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# Clinical Reasoning Guideline for Home Modification Interventions

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## MeSH TERMS

- decision making
- environment design
- guidelines as topic
- occupational therapy
- patient-centered care

**OBJECTIVE.** The objective of this study was to develop and validate a clinical reasoning tool to describe an occupational therapist's clinical reasoning process while delivering home modification interventions.

**METHOD.** We used a two-phase, mixed-methods approach. In Phase 1, we developed a personal factors guideline to support clinical reasoning in home modification interventions based on in-depth interviews, a focus group, and field observations of 6 home modification experts. In Phase 2, the guideline was validated by a second group of 6 home modification experts.

**RESULTS.** During analysis, 16 personal and environmental factors with a corresponding set of conditions and strategies for each factor emerged to form a clinical reasoning guideline, which was validated by a second group of experts.

**CONCLUSION.** Unpacking the "black box" of the clinical reasoning process has yielded a useful clinical reasoning tool that will allow occupational therapists to deliver complex interventions with fidelity.

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Home modifications improve daily activity performance (Connell & Sanford, 2001), slow the rate of functional dependence for older adults (Mann, Ottenbacher, Fraas, Tomita, & Granger, 1999; Stark, Landsbaum, Palmer, Somerville, & Morris, 2009), reduce the rate and risk of falls (Cumming et al., 1999; Nikolaus & Bach, 2003), and enhance caregiver self-efficacy (Gitlin, Corcoran, Winter, Boyce, & Hauck, 2001). Home modifications include adaptive equipment, such as raised toilet seats, and changes to the physical environment, such as grab bars or railings on stairs. These modifications help compensate for impairments and improve performance of daily activities (Siebert, Smallfield, & Stark, 2014). Although other professions provide home modifications (Tinetti et al., 1999), they are often delivered by occupational therapists (Siebert et al., 2014).

Of the 57.6 million adults with disabilities in the United States, 12 million report difficulty completing daily activities independently (Brault, 2012). Despite the *Healthy People 2020* goal of lowering the number of people with disabilities who encounter environmental barriers to participation in the home (U.S. Department of Health and Human Services, n.d.), the prevalence of home modifications to support performance remains low (Berg, Hines, & Allen, 2002; Pynoos, 1993). Occupational therapy has an important role in filling this unmet need.

Home modification interventions delivered by occupational therapists have demonstrated greater efficacy in reducing falls (Clemson, Mackenzie, Ballinger, Close, & Cumming, 2008; Gillespie et al., 2009; Pighills, Torgerson, Sheldon, Drummond, & Bland, 2011) and improving function (Tinetti et al., 1999) in older adults than home modification interventions delivered by other professionals. Why home modification interventions delivered by occupational

therapists are more effective than home modification interventions delivered by those in other professions is unknown. Unique aspects of occupational therapy professional training may contribute to the difference in outcomes. Occupational therapists analyze the personal factors unique to each client and make recommendations for home modifications that account for these individual factors (Siebert et al., 2014). This tailored approach (Gitlin et al., 2006) to delivering occupational therapy involves individualized recommendations based on the personal circumstances and preferences of the client. Personal factors such as gender, race, age, economic resources, comorbid conditions, lifestyle, habits, coping styles, social background, and education (World Health Organization, 2001) are regularly documented in health and research records. However, little evidence has supported how to tailor health interventions in the presence of these factors.

A growing body of work has identified intrinsic and extrinsic personal factors that might influence the outcomes of home modifications (Cumming et al., 1999; Gitlin, 1995). Emerging empirical support suggests that tailoring interventions to individual clients is more effective than not doing so (Clemson et al., 2008; Gitlin et al., 2003, 2006; Stark et al., 2009). To include tailoring as part of a systematic intervention delivered with fidelity in a clinical or clinical research context, the complexities of tailored home modification interventions must be unraveled (Ballinger, Ashburn, Low, & Roderick, 1999). Therefore, the purpose of this study was to develop a grounded explanatory framework describing how personal factors influence the clinical reasoning process used by occupational therapists to tailor home modification interventions.

## Method

### *Design*

We used a two-phase, mixed-methods approach. In Phase 1, a personal factors guideline to support clinical reasoning in home modification interventions was developed. In Phase 2, the guideline was validated. The Washington University in St. Louis institutional review board approved each phase of the study.

### *Phase 1*

*Development of the Personal Factors Guideline.* Key informant interviews, a focus group, and field observations were conducted and analyzed to identify client personal factors that influence intervention decisions made by expert therapists.

*Participants.* Clinicians with expertise in home modification intervention who lived in the St. Louis, Missouri,

region were recruited using convenience sampling. Potential participants known to the research team were sent a study flyer by means of email. A snowball sampling method was used on a rolling basis to increase the sample size. Occupational therapists or certified occupational therapy assistants were invited to participate in the study if they had ≥2 yr of experience providing home modifications.

*Procedures.* We used grounded theory to conceptualize the phenomenon of the clinical reasoning process used by expert occupational therapists in providing home modification interventions. This method uses constant comparative analysis of a variety of data sources to describe an existing phenomenon (Glaser & Strauss, 1967; Strauss, 1987). We conducted focus groups to yield insights through interaction with expert clinicians (Lindlof, 1995) and in-depth interviews and field observations of expert clinicians to explore the rationale for intervention choices by expert clinicians (Kusenbach, 2003). We (Susan L. Stark, Emily Somerville, and Aliza Smason) used the “go-along” method (Kusenbach, 2003) to observe the clinicians’ practice and to view and discuss the therapeutic interaction and intervention planning.

We developed a discussion guide containing a series of open-ended questions and prompts based on a review of the literature to reveal the clinical reasoning process that expert occupational therapists use when making recommendations for home modifications. Example questions from the discussion guide include “There are often many ways to overcome barriers in the home. How do you decide what modifications you will recommend to your clients?” and “Are there characteristics about your clients or their families or their environments that lead you to choose one solution over another?”

An expert clinician in home modification with experience leading focus groups facilitated the focus group (Stark), and a single researcher (Smason) conducted the key informant interviews. The 2-hr focus group and 75-min interviews were audiotaped and transcribed verbatim. Extensive field notes were taken during the go-along sessions. Transcripts and field notes were analyzed independently by four team members (authors Smason, Stark, Somerville, and Bigham) using constant comparative analysis (Hewitt-Taylor, 2001; Strauss & Corbin, 1990). The data were reviewed in detail and coded to form initial categories; this was followed by selective coding in which categories were examined to detect overlap, signifying the development of overarching themes. The process of data analysis was iterative, in which factors, conditions, and strategies were identified by comparing and contrasting the codes and through team discussion until consensus was reached. Descriptions of the themes were developed on the basis of supporting quotes from the original transcripts and

field notes. Data collection (focus group, interviews, and go-along sessions) was completed on reaching saturation.

From the coding and thematic analysis, a personal factors guideline to support clinical reasoning in home modification interventions was developed; it included a factor, a set of conditions for that factor, intervention strategies to address the condition, and a clinical exemplar. The draft was presented to a subset of the original expert clinician participants for member check and revised on the basis of their feedback.

Multiple strategies were used to improve the trustworthiness (Krefting, 1991) of the data during Phase 1 of the study. We triangulated data collection approaches using both interview approaches (focus group, interview) and field observations (go-along method) to confirm the informants' behaviors relative to their description of their behavior (thus avoiding a socially desirable response). In addition, use of a team of researchers to code using constant comparison, discuss, and interpret the findings assisted in the reflexivity and dependability of the analysis. Member check throughout the field observations and during the interviews, and a final formal member check of the draft guideline, increased the credibility of the data. The preliminary findings were examined in a second phase of the study in which a second, external group reviewed the findings.

## Phase 2

*Validation of the Personal Factors Guideline.* Content validity of the guideline was ascertained with a review by a second set of expert clinicians in home modification.

*Participants.* Six occupational therapy scholars or clinicians were selected on the basis of their expertise in home modification intervention or record of publications in home modifications and recruited through convenience sampling methods. Each expert was invited to participate through email correspondence.

*Procedures.* The experts independently rated each item on a 4-point relevance scale (i.e., the extent to which each item related to the clinical reasoning of expert home modification providers). A content validity index (CVI), or the proportion of experts who rated the item as content valid, was calculated for each item (Lynn, 1986). Experts rated each factor, condition, intervention strategy, and clinical exemplar on a scale ranging from 1 to 4 (1 = *not relevant*, 2 = *somewhat relevant*, 3 = *quite relevant but needs minor revisions*, and 4 = *highly relevant*). Individual item CVI scores were calculated as the proportion of the 6 raters who scored the item as valid (rating of 3 or 4). The a priori cutoff to retain an item was .78 (Lynn, 1986). An overall scale-level CVI was calculated by averaging the factor-level CVI scores (Polit, Beck, & Owen, 2007). Experts provided extensive

open-ended comments for each item and the instrument. The form was revised by the research team on the basis of the expert review.

## Results: Phase 1

The participants were 6 occupational therapists with an average age of 37 yr (range = 30–54 yr) and an average of 12 yr experience as an occupational therapist and 5 yr experience in home modification. All 6 therapists currently practiced in the field of home modification in some capacity (contract, part time, and full time).

Nine themes emerged from the qualitative data provided by the expert occupational therapists as relevant during their clinical reasoning process when delivering home modification interventions. The data also revealed the possible continuum of conditions within these factors as well as strategies to use if these conditions were present. Two overarching themes emerged: intrinsic (characteristics of a client) and extrinsic (characteristics of a client's social or physical environment). Codes within these overarching themes described 14 unique elements of the occupational therapy clinical reasoning process.

### *Intrinsic Themes*

*Clinical Course of the Disease.* Expert occupational therapists conducted standardized assessments to measure the client's capacity. These occupational therapists also used their knowledge of the clinical course of a health condition to predict their clients' future capacity and to determine the optimal set of home modifications in the present and the future. One clinician stated that the modification plan "depends on their . . . functional abilities and capabilities. If they're recovering from a hospitalization and they're still a little weak, that's different than somebody who has [a multiple sclerosis] exacerbation." We observed that expert occupational therapists overcompensated for environmental barriers for clients with a progressive disease; they predicted future environmental barriers on the basis of the clinical course of the disease process to ensure that the intervention was effective for as long as possible.

*Personal Assistance Preferences.* The occupational therapists ascertained client preferences for using personal support to perform their daily activities and varied the intervention plan accordingly. If a client stated a preference for and had access to human assistance, the occupational therapist recommended modifications and provided training that involved a caregiver. One therapist stated, "[Having a caregiver] makes me think of different solutions." A preference for no personal assistance would result in a plan that included more architectural modifications or adaptive equipment.

*Ability to Maintain Home Modifications.* Occupational therapists considered clients' ability to care for and maintain the modification. If clients were physically, cognitively, or financially unable to maintain a device or product, alternative solutions were considered. One occupational therapist stated,

The upkeep of the item or what it's going to take to keep it [is an important consideration], if it's a one-time thing and it's done . . . and there's nothing really that they have to do to kind of keep it up . . . [or] if there's going to be routine things that might need to be done—changing batteries, for example.

*Readiness for Change and Compliance.* Occupational therapists noted that a client's openness and willingness to make changes to the home influenced their therapeutic approach. This readiness for change was described by one occupational therapist as Prochaska and DiClemente's (1982) Stages of Change model. A client's readiness for change altered how occupational therapists presented intervention strategies to them. One occupational therapist noted that "it really . . . depends on the client as to how willing they are to make changes to stay in their homes." Therapists indicated that readiness influences the choices clients make about home modifications and their approach to the intervention. One clinician noted a technique she uses with clients who are not ready to make changes: "I [say] things like, well, we can try it for this week and if you don't like it we can take it off . . . or tweak it—just give it a week's try."

In addition to the readiness for modifications, in some cases the ability to follow through and implement changes influenced the recommendations occupational therapists made. Therapists noted that compliance could be affected by cognitive capacity or characteristics of the client's personality versus a desire to make the changes.

*Concern for Aesthetics.* The occupational therapists considered clients' concern for the aesthetic appearance of the home when making recommendations. One therapist stated, "She [didn't] like this idea about the toilet because it doesn't match [the rest of her blue bathroom fixtures]." The therapist went on to say that despite the improved safety and function, the client would not consider making changes until her aesthetic priorities had first been met. Several therapists also noted that function rather than aesthetics might be the primary goal of other clients. The stigma of medical devices was also noted as a client concern. Thus, determining individual aesthetic preferences is an important factor in the clinical reasoning process.

## *Extrinsic Factors*

*Financial Resources.* Understanding the client's financial situation and making appropriate recommendations based on the available resources was another theme therapists identified as important in the home modification process. One clinician described the process:

You look at what they're doing . . . you look at all the factors and then . . . in your mind think of lots of possibilities, but then I think you start narrowing that down. . . . What's the financial situation—are they [going to] really use this?

In addition, it is important that clinicians not undermine the trust and relationship that they have developed with their clients by making recommendations that are beyond the scope of what a client could realistically implement. As one therapist noted,

A person had very few financial resources. . . . It made me think that sometimes it's discouraging for me to go in there and enlighten them on all these possible things that could help that they can't get. . . . At the same time, you don't want to discourage them . . . or make them feel depressed about their situation by telling them all the ideal solutions. . . . You just kind of have to figure out what is ideal for them within their range of . . . realistic possibilities.

Therapists also noted that although some clients had the financial resources for home modifications, they might not have support from family members or friends to cover the full expenditure. One clinician stated, "If somebody is not expected to live more than a year . . . to spend thousands of dollars on [a new bathroom is hard]. . . . They might just do a bed bath instead." Budgets influenced how occupational therapists prioritized solutions.

*Personal Assistance Available and Social Support.* The occupational therapists discussed the importance and influence that personal assistance in the form of a caregiver has on the intervention process and outcome. The level of involvement of a caregiver influenced the type of modifications occupational therapists prescribed. One clinician shared that she would "try to include the caregiver in the whole process and [explain] the options [to] get their feedback." Another clinician stated, "[I ask] how are the changes, the recommendations . . . affecting them, how are they experiencing the whole caregiver experience?" The caregiver's approval or lack of approval was noted as an important factor in acceptance of home modifications. One therapist noted, "Sometimes the caregiver doesn't want the client to be independent, or they don't think that they need

equipment.” In some cases, occupational therapists identified care providers from community groups as a linchpin in a successful intervention. The level of social support was also considered in determining the types of modifications needed. Social support ranged from installing the intervention to helping with daily activity performance and maintaining the intervention if needed.

*Lives With Others.* The occupational therapists noted that clients often shared their home with other family members or pets and discussed the importance of ensuring that modifications work for all residents in the home. One clinician said, “I’m thinking of a person that we had whose husband has dementia, so some of the recommendations that we make could even be a safety hazard for him.” In one instance in the field, a bathroom modification resulted in use of a toilet riser instead of a comfort-height toilet because the home was shared with small children who would have had difficulty with a taller toilet.

*Structural Condition of the Home, Housing Type, Weather Conditions, and Available Space and Layout.* Occupational therapists noted that factors such as type of housing, structural condition, ability to maintain one’s home, levels of the home, outside space availability and condition, and general floor plan were important characteristics to consider. One clinician noted, “I’m definitely looking at what type of housing it is. . . . Obviously . . . with apartments . . . they may not be allowed to [modify the home structurally without] some fights with landlords.” The occupational therapists discussed the challenge of providing home modifications when the structural integrity of the home was not sound. In other cases, the neighborhood conditions were important considerations in the clinical reasoning process. For example, weather conditions and neighborhood safety influenced choices, such as installing a ramp in a garage protected from the elements and out of sight of potential criminals who might perceive a person with a ramp as a vulnerable target. Modification plans were also influenced by the layout and flexibility of space. Available space to expand rooms or build additions was also discussed as an important consideration in developing intervention plans.

The initial guideline included a set of 14 personal factors and conditions derived from the nine themes: clinical course of the disease, personal assistance preferences, ability to maintain home modifications, readiness for change, compliance, concern for aesthetics, financial resources, personal assistance available, social support, living with others, structural condition of the home, housing type, weather conditions, and available space or layout. After a member check review by a subset of the Phase 1 experts, the guideline was refined to improve clarity and to develop clinical examples.

During this process, two additional factors were identified. *Portability* was described as the need for modifications to “travel” with clients who live in different homes seasonally or on the basis of caregiver availability. *Literacy level* was also identified as a consideration in selecting home modification interventions and in training clients to use and maintain interventions. The guideline was revised to reflect these two additional factors. Table 1 presents the factors and conditions.

## Phase 2 Results: Judgment Stage

The occupational therapists in Phase 2 ranged in age from 37–46 yr, with an average of 18 yr experience as an occupational therapist and 11 yr home modification experience. The countries represented were the United States ( $n = 4$ ), the United Kingdom ( $n = 1$ ), and Australia ( $n = 1$ ). None of the experts in Phase 2 were involved in Phase 1.

The majority of the individual items were rated either 3 or 4, yielding a CVI score of 0.83–1.0 by all 6 experts. Item CVI  $>.78$  was considered excellent regardless of the number of experts (Polit et al., 2007). Of the 138 items reviewed, 132 were considered acceptable. Six items were not acceptable and were substantially revised on the basis of expert feedback. Item CVI scores for relevance are shown in Table 2. The overall scale CVI was .97. No additional factors were identified by the experts.

## Discussion

This study identified and described 16 personal factors that expert occupational therapists routinely assess and integrate into their home modification intervention plans to increase acceptability of and adherence to home modification interventions. These intrinsic and extrinsic personal factors have a range of conditions (reflecting heterogeneous subgroups) and a corresponding set of strategies to address each condition. These findings informed the development of a personal factors guideline to support clinical reasoning in home modification interventions. The tool is designed to support a systematic approach to evaluating and addressing the personal factors relevant to home modification practice. The content of the guideline was externally validated by an additional group of national and international occupational therapist experts in home modifications and is now ready for further validity and reliability testing.

To our knowledge, this study is the first to describe systematically and validate a set of personal factors that occupational therapy experts in home modification interventions use during the clinical reasoning process to tailor home modification intervention plans. We have identified

**Table 1. Intrinsic and Extrinsic Personal Factors and Conditions**

Factor	Conditions
Clinical course of the disease	<ul style="list-style-type: none"> <li>• <i>Chronic</i>—Static disease process</li> <li>• <i>Chronic</i>—Progressive disease process</li> <li>• Temporary health condition or aggressively progressing, terminal disease</li> </ul>
Personal assistance preferences	<ul style="list-style-type: none"> <li>• Amenable to personal assistance to complete the task (formal or informal assistance)</li> <li>• Prefers to be independent or no personal assistance present</li> </ul>
Ability to maintain home modifications	<ul style="list-style-type: none"> <li>• Has adequate personal resources to maintain solutions (e.g., financial, functional, cognitive)</li> <li>• Does not have personal resources to maintain the solution in good working order (e.g., financial, functional, cognitive)</li> </ul>
Readiness for change	<ul style="list-style-type: none"> <li>• <i>Precontemplation</i>: Not considering possibility of change, does not feel there is a problem</li> <li>• <i>Contemplation</i>: Thinking about change in the near future</li> <li>• <i>Preparation</i>: Making a plan to change, setting gradual goals</li> <li>• <i>Action</i>: Implementation of specific action steps, behavioral changes</li> <li>• <i>Maintenance</i>: Continuation of desirable actions or repetition of periodic recommended steps</li> </ul>
Compliance	<ul style="list-style-type: none"> <li>• Likely to follow through with recommendations and use compensatory strategies to complete daily tasks</li> <li>• Not likely to follow through with recommendations (e.g., cognitive limitations)</li> </ul>
Concern for aesthetics	<ul style="list-style-type: none"> <li>• A high value placed on appearance of home (rejection of “medical-looking” devices)</li> <li>• Function valued over appearance</li> </ul>
Financial resources	<ul style="list-style-type: none"> <li>• Limited income</li> <li>• Has financial resources (or family does) to afford modifications</li> <li>• Is a veteran</li> <li>• Has a disease-specific organization (e.g., Multiple Sclerosis Society, American Parkinson Disease Association) or age- and residency-specific organizations (Area Agencies on Aging)</li> </ul>
Physical assistance available	<ul style="list-style-type: none"> <li>• Physical assistance available and accessible</li> <li>• No personal support available</li> </ul>
Social support	<ul style="list-style-type: none"> <li>• Family, friends, neighbors available, able, and willing to provide assistance</li> <li>• Active in a community organization (social clubs, religious organization)</li> </ul>
Lives with others	<ul style="list-style-type: none"> <li>• Children</li> <li>• Adults without disability</li> <li>• Adults with disability</li> <li>• Pets</li> </ul>
Structural condition of the home	<ul style="list-style-type: none"> <li>• Home in disrepair</li> <li>• Unsafe flooring conditions</li> <li>• Overall integrity of the interior walls, ceilings, plumbing, and drainage</li> </ul>
Housing type	<ul style="list-style-type: none"> <li>• Rental unit</li> <li>• Privately owned, single-family home</li> <li>• Privately owned, multifamily home</li> </ul>
Weather conditions	<ul style="list-style-type: none"> <li>• Climate of geographic area</li> </ul>
Available space and layout	<ul style="list-style-type: none"> <li>• Limited amount of space or floor plan</li> <li>• Availability and characteristics of land adjacent to home</li> </ul>
Portability	<ul style="list-style-type: none"> <li>• Client wants equipment to be able to be used in different places (both in their own house and others’ houses)</li> </ul>
Literacy level	<ul style="list-style-type: none"> <li>• Fully literate</li> <li>• Literacy issues present</li> </ul>

and described how occupational therapy experts in home modification tailor treatment in the presence of a client’s personal factors. The fidelity of an intervention, or whether the intervention is delivered in the field as intended, can be threatened by tailoring unless tailoring is systematic. The resulting guideline has the potential to improve the fidelity of home modification interventions by providing clinicians with a systematic approach to addressing the factors that

could significantly affect the outcome of a treatment intervention. The guideline is designed to systematically assess intrinsic and extrinsic personal factors essential to consider in the development of tailored home modification treatment plans. Given the high need for home modifications with a growing population of older adults with disabilities, this standardization could increase the capacity of occupational therapists not expert in home modification

**Table 2. Content Validity Index of the Personal and Environmental Factor Guidelines**

Content Validity Index	Factor (n = 16)	Conditions (n = 41)	Strategy (n = 41)	Example (n = 41)
Accepted as valid				
1.0	14	37	33	37
0.83	2	—	—	—
0.80	—	4	5	1
Questionable				
0.75	—	—	—	3
0.60	—	—	1	—
0.50	—	—	2	—

Note. For the Content Validity Index, scores of 3 (*quite relevant but needs minor revisions*) and 4 (*highly relevant*) are considered accepted as valid. Scores of 1 (*not relevant*) and 2 (*somewhat relevant*) are considered questionable. — = no response in this category.

interventions and could lead to interventions for this rapidly growing population.

This study's findings verify those of previous studies. Occupational therapists do vary their strategy and approach to meet clients' unique needs (Guidetti & Tham, 2002), and they consider personal factors such as degenerative health conditions and type of housing (Nocon & Pleace, 1998). We have identified a broader list of intrinsic and extrinsic factors, a continuum of conditions within these factors, and strategies for intervention. Evidence has suggested that when provided by occupational therapists, home modification interventions are more effective than interventions provided by other professions (Clemson et al., 2008; Gillespie et al., 2009; Pighills et al., 2011). Clarifying the clinical reasoning process used by occupational therapists may clarify the mechanism of change that improves outcomes.

Although this study benefited from a grounded discovery of the practice of expert occupational therapists and external validation, the findings may lack generalizability. Results should be interpreted with caution. It is likely that additional subgroups (or conditions) or regional differences were not identified in this study. Despite this limitation, the findings of this study identify an initial set of personal factors that occupational therapists providing home modification interventions might consider and strategies that may be used during intervention delivery. Future studies to examine the feasibility, reliability, and effectiveness of the guideline are warranted. Additional studies may be needed to provide a more comprehensive list of personal factors relevant to populations not previously addressed by the experts in this study.

## Implications for Occupational Therapy Practice

A clinical reasoning tool that elucidates the tacit knowledge essential to develop effective, tailored home modification

interventions will be useful for occupational therapy. As the demand for home modification increases, explicating the clinical reasoning process of expert clinicians will enable more occupational therapists to deliver the intervention successfully. Effective home modification interventions are dependent on tailored treatment approaches. This study provides a systematic guideline to address the unique personal factors of a client's life. ▲

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