involved full-text review. Three additional research team members participated in the second round of screening and reached consensus for final inclusion or exclusion of articles. An example of a questionable article excluded was a study that only measured how much room was needed for scooters (Dutta et al., 2011). The team determined this article described specific dimensions for five specific scooters and, therefore, did not meet the criteria of an evaluation tool.

### *Data Extraction and Synthesis*

Data from the full-text articles considered relevant to the research questions were extracted into a matrix format as described by Aveyard (2014), with column headings relevant to methodological issues as well as concepts and issues vital to this study’s purpose. Primary data considered relevant from the full-text articles were any assessments, scales, instruments, or procedures used in the home modifications process. Also included in data extraction was the main focus of the study, the demographics (specifically geographic location, diagnosis, and age), and limitations of the study. The project team included an occupational therapist, two researchers of home modifications, and two graduate research assistants who together reviewed the matrix input from the 26 articles and provided recommendations for edits. One graduate research assistant cross-checked the articles to ensure inclusion criteria and accuracy of categorization.

### **Results**

The database searches were conducted on December 22–26, 2017. The written report and matrix of the rapid review was completed in 2018. The total number of records retrieved was 281, and a total of 26 articles were selected after full-text screening (Figure 1). From the final 26 articles, a total of 43 data collection scales, instruments, and procedures were identified. A detailed reading of the full articles identified that 10 of the 43 did not meet the inclusion criteria. These 10 were specific to client factors (e.g., balance, cognitive level, coordination, or depression) and housing-related control beliefs. These 10 assessments were excluded, leaving 33 distinct assessments that met

**Table 1. Search Strategy for PubMed.**

Set Number	Search Terms
1	("Adult"[Mesh] OR "Aged"[Mesh] OR "Aged, 80 and over"[Mesh] OR "Frail Elderly"[Mesh] OR "Young Adult"[Mesh] OR "Middle Aged"[Mesh] OR adult[ti] OR adults[ti] OR "middle aged person"[ti] OR "middle aged persons"[ti] OR "old people"[ti] OR "older people"[ti] OR "old person"[ti] OR "old persons"[ti] OR "elderly person"[ti] OR "older person"[ti] OR "older persons"[ti] OR "senior people"[ti] OR "senior persons"[ti] OR "elderly people"[ti] OR "Disabled Persons"[Mesh] OR "Mentally Disabled Persons"[Mesh] OR "Mentally Ill Persons"[Mesh] OR "Persons With Hearing Impairments"[Mesh] OR "Visually Impaired Persons"[Mesh] OR "Deaf-Blind Disorders"[Mesh] OR "Deaf-Blind Persons"[Mesh] OR "Communication Disorders"[Mesh] OR "Language Disorders"[Mesh] OR "Mental Disorders"[Mesh] OR "Developmental Disabilities"[Mesh] OR "Self-Help Devices"[Mesh] OR "Intellectual Disability"[Mesh] OR "Wheelchairs"[Mesh] OR "Dependent Ambulation"[Mesh] OR "Vision Disorders"[Mesh] OR "noexp" OR "Brain Injuries, Traumatic"[Mesh] OR "Walkers"[Mesh] OR "Cognition Disorders"[Mesh] OR "noexp" OR "Mobility Limitation"[Mesh] OR "Cognitive Dysfunction"[Mesh] OR "Neurocognitive Disorders"[Mesh] OR "Spinal Cord Injuries"[Mesh] OR "noexp" OR "Alzheimer Disease"[Mesh] OR "Motor Skills Disorders"[Mesh] OR "Dementia"[Mesh] OR "Arthritis"[Mesh] OR "Aurism Spectrum Disorder"[Mesh] OR "Blindness"[Mesh] OR "ambulatory limitations"[ti] OR "activities of daily living"[ti] OR "activity limitation"[ti] OR "activity limitations"[ti] OR "ambulatory limitation"[ti] OR "ambulatory limitations"[ti] OR "assistive device"[ti] OR "assistive devices"[ti] OR blindness[ti] OR "cognition disorder"[ti] OR "cognition disorders"[ti] OR "cognitive decline"[ti] OR "cognitive disorder"[ti] OR "cognitive disorders"[ti] OR "cognitive dysfunction"[ti] OR "cognitive dysfunctions"[ti] OR "communication disorder"[ti] OR "communication disorders"[ti] OR "coordination disorder"[ti] OR "coordination disorders"[ti] OR "developmental disorder"[ti] OR "developmental disorders"[ti] OR "functional limitation"[ti] OR "functional limitations"[ti] OR "hearing disorder"[ti] OR "hearing disorders"[ti] OR "impaired executive function"[ti] OR "impaired executive functioning"[ti] OR "language disorder"[ti] OR "language disorders"[ti] OR "limitation of activity"[ti] OR "mobility limitation"[ti] OR "mobility limitations"[ti] OR "motor skills disorder"[ti] OR "motor skills disorders"[ti] OR "participation limitation"[ti] OR "participation limitations"[ti] OR "participation restriction"[ti] OR "special care needs"[ti] OR "special health care needs"[ti] OR "special needs"[ti] OR "speech disorder"[ti] OR "speech disorders"[ti] OR "TBI"[ti] OR "vision disorder"[ti] OR "vision disorders"[ti] OR alzheimers[ti] OR arthritis[ti] OR autism[ti] OR autistic[ti] OR autistic[ti] OR dementia[ti] OR demencias[ti] OR disabilities[ti] OR disabled[ti] OR handicapped[ti] OR wheelchair*[ti])
2	("Independent Living"[Mesh] OR "Housing for the Elderly"[Mesh] OR "Housing"[Mesh] OR "aging in place"[ti] OR "domestic environment"[ti] OR "domestic environments"[ti] OR "indoor environment"[ti] OR "indoor environments"[ti] OR "living environment"[ti] OR "living environments"[ti] OR "micro scale environment"[ti] OR "private residence"[ti] OR "private residences"[ti] OR "built environment"[ti] OR "built environments"[ti] OR "home environment"[ti] OR "home environments"[ti] OR "house environment"[ti] OR "house environments"[ti] OR "housing environment"[ti] OR "housing environments"[ti])
3	("Interior Design and Furnishings"[Mesh] OR "Floors and Floorcoverings"[Mesh] OR "Household Articles"[Mesh] OR "noexp" OR "Facility Design and Construction"[Mesh] OR "noexp" OR "Privacy"[Mesh] OR "noexp" OR "Textiles"[Mesh] OR "noexp") AND (accessible[ti] OR accessibility[ti] OR aesthetic[ti] OR aesthetics[ti] OR enabler[ti] OR enablers[ti] OR facilitator[ti] OR facilitators[ti] OR "environmental facilitator"[ti] OR "environmental enabler"[ti] OR "environmental enablers"[ti] OR "environmental enablers"[ti] OR "assistive device"[ti] OR "assistive devices"[ti] OR "entrance"[ti] OR "environmental design"[ti] OR "environmental design"[ti] OR "environmental adaptations"[ti] OR "environmental intervention"[ti] OR "environmental interventions"[ti] OR "environmental modification"[ti] OR "environmental modifications"[ti] OR "built environment"[ti] OR "built environments"[ti] OR "environmental safety"[ti] OR "environmental safety"[ti] OR "home design"[ti] OR "house design"[ti] OR "housing design"[ti] OR "home adaptation"[ti] OR "home adaptations"[ti] OR "home adaptations"[ti] OR "housing adaptations"[ti] OR "home modification"[ti] OR "home modifications"[ti] OR "home safety"[ti] OR "space layout"[ti] OR "spatial design"[ti] OR "spatial layout"[ti] OR "spatial layout"[ti] OR "spatial layouts"[ti] OR "wheelchair access"[ti] OR "wheelchair accessible"[ti] OR "wheelchair accessibility"[ti] OR "barrier free"[ti] OR "barrier-free"[ti] OR "interior design"[ti] OR universal[ti] OR universality[ti] OR environmental[ti] OR lighting[ti] OR retrofit[ti] OR retrofitting[ti] OR retrofitted[ti] OR sensory[ti] OR "visability[ti] OR visible[ti] OR acoustic[ti] OR acoustics[ti] OR stairs[ti] OR stair[ti] OR stairway[ti] OR stairways[ti] OR illumination[ti] OR smell[ti] OR olfactory[ti] OR "visual navigation"[ti] OR feeling[ti] OR color[ti] OR colors[ti] OR desire[ti] OR desirable[ti] OR desirability[ti] OR privacy[ti] OR "comfort[ti] OR textiles[ti] OR comfort[ti])
4	("Interior Design and Furnishings"[Mesh] OR "Floors and Floorcoverings"[Mesh] OR "Household Articles"[Mesh] OR "noexp" OR "Facility Design and Construction"[Mesh] OR "noexp" OR "Privacy"[Mesh] OR "noexp" OR "Textiles"[Mesh] OR "noexp") AND (accessible[ti] OR accessibility[ti] OR aesthetic[ti] OR aesthetics[ti] OR enabler[ti] OR enablers[ti] OR facilitator[ti] OR facilitators[ti] OR "environmental facilitator"[ti] OR "environmental enabler"[ti] OR "environmental enablers"[ti] OR "environmental enablers"[ti] OR "assistive device"[ti] OR "assistive devices"[ti] OR "entrance"[ti] OR "environmental design"[ti] OR "environmental design"[ti] OR "environmental adaptations"[ti] OR "environmental intervention"[ti] OR "environmental interventions"[ti] OR "environmental modification"[ti] OR "environmental modifications"[ti] OR "built environment"[ti] OR "built environments"[ti] OR "environmental safety"[ti] OR "environmental safety"[ti] OR "home design"[ti] OR "house design"[ti] OR "housing design"[ti] OR "home adaptation"[ti] OR "home adaptations"[ti] OR "home adaptations"[ti] OR "housing adaptations"[ti] OR "home modification"[ti] OR "home modifications"[ti] OR "home safety"[ti] OR "space layout"[ti] OR "spatial design"[ti] OR "spatial layout"[ti] OR "spatial layout"[ti] OR "spatial layouts"[ti] OR "wheelchair access"[ti] OR "wheelchair accessible"[ti] OR "wheelchair accessibility"[ti] OR "barrier free"[ti] OR "barrier-free"[ti] OR "interior design"[ti] OR universal[ti] OR universality[ti] OR environmental[ti] OR lighting[ti] OR retrofit[ti] OR retrofitting[ti] OR retrofitted[ti] OR sensory[ti] OR "visability[ti] OR visible[ti] OR acoustic[ti] OR acoustics[ti] OR stairs[ti] OR stair[ti] OR stairway[ti] OR stairways[ti] OR illumination[ti] OR smell[ti] OR olfactory[ti] OR "visual navigation"[ti] OR feeling[ti] OR color[ti] OR colors[ti] OR desire[ti] OR desirable[ti] OR desirability[ti] OR privacy[ti] OR "comfort[ti] OR textiles[ti] OR comfort[ti])
5	("Interior Design and Furnishings"[Mesh] OR "Floors and Floorcoverings"[Mesh] OR "Household Articles"[Mesh] OR "noexp" OR "Facility Design and Construction"[Mesh] OR "noexp" OR "Privacy"[Mesh] OR "noexp" OR "Textiles"[Mesh] OR "noexp") AND (accessible[ti] OR accessibility[ti] OR aesthetic[ti] OR aesthetics[ti] OR enabler[ti] OR enablers[ti] OR facilitator[ti] OR facilitators[ti] OR "environmental facilitator"[ti] OR "environmental enabler"[ti] OR "environmental enablers"[ti] OR "environmental enablers"[ti] OR "assistive device"[ti] OR "assistive devices"[ti] OR "entrance"[ti] OR "environmental design"[ti] OR "environmental design"[ti] OR "environmental adaptations"[ti] OR "environmental intervention"[ti] OR "environmental interventions"[ti] OR "environmental modification"[ti] OR "environmental modifications"[ti] OR "built environment"[ti] OR "built environments"[ti] OR "environmental safety"[ti] OR "environmental safety"[ti] OR "home design"[ti] OR "house design"[ti] OR "housing design"[ti] OR "home adaptation"[ti] OR "home adaptations"[ti] OR "home adaptations"[ti] OR "housing adaptations"[ti] OR "home modification"[ti] OR "home modifications"[ti] OR "home safety"[ti] OR "space layout"[ti] OR "spatial design"[ti] OR "spatial layout"[ti] OR "spatial layout"[ti] OR "spatial layouts"[ti] OR "wheelchair access"[ti] OR "wheelchair accessible"[ti] OR "wheelchair accessibility"[ti] OR "barrier free"[ti] OR "barrier-free"[ti] OR "interior design"[ti] OR universal[ti] OR universality[ti] OR environmental[ti] OR lighting[ti] OR retrofit[ti] OR retrofitting[ti] OR retrofitted[ti] OR sensory[ti] OR "visability[ti] OR visible[ti] OR acoustic[ti] OR acoustics[ti] OR stairs[ti] OR stair[ti] OR stairway[ti] OR stairways[ti] OR illumination[ti] OR smell[ti] OR olfactory[ti] OR "visual navigation"[ti] OR feeling[ti] OR color[ti] OR colors[ti] OR desire[ti] OR desirable[ti] OR desirability[ti] OR privacy[ti] OR "comfort[ti] OR textiles[ti] OR comfort[ti])
6	#4 OR #5
7	# 1 AND #2 AND #3 AND #6
8	#7, Filters: English; Publication date from January 1, 2000

the criteria for answering the research questions. Some of these 33 assessments measured more than one area as noted in Table 2.

### *Identification of Assessments*

The first research question sought to identify data collection scales, instruments, and procedures that have been used to assess home modifications, adaptations, or interior designs for people with disabilities in terms of (1) accessibility; (2) use, usability; (3) activities; (4) comfort, satisfaction; and (5) aesthetics. Standardized assessments are defined as those assessments with tested psychometrics. Non-standardized assessments are those tools, scales, or procedures that had no reported psychometrics.

**Accessibility.** The review identified 18 assessments that have been used to assess residential designs or modifications regarding accessibility. Eleven were standardized assessments identified by an asterisk in Table 2. Multiple articles included in this rapid review used similar assessments. Specifically, these studies identified utilized seven non standardized tools, scales and procedures. For example, the Home Safety Self-Assessment Tool, a nonstandardized tool, has no reported reliability or validity and was developed solely for use in the reported study (Horowitz et al., 2013). An example of a scale was The Home Identity Likert-Type Scale (Ewen et al., 2014). Examples of assessment procedures are interviews with clients, observations, digital photos, and video recordings.

**Usability.** Within the included articles, three assessments measured usability. One example, the Short Falls Efficacy Scale (Ekstam et al., 2014), is used to identify if home modifications reduced (had usability in the reduction of) fear of falling. The Usability in My Home assessment tool helps users examine the usability of home modifications for improved activity performance (Ekstam et al., 2014). Another method for assessing usability is a nonstandardized interview procedure. Other assessments identified may potentially address use or usability as part of the assessment.

**Activities.** Fifteen assessments or procedures specifically addressed ADLs or functional activities

and are listed in Table 2. Activities assessed ranged from bathing and dressing, to mobility, to kitchen tasks. Also evaluated in this category was the client's perceived severity of physical limitations (Vredenburgh et al., 2010). A nonstandardized method of observation was identified 3 times and was used to assess activities in the home that might be limited by accessibility problems needing home modifications.

**Comfort/satisfaction.** Five assessments utilized in the included articles addressed comfort and satisfaction. These included quality of life and life satisfaction measures as well as nonstandardized interviews and questionnaires. None of these assessments were specific to home modifications, although they were used in assessing the client's evaluations of comfort or satisfaction after the home modification process.

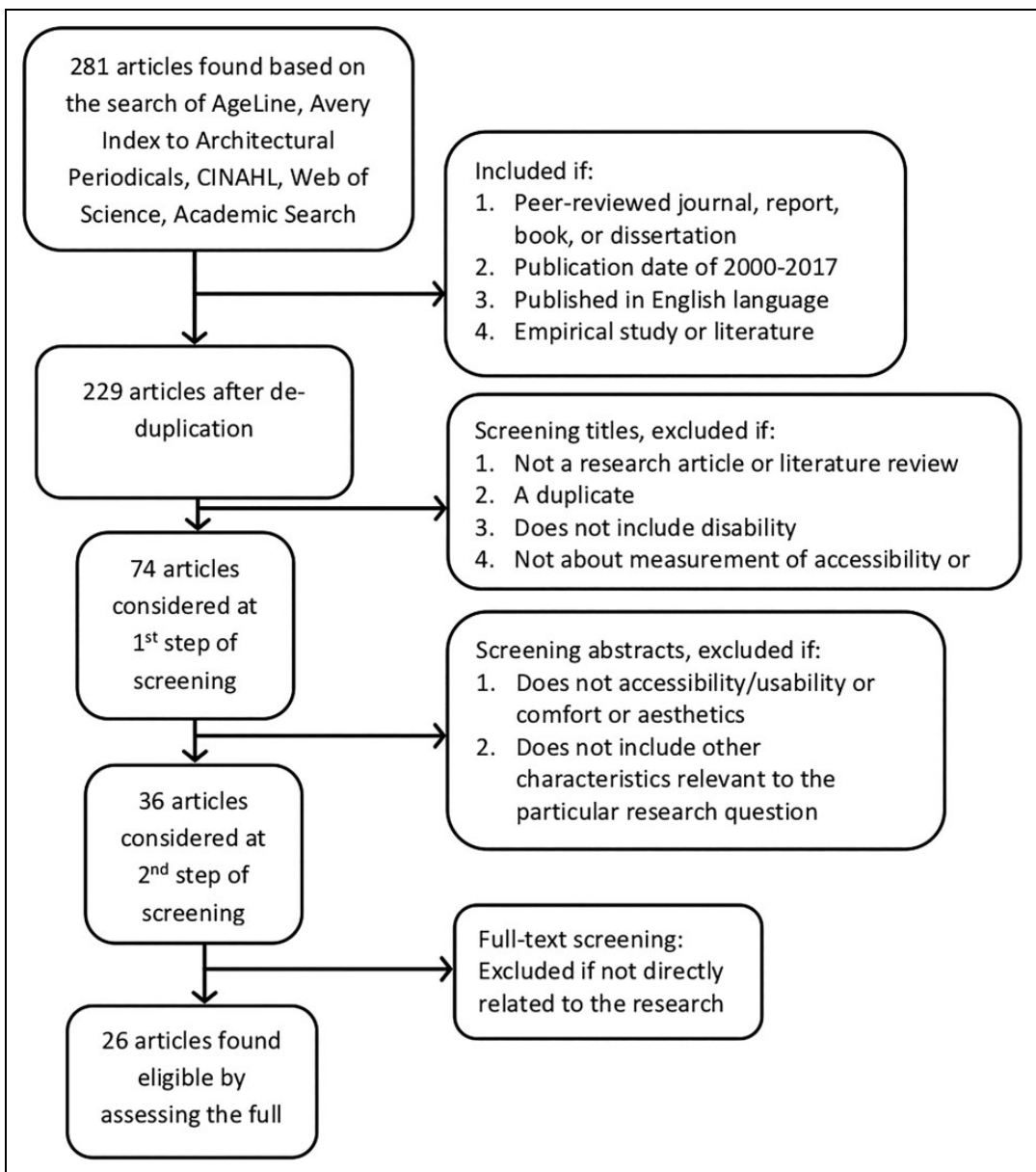
**Aesthetics.** No included articles identified assessment tools that specifically target aesthetics.

### *Disability Conditions Targeted*

Although the second research question aimed to identify which specific disabilities the data collection scales, instruments, or procedures target, none of the assessments were particular to any one diagnosis. However, some studies did target specific diagnoses or populations, such as low vision (Barstow et al., 2011), stroke (Reid, 2004; Schulz et al., 2012), liver disease (Somerville et al., 2016), and wheelchair users (Rousseau et al., 2013; Vredenburgh et al., 2010). Five studies included participants from multiple disabilities groups in the same study. Five studies targeted participants with functional or motor physical disabilities. Lastly, 13 studies included older adults.

## **Discussion**

The research aim was to identify standardized instruments that assess accessibility, usability, activities (both functional activities and ADLs), comfort/satisfaction, or aesthetics of home modifications, adaptations, or interior designs for persons with disabilities. Our review identified 33 distinct assessments from a total of 26 articles that met the inclusion criteria. The majority of assessments



**Figure 1.** Flowchart of rapid research review decision-making process.

identified addressed accessibility and ADLs, which is expected because home modification interventions improve the person–environment fit (Stark et al., 2017). A few assessments within the included articles examined usability and comfort and/or satisfaction. For instruments assessing usability and comfort, the majority did not have published reliability or validity, or since the

purpose of these instruments was unique to the study and not for public use. More assessments are needed to address usability, comfort, and satisfaction of the home environment as these are essential factors in the person–environment fit. The lack of assessments addressing these areas may indicate missing concepts that would improve the home modifications process.

**Table 2.** Instruments Identified in Literature.

Instruments	Reference	Accessibility	Usability	Activities of Daily Living	Comfort/ Satisfaction
12 Kitchen-related items	Helle et al. (2014)		X		
Activities of daily living staircase	Oswald et al. (2007), Ekstam et al. (2014), and Fänge and Iwarsson (2003, 2005a, 2005b, 2007)		X		
Behavioral Risk Factor Surveillance System Survey	Bouldin et al. (2015)	X			
Craig Hospital Inventory of Environmental Factors*	Gray et al. (2008)	X			
Client Clinician Assessment Protocol*	Petersson et al. (2007)	X			
Canadian Occupational Performance Measure	Stark (2004) and Chase et al. (2012)		X		
Digital photos	Sim et al. (2015)	X			
Envirofunctional Independence Measure*	Stark (2004)	X			
EQ-5D-5L	Ekstam et al. (2014) and Tongtong et al. (2017)		X		X
Facilitators and Barriers Survey	Gray et al. (2008)	X			
Functional Independence Measure	Stark (2004) and Schulz et al. (2012)		X		X
Functional Autonomy Measurement System	Reid (2004)		X		X
Home Assessment of Environmental Interaction*	Rousseau et al. (2013) and Morales and Rousseau (2010)	X			
Home Identity Likert-Type Scale	Ewen et al. (2014)	X			
Home Safety Self-Assessment Tool*	Horowitz et al. (2013)	X			
Housing Enabler*	Fänge and Iwarsson (2003, 2005a, 2005b, 2007), Helle et al. (2010, 2014), Iwarsson and Wilson (2006), Oswald et al. (2007), Slaug et al. (2015), Barstow et al. (2011), and Ekstam et al. (2014)	X			
Instrumental Activities of Daily Living Scale	Naik and Gill (2005)		X		
In-Home Occupational Performance Evaluation*	Somerville et al. (2016) and Chase et al. (2012)	X			
Interview Self-Report	Sim et al. (2015), Barstow et al. (2011), Ekstam et al. (2014), and Iwarsson and Wilson (2006)	X	X		X
Measure of Quality Environment*	Gray et al. (2008)	X			
Mobility Scale	Naik and Gill (2005)		X		X
Observation	Helle et al. (2014), Iwarsson and Wilson (2006), and Naik and Gill (2005)	X	X		X

(continued)



**Table 2.** (continued)

Instruments	Reference	Accessibility	Usability	Activities of Daily Living	Comfort/ Satisfaction
Perceived severity of physical limitations	Vredenburgh et al. (2010)			X	
Positive and Negative Affect Scale	Oswald et al. (2007)				X
Question about housing satisfaction	Oswald et al. (2007)				X
Safety Assessment of Function and the Environment for Rehabilitation*	Schulz et al. (2012) and Barstow et al. (2011)	X			
Life Satisfaction Scale	Ewen et al. (2014)				X
Short Falls Efficacy Scale	Ekstam et al. (2014)		X	X	
Transfer Test	Naik and Gill (2005)			X	
Usability in My Home*	Oswald et al. (2007), Reid (2004), Ekstam et al. (2014), and Fänge and Ivarsson (2003, 2005a, 2005b, 2007)	X	X		
Video	Tongsiri et al. (2017)	X			
Westmead*	Barstow et al. (2011)	X			
International Classification of Function seven functional items	Tongsiri et al. (2017)			X	

Note: Instruments marked with an asterisk indicate standardized assessments.

This review identified several gaps in the literature. The most notable gap was the lack of assessments to address the aesthetics (or attractiveness) of the home modifications or interior designs for people with disabilities. Measuring beauty or aesthetics of architecture, design, or other physical objects can be a contentious endeavor. Some critics and researchers assume aesthetic assessment within an individual-based, subjective realm (as in “beauty is in the eye of the beholder”). Others establish evolutionary foundations (e.g., Dutton, 2010) or shared archetypal spaces (e.g., Norberg-Schultz, 1979) for interpreting aesthetics and beauty. Still others reference the cultural or social context of aesthetic appeal or assessment (see Nasar, 1992, for a compendium of perspectives). Indeed, within the field of environment–behavior psychology, there have been various research efforts to develop assessment tools for identifying and measuring the beauty or attractiveness of buildings or landscapes (Nasar, 1992). Thus, it is not the absence of such assessment instruments or approaches in general that is the core issue here but rather that researchers to date have not considered environmental meaning or aesthetic appraisal of sufficient importance to include in assessments of the residential environments of persons with disabilities. As critical disability theorist, Jos Boys (2014) argues, few practitioners and policymakers in the field have gone “beyond accessibility.” The stigma of specialized design for persons with disabilities has limited its social acceptance, and such stigmatized design often emanates from addressing medical and safety necessities and no further (Sanford, 2012). Fortunately, there are examples of architects and designers creating disability-inspired designed spaces and products that are strikingly appealing (Pierce, 2012; Pullin, 2011). Unfortunately, the research field has yet to devise or appropriate a method for assessing the aesthetics of such.

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The frequency of occurrence for some assessments may be due to prolific publication by the same team of researchers using the same instrument; hence, the frequency of occurrence should not be confused with widespread use (something not calculated explicitly in this review). For example, the Housing Enabler was identified 10 times, of which 8 had some of the same authors. However, this finding could also be interpreted to mean the Housing Enabler is a high-quality home modifications assessment choice for use in research and potentially in practice.

No assessments were identified for a specific diagnosis or disability. Barstow et al. (2011) identified the need for considering low vision in the assessment of home modifications. Studies identified broad groups of persons such as older adults or adults with mobility impairments, or adults who qualified for housing adaptations, making it difficult to answer the second research question addressing which specific disabilities these assessments are targeted to. The advantage of this finding was that the assessments identified were used across multiple diagnoses, meaning the identified assessments might be practical for use in a variety of populations.

In addition to addressing the specific research questions, further examination of the articles revealed additional directions for the research in this area. For instance, many articles in this review focused on the bathroom and the kitchen spaces. In 14 articles, the bathroom was addressed in terms of accessibility. In two of these articles (Naik & Gill, 2005; Sim et al., 2015), the bathroom space was the sole focus of the study. The kitchen was assessed in 10 articles and was the exclusive focus of one study (Helle et al., 2014). One study focused exclusively on both the bathroom and kitchen (Vredenburg et al., 2010). A focus on these two spaces—bathroom and kitchen—may indicate their prominent need among residential interiors for home modifications, perhaps in part because of their alignment with many ADLs or because of renovation and modification challenges of rooms with many fixtures, built-in cabinetry, and appliances.

Additionally, the importance of using a standardized method of assessment was a frequently reoccurring topic (Barstow et al., 2011; Fänge & Iwarsson, 2007; Rousseau et al., 2013). The Housing Enabler was the most commonly identified assessment; from the 26 articles, it was identified 10 times. Many included articles discussed the following assessments: the Usability in My Home (seven), Activities of Daily Living Staircase (five), Safety Assessment of Function and the Environment for Rehabilitation (two), EQ-5D-5L (two), and Home Assessment of Environmental Interaction (two). The most frequently identified assessments all had published reliability and validity.

*Additionally, the importance of using a standardized method of assessment was a frequently reoccurring topic.*

The method for classifying the assessments into each subsection of this research question has potential limitations. Without going beyond the research articles to examine the actual instruments, manuals, and full procedural details, we were unable to finely assess whether some of the assessments may encompass more categories than what was suggested in the research article. This is one of the limitations of a rapid research review. A more detailed examination and quality appraisal of each assessment instrument would be a potential follow-up study for this review. What this review provides is an identification of the various assessment tools that have been used in assessing home modifications or designs for persons with disabilities. In doing so, it also lays the foundation for the future development of a more comprehensive, standardized research instrument.

Rapid reviews as a methodology for evidence synthesis have many strengths. The choice of a rapid review assisted us in expeditiously identifying assessment instruments. The scope of what we discovered can likewise prove useful as a guide to other researchers searching for such research tools, as well as informing the knowledge field of some of the deficiencies of appropriate standardized assessments in this arena. However, it is important to note that the

methodological limitations of rapid reviews include the highly focused nature of the search strategy (key word search was restricted to the title field only instead of title and abstract, introducing source-selection bias), the smaller number of bibliographic databases utilized (leading to source selection bias and publication bias), that only one team member screened the studies for inclusion and exclusion (introducing a level of error that two reviewers may offset), and that no critical appraisal occurred of the studies included in the review (Harker & Kleijnen, 2012; Khangura et al., 2012; Rodgers et al., 2016). A comprehensive systematic literature review with more databases and critical appraisal of the assessments is needed to identify additional assessments and to examine and compare the rapid review methodology.

## Conclusion

The results indicated that 18 assessments evaluated accessibility, 3 examined usability, 5 focused on comfort and/or satisfaction, and 15 were associated with ADLs. A comprehensive list of these assessments was developed, as seen in Table 2. No assessments were identified for aesthetics. Additionally, the bathroom, followed closely by the kitchen, were the most commonly assessed spaces. The bathroom and kitchen are key areas where persons with disabilities need accessibility to participate in ADLs to remain or return home. The identification of these two areas guided the focus group questions in the next phase of the multiphase project that followed this rapid review. Further research is needed to address the lack of assessments focusing on the aesthetics or attractiveness of home modifications. A need exists for the development of assessments that are individually tailored to specific diagnoses or populations to address disability-specific issues. Overall, the findings of this study contribute to the understanding of available data collection scales, instruments, and procedures to evaluate the home as a healthcare environment, specifically addressing accessibility, usability, activities, comfort/satisfaction, and aesthetics. The assessments identified in this study provide the researcher or clinician with a

list of options to consider when evaluating the home environment.

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## Implications for Practice

- The assessments identified in this study provide the researcher or clinician with a list of options to consider when evaluating the home environment.
- The bathroom and kitchen are key areas to assess, as these are where persons with disabilities need accessibility to participate in ADLs.
- The use of rapid review methodology is a viable option when a literature review is needed in a timely manner to inform practice or the next step of a larger research study.


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