The *Housing Enabler* – Integration of a computerised tool in occupational therapy undergraduate teaching

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Introduction

For decades, occupational therapists, architects, public planners, and geographers with a specific interest in promoting possibilities for persons with disabilities to participate in society have advocated accessibility and universal design, and the need for intensified teaching endeavours in this field (Christophersen 2002). The assessment of accessibility problems is an important part of occupational therapists' everyday practice (Clemson, Roland and Cumming 1992; Fänge 2004), yet research and practice on home environments generally lack sound psychometric measures (Gitlin 2003). In order to develop quality case management of in-house modifications, valid and reliable assessment methods are imperative. Further, in order to arrive at valid analyses in an efficient way, computerised methods are preferable. Virtually all occupational therapy undergraduate teaching around the world comprises courses that include, to some extent, targeting universal design as well as individual housing adaptations. However, to date only a few universities integrate valid and reliable assessment and computerised analysis methods targeting accessibility issues in their curricula, and in addition there is a substantial need for integration and use of systematic methods in current occupational therapy practice.

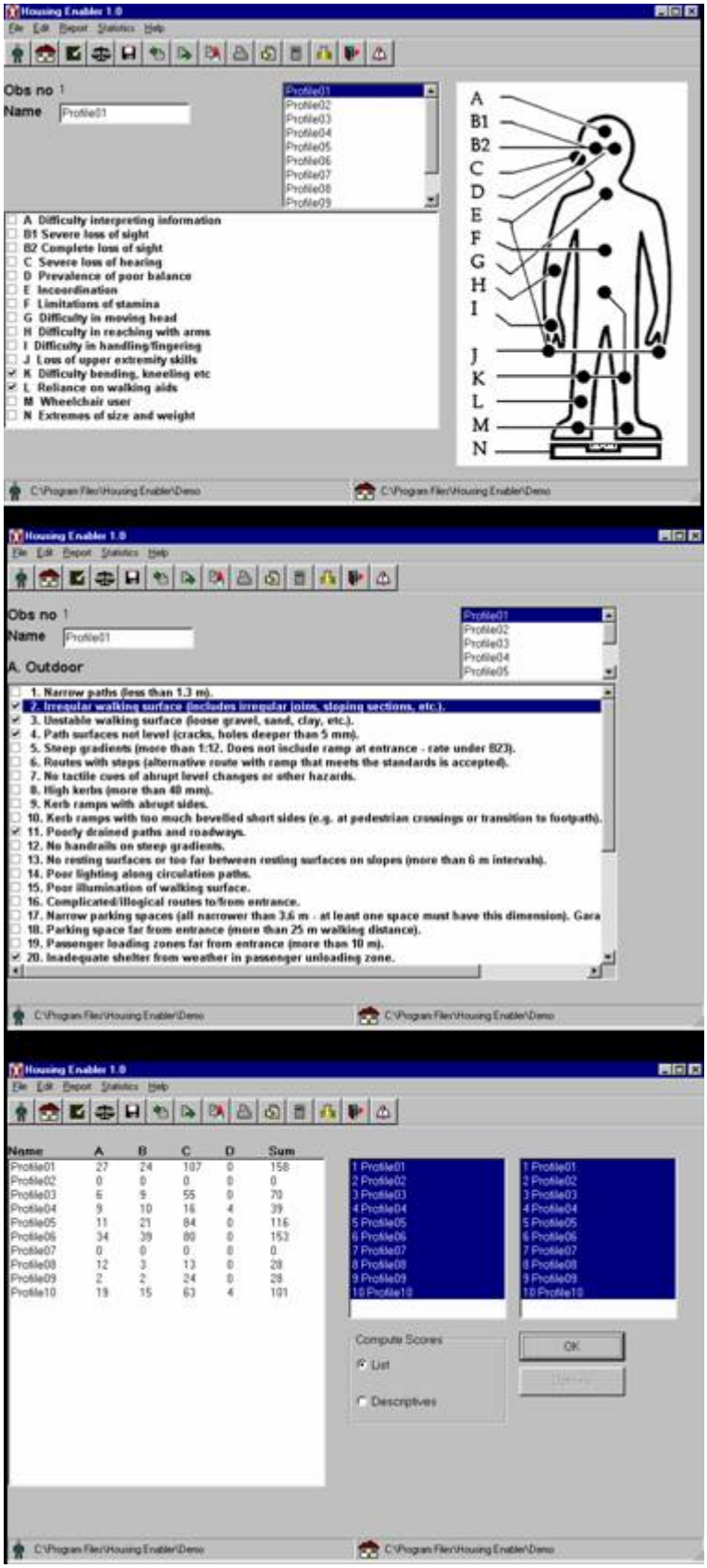
For more than one decade Iwarsson has engaged in developing assessment instruments and analysis tools for accessibility research, (Iwarsson and Slaug 2001). For five years, teachers involved in undergraduate teaching in occupational therapy at Lund University have engaged in the development of pedagogic strategies to teach on accessibility issues and housing modifications, in close interaction with ongoing development in Iwarsson's research team. Based on a multi-dimensional assessment instrument and a computerised tool for analysis of housing accessibility problems, the teaching methods have successively been developed. The purpose of this paper is to describe current use of these methods in occupational therapy undergraduate teaching at Lund University, Sweden.

Description of the *Housing Enabler* methodology

The Enabler Concept is originally an American idea, with a design (Steinfeld Schroeder, Duncan, Faste and Chollet 1979) operationalising accessibility in terms of functional capacity and environmental demands (Iwarsson 1999). It can be applied with great flexibility and is thus suitable for assessment tasks from various perspectives. Iwarsson et al. gradually developed a methodology for assessment and analysis of housing accessibility based on the Enabler Concept (Steinfeld et al. 1979). This methodology enables a *predictive*, *objective*, and *norm-based* assessment and analysis of accessibility problems in the physical home environment. It allows analysis from both an individual and group/population perspective (see www.enabler.nu).

The *Housing Enabler* instrument is intended for housing accessibility assessment and comprises an introductory descriptive part concerning individual or group data and housing standards. Assessor reliability (Iwarsson and Isacsson 1996), content (Iwarsson and Slaug 2001), and construct validity (Fänge and Iwarsson 2003) have been established. The assessment is administered in three steps, as detailed in Figure 1. In the first and second steps the assessment is conducted according to checklists for functional limitations and dependence on mobility devices as well as for physical environmental barriers. In the third step an analysis of accessibility problems is undertaken, by relating functional limitations and dependence on mobility devices to environmental barriers. The analysis provides a quantification

of the accessibility problems anticipated in each case, in the form of a total score.



Step 1.
Assessment of functional limitations and dependence on mobility aids

Step 2.
Assessment of environmental barriers

Step 3.
The accessibility scores that result from relating the functional limitations with the physical environmental barrier

Figure 1. Structure of the *Housing Enabler* assessment
(Iwarsson and Slaug 2001; Slaug and Iwarsson, 2001; www.enabler.nu).

Step 1. Assessment of functional limitations (the personal component of accessibility) This first step of the assessment is a combination of interview and observation, in order to dichotomously assess the person's functional limitations (13 items) and dependence on mobility devices (2 items) (Figure 1). Thus, the personal component of accessibility is operationalised primarily in terms of physical functional capacity, while four of the items concern perception or cognition. This section of the instrument fulfils very high inter-rater reliability requirements, kappa=0.87 (Iwarsson and Isacsson 1996). The result of this step is expressed in terms of profiles of functional limitations, i.e., the significant characteristic of this assessment is that it takes simultaneous occurrence of several different functional limitations into account. In this kind of profile, the presence as well as the absence of any of the functional limitations is crucial, since the result of the quantitative analysis takes both aspects into account (Carlsson, Iwarsson and Ståhl 2002).

Step 2. Assessment of physical environmental barriers (the environmental component of accessibility) This consists of a detailed on-site observation of physical environmental barriers in the home and the immediate outdoor environment (188 items). Thus, the environmental component of accessibility is operationalised in terms of the presence of physical environmental barriers. The housing environment is divided into four sections: outdoor environment (33 items), entrances (49 items), indoor environment (100 items), and communication features (6 items). A few examples of item definitions are given in Figure 1. Just below 70% of the items are defined according to official Swedish norms or guidelines. The remaining items are defined and assessed based on professional experience, primarily occupational therapy expertise. The 188 items constitute a valid source of information, and they are subsequently entered into the quantitative analysis (see Step 3 below; Figure 1). If the objective of the assessment is to serve as the basis for planning of practical intervention, e.g., individual housing modification or planning for rebuilding in order to meet the needs of a specific user group, collection of additional qualitative information is recommended. During the on-site observation the assessor is recommended to take additional notes, make sketches, etc. that might be useful in the planning process. Even if this section of the instrument is very complex and comprises many items, it fulfils high assessor reliability requirements, kappa=0.68 (Iwarsson and Isacsson 1996).

Step 3. Calculation of accessibility score This step is a quantitative analysis of accessibility. It is a calculation of a total score predicting the demand caused by a particular combination of functional limitations in an individual or a group and physical environmental barriers (environmental design features), i.e., the degree of objective, norm-based accessibility problems in housing. For each environmental barrier item, the instrument comprises predefined points (1 to 4), adopted from the original Enabler Concept (Steinfeld et al. 1979), quantifying the severity of the problems predicted to arise in the specific case. Based on the assessor's dichotomous assessments in steps I and II of the administration procedure, the predefined points 1–4 already fixed in the instrument format yield a score summing up the degree of accessibility problems anticipated, i.e., predictive physical environmental demand (Figure 1). In cases where no functional limitations or dependence of mobility devices are present in the person, the score always is zero. In cases where the person has functional limitations and/or is dependent on mobility devices, higher scores mean more accessibility problems and higher environmental demand.

Software for analysis – The *Housing Enabler 1.0*

The *Housing Enabler 1.0* (Slaug and Iwarsson 2001) is a Windows-based program, offering a user-friendly interface for registration of functional limitations and mobility assessments as well as physical environmental barriers by means of the *Housing Enabler* instrument (Iwarsson and Slaug 2001). For each item in the *Housing Enabler* checklists (Steps 1 and 2), the software has a checkbox that can be ticked, marking that a functional limitation/dependence on mobility device or an environmental barrier is present in the case assessed. When all items have been assessed according to the assessment format, the data can be saved and stored in a database. The *Housing Enabler 1.0* database has separate files for Step 1 functional limitations and dependence on mobility devices and Step 2 environmental barriers (Figure 1). After indication of which housing environment a particular person should be linked to, the accessibility score that results from relating the functional limitations of a particular individual with the physical environmental barriers present is calculated by the 'Compute Scores' feature. This operation makes it possible not only to predict the problems for an individual in his/her current housing environment, but also to predict the magnitude of accessibility problems anticipated in an alternative housing environment available in the database. Thus, comparisons between the magnitude of accessibility problems in different housing environments in relation to a particular person can be made which gives the program a built-in flexibility, suitable for comparison between different housing alternatives for a person. Further, the program has another module, 'Rank Environmental Barriers', which produces a priority or ranking list of those environmental barriers causing accessibility problems in relation to the person or group at target for the analysis.

A complete user instruction is available by using the 'Help-button' in the software and as a chapter in the Housing Enabler manual (Iwarsson and Slaug 2001). For teaching purposes, an exercise compendium based on a 'demo scenario' is available. A demonstration version of the software is available for free download at the web site http//:www.enabler.nu.

The *Housing Enabler* in the occupational therapy curriculum at Lund University

The occupational therapy undergraduate program at Lund University is based on problem-oriented methods to promote the students' ability to solve problems within an

occupational therapy theory and practice context. Throughout the curriculum, occupational therapy is integrated with reference subjects in medical and social sciences, successively building up knowledge and professional competence.

In the second and fifth semester of the three-year curriculum, while introducing environmental interventions as part of the occupational therapy process, the *Housing Enabler* instrument and the software for analysis are introduced and applied in mandatory courses. To further deepen the knowledge of reliable and valid administration of the methodology as part of occupational therapy practice, during the sixth (final) semester the students have the possibility to take an elective course, 'Accessibility and Usability to the Physical Environment: Occupational Therapy Perspectives' (http://www.arb.lu.se).

The Housing Enabler in the mandatory courses

In the second semester, the *Housing Enabler* is briefly introduced as one of several assessment instruments used in occupational therapy, focusing on physical environmental assessments and interventions to promote everyday activity. In the fifth semester, basic teaching in the *Housing Enabler* assessment approach is given and the software for analysis is introduced, aiming at providing the students with tools for valid data collection and analyses in relation to housing adaptations (Fänge 2004). The application of the *Housing Enabler* is a part of a three–week assignment focusing on analyses based on research methodology, and how to write a short paper following conventional publication rules. Data for this assignment is collected during a period of student fieldwork. The sample for this small study is defined as occupational therapy clients who come up for a housing modification. The data to be collected comprises variables such as age, gender, diagnoses, prevalence of functional limitations, use of mobility devices, prevalence of environmental barriers (Iwarsson and Slaug 2001), and subjective well-being. After data collection, the students practice data entry using the *Housing Enabler* 1.0. software (Slaug and Iwarsson 2001) as earlier described. Further, the students learn to export *Housing Enabler* scores to *SPSS* software (*SPSS* Inc 2001) and to compute basic statistical analyses, e.g., correlation between accessibility problems, age, gender, and subjective well-being.

The Housing Enabler in the elective course

Based on the very first contact with the *Housing Enabler* methodology as introduced in the mandatory courses, the elective course develops a deeper theoretical knowledge, more methodological skills, and integrates assessment results with the occupational therapy process. Besides the concept of accessibility, related concepts are introduced, e.g., usability and universal design (Iwarsson and Ståhl 2003), along with presentation of alternative assessment and analysis methods.

Besides participation in skill training sessions and tutorial groups, the students have to write two assignments. The first assignment is focused on individual client needs for housing modification, using data collected at an individual level during the home-visits. The students analyse housing accessibility problems by use of the software feature 'Rank Environmental Barriers', providing them with a list showing the environmental barriers causing the most accessibility problems, in descending order, for a particular person. In occupational therapy practice, this list can be used for planning of individual housing modifications, or for advice targeting planning of housing for specific citizen groups, e.g., elderly persons. In the second assignment, the students try to communicate their professional knowledge to colleagues and others in the health care and housing planning sectors. Analyses on group level are first computed in the Housing Enabler software using the 'Compute Scores' feature. Individuals with high and low accessibility problem scores are identified based on this step. In addition, the software makes it possible for the students to investigate whether alternative dwellings would render fewer accessibility problems for a person than his or her present house/apartment. Such simulations make it possible to sort out dwellings with more or fewer accessibility problems for persons with a specific profile of functional limitations and dependence on mobility devices, serving as a basis for discussions on housing planning issues at municipality level. Further, the students have to export the *Housing Enabler* scores to *SPSS* and compute correlations between accessibility problem scores other variables, e.g., usability. Thus, the *Housing Enable*r database is used to illustrate epidemiological considerations in occupational therapy assessments and interventions. The final examination is an oral presentation or a short article for a staff magazine, focusing on housing accessibility and usability problems in the community.

Discussion

The *Housing Enabler* instrument provides a systematic way of operationalising, assessing, and analysing accessibility problems in housing. Introducing the *Housing Enabler* software through the occupational therapy undergraduate curriculum allows students to train themselves to gather the kind of evidence needed to be able to make valid and reliable proposals for environmental interventions, at both an individual and group level. The students' acquisition of knowledge while using these research-based tools provides a basic platform for future practice in community-based occupational therapy.

By using the *Housing Enabler* software to build up a database comprising data on functional capacity and environmental demands, aggregation of individual data to group and population levels can be demonstrated and applied. Thus, the usefulness of data collected in relation to individual cases of housing modifications and, for municipality level planning of housing can be demonstrated and discussed during skill training sessions. These data, as well as knowledge on how to use it for planning purposes are crucial for occupational therapists within the municipalities. According to the course evaluations, the students find the skill training sessions valuable, and some of them ask for more data analysis training.

The use of the *Housing Enabler* software for entering and analysing data allows students to acquire and practice skills in how to use computerised technology for efficient assessment, planning, and intervention purposes. The skill training sessions involving use of the *Housing Enabler*

software as well as *SPSS* presumably contributes to practice and research development within occupational therapy in general. In particular, since computerised technology increasingly is being introduced in health care contexts, e.g., for client records, educational efforts aiming to train students to use such methods are very important.

The *Housing Enabler* occupational therapy methodology has now been used for six years for the systematic assessment of housing accessibility and modification cases in a south Swedish municipality chosen for demonstration and implementation. The basis for this development was a PhD student project (Fänge 2004), and the experiences and knowledge thus generated have served as an important basis for the development of the courses presented in this paper. Currently in the demonstration municipality, the application of the *Housing Enabler* computerised tool is being further developed, with respect to the software as well as the user interface for data collection. In order to facilitate on-site data collection and data entry, palm computers with a special version of the *Housing Enable*r software are being introduced. The use of palm-computers will most probably promote efficient data collection and data-entry, and successively the experiences gained in practical demonstration will underfeed further development of the occupational therapy curriculum courses.

Conclusion

The *Housing Enabler* methodology offers a wide range of applications and is well suited for use in occupational therapy teaching. The methodology has the potential to make case management within occupational therapy practice more efficient. In addition, the methodology can be applied in housing planning at municipality level. The introduction of such methods in undergraduate teaching will presumably facilitate the introduction of computerised tools in occupational therapy practice in general.

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