Changes in ADL Dependence and Aspects of Usability Following Housing Adaptation—A Longitudinal Perspective

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OBJECTIVE. To investigate longitudinal changes in activities of daily living (ADL) dependence and aspects of usability in housing among clients receiving housing adaptation grants in Sweden.

METHODS. The ADL Staircase and the Usability in My Home instruments were used to collect data on three occasions: at baseline 1 month before housing adaptation, at follow-ups 2 to 3 months after housing adaptation completion, and after another 6 to 7 months. In all, 131 clients, living in ordinary housing 24 to 93 years of age were consecutively enrolled.

RESULTS. Overall ADL dependence did not change significantly whereas dependence in “Bathing” decreased over time. “Activity aspects” and “Personal and social aspects” of usability improved at different phases in the process.

CONCLUSION. This study delivers new insights about the complexity of longitudinal person–environment–activity transactions, specifically targeting activity and usability. The results are useful for developing efficient strategies for evaluating housing adaptations within occupational therapy practice and research.


Occasional therapists in community-based practice use a vast array of individually tailored environmental interventions (e.g., housing adaptations to enhance daily activities) (Canadian Association of Occupational Therapists [CAOT], 1997; Gitlin, 1998), and promote ability to lead an independent life. Housing adaptation is defined as an alteration of permanent physical features in the housing and the immediate outdoor environment, and is performed in order to reduce demands from the physical environment on activity performance (Boverket, 2000).

According to international policy and guidelines, all housing should be accessible for all people (United Nations, 1993). Current Swedish building regulation furthermore emphasizes that a person should be able to move around in, be in, and use the environment in order to perform activities on equal terms with other citizens (i.e., the housing should be usable for all). In spite of this, substantial international differences in building legislation and in building standards and housing conditions prevail (Wahl & Gitlin, 2003). For example in Sweden, according to current legislation the full costs for a housing adaptation can be granted for the purpose of enhancing performance of daily activities within the home and its close surroundings; however, regulative frameworks for providing and financing housing adaptations vary between countries, governing the type of adaptations provided. Clients receiving housing adaptations constitute a heterogeneous group (e.g., age and degree of activities of daily living [ADL] dependence) (Fänge & Iwarsson, 2003; Iwarsson & Isacsson, 1993), with people 65 years of age and above representing approximately 75% of the clients. In 2003 in Sweden, the public cost for
housing adaptations was 91 million Euro (110 million U.S. dollars) (Boverket, 2004).

Empirical research on housing adaptations is scarce and studies targeting a mixed sample of community-living adults receiving housing adaptation grants are lacking. For example, in a longitudinal study targeting 104 frail elderly clients, Mann, Ottenbacher, Fraas, Tomita, and Granger (1999) demonstrated that housing adaptations slowed down the rate of functional decline, and reduced the costs for health care services. Reduced incidences of fall accidents were demonstrated after housing adaptations among elderly clients at risk (Cumming et al., 1999). Compliance with housing adaptations has also been a focus of research (Corcoran & Gitlin, 2001; Cumming et al., 2001). In one randomized study of a multicomponent intervention program, using housing adaptations as well as behavioral methods, Alzheimer clients’ caregivers were the target group. The results after intervention indicated reduced dependence in instrumental activities of daily living (IADL) among the clients, and reduced upset among the caregivers (Gitlin, Corcoran, Winter, Boyce, & Hauck, 2001). In one study focusing on younger clients with asthma, Frisk, Blomqvist, Stridh, Sjödén, and Kiviloog (2002) demonstrated a reduced amount of airborne dust in the indoor environment after housing adaptation, thus leading to improved lung function and reduced respiratory symptoms.

In most previous studies on housing adaptations the conceptual definitions, as well as the methods used, differ. Furthermore, cross-sectional studies do not provide enough knowledge useful for describing changes over time, indicating that longitudinal studies are imperative in order to describe the direction, magnitude, and pace of changes (Gitlin et al., 2001; Golant, 2003). To date, systematic, research-based strategies useful for evaluations of housing adaptations in research and practice are lacking, and the need for development of such strategies is substantial. In order to approach this task, one important step is to identify, operationalize, and empirically investigate relevant outcome dimensions based on clear-cut conceptual definitions.

**Conceptual Definitions**

The two core concepts for this study are activity and usability. First, activity is the execution of a task or action by an individual (World Health Organization [WHO], 2001). Activity performance can be operationalized as dependence or independence on other persons in personal activities of daily living (PADL) or IADL (Iwarsson & Isacsson, 1997; Sonn & Hulter-Åsberg, 1991), and can be assessed from a professional perspective. Second, usability is a concept representing transactions between the person (P), the environment (E) and the activities (A), (i.e., the person, the environment and the activity [P–E–A] transactions) (Iwarsson & Ståhl, 2003). Usability is the extent to which human needs can be fulfilled in terms of activity performance in the environment at target, based on the person’s subjective evaluation of the constraining or supportive impact of the environment on activities (Fänge & Iwarsson, 2003; Golant, 2003). In this study, usability relates to the experience of performing daily activities within the home environment (Fänge & Iwarsson, 2003). The three components of usability (i.e., P–E–A) need further definition. First, the personal component is complex, and reflects such diverse aspects as functional capacity (Iwarsson, Isacsson, & Lanke, 1998), adaptation (Schultz & Heckhausen, 1997), roles, and interests (Kielhofnner, 2002). Thus, in usability the personal components relates to social aspects as well. Next, the environmental component is delimited to the demands in the physical housing environment and its close surroundings (Iwarsson, 2004; Iwarsson et al., 1998). Finally, the activity component relates to the personal repertoire of activities performed within the home (CAOT, 1997; Persson, Erlandsson, Eklund, & Iwarsson, 2001). When included in usability, the P–E–A components are closely interwoven, subjectively oriented, and judged from a personal perspective, taking into account clients’ subjective evaluations and expressions.

On the basis of these conceptual definitions, and the objectives of housing adaptations, activity performance, and usability served as outcome dimensions for this study. Consequently, the objective of this study was to investigate longitudinal changes in ADL dependence and aspects of usability among Swedish clients receiving housing adaptation grants.

**Material and Methods**

**Design**

A longitudinal design was chosen, collecting data on home visits on three different occasions; baseline assessments (T₁) were conducted no more than 1 month before housing adaptation, with a first follow-up (T₂) 2 to 3 months after the housing adaptation was completed, and a second follow-up (T₃) after 8 to 9 months from completion of housing adaptation. The Ethics Committee at Lund University, Sweden, approved the study.

**Study District and Sampling Procedure**

In order to reflect the variety of housing standards and conditions in Swedish municipalities, a medium-sized municipality in southern Sweden with urban as well as more sparsely populated rural areas was chosen for this study. At
the time of data collection, the municipality had 74,400 inhabitants. The demographic characteristics reflected those of other parts of the region. Annually, around 770 housing adaptations were granted, the majority of them to elderly persons, and persons staying in different types of care facilities at the time for application. The target population consisted of clients more than 18 years of age, living in ordinary housing, and who were being considered for housing adaptation grants administered by the community-based occupational therapists. In order to capture subjective experiences of problems in a valid way, the target population was furthermore restricted to clients who had been living at the current address for at least 3 months before T1. Excluded were clients who spent most of the day in a bed or chair, and clients with communication problems. Clients were consecutively enrolled over 18 months, and 158 persons fulfilled the inclusion criteria.

**Study Sample**

In all, 131 clients (83% of the target population) agreed to participate. Mean age was 71 years at T1, and the sample included 88 women and 43 men. Out of the 131 assessed at T1, some declined further participation in the study, or could not be reached at T2 or T3, or both. In all, 104 clients participated at T2, and 98 clients at T3. During the data collection process two clients moved to sheltered accommodation: one between T1 and T2, one between T2 and T3. Characteristics for the sample at T1 are presented in Table 1. When comparing the sample lost from T1 to T3 (n = 33) with the 98 clients possible to follow to T3, there were statistically significantly more men in the dropout sample (chi-square test; \( p = .033 \)).

**Housing Adaptations**

Different kinds of housing adaptations were performed in the clients’ homes. Some adaptations were completed in 1 day, whereas others took several months to complete. The grants often covered adaptations in more than one housing part. The majority of the adaptations granted targeted hygiene facilities (73 grants), entrances, including balcony and patio (38 grants), and adaptations to stairways and door areas (30 grants). The majority of the adaptations in hygiene facilities targeted installation of grab bars at the bathtub or shower, and/or replacing the bathtub with a shower. A few adaptations targeted floor surfaces in bathrooms. With some exceptions, due to the relatively high standard in the houses adapted, many adaptations were not time-consuming, and thus the time span between grant application and completion of adaptation was fairly short. On the contrary, some adaptations concerned the construction of entirely new hygiene facilities or kitchen areas, or required considerable reconstruction of entrances and outdoor areas. Consequently, the time span between T1 and T2 varied considerably among the cases investigated, 71–238 days (\( M = 103, Q1–Q3 = 90–110 \)). Furthermore, due to increasing needs for environmental adaptations in the home and declining functional capacity, out of the 98 clients assessed at T3, 25 (26%) had been granted a second housing adaptation during the study period. A wide variety of self-reported diagnoses were represented among the clients (e.g., age-related diseases and disorders, progressive neurological or rheumatologic diseases, and traumatic injuries). In order to describe the sample in terms of consequences of the diagnoses, data on the prevalence of functional limitations and dependence on mobility devices were collected. At T1, all clients had one or more functional limitation and/or were dependent on mobility devices (median = 4). Most prevalent were difficulties in bending and kneeling (78%), poor balance (61%), and limitation of stamina (53%). Least frequent were difficulty in interpreting information, complete loss of sight, and extreme size or weight. Data on the prevalence of functional limitations and dependence on mobility devices at T1 are presented in Table 2.

**Procedure**

All assessments at T1 were conducted by the occupational therapists employed by the municipality (\( N = 14 \)), whereas assessments at T2 and T3 were conducted either by them, by the project leader (AF), or by a project assistant. All data collectors were registered occupational therapists, and data were collected on regularly scheduled home visits. Initially, in order to obtain valid and reliable data, the occupational therapists underwent study-specific data collection training given by the project leader (AF) and the principal investigator (SI).

**Instruments**

The **ADL Staircase, Revised Version.** Data on ADL dependence were collected by means of the ADL Staircase (Sonn & Hulter-Åsberg, 1991), revised version (Iwarsson & Isacsson, 1997; Iwarsson et al., 1998). The ADL Staircase is a Swedish instrument, reliable and valid for use in urban (Sonn & Hulter-Åsberg) and rural areas (Iwarsson & Isacsson, 1997). The instrument is an extension of the Katz’s ADL Index, and comprises five PADL (feeding, transfer, going to the toilet, dressing, and bathing), and four IADL items (cooking, shopping, cleaning, and transportation) (Iwarsson, 1998; Sonn & Hulter-Åsberg). A professional administers the assessment as a combination of observation and interview. The measurement level is independence or dependence, with dependence denoting dependence on other persons, and the assessment is recorded...
on a 3-graded scale: independent, partly dependent, and dependent.

*The Usability in My Home Instrument.* In order to capture different aspects of usability, the self-administered Usability in My Home instrument (UIMH; Fänge, 2002; Fänge & Iwarsson, 2003) was used. The instrument comprises 23 items, of which 16 items are to be rated on a 7-point scale with 1 indicating the most negative and 7 indicating the most positive response alternative. Given case-specific situations, at the most six questions in the instrument (four regarding PADL and IADL, and two regarding specific housing sections) are “nonapplicable” to clients dependent in the specific activity (e.g., in cooking, and need not be answered). The rationale for this is that usability is based on subjective evaluations of the constraining or supportive impact of the environment on activity performance, and thus experiences from performing daily activities in a specific environment (e.g., the kitchen is crucial, as indicated in a previous study) (Fänge & Iwarsson, 2003). Another seven questions are open-ended: six for definition of the type of usability problems experienced in different sections of the housing environment, and one question for expression of any additional opinions.

The instrument was developed in several steps. Content validity was established by means of an expert panel review, and a test–retest reliability study indicated moderate to very good agreement for each item to be rated, $\kappa = .57–.88$ (Fänge & Iwarsson, 1999). For further instrument optimization purposes, in a previous study (Fänge & Iwarsson, 2003) factor analysis comprising the 16 items to be rated resulted in three factors, representing three different aspects of usability: “Activity aspects,” “Personal and social aspects,” and “Physical environmental aspects,” thus supporting its construct validity. For this study, “Activity aspects” (Cronbach’s $\alpha = .77$) and “Personal and social aspects” (Cronbach’s $\alpha = .74$), were considered relevant to analyze, because they mirror subjective evaluations related to the objective of a housing adaptation (i.e., increased independence in daily activities). In particular, the factor “Activity aspects” reflects the subjective aspects related to independence in daily activities. The factor “Personal and social aspects” comprises hobby and leisure activities, as well as activities related to social contacts with others. Furthermore, in “Personal and social aspects” dimensions related to personal interests, as well as adaptive strategies are reflected (i.e., dimensions of particular importance for activity performance) (CAOT, 1997). The two factors are further described in Table 3. Results on changes over time in the UIMH factor “Physical environmental aspects” along the housing adaptation process are presented elsewhere (Fänge & Iwarsson, 2005). The UIMH instrument represents a novel approach to target P–E–A transactions in the home environment, and thus it is relevant for this kind of research.

In addition, descriptive data were collected by means of project-specific interview questions, whereas data on the prevalence of functional limitations and dependence on mobility devices were collected by means of the Housing Enabler instrument, personal component (Iwarsson & Slaug, 2001).

*Statistical Analyses.* Besides descriptive statistics, data were analyzed by means of different statistical methods appropriate for each assessment instrument. Results were considered significant at $p < .05$.

**Table 1. Characteristics for the Study Sample at T1 ($N = 131$)**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years</td>
<td>75</td>
</tr>
<tr>
<td>Time living in present dwelling, years</td>
<td>66–80</td>
</tr>
<tr>
<td>Gender, %</td>
<td>33</td>
</tr>
<tr>
<td>Civil status, %</td>
<td>67</td>
</tr>
<tr>
<td>Type of dwelling, %</td>
<td>53</td>
</tr>
<tr>
<td>Formal and/or informal help in the home, %</td>
<td>57</td>
</tr>
</tbody>
</table>

**Table 2. Prevalence of Functional Limitations and Dependence on Mobility Devices in the Study Sample at T1 ($N = 131$)**

<table>
<thead>
<tr>
<th>Functional limitation or dependence on mobility devices*</th>
<th>Prevalence, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficulty in interpreting information</td>
<td>&lt; 1</td>
</tr>
<tr>
<td>Severe loss of sight</td>
<td>26</td>
</tr>
<tr>
<td>Complete loss of sight</td>
<td>&lt; 1</td>
</tr>
<tr>
<td>Severe loss of hearing</td>
<td>5</td>
</tr>
<tr>
<td>Prevalence of poor balance</td>
<td>61</td>
</tr>
<tr>
<td>Incoordination</td>
<td>15</td>
</tr>
<tr>
<td>Limitations of stamina</td>
<td>53</td>
</tr>
<tr>
<td>Difficulty in moving head</td>
<td>8</td>
</tr>
<tr>
<td>Difficulty in reaching with arms</td>
<td>46</td>
</tr>
<tr>
<td>Difficulty in handling and fingering</td>
<td>34</td>
</tr>
<tr>
<td>Loss of upper-extremity skills</td>
<td>10</td>
</tr>
<tr>
<td>Difficulty in bending, kneeling, etc.</td>
<td>78</td>
</tr>
<tr>
<td>Extremes of size and weight</td>
<td>&lt; 1</td>
</tr>
<tr>
<td>Reliance on walking aids</td>
<td>74</td>
</tr>
<tr>
<td>Reliance on wheelchair</td>
<td>18</td>
</tr>
</tbody>
</table>

*According to the Housing Enabler, personal component (Iwarsson & Slaug, 2001).

NB: Many clients had more than one functional limitation or dependence on mobility devices.
In order to use as much data from the assessment occasions as possible, analyses were based on \( N = 131 \) at T1, \( N = 104 \) at T2, and \( N = 98 \) at T3. Consequently, analyses of changes T1–T3 were based on \( N = 98 \), between T1 and T2 on \( N = 104 \), and finally, analyses of changes between T2 and T3 were based on \( N = 91 \). Due to internal dropouts on different items the calculations were based on slightly different sample sizes (see notes in Tables 4 and 5).

First, changes in dependence in each separate ADL item and in the UIMH factors “Activity aspects” and “Personal and social aspects” over the time span from T1–T3 were investigated. Second, separate pairwise analyses from T1 to T2 and from T2 to T3 were performed. Analyses of changes in each separate ADL item, and in the UIMH factors “Activity aspects” and “Personal and social aspects” were performed using the Sign test (Altman, 1994). One particular advantage of the Sign test, compared to other statistical methods, is that it maintains within-person differences in the course of the analyses. Changes over time in overall ADL dependence were analyzed by first computing ADL ranks (Iwarsson et al., 1998; Iwarsson & Lanke, 2004) based on the 3-graded scale of the ADL Staircase, and thereafter changes over time, T1–T3, as well as T1–T2, and T2–T3 were analyzed by means of the Sign test (Fänge, Lanke, & Iwarsson, 2004; Iwarsson & Lanke).

The commercial program SAS, version 6.12 (SAS Institute) was used to calculate ADL ranks and changes in overall ADL dependence, and dependence in each separate ADL item. All other calculations were performed using the SPSS, version 11.0.5.

Results

Activities of Daily Living Dependence

At T1, 15% of the clients were independent in all activities assessed. Slightly less than half of the sample (48%) was dependent in IADL only, whereas well above one third (37%) were dependent in both PADL and IADL. One client was dependent in all activities. Proportions of dependence in each activity are presented in Table 4. No significant changes in overall ADL dependence were found between T1 and T3, between T1 and T2, or between T2 and T3. When it comes to separate ADL items, at T3 fewer clients were dependent in bathing than at T2 (\( p = .0020 \)). No other significant item-specific changes occurred in any phase of the housing adaptation process.

Usability

No significant improvements or declines were found in “Activity aspects” between T1 and T3. However, analyses of changes from T1 to T2 and from T2 to T3 revealed that the clients perceived that their housing environment supported daily activities to a significantly greater extent at T2 than at T1 (\( p = .045 \)), whereas no changes were found further along in the process.

Table 3. Description of Items Included in the Usability in My Home Factors “Activity Aspects” and “Personal and Social Aspects”

<table>
<thead>
<tr>
<th>UIMH factora</th>
<th>Items included, ( n )</th>
<th>Score (min–max)b</th>
<th>Item descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity aspects</td>
<td>4</td>
<td>0–28c</td>
<td>Personal hygiene, dressing, visiting the toilet, how to eat Cooking, heating of food, preparation of snacks Washing, doing the dishes, cleaning, care of flowers Washing up, ironing, mangling, repair of clothes</td>
</tr>
<tr>
<td>Personal and social aspects</td>
<td>6</td>
<td>5–42c</td>
<td>Perceived security Privacy Social contact maintenance Environmental flexibility and adaptability Hobbies and leisure Communication features in the home environment</td>
</tr>
</tbody>
</table>

aAccording to the Usability in My Home (UIMH; Fänge, 2002; Fänge & Iwarsson, 2003)
bBecause nonapplicable questions are included in the factor “Activity aspects,” a 0 score is possible.
cBecause nonapplicable questions are included in the factor “Personal and social aspects,” a score of 5 is possible.

Table 4. Proportions of Clients Dependent in Separate ADL Activities at T1, T2, and T3

<table>
<thead>
<tr>
<th>Activity</th>
<th>( T_1 )</th>
<th>( T_2 )</th>
<th>( T_3 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportions of clients, %c</td>
<td>131</td>
<td>104</td>
<td>98</td>
</tr>
<tr>
<td>Feeding</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Transfer</td>
<td>11</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>Going to the toilet</td>
<td>12</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Dressing</td>
<td>13</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>Bathing</td>
<td>20</td>
<td>26</td>
<td>12d</td>
</tr>
<tr>
<td>Cooking</td>
<td>38</td>
<td>38</td>
<td>38</td>
</tr>
<tr>
<td>Shopping</td>
<td>68</td>
<td>66</td>
<td>60</td>
</tr>
<tr>
<td>Cleaning</td>
<td>63</td>
<td>69</td>
<td>60</td>
</tr>
<tr>
<td>Transportation</td>
<td>61</td>
<td>71</td>
<td>64</td>
</tr>
</tbody>
</table>

\( ^a \) According to the ADL Staircase (Sonn & Hulter-Åsberg, 1991), revised version (Iwarsson & Isacsson, 1997).  
\( ^b \) Proportions calculated on the specific sample size for T1, T2, and T3 respectively.  
\( ^c \) Due to internal dropouts some of the proportions were calculated on lower sample sizes.  
\( ^d \) \( p = .0020 \) (Sign test)
For “Personal and social aspects” no statistically significant changes were found between T<sub>1</sub> and T<sub>3</sub>. On the other hand, analyses revealed significant improvements between T<sub>2</sub> and T<sub>3</sub> (p = .008), although no changes occurred earlier in the housing adaptation process (see Table 5 for descriptive data on “Activity aspects” and “Personal and social aspects”).

Discussion

To the best of our knowledge, this study is one of the first specifically targeting changes over time in ADL dependence and aspects of usability following housing adaptations. The results elucidate different types of outcomes of housing adaptations, and deliver new knowledge on the complexity of P–E–A transactions, useful for developing strategies for evaluation of housing adaptations.

The pattern of improvements found in the different outcome dimensions investigated is complex, and given the considerable challenge inherent in following community-living clients over time there are of course limitations in our study. First, the sample size is relatively small, thus reducing the statistical power of the calculations, and increasing the risk of not detecting significant changes over time. Thus, there is a risk that the lack of significant changes found at different stages of the housing adaptation process might be due to the small sample size. Next, at T<sub>1</sub> the number of men was considerably lower than the number of women, and there were more men than women among the dropouts from T<sub>1</sub> to T<sub>3</sub>. Even if the data available do not allow for systematic analyses of gender differences and health, at the outset of the study the health status among the men might have been worse, explaining the fact that it was not possible to follow them over time to the same extent as the women.

Furthermore, it is important to note that even if improvements over time were found in all outcome dimensions investigated, in our sample many other interventions targeting one or more of the P–E–A components may have been effectuated, not only housing adaptations. For example, mobility devices were prescribed at different stages of the housing adaptation process (Fänge & Iwarsson, 2005).

In addition, interventions are tailored for a given level of functional capacity, ADL dependence, activity needs and preferences, but because many clients face rapid decline, a particular housing adaptation might be useful and effective only for a brief period of time (Gitlin, 1998) until the need for further adaptations comes up. The fact that at T<sub>3</sub>, 25 of the 98 clients had applied for another housing adaptation grant indicates that their needs may have changed very soon after the intervention (i.e., even before the follow-ups). Another aspect worth consideration is that individual housing adaptation processes differ considerably among clients (e.g., functional capacity, magnitude of dependence in ADL, usability ratings, housing conditions, and types of adaptations thus affecting the outcomes of housing adaptation). In this respect, one noteworthy observation from the current study was the obvious lack of systematic approaches to the intervention as such; in most aspects housing adaptations represent “a black box,” challenging traditional approaches to evaluation. In order to base housing adaptations on scientific evidence, studies aiming at systematization of intervention procedures are imperative. Thereafter, robust and valid evaluation is possible to accomplish. In order to deepen the knowledge on the effects of housing adaptations, a process perspective involving long-term follow-up is necessary. Given this, randomized, controlled studies specifically targeting intervention processes in community-based rehabilitation would generate considerable knowledge, thus contributing to quality improvement in practice. However, from an ethical point of view randomized studies raise numerous questions, at least in municipalities with short waiting lists. When it comes to housing adaptations specifically, additional information on administrative procedures and economic aspects is necessary. Such data are available on the current sample, but are still being analyzed.

The significant decrease in dependence in the single activity “Bathing” found between T<sub>1</sub> and T<sub>3</sub> is important and in line with Nygren, Iwarsson, Isacsson, and Dehlin (2001), who reported the same kind of results among men in a follow-up study after geriatric rehabilitation. Physical environmental adaptations in hygiene facilities are common

Table 5. Descriptive Data on “Activity aspects” and “Personal and social aspects” of Usability* at T<sub>1</sub>, T<sub>2</sub>, and T<sub>3</sub>

<table>
<thead>
<tr>
<th>UIMH factor*</th>
<th>T&lt;sub&gt;1&lt;/sub&gt; N = 131</th>
<th>T&lt;sub&gt;2&lt;/sub&gt; N = 104</th>
<th>T&lt;sub&gt;3&lt;/sub&gt; N = 96</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Median Range Q1–Q3</td>
<td>Median Range Q1–Q3</td>
<td>Median Range Q1–Q3</td>
</tr>
<tr>
<td>Activity aspects</td>
<td>20 0–28 12–24</td>
<td>21 0–28 14–27</td>
<td>21 0–28 14–27</td>
</tr>
</tbody>
</table>

*According to the Usability in My Home (UIMH; Fänge, 2002; Fänge & Iwarsson, 1999, 2003).

Due to two internal dropouts usability was assessed for N = 96.
(Iwarsson & Isacsson, 1993; Mann et al., 1999), and even if details on environmental barriers are not accounted for here, in our sample the majority of housing adaptations were made in hygiene facilities, most of them targeting bathtub or shower. In this respect, the objectives of the housing adaptations (i.e., removal of environmental barriers in order to enhance daily activities) seem to have been fulfilled.

In addition, the UIMH factors “Activity aspects” and “Personal and social aspects” improved after intervention, although at different phases in the housing adaptation process. It seems reasonable that the housing environment was judged to enhance performance of daily activities, hobbies, and leisure activities, as well as social contacts, etc. (i.e., dimensions investigated in this study) to a greater extent after the housing adaptation than before. Housing adaptation is a highly individualized intervention, affecting personal goals (Gitlin, 1998), and thus the intervention may have positive effects (e.g., by facilitating for the caregiver, or by enabling the clients to perform the activities with less effort). The results indicate that usability is a crucial outcome dimension in evaluation of housing adaptations. The results furthermore support previous studies indicating that accessibility and usability are different but related concepts (Fänge & Iwarsson, 2003).

The fact that overall ADL dependence did not change significantly following housing adaptation whereas dependence in one single item (“Bathing”) decreased over time demonstrates the need for conscious choices of assessment instruments and analysis designs. That is, in order to detect changes, methods with sufficient sensitivity should be used. In order to discriminate among the many people living in the community that are relatively independent in ADL, instruments comprising both PADL and IADL are necessary (Avlund & Schultz-Larsen, 1991). In this respect it is worth commenting on the fact that two of the activities included in the ADL Staircase, shopping and transportation, are performed outdoors, mainly in parts of the environment that are not within the scope of a housing adaptation. The rationale for including outdoor activities in this study was that in order to perform them, entrances as well as private outdoor areas (i.e., areas that are eligible for housing adaptation grants) need to be accessed. Consequently, dependence in shopping and transportation could be affected by housing adaptations, even if this was not the case in our sample.

As indicated by our results, even if the 3-graded scale was used in order to improve the statistical power of the calculations of ADL Staircase data (Fänge et al., 2004), such improvements may not be detectable in global ADL assessments with a measurement level as strict and relatively insensitive as dependence or independence, but rather in subjective usability evaluations (Fänge & Iwarsson, 2003). However, the UIMH instrument is novel, and analyses are based on only a few studies. Consequently, further studies are necessary in order to investigate its validity and feasibility for evaluation purposes. In addition, when it comes to valid operationalization and delimitation of both “Activity aspects” and “Personal and social aspects,” further development is needed.

In this respect, it is important to note the different perspectives on assessment that are reflected in the UIMH instrument, and the ADL Staircase, respectively, based, for example, on differences in conceptual definitions. The ADL Staircase is valid and reliable for use with mixed samples of clients, such as housing adaptation clients, in community-based practice. The assessment is performed by professionals, mostly occupational therapists, and aims at measuring level of dependence or independence by means of a combination of interview and observation. Thus, all activities included in the instrument should be assessed. On the other hand, the UIMH instrument was developed in order to capture subjective evaluations of P–E–A transactions, and thus personal experience from performing activities in the housing environment is crucial. Given this, it is important to exclude those activities from the evaluation that the client does not perform at all (i.e., some questions become nonapplicable).

The choice of dimensions to operationalize and measure for evaluation purposes is demanding, and theoretical support is crucial. Until recently, research on environmental interventions has focused on the interaction between the person and the environment (i.e., P–E interaction or P–E fit) (Iwarsson et al., 1998; Oswald, Schilling, Wahl, & Gäng, 2002; Wahl, 2001), underpinned by the ecological model of aging (Lawton & Nahemow, 1973; see also Scheidt & Norris-Baker, 2004), and the docility hypothesis (Lawton & Simon, 1968). As indicated by the results of this study, in order to better understand the results of housing adaptation processes, an evident approach to evaluation is to target P–E–A transactions. When it comes to conceptual definitions and relationships between concepts central for this kind of research, the results of this study indicate the need for studies on how activity performance and usability are related. It should be borne in mind that usability comprises an activity component (Iwarsson & Ståhl, 2003), and since the concept is based on the notion of P–E–A transactions (Fänge & Iwarsson, 2003; Iwarsson, 2004), it is closely related to activity performance (Carlsson, 2002). Consequently, research including the activity component is crucial (Golant, 2003), thus contributing to further our understanding of the mechanisms of P–E–A transactions in different housing environments (Iwarsson, 2004).
To conclude, this study represents a first attempt to survey changes in ADL dependence and aspects of usability after housing adaptations, based on explicit conceptual definitions and systematic methodology. Efficient resource utilization calls for evidence to be presented on the benefits of different interventions for different groups of clients, and in this respect, the results indicate that housing adaptations contribute to improved activity performance and usability in housing. The findings highlight the considerable complexity of housing adaptation processes, and elucidate changes and transactions of P–E–A components over time. Moreover, the advantage of using objective, professionally based assessments alongside clients’ subjective evaluations is indicated. The methodology used for collecting and analyzing data for this study is to some extent new, and with more knowledge at hand, different assessment instruments may be used with different clients. Such strategies would improve the efficiency of assessment and evaluation procedures within community-based occupational therapy. The results challenge occupational therapists to make more conscious choices of different assessment and evaluation strategies in relation to housing adaptations, and even if not targeted by the current study, the need for development of systematic intervention procedures is obvious.

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