Choosing the most appropriate environment to evaluate independence in everyday activities: Home or clinic?

Carolina Bottari,1,2 Élisabeth Dutil,1,2 Clément Dassa,3,4 and Constant Rainville2,5

1École de réadaptation, Université de Montréal, 2Centre de recherche interdisciplinaire en réadaptation du Montréal métropolitain (CRIR), 3Département de Médecine sociale et préventive, Université de Montréal, 4Groupe de recherche interdisciplinaire en santé and 5Département de psychologie, Université de Montréal, Montreal, Quebec, Canada

Background and Aim: To better document independence in activities of daily living (ADL), particularly with persons with traumatic brain injury, the influence of the context in which performance-based assessments are administered must be considered. This paper examines the issue of context in ADL assessment according to specific criteria.

Main Findings: Overall, the limited number of studies found to have investigated the influence of context (home, clinic) on performance-based ADL assessments in persons with cerebral damage does not provide clear evidence to support the superiority of either environment.

Conclusion: The issue of context in ADL assessments has been minimally documented and can be explained by the complexity of data collection. Occupational therapists will need to address this issue.

KEY WORDS activities of daily living evaluation, context, ecological validity, independence.

Introduction

Occupational therapists frequently use performance-based evaluations of activities of daily living (ADL) (e.g. A-One, AMPS, PRPP, ADL Profile) (Arnadottir, 1990; Chapparo & Ranka, 1996; Dutil, Bottari & Vanier, 2002; Dutil, Bottari, Vanier & Gaudreault, 2005; Fisher, 2001) to guide clinical interventions. Evaluations involve the direct observation of people as they perform various activities to better understand the consequences of underlying deficits on performance. Results obtained from assessments of those with moderate or severe traumatic brain injury (TBI) are frequently used by rehabilitation teams to determine readiness for home discharge from acute care hospitals, the continued need for supervision or assistance upon discharge, and the nature of the assistance required to attain an optimal level of independence. Also, results are used to determine the ability to maintain independent community living, and the need for ongoing functional skills retraining. To adequately predict need, these decisions must consider both persons’ abilities and the environmental demands that will be placed upon them after discharge (Batavia, 1992). However, it is essential for overall safety and well-being that these decisions be based on information that accurately reflects how the person’s skills and the demands of the home and community environment mesh in day to day routines and demands (Keith, 1995).

Traumatic brain injury results in multiple sensorimotor (balance, coordination and dexterity) and psychological disabilities (problems with memory, attention, behaviour and executive functions) (Cooper, 1993). The latter typically interact with environmental characteristics and can contribute to the development of various participation restrictions, such as in ADLs, which can persist for many years after the injury (Cohadon, Castel, Richer, Mazaux & Loiseau, 2002; Dutil, Vanier & Lambert, 1995). As such, performance-based ADL assessments of people...
living with the effects of TBI must consider the complex interactions of potential disabilities with the many environments in which the person undertakes daily responsibilities.

Administration protocols of some ADL assessments specify the ideal setting in which these measures should be administered, yet frequently leave a certain amount of choice to the evaluator. For instance, the ADL Profile (Dutil et al., 2005), the Assessment of Motor and Process Skills (AMPS) (Fisher, 2001) and the Perceive, Recall, Plan and Perform System of Task Analysis (PRPP) (Chapparo & Ranka, 1996) recommend that, when possible, the assessment be completed in the individual’s real-world environment (i.e. the person’s home or community). However, other assessments such as the Arnadottir OT-ADL Neurobehavioural Evaluation (A-ONE) (Arnadottir, 1990) specify a single setting, in this case, the clinic. There is some speculation that the specific context in which the assessment is completed may influence the findings of the assessment, particularly for persons with TBI. However, frequently, therapists choose to assess ADL independence in the clinical setting and use the results to predict functioning in the home upon discharge. Adding to the debate on the ideal setting for the evaluation, it has been suggested that completing behavioural observations in the home with patients with TBI is not realistic in the context of community rehabilitation (Powell, Beckers & Greenwood, 1998). However, evidence-based practice requires that we reexamine these clinical practices on the basis of research findings to determine whether ADL assessments performed in the home more accurately reflect ADL independence than those performed in the clinic. Alternately, results obtained on hospital-based assessments should be examined to determine if they adequately predict independence in the home upon discharge from an inpatient setting. In essence, two alternate hypotheses are possible. First, if the familiarity of the home environment enhances ADL independence, results obtained in the clinic may overestimate deficits. Alternately, if the greater complexity, greater demands and lesser structure of the real-world environment limit ADL independence, results obtained in the clinic may underestimate deficits.

This paper will examine these issues of context from the perspective of the definition of ADL independence, relevant theoretical and practice models, the concept of ecological validity, and finally empirical studies having specifically examined the influence of context (home vs. hospital) on performance-based ADL assessments. As context has a limited effect on ADL assessments administered via questionnaire (patient or proxy reports), these studies have been excluded from this review.

How do we define independence in activities of daily living?

Two separate but interrelated concepts must be defined: ADLs and independence. Overall, ADLs refer to the specific tasks, which a person should be able to perform (independently or with the help of available resources) to ensure survival and maintenance in the community (Hamont & Bégué-Simon, 1988). ADL is frequently subdivided into two categories: personal activities of daily living (PADL) and instrumental activities of daily living (IADL). PADL includes activities such as eating, personal hygiene and grooming, dressing, and bathing/showering—activities considered central to the individual’s survival. IADL occurs, in the home and in the surrounding community and includes activities such as accessing one’s community, shopping, meal preparation and clean up, housekeeping and financial management. These activities are central to the return to independent living in the community (McColl et al., 1999).

There is less consensus about the definition of independence. Some studies limit their definition to physical independence (e.g. the ability to bring food to the mouth, the ability to transfer from the wheelchair into the bed), whereas others have a broader definition that includes cognitive ability and contextual demands. A general trend can be observed in the literature towards the acceptance of the broader definition as greater consideration is given to the contribution of cognitive abilities to a person’s ADL independence and to the interdependence between ADL ability and environmental factors (Gitlin, Corcoran, Winter, Boyce & Hauck, 2001; Hoppes, Davis & Thompson, 2003; Lysack, MacNeill & Lichtenberg, 2000; MacNeill & Lichtenberg, 1997; MacNeill, Lichtenberg & LaBuda, 2000).

Nosek and Fuhrer (1992) present a heuristic model of independence in which independence is defined in terms of four major components: perceived control of one’s life, physical functioning, psychological self-reliance and environmental resources. A complex inter-relationship exists between these components. For example, ‘the less one is able to do for one’s self, the more one must rely on other people or things in the environment … As the availability of environmental resources increases, demands on physical abilities decrease’ (Nosek & Fuhrer, 1992, p. 9). Overall, independence in ADL occurs as a result of the competence of persons to do things for themselves in interaction with the environment in which they live. Competence implies the ability to decide what one wants to do, to plan a course of action, to do the task and to assess the outcomes. It also implies a measure of mastery over the environment in which one lives (Rogers,
1982). As this definition of independence in ADL provides an accurate appraisal of a person’s abilities, it is this definition which will be retained in this paper. Based on this definition, home-based ADL assessments may be thought to be superior to hospital-based ADL assessments as only with this format can people be observed as they interact with the environment in which they live. Moreover, observing a person’s ability to decide what they want to do, when and how, is more difficult in the structured environment of the hospital where activities are regulated by rules and schedules.

Relevant theoretical and practice models

Several theoretical and practice models have examined the role of the environment in relation to independence in ADL. These include models specific to occupational therapy such as the Person–Environment–Occupation Model (Law et al., 1996), the Model of Competence (Rousseau, Potvin, Dutil & Falta, 2002), the Model of Human Occupation (Kielhofner, 1995), the Occupational Performance Model (Australia) (Chapparo & Ranka, 1996), the Canadian Model of Occupational Performance (Canadian Association of Occupational Therapists, 1997), the Occupational Competence Model (Polatajko, 1992) and the Ecology of Human Performance Framework (EHP) (Dunn, Brown & McGuigan, 1994). Others are more multidisciplinary such as the International Classification of Functioning, Disability and Health (World Health Organization, 2001) and the Competence Environmental Press Framework (Gitlin et al., 2001). A basic assumption underlying these models is that occupational performance (which includes ADLs) is best understood in context. For instance, the primary theoretical postulate fundamental to the EHP framework (Dunn et al., 1994) is not only that performance cannot be understood outside of context, but that evaluations performed out of context may lead to misinterpretations of the person’s behaviours and have potentially detrimental consequences for the person. The Competence Environmental Press Framework (Gitlin et al.) further postulates that as competency declines, an environmental approach to treatment will minimise the effects of the latter as it will allow for the modification of the environmental demands on the person. Models such as these become particularly interesting when they serve as the basis of assessments that in fact permit a more refined analysis of persons in interaction with their environment. However, few such assessment tools have been developed. Despite these models recommending home-based ADL evaluations as the optimal method of measuring ADL independence on a more conceptual level, these assumptions remain to be validated with empirical studies.

Are ADL assessments ecologically valid?

Ecological validity can be defined as the extent to which inferences can be accurately drawn from test scores about behaviours or situations other than those involved in the assessment procedure (i.e. behaviours that occur over long periods of time and in a variety of real-world settings) (Franzen & Wilhelm, 1996; Sbordone, 1997). Overlap with other forms of validity include face validity (similarity between the test items and behaviours in the real-world environment) and predictive validity (extent to which test results predict behaviour in the real-world environment) (Franzen & Wilhelm; Silver, 2000). However, predictive and ecological validity are two distinct concepts. Predictive validity refers to the degree to which test scores predict a criterion measurement that will be made in the future (Crocker & Algina, 1986). For example, a predictive validity study would look at the extent to which an entrance high school exam predicts college grade point average. Ecological validity, on the other hand, is interested in the extent to which test scores reflect current real-world functioning (Sbordone & Guilmette, 1999). In essence, to test ecological validity, two concurrent measures of performance are considered, whereas in predictive validity a second measure is taken at some point in the future.

Several problems inherent to most assessment settings, as described in the neuropsychological literature, limit the ecological validity of tests. These include: (i) administration of the test in a quiet environment with few distractions where task demands are minimised; (ii) assistance provided by the examiner for the maintenance of task focus, motivation and persistence; and (iii) assistance in limiting frustration and fatigue (Cripe, 1996). These can be summarised as being a critique regarding the use of a more structured approach to assessment. Hence, the interest of ecologically valid assessments is in examining what the person actually does (outside the testing situation) and not what the person ‘can do’ (optimal ability observed under ideal conditions). Moreover, the performance of persons with TBI may significantly deteriorate in real-world settings where many distractions are present, multitasking is required and frustration and lack of encouragement may occur. Thus, predictions of functional status made from tests administered within a structured setting may not accurately reflect the person’s functioning within a real-world setting. To address the issue of the ecological validity
of neuropsychological tests, results obtained from these tests are generally compared to the person’s overall functioning in everyday life. People’s performance on ADL assessments is used as the criterion of choice for this comparison (Higginson, Arnett & Voss, 2000; Farias, Harel, Neumann & Houtz, 2003).

However, performance-based ADL assessments may also have limited ecological validity. For instance, the presence of an examiner otherwise termed the issue of reactivity, whether in the home or in the hospital, may alter the demands of the real-world environment in ways that will greatly modify the performance of a person with TBI, and thus limit the ecological validity of the data obtained (Franzen & Wilhelm, 1996). Use of simulated assessments or of tests with administration protocols that require the evaluator, as opposed to the patient, to select task components necessary for ADL independence (e.g. where the evaluator specifies the tasks to be performed) or where potential environmental distractions are systematically removed (e.g. presence of children during meal preparation) will limit the ecological validity of ADL assessments. The same can be said of tests that use only simple ADL or PADL tasks. Merely changing the context (hospital, home) in which such ADL assessments are administered may not suffice to increase their ecological validity. Improvements such as in vivo assessments, less structured approaches, greater consideration of environmental demands, and larger sampling of more complex tasks may need to be made to ADL assessments in order to enhance their ecological validity and reduce inaccurate inferences.

**ADL Profile**

Test characteristics thought to enhance the ecological validity of assessments, as discussed previously, were used by our research team to develop an ADL assessment called the ADL Profile (Dutil, Forget, Vanier & Gaudreault, 1990; Dutil et al., 1996, 2002, 2005). This assessment was developed to provide a criterion-referenced measure of independence in everyday activities (PADL and IADL) for persons with a TBI. Several validity and reliability studies of the ADL Profile have been completed (Dell’Anniello-Gauthier, 1994; Dutil et al., 1994; Gervais, 1995; Kasindi, 1998; Rousseau, Dutil & Lambert, 1994a,b). The administration protocol recommends that the assessment be completed, when possible, in the person’s home and community environment. The presence of PADL and IADL tasks is representative of tasks required for independent living in the community. Moreover, the assessment protocol emphasises the importance of a non-structured approach allowing for the observation of important executive processes (e.g. goal formulation and planning). It has been reported that the principal cause of impaired independence in TBI is the range of complex behavioural and cognitive disturbances associated with executive processes (von Cramon & Matthes-von Cramon, 1994; Eslinger & Damasio, 1985; Gadoury, 2001; Shallice & Burgess, 1991; Stuss & Benson, 1986). Also, the observation of routines rather than individual tasks creates the possibility of observing multitasking as well as the influence of fatigue on a person’s performance. Future studies will be required to investigate the influence of context (home, clinic) on the results obtained with this assessment.

Despite the cited limitations of performance-based ADL assessments, literature pertaining to ecological validity argues, overall, in favour of home-based ADL assessments as the ideal method of obtaining ecologically valid information.

**The influence of context on ADL assessments: A review of the evidence**

This section analyses the methodological qualities and results of studies where persons with cerebral damage were administered a performance-based ADL assessment both in the hospital or in the clinic and in their home within a short time-period. The results obtained stem from a search of the following computerised databases (1982–2004): Medline, CINAHL, PsyInfo, Cochrane Database of Systematic Reviews, Current Contents, EBM Database of Abstracts of Reviews of Effects, Health and Psychosocial Instruments, and OTDBASE. Search words included: activities of daily living, assessment, cognition disorders, predicative validity, ecological validity, community rehabilitation, community-based rehabilitation, home-based rehabilitation and person and environment. Reference lists obtained from pertinent articles were also examined. Over a hundred abstracts were read. Twenty-five articles were found that presented empirical data related to ADL interventions/evaluations within a real-world environment. These studies were examined in detail. A number of studies were excluded from the review because of the use of performance-based ADL observations outside the context of a standardised ADL assessment (Brown, Moore, Hemman & Yunek, 1996; Lysack & Neufeld, 2003; Zhang et al., 2003), or the use of ADL assessments with acceptable psychometric qualities that were unjustifiably modified (i.e. changes to the tool’s psychometric properties were not investigated following the modifications) to study the influence of
context (Rogers, Holm, Goldstein, McCue & Nussbaum, 1994). Moreover, studies that compared a performance-based ADL assessment administered in the clinic to a questionnaire administered in the home (Grimby, Andren, Daving & Wright, 1998; Smith & Clark, 1995) were also excluded as comparing the results of evaluations obtained on two different types of assessments in two different contexts can confound the results in persons with TBI (Abreu et al. 2001). In addition, the time elapsed in these latter studies between the two assessments was generally quite long (e.g. 2 years) as the studies measured rehabilitation outcomes and not the influence of context on ADL assessments. It is also important to note that Abreu et al. found evidence that persons with TBI would be greater for patients hospitalised for weeks or months prior to assessment. Also, due to the profound physical or cognitive changes that can occur after TBI, persons may not recognise their home environment (Darragh et al.). This would likely modify the results of the assessment. Only one study (Cooper-McNulty & Fisher, 2001) was with hospitalised patients awaiting discharge.

### ADL assessments

Four of the five studies used the Assessment of Motor and Process Skills (AMPS) (Fisher, 2003). The AMPS was developed to simultaneously measure independence in ADL (PADL and IADL) and underlying skills performance. This criterion-referenced evaluation involves the in vivo observation of two or three ADL tasks selected from a list of 83 standardised task choices. Performance on each of 16 motor skills and 20 process (organisational/adaptive) skills is rated on a four-point rating scale: (1) deficit, (2) ineffective, (3) questionable, and (4) competent. Scores are then transformed into interval level scores using a many-faceted Rasch Model. ADL tasks are calibrated on two common linear scales of increasing ADL ability, that is an ADL motor scale and an ADL process scale. This assessment has benefited from many formal studies of validity and reliability (Doble, Fisk, Fisher, Ritvo & Murray, 1994; Doble, Fisk, MacPherson, Fisher & Rockwood, 1997; Duran & Fisher, 1996; Fisher, 1997; Pan & Fisher, 1994). However, it has certain limits. First, as only one task is performed at a time, multitasking is not observed. Second, the assessment is relatively brief (between 30 and 60 min) for the prediction of performance over an extended period of time (days, weeks, months). Third, the protocol is fairly structured, limiting the observation of important aspects of ADL independence such as goal formulation and problem solving. Fourth, nearly all task options are restricted to tasks that can be accomplished within the house with the exception of outdoor maintenance tasks and a shopping task that takes place in the community. In summary, it does not cover the full range of IADL tasks required for independent living in the community, nor the important aspects of IADL independence such as use of public transportation.

One study used the Structured Assessment of Independent Living Skills (SAILS) (Mahurin, DeBettignies & Pirozzolo, 1991), designed to measure functional abilities in persons with dementia. It consists of 50 items representing four domains: motor abilities, cognitive abilities, instrumental activities of daily living and social interaction skills. However, these four domains mix concepts such as abilities and activities together. IADL tasks include writing a cheque, using...
a telephone book, opening a medication container and dialling a telephone. Tasks are administered as a laboratory-based psychometric test with artificial materials and simulated daily life scenarios rather than as an IADL assessment in the person’s real-world environment. Tasks are scored on an ordinal scale of 0–3 based on typical performance, speed and number of errors. Psychometric testing of this instrument has been rudimentary as the only data available are inter-rater reliability ($r = 0.99$ for both total score and motor time) obtained on 10 subjects with Alzheimer’s disease by two raters and test–retest ($r = 0.81$ for the total score and $r = 0.97$ for the motor time) obtained on 10 control subjects at a 1-week interval. No studies were found regarding the content validity, internal homogeneity or construct validity.

**Procedures**

All five studies investigated the effect of context familiarity on performance. Assessments were administered both in a familiar setting (home) and in an unfamiliar setting (hospital or clinic). Two studies (Darragh et al., 1998; Park et al., 1994) divided the subjects into two groups with half the sample tested first in the clinic and the other half tested first in the home. Nygard et al. (1994) tested all subjects in the clinic first. The time between the two tests varied from 2 hr (Park et al.) to anywhere between 5 and 29 days after discharge (Cooper-McNulty & Fisher, 2001). Trained AMPS raters (5-day training session) administered all AMPS assessments. A weakness of these studies is that no information is given on environmental demands such as complexity of available appliances, elevated noise levels or cluttered physical space, either in the clinic or in the home assessment. The only information reported is that only the principal investigator and the subject were present during the assessment (Darragh et al.; Park et al.).

**Data analysis**

Studies based on the AMPS used a MANOVA to investigate the effect of setting order, a two-tailed $t$-test to investigate the significant difference in mean ability between the two settings and a graphic scatter plot analysis to investigate individual differences between the two settings (Darragh et al., 1998; Park et al., 1994). Motor and process ability measures were derived using a Rasch computer program (FACETS) (Linacre, 2005). One study (Cooper-McNulty & Fisher, 2001) used Pearson product moment correlations to compare performance on the AMPS with results on a standardised measure of home safety, the SAFER tool, and multiple regression analyses to verify the strength of prediction of the AMPS administered both in the clinic and in the home with a standardised measure of safety.

Classification tables generated by discriminant analysis were used to investigate the sensitivity, specificity and overall predictive validity of ADL assessments administered in the home and in the clinic of home safety.

**Results**

Overall, the findings suggest that there was a statistically significant mean difference in ADL ability between performance in the two environments with performance shown to be significantly better in the familiar home environment (Cooper-McNulty & Fisher, 2001; Darragh et al., 1998; Hoppes et al., 2003; Park et al., 1994). Hoppes et al. found that participants with dementia performed significantly better in the home, but only on motor tasks ($t = 2.925, P = 0.01$). In this study, the environment was not shown to have an effect on cognitive, instrumental ADL or social performances. However, as was previously stated, the assessment used (i.e. the Structured Assessment of Independent Living Skills) is basically a laboratory-based psychometric test that uses task simulations of relatively simple steps of a more complex task (e.g. dial a phone) with little consideration given to the effect of contextual demands on performance. Darragh et al. found the IADL mean process ability measure to be significantly better ($t = -4.28, P = 0.025$) in the familiar home environment, when compared to the unfamiliar clinical setting, in participants with moderate to severe acquired brain injury living in the community. More specifically, process ability scores differed in a clinically meaningful way between the two settings in six of the 20 participants. Motor scores differed in a clinically meaningful way in only three of the 20 participants. However, use of the AMPS as an assessment tool may have reduced the effect of the environment novelty on ADL task performance (process ability in terms of adaptation and problem solving). This assessment protocol specifies that the subject who will be tested in a clinical or other unfamiliar setting must previously be fully familiarised, by the examiner, with the environment in which the assessment will take place. No effect of setting order was found. A single study found no statistically significant difference in mean IADL motor or process ability measures between the two settings (Nygard et al., 1994). Cooper-McNulty & Fisher (2001) reported moderate positive relationships between the clinic assessment of the AMPS and safety ($r = 0.73$, $P = 0.002$) and between the home assessment and safety ($r = 0.75$, $P = 0.01$). Process ability measures assessed within the home environment were reported to have better predictive value of home safety than motor ability.
Conclusion

Overall, the limited number of studies found to have investigated the influence of context (home, hospital) on assessments of independence in ADL in people with cerebral damage does not provide clear evidence to support either environment. However, if the premise underlying studies on ecological validity is true, ADL assessments that meet these characteristics and allow for the observation of behaviour in a real-world environment should more accurately measure independence in ADL. Future studies intending to investigate the influence of context on ADL assessments should select assessments whose administration protocols clearly allow for the consideration of real-world environmental demands and be based on hospitalised persons awaiting home discharge.

It is important to consider that the environment (home or clinic) deemed most appropriate for the administration of an ADL assessment for people awaiting home discharge will vary according to the various stages of recovery typical to TBI. One need only think of the medical needs of persons with TBI in acute care settings to realise that, prior to considering a home-based assessment, the therapist must ascertain that the person has the necessary prerequisite skills. Specifically, the person cannot be acutely ill, not at any great risk of injury (e.g. safety risk because of a state of neurological agitation or confusion) and physically able, with or without help, to access his or her home. Moreover, the question of the most appropriate testing environment is only formulated when the person in question has a home in which the evaluation can take place. Also, the person and their family members must agree to collaborate with the home-based ADL assessment.

It can be hypothesised that ADL assessments administered within the home would provide information that is more meaningful to the person, as compared to assessments that rely on more artificial simulations in the clinic. Anecdotal evidence suggests that clinicians experienced in providing services to people with a TBI have been confronted by those who object to negative test findings obtained in a clinical environment who state that, in their perspective, all assessments completed in the home environment may thus enhance communication between the person and the rehabilitation team, particularly when discussing readiness for discharge or need for ongoing functional skills retraining, as the influence of the home and community environment on the person’s independence in everyday activities will have been more explicitly documented.

Acknowledgements

The authors wish to thank the Fonds de la recherche en santé du Québec, the Réseau provincial de recherche en réadaptation/adaptation, the Société de l’assurance automobile du Québec, the Association des hôpitaux du Québec, and the Association des établissements de réadaptation en déficience physique du Québec for their generous financial support of this study completed to meet the partial requirements of the first author’s doctoral degree.

References


Eslinger, P. J. & Damasio, A. R. (1985). Severe disturbance of
higher cognition after bilateral frontal lobe ablation: 


