

Title: Initial Validation of the Dimensions of Home Measure (DOHM)**Abstract:**

Background: Research has established a need to consider further aspects of the home environment in home modification provision and evaluation. The Dimensions of Home Measure (DOHM) was developed as a self-report outcome measurement tool for home modification practice to meet this need. Its development was informed by a literature review and qualitative exploration which identified six dimensions of the home environment, the physical, social, personal, temporal, occupational and societal dimensions which contribute to one's experience of home. This paper reports the initial evaluation of the validity of the DOHM.

Method: The DOHM was completed by 163 community dwelling older adults and people with disabilities. The Rasch measurement model was used to evaluate three aspects of construct validity, rating scale structure, unidimensionality and targeting.

Results: The 5-point DOHM rating scale function was evaluated using Linacre's (2002) guidelines. The middle rating category did not function well, and this resulted in collapsing the rating scale from 5 to 4 points. The unidimensionality of the DOHM's subscales was supported by Rasch-based principal component analysis and item fit analysis. However, hierarchical results of item difficulties revealed significant gaps in each of the DOHM's subscales, indicating that more items will be needed to capture the full range of participant's experiences of home.

Conclusion: The DOHM was developed to provide a relevant evaluation tool for home modification practice which comprehensively measures the home environment.

This study identified preliminary validity of this tool, with revision and further psychometric validation required.

Keywords: Outcome evaluation, assessment, psychometrics, questionnaire, environmental modification

Introduction

Home modifications are a key aspect of occupational therapy practice. Defined as “adaptations to living environments intended to increase usage, safety, security, and independence for the user” (Siebert, 2005, p. 28). Their provision is likely to increase in the future with an aging population, and older adults’ desire and policy trends towards aging in place. Research investigating home modifications however has remained relatively uncommon with ongoing calls for occupational therapists to develop an evidence base that supports and informs practice (Cabrera & Chase, 2008; de Jonge, 2011, Gitlin, 2003). Within Australia, home modifications are prescribed by occupational therapists working within community health and care services (government or non-government organisations), social housing departments (for social housing residences), or veteran services. Eligibility and funding for modifications is varied across the nation, with services paying for a range of modification costs dependent on the service guidelines and/or client’s personal circumstances (Jones, de Jonge & Phillips, 2008).

Research into home modifications has predominately focused on functional performance and safety outcomes, with evidence suggesting that modifications achieve their fundamental aim of enhancing occupational performance and safety in the home (Stark & Keglovits, 2012). Review of previous studies indicates that there are wider outcomes after the provision of home modifications. Clients revealed that home modifications impacted caring and carers in the home (Gitlin, Corcoran, Winter, Boyce & Hauck, 2001; Heywood, 2004a, 2005; Roy, Rousseau, Allard, Feldman, & Majnemer, 2008; Tanner., 2008), relationships and social networks (Heywood, 2004a,

2004b, 2005; Mayes, Cant, & Clemson, 2011; Niva & Skar, 2006; Roy, Rousseau, Allard, Feldman & Majnemer, 2008; Tanner, Tilse & de Jonge, 2008) as well as allowing clients to remain in their homes longer (Tanner et al., 2008). Privacy (Fänge & Iwarsson, 2005; Heywood, 2004b, 2005), freedom (Heywood, 2005; Jones, de Jonge & Phillips, 2008; Tanne, Tilse & de Jonge, 2008), self-identity and self-esteem connected with home (Heywood, 2005; Jones et al., 2008; Roy et al., 2008; Tanner et al., 2008) were also highlighted to be impacted both positively and negatively by home modifications.

These wider outcomes point to the aspects of the home environment which are important to consider during the home modification process and highlight the impact of modifications on clients' experience of home. Experience of home is defined as one's individual experience of their home environment including its meaning and usability (Aplin, de Jonge, & Gustafsson, 2015). While the outcomes of home modification on the experience of home have been widely described as shown above these have largely been obtained from qualitative approaches (Heywood, 2004a, 200b, 2005; Tanner et al., 2008; Jones et al., 2008; Roy et al., 2008; Mayes et al., 2011). A need was therefore established for the development of a clinically useful and psychometrically sound instrument that could incorporate these important outcomes to quantify the impact of home modifications on the experience of home. This tool would also aid occupational therapists in decision making by enhancing their understanding of clients' experience of home.

This article describes the validation of the Dimensions of Home Measure (DOHM), a measure of the experience of home. The DOHM was developed through a rigorous

process of scale development which involved four steps: defining the construct, designing the instrument, field testing the instrument, and initial item analysis. The DOHM's construct of interest was the home environment. Six dimensions of the home environment were determined through a literature review and qualitative study involving home modification clients and their families (Aplin, 2013; Aplin, de Jonge & Gustafsson, 2013; 2015). These dimensions included the personal, social, physical, temporal, occupational, and societal dimensions

The dimensions of home

The *personal dimension* describes our emotional connections with home and incorporates four aspects: safety and security, privacy, freedom and independence, and identity and connectedness. The home is a place of physical and emotional security, where we should feel most safe. Privacy allows us to be alone and feel comfortable to do as we wish (Smith, 1994). Home as a place of freedom is where we should be most in control, a place where we are free to make our own choices and actions and have our greatest sense of independence (Despres, 1991; Sebba & Churhman, 1986; Smith, 1994; Tanner, 2011). Identity and connectedness incorporates our self-expression within the home, our deep sense of identity, connection and belonging (Hayward, 1977; Heywood, 2005; Oswald & Wahl, 2005; Sixsmith, 1986; Smith, 1994).

The *social dimension* describes home as a place of social activities and participation. A place to foster, develop and engage in relationships with family, friends, neighbours and the wider community. These connections contribute towards the feeling of home (Aplin et al., 2013; Sixsmith, 1986). The *physical dimension* has four elements:

Structure, services and facilities, space, ambience, and location. Ambience includes lighting, airflow, shade and weather or the climate's impact on comfort and the temperature of home (Sanford & Bruce, 2010). The location of home determines the climate, topography, and access to local facilities, services and transport (Dahlin Ivanoff et al, 2007; Despres, 1991).

Cyclical and linear aspects are included in the *temporal dimension* (Werner, Altman & Oxley, 1985). The past, present and future is included in linear time where the needs and meaning of home change through different life stages (Tanner, 2011; Werner et al., 1985). Cyclical time refers to the routines of daily, weekly and yearly activities and events (Werner et al, 1985). The routines and order of everyday life at home are determined by social and cultural influences and evolve over time (Dovey, 1985). The familiarity and order of the home space is an important factor for one's comfort and meaning of home, particularly for older people (Rowles, 1983).

The *occupational dimension* describes home as a place of meaningful occupations. A place where everyday activities such as leisure, rest, relaxation, domestic activities, self-care, caring, and work, should be easy to do and contribute to the meaning and value of life at home (Aplin et al., 2015; Rowles, 1991). The *societal dimension* highlights the political and economic conditions which affect the resources and control people have over their homes (Keihofner, 2008). This includes government policies, national building standards, individual service restrictions, guidelines and costs (Aplin et al., 2013, 2015).

Dimensions of Home Measure

The DOHM was developed based on a literature review and qualitative study conducted by the researchers which confirmed the six dimensions of home (Aplin, 2013; Aplin et al., 2013, 2015). An initial pilot of the DOHM was completed with 23 clients of a major home modification service with resulting changes to the wording and the response scale (Aplin, 2013). The DOHM was then reviewed by six expert occupational therapists and academics who established the content validity. The DOHM was rated as being comprehensive in its overall measurement of the dimensions of home among the experts with inter-rater agreement of 0.83 (Aplin, 2013). Ratings for clarity and relevance were acceptable for all but two items, and final revisions were made to the DOHM based on these findings and experts feedback. The DOHM that was used in this study consisted of 36 items in five subscales and one single item, measuring different dimensions of home: personal (11 items), social (4 items), occupational (5 items), temporal (3 items), physical (12 items), and societal (a single item measuring clients comfort with the cost of the modifications). Each item is rated on a 5-point Likert scale with progressive response descriptors including (1) strongly disagree, (2) disagree, (3) unsure, (4) agree, and (5) strongly agree. One item which related to carers was able to be rated as non-applicable for those people who did not have carers. Each item was positively worded and detailed contents are presented in Appendix 1.

The purpose of the present study was to conduct the initial psychometric evaluation of the construct validity of the DOHM when administered to a sample of adults with disabilities and older adults who have or may need home modifications in the future. The study findings were to be used to provide construct validity evidence for the

current version of the DOHM or facilitate further revision with the ultimate aim of providing an assessment tool for home modification practice that clinicians and researchers can use with confidence.

Methods

Ethical approval for this study was granted from University and State government health department ethical review committees.

Participants and sampling

Participants were community dwelling older adults and people with a disability. Convenience sampling was used to recruit participants from five community health and care services, and advertisements were also placed in community organisations such as Parkinson's support groups and seniors groups. Participants who had modifications, were awaiting modifications or who received support services within their home were eligible to be included in the study.

Data collection tools

All participants completed the DOHM that was outlined in the previous section. In addition to the DOHM, a purpose designed demographic information questionnaire obtained personal information such as age, gender, modifications installed or anticipated, time spent in current home and self-rated health, measured on a five point likert scale of excellent, very good, good, fair and poor.

Procedure

A total of 665 packages inviting potential participants were sent to clients of the community services. Volunteers who responded to advertisements in the community were also sent the packages to complete and return the DOHM. The packages included a letter of invitation, participant information sheet, consent form, DOHM, demographic information questionnaire and a prepaid self-addressed envelope. People who were interested in research participation were asked to complete and return the enclosed questionnaires in the pre-paid envelope along with the signed consent form. As all questionnaires could be returned anonymously a response rate was unable to be determined from each of the services.

Data analysis

Rasch analysis based on Rating Scale Model (RSM) was used to examine three aspects of construct validity of the DOHM, including the rating scale structure, unidimensionality and targeting. The Rasch RSM is a one-parameter Item Response Theory model which examines the relationship between item difficulty and person ability (Andrich, 2004), based on the assumptions that the easier an item is the more likely it will be passed, and the more able the person the more likely he or she will pass the item (Bond & Fox, 2007). The RSM was utilised in this study as the rating scale of each DOHM item had constant meaning across items (Kottorp & Petersson, 2011). Rasch analysis has been widely used in the last decade in occupational therapy based assessment tools (Veloza, Kielhofner & Lai, 1999). More details of the Rasch model have been comprehensively described elsewhere (Lim, Rodger & Brown, 2009; Veloza et al., 1999)

In this study, Rasch analysis was performed initially for all the DOHM items as a whole, then on each subscale separately, to examine if a single dimension can be established for the total scale or each subscale. It is noted that the single item “I am comfortable with the cost of the modification” in the societal dimension was unable to be investigated using Rasch analysis. Rasch analysis was conducted using the statistical program Winsteps version 3.72.3®. The three aspects (i.e., rating scale structure, unidimensionality, and targeting) of Rasch-based construct validity examinations are described below.

Rating scale structure

The appropriateness of the 5-point DOHM rating scale was investigated using a range of Linacre’s (2002) guidelines. These included 1) that there are at least 10 observations for each category. 2) Average measures increase monotonically. 3) Outfit mean squares for categories must be less than 2.0. 4) And step calibrations must advance. The first three are described as essential by Linacre (2002).

Unidimensionality

The unidimensionality was investigated by a Rasch-based principal component analysis (PCA) of residuals to confirm whether the items could be summed as an overall score for each scale of the DOHM. The following criteria were used to indicate unidimensionality, the Rasch-derived principal component accounted for more than 50% of the variance and the variance explained by the first contrast had an eigenvalue smaller than 2 (Linacre, 2011; Raiche, 2005). In addition, fit statistics were used to assist in evaluation of unidimensionality of the DOHM items. There are two types of fit statistics, infit and outfit. Infit represents the weighted mean square

residual difference between expected and observed results while outfit is unweighted and more sensitive to outliers (Gothwal, Wright, Lamoureux, & Pesudovs, 2009). In this study, the items with fit statistics of mean square (MnSq) values >1.4 with their standardised z values (Zstd) >2.0 are considered to misfit the Rasch model's hierarchical expectations (Bond & Fox, 2007). Misfitting items may need to be eliminated or revised as they are indicative of poorly defined items or those measuring other constructs (Chien & Bond, 2009; Smith, 2001).

Targeting

The Rasch-generated item-person map was used to examine whether the person ability and item difficulty of the DOHM were matched appropriately. The item-person map provides an overall visual map, where the difficulty levels of the DOHM items relative to the ability measures of the sample are presented on the same measurement continuum.. Targeting was investigated by examining the difference between average person and item measures. Perfect targeting is demonstrated by a difference of zero. The larger the difference between person and item average measure the more mis-targeted the items are to the sample. The floor and ceiling effects were also calculated, with percentages above 5% considered significant floor or ceiling effects (Fisher, 2007).

Results

Demographic information

In total 163 participants completed the DOHM. Most participants had a modification present in their homes (83%). The modifications most often included grab rails (73%) and a hand-held shower hose (56%), followed by major bathroom modifications

including a level access shower (40%). Participants ranged in age from 31 to 95 years with an average of 68 years. They most often rated their health as fair or poor (66%). Participants had lived in their homes for an average of 21 years ranging from 6 weeks to 65 years. A summary of participants' demographic information is presented in Table 1.

Rasch analysis results

Rating scale structure

The rating scale function of the DOHM met most of Linacre's guidelines (see Table 2). The "strongly agree" category however showed average measures that did not increase monotonically and the middle category of "unsure" demonstrated disordering of step calibrations. The probably of response map generated by Winsteps® to provide a visual representation of the category function showed an unclear and messy probability curve for the "unsure" category. This suggested that this middle rating category did not function well. The method of working with neutral categories such as "unsure" may not be generalisable and rather should consider the survey construct (DeMars & Erwin, 2004). A decision was therefore made by the research team to collapse the category of *unsure* by combining it with the *disagree* category. The wording of "unsure" in a rating scale can be ambiguous may imply respondents' have difficulty choosing as they are in the middle (DeMars & Erwin, 2004). This decision however considered that respondents have a tendency as a result of social conformity to agree rather than disagree when responding to a scale (Linacre, 2002). It was therefore hypothesised that responding as "unsure" is likely to be closer to the meaning of a negative opinion (e.g., disagreement) rather than positive agreement in regards

to the dimensions of home as it is easier to agree rather than be in the neutral category or more negative category. Further the combination of the *disagree* and *unsure* categories improves the proportion of responses in the disagree category which enhances the regular distribution of observations, a further guideline of Linacre's indicating a functional scale (2002). The revised 4-point rating scale by combining the two categories of unsure and disagree exhibited satisfactory function in all evaluation criteria for all categories, providing evidence of validity for the new 4-point scale and was therefore used in the remaining analyses of the DOHM.

Unidimensionality

Initial analysis of all the DOHM items revealed that only 35.5% of the variance was explained by the Rasch-derived measures, and the first contrast eigenvalue was 5.1 indicating that at least five items contributed to a secondary dimension. Therefore, inclusion of all DOHM dimensions was not considered as unidimensional. A decision was made to investigate the unidimensionality of the items in the five subscales separately.

The PCA of residuals for each of the five subscales demonstrated varying results for the total explained variance. The social, occupational, and temporal subscales with an explained variance of 63.8%, 56.6% and 54.4% respectively, show preliminary evidence of unidimensionality. On the contrary, the results indicated that the personal (42.4%) and physical (45.4%) subscales were not unidimensional. Each of the two subscales were subsequently spilt into two further subscales based on clustering of items in factor loading maps derived by the PCA of residuals.

The personal subscale was divided into the subscales of privacy, safety and freedom (7 items), and identity and connectedness (4 items). The physical subscale was divided into two subscales also, being; structure, services and facilities (6 items), and ambience and space (6 items) (see Appendix 1). When re-submitted to Rasch analysis with new subscales, evidence of unidimensionality was shown for all but one subscale. The privacy, safety and freedom subscale explained variance achieving only 45.7% with the first contrast eigenvalue of 2.1. However, further division of the safety, privacy and freedom subscale was not considered, due to the limited number of items and no consistently plausible patterns in the factor loading maps in the PCA of residuals. Thus, the four new subscales retrieved from the personal and physical subscales were tentatively maintained for further item fit analysis.

Fit statistics of the DOHM items were examined to complement the PCA results. Of the 35 items across three original subscales and four new subscales, three items were identified as misfit (see Table 3), one each from the occupational, ambience and space and the privacy, safety and freedom subscale. The three misfitting items were temporarily removed from the corresponding subscales, and the PCA of residuals revealed slight improvements in the total explained variance of these three subscales. For the privacy, safety and freedom subscale that had unacceptable unidimensionality results, the removal of the misfitting item improved the explained variance from 45.7% to 49.5% and the first contrast eigenvalue from 2.1 to 2.0, but this remained the borderline of unidimensionality. Taken together, although the removal of each misfitting item improved the explained variance, these items were retained and recommended to be revised due to their clinical usefulness (described in discussion).

Targeting

The targeting of the DOHM's items was investigated through the item-person maps. Figure 1 illustrates the item-person map of the structure, services and facilities subscale which is representative of all other DOHM subscales.

Overall the item-person maps for every subscale reflected large gaps between the person's experience of home and the difficulty range of the items. Each subscale showed significant gaps between the most difficult item and the majority of participant's ability level which sat above these items on the map as can be seen in figure 1 for structure, services and facilities subscale. . This indicates that the difficulty range of the items and rating scales is not sufficient to capture people who are positively experiencing their home at the agree level. On the other hand, the gaps between the easiest items (ventilation in the figure shown) and participants with more negative experiences of home (responding at the disagree level) indicated that people with lower experiences of home at the disagree level were not sufficiently covered by the items of these subscales. This was also found for the identity and connectedness, occupational, and temporal subscales (item-person maps were not provided)

This poor targeting was also reflected in the average difficulty of the DOHM items being largely deviated from the abilities of the participants (ranging from 1.66 to 3.66 logits difference). These results in combination with the item-person maps indicate that participants' with more positive experiences of home may not be suitably targeted by the difficulty range of the current version of the DOHM items. In addition, all of

the DOHM subscales were found to exhibit ceiling effects of 5.5–11% but no floor effects (0–0.6%) were identified.

Discussion

This study used Rasch analysis to examine the construct validity for a newly developed tool, the DOHM which capture people's experience of home. Overall, the study findings have led to further improvements in this instrument. The original 5-point Likert scale did not function well in the sample of this study due to the problematic middle category of *unsure*. This category was originally designed to provide a neutral rating category, however the wording of “unsure” could be ambiguous and may imply respondents' difficulty choosing or that they have no opinion on the topic (DeMars & Erwin, 2004). Combining the two response categories of *unsure* and *disagree* resulted in appropriate rating scale function. This four-point scale (*strongly disagree*, *disagree*, *agree*, and *strongly agree*) is accordingly used in the revised version of the DOHM.

The DOHM, as a whole, did not constitute a single construct for the experience of home. This finding was somewhat expected as the experience of home is a complex and multifaceted construct combining different dimensions of home (Aplin et al., 2013, 2015). Instead, by examining the unidimensionality of the subscales separately, the social, occupational and temporal subscales demonstrated acceptable evidence for unidimensionality. There was one item “*It is easy for my carers to help me with the activities I need help with*”, that demonstrated a slight misfit from the occupational subscale. However this item was retained because the PCA of residuals was generally supportive for the unidimensionality. More than half of the participants (i.e., 80

participants) considered this item as not applicable, because they did not have carers assisting them in their homes. The large proportion of missing values could lead Rasch analysis to rely more on those respondents in the estimation of the item difficulty and goodness-of-fit, potentially making this item more likely to misfit within this subscale.

The original physical and personal dimensions did not demonstrate evidence of unidimensionality. The split of the physical and personal dimensions into two further subscales was also supported by the literature review and qualitative studies (Aplin, 2013; Aplin et al, 2013, 2015). For example the items concerning privacy, safety, independence, getting out of the home and feeling free to be one's self at home represent the three aspects of the personal dimension (privacy, safety and security, and independence and freedom) (Aplin, 2013). The aspects of privacy, safety and freedom are linked, as through control and freedom a sense of security is generated and people can control their private spaces and time alone; the home becomes a refuge from the outside world and a place of one's own (Despres, 1991; Hayward, 1977; Tanner, 2011). After the splitting, the new privacy, safety and freedom subscale did not fulfil evidence for unidimensionality. The removal of the one misfitting item, "*I feel independent, that I am able to do the things I want to myself*" resulted in nearly fair evidence of unidimensionality for this subscale. This item may have confused the participants with thoughts on their independence generally rather than how independent they feel at home. For example independence related to accessing their local community may have influenced their response. It was therefore necessary that this item be reworded to focus on independence at home.

The item “*When coming and going from my home I am protected from the weather*” from the new ambience and space subscale was also found to show misfit in two out of the four fit statistics. The item however was clinically relevant to include as participants in the qualitative study spoke of modifications such as lifts that were not covered and that they had to cover this themselves to be able to use it in the weather (Aplin et al., 2015). Given also that the misfit was not serious and this item was the most difficult item for the subscale, it was retained to ensure a wider range of item difficulty. However, it is worthy to note that the item’s wording has been refined to read more clearly, “*I am protected from the weather when coming and going from my home*”.

The poor targeting of items to persons was indicated by the item-person maps, along with the ceiling effects and large differences between item and person average measures. The sample however were volunteers sourced from community services, with most having modifications present in their home. Therefore we speculate that the study sample had a positive experience of home and endorsed positively on the DOHM items. This sampling issue may have played a significant role in the results of poor targeting, as Item Response Theory models usually require a balanced, representative sample (DeVellis, 2012; Zickar & Broadfoot, 2008). Furthermore, the homogenous sample of this study may have also resulted in the obvious gaps revealed in the item range for each step threshold of the rating scale. The DOHM subscales ranged from 3 to 7 items. It is recommended that when developing a new scale at least twice as many items should be included than is expected in the final scale (DeVellis, 2012). The initial development of the DOHM therefore should have drawn from a wider pool of initial items for each subscale and used Rasch analysis to determine the

most appropriate items to measure each dimension. In an attempt to create a useful and simple measure which was not overly onerous for clients to complete too few items were included which impacted the targeting results. The findings suggest that more items are needed for inclusion in the DOHM to differentiate people who have a positive experience of home. Particularly, inclusion of more extremely and moderately difficult items are needed to enhance the construct validity of the DOHM.

Limitations

The main limitation of the study was the participant sample who had a more positive experience of home as indicated by the item-person maps. Further studies that recruit participants who have a disability or health condition but are not accessing services and do not have modifications in their homes are warranted. These should aim to include more people who rent, both privately and tenants of social housing as this group are likely to have a more negative experience of home (Aplin, 2013). Their inclusion should provide a more diverse sample.

Clinical Implications and future research

Home modification services often rely on informal evaluation methods such as observation and untested measures developed by their service. The DOHM has the potential to provide the first rigorously developed tool specific to home modifications. It aims to provide occupational therapists with a useful information gathering tool, providing a picture of the client's experience of home. This information could be used to inform home modification decision making with the client. When completed pre and post modification, the DOHM also provides a home modification specific measure which evaluates aspects that are meaningful to the client. A study is currently

underway to refine and re-evaluate the construct validity of the DOHM. This study aims to include a more diverse sample with data being collected both pre and post modifications.

Conclusion

While the unidimensionality of each subscale appears to be preliminarily validated, the DOHM required revision, including the new 4-point rating scale, revision of some individual misfitting items, and the addition of a few items to each of the subscales in order to provide a more evenly distributed item hierarchy. The current version of the DOHM could be claimed to demonstrate preliminary evidence of construct validity. However ongoing investigation of the unidimensionality, targeting and appropriateness of the rating scales following the revision of the DOHM will be required.

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Table 1: Participant demographic information

Client demographic information (N=163)	n (%)
Modifications installed in the home	136 (83)
Clients waiting for modifications to be installed	9 (6)
No modifications present in home	18 (11)
Male	48 (30)
Female	115 (70)
Age (in years)	
30-40 (M=36, SD=3.3)	5 (3)
41-60 (M=53, SD=5.8)	37 (23)
61-80 (M=70, SD=6)	81 (50)
80+ (M=84, SD=3.6)	38 (23)
Not provided	2 (1)
Living situation	
Lived alone	78 (48)
Lived with spouse	59 (36)
Lived with family	20 (12)
Lived with others	6 (4)
Marital status	
Married	71(43)
Widowed	49 (30)
Separated	3 (2)
Divorced	14 (9)
De facto relationship	1(<1)
Single	25 (15)

<hr/> Housing situation		
Own home		120 (74)
Renting		14 (9)
Social housing home		27 (16)
Relatives home		2 (1)
<hr/> Dwelling type		
High set house		32 (20)
Low set house (small number of stairs)		51 (31)
Townhouse (with stairs)		14 (9)
Slab on ground house		39 (24)
Unit – ground level		23 (14)
Unit – upper levels		2 (1)
Other		1 (<1)
<hr/> Self-rated health status		
Excellent		5 (3)
Very good		12 (8)
Good		37 (23)
Fair		68 (42)
Poor		39 (24)
<hr/> Modifications completed at home		
Grab rails		119 (73)
Major bathroom modification		66 (40)
Step ramp		21 (13)
Chair lift		14 (9)
Water lift		1(<1)
Kitchen modification		14 (9)
Ramp		23 (14)
<hr/>		

Handrail on stairs	55 (34)
Hand held shower hose	92 (56)
Drop down shower seat	20 (12)
Ceiling hoist	3 (2)
Lever taps	35 (21)
Widening door/hallway	9 (6)
Path installed	38 (23)
Non-slip flooring	4 (2)
Installed higher toilet	3 (2)
Other †	2 (1)
None	18 (11)

†(*other modifications included repositioning of vanity, laundry modifications*)

Table 2: DOHM rating scale category function

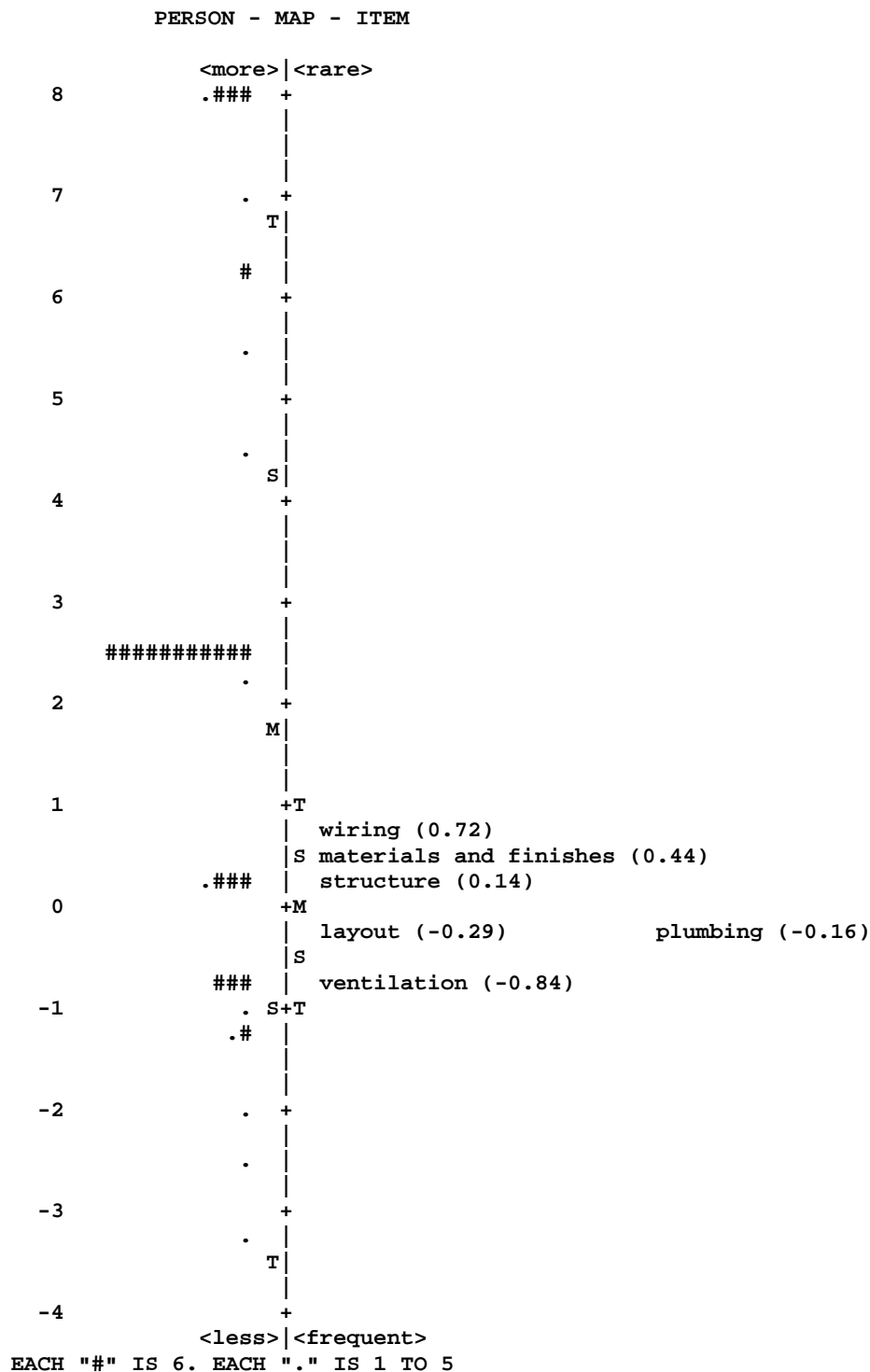
Dimensions	Category	Average	Outfit	Step	Measure imply category (ratings) coherence	Category (ratings) imply measure coherence
Questionnaire	count	measure	MnSq	calibration		
Strongly disagree	106	-0.38	1.15	None	0%	0%
Disagree	309	0.01	1.04	-1.40	41%	15%
Unsure	385	0.48	1.06	-0.05	18%	23%
Agree	3685	0.97	0.88	-1.57	77%	90%
Strongly agree	1095	0.273	0.96	3.02	75%	42%

Note: MnSq = Mean square

Table 3: Misfitting items of the DOHM

Item		Infit		Outfit		Item
		MnSq	Zstd	MnSq	Zstd	measure
Personal dimension – Privacy, safety, freedom						
5	I feel independent, that I am able to do the things I want to myself	1.38	2.5	1.71	3.7	1.12
Occupational dimension						
20	It is easy for my carers to help me with the activities I need help with	1.51	2.0	1.33	1.1	-0.61
Physical dimension – Ambience and space						
35	When coming and going from my home I am protected from the weather	1.26	1.9	1.45	2.5	1.06

Figure 1: Item-person map with item difficulty measures for Structure, services and facilities subscale



Item key:

Wiring = The wiring in my home is in a good condition

Ventilation = The ventilation in my home is in good working order.

Plumbing = The plumbing in my home is in good working order. (For example drainage in the bathroom)

Layout = I am happy with the layout of my home

Structure = My home has no structural problems

Materials and finishes = The materials and finishes in my home are in good condition. (For example the flooring, taps, sink and tiles)

Note: Item average difficulty (expressed using Rasch-based logit score) is provided in the bracket for each item.

Appendix 1: List of DOHM items

Item	
Personal dimension – Privacy, safety, freedom	
1	I have the privacy I want from others in my home
2	I have enough privacy from neighbours and other people in the street
3	I feel safe living in this home
4	I feel safe while moving around and doing activities in and around my home
5	I feel independent, that I am able to do the things I want to myself
6	My home allows me to get out as much as I want to
7	I can be myself at home
Personal dimension – Identity and connectedness	
8	I am happy with the appearance of my home
9	My home reflects who I am
10	I feel connected to my home
11	My home contains special memories for me
Social dimension	
12	I can easily have friends and family visit if I want to
13	I have good relationships with those I live with or who visit often
14	The modifications will/do suit others who use my home
15	It is easy for me to do activities with my friends and family at my home
Occupational dimension	
16	My home is easy to clean
17	I can easily move around in my home

18	I can easily do the activities I need to in my home (For example shower, toilet)
19	I can easily do the activities I enjoy at home (For example leisure activities)
20	It is easy for my carers to help me with the activities I need help with
Temporal dimension	
21	I am happy with my daily/weekly routine at home
22	I know where everything is and how it works in my home
23	With how things are at the moment, I am well set up for the future in my home
Physical dimension – Structure, services and facilities	
24	The wiring in my home is in a good condition
25	The ventilation in my home is in good working order.
26	The plumbing in my home is in good working order. (For example drainage in the bathroom)
27	I am happy with the layout of my home
28	My home has no structural problems
29	The materials and finishes in my home are in good condition. (For example the flooring, taps, sink and tiles)
Physical dimension – Ambience and space	
30	I enjoy the ambience of my home. (For example a view, breeze or sunshine)
31	I can easily keep warm/cool enough in my home
32	I have enough space in my home for my needs
33	I have enough storage space in my home
34	I have good light in my home
35	When coming and going from my home I am protected from the weather
Single item - Cost	

36 I am comfortable with the cost of the modifications (Eg. Initial installation costs, maintenance)
