Université de Montréal

Développement et validation d'un instrument de mesure de l'indépendance dans les activités instrumentales basé sur les fonctions exécutives suite à un traumatisme crânien

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Cette thèse intitulée :

Développement et validation d'un instrument de mesure de l'indépendance dans les activités instrumentales basé sur les fonctions exécutives suite à un traumatisme crânien

présentée par :
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Clément Dassa, co-directeur
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Résumé

Cette étude visait à poursuivre les travaux sur le Profil des AVQ en développant une version alternative, soit le *Profil des Activités Instrumentales* (PAI). Cet outil a été développé afin de considérer l'évolution des connaissances dans le domaine des fonctions exécutives (FE), plus particulièrement dans le cadre des évaluations écologiques.

Un devis «recherche de développement» a été utilisé. Planification / construction : Le PAI découle d'une recension des écrits, d'une consultation d'experts (n=8) et d'un pré-test auprès de la clientèle cible (n=8). Validation : Un échantillon de convenance, composé de 100 personnes ayant subi un traumatisme crânien (TC) modéré ou sévère, âgées de 16 à 65 ans et recrutées parmi 12 centres de réadaptation du Québec, a été utilisé. Huit tâches dont six inter reliées et visant un but commun (recevoir des invités pour un repas), ont été administrées à l'intérieur et à l'extérieur du domicile des sujets (PAI). Fidélité : Un examinateur a administré le PAI (n=30), enregistré sur bande vidéo et cotée à deux occasions par trois juges. Validité : Des analyses factorielles de types exploratoires et confirmatoires ont été effectuées (n=100). Aussi, des corrélations entre les scores du PAI avec trois mesures des FE, avec des données sociodémographiques et avec des indices de sévérité du traumatisme ont été faites.

Soixante pourcent des coefficients de généralisabilité indiquaient un accord satisfaisant et la consistance interne était très élevée (α = 0,95). Les analyses factorielles exploratoires et confirmatoires ont permis d'identifier six facteurs corrélés entre eux, reliés aux tâches du PAI, expliquant 73,6% de la variance totale. Plusieurs scores du PAI étaient corrélés de façon significative avec des indices de sévérité du traumatisme crânien (r= ,248 à r=,532), avec le niveau d'éducation (r = 0,221 à r= 0,411) et avec les FE liées à la planification et à la mémoire de travail (r= ,209 à r=,425).

Il ressort de cette étude que le PAI, appliqué aux TC, démontre de bonnes qualités psychométriques (fidélité, validité). Aussi, cet outil illustre un potentiel pour évaluer les répercussions des déficits exécutifs sur les activités instrumentales réalisées dans le milieu de vie de la personne.

Mots-clés : traumatisme crânien, activités instrumentales, fonctions exécutives, instrument de mesure, psychométrie, théorie de la généralisabilité, analyse factorielle confirmatoire

Abstract

The present study aimed to expand upon previous work completed on the ADL Profile as we developed an alternate version, the *IADL Profile*. This instrument was developed to consider recent advances in the field of executive functions (EF), more specifically in the area of ecological assessment.

To develop the *IADL Profile*, a "measurement development research" design was used. Planning / construction: To develop the *IADL Profile*, we reviewed the literature, consulted experts in the area of EF, traumatic brain injury (TBI), activities of daily living and instrument development (n=8), and pilot tested the tool with the target population (n=8). Validation: An eight-task performance-based test of IADL independence administered in subjects' home and community environment was developed. The test includes a complex sequence of six inter-related tasks that are linked to the overarching goal of receiving guests for a meal. The tool was administered to 100 individuals with moderate or severe TBI, aged 16 to 65 (convenience sample), and recruited from 12 rehabilitation hospitals in Quebec. Reliability: A trained examiner administered the *IADL Profile* (n=30) and three judges rated video recordings on two occasions (one-month interval). Validity: Exploratory and confirmatory factor analyses were completed (n=100). Pearson correlation coefficients were used to document the criterion related validity of the tool with three measures of EF, sociodemographic data and indices of injury severity.

A high percentage of generalizability coefficients (60%) indicated satisfactory agreement between raters. Internal consistency of the total scale was very high ($\alpha = 0.95$). Exploratory and confirmatory factor analyses disclosed six correlated factors linked to the tasks of the tool. The total explained variance was 73.6%. Criterion related validity studies showed that a large number of *IADL Profile* scores were significantly correlated with indices of injury severity (r=.248 to r=.532), level of education (r=.221 to r=.411), and executive function measures of planning and working memory (r=.209 to r=.425).

This study has demonstrated that the *IADL Profile* has good psychometric qualities (reliability, validity). Results suggest that the *IADL Profile* is a promising means of documenting both IADL independence and the repercussions of EF deficits on everyday tasks in real-world environments.

Keywords: Traumatic brain injury, instrumental activities of daily living, executive functions, measurement instrument, psychometrics, generalizability, confirmatory factor analysis

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List of abbreviations

ADL	Activities of daily living
ADS	Action Disorganisation Syndrome
AMPS	Assessment of Motor and Process Skills
A-ONE	Arnodottir OT-ADL Neurobehavioral Evaluation
CFA	Confirmatory factor analysis
CFI	Comparative Fit Index
D coefficients	Dependability coefficients
D-study	Decision study
EHP	Ecology of Human Performance Framework
EF	Executive functions
EFA	Exploratory factor analysis
F1	Factor 1
FIM	Functional Independence Measure
G-study	Generalizability study
G coefficients	Generalizability coefficients
GCS	Glasgow Coma scale
GFI	Goodness-of-Fit Index,
IADL	Instrumental activities of daily living
κ	Cohen's unweighted kappa statistics

M1	Model 1
MET	Multiple Errands test
NNFI	Non-normed Fit Index
PA	Percent agreement
PADL	Personal activities of daily living
PNFI	Parsimonious Normed Fit Index
PRPP	Perceive, Recall, Plan and Perform System of Task Analysis
PTA	Posttraumatic amnesia
R1	Rater 1
RMSEA	Root Mean Square Error of Approximation
SAILS	Structured Assessment of Independent Living Skills
SRMR	Standardized Root Mean Square Residual
TBI	Traumatic brain injury
ToL	Tower of London
WMI	Working Memory Index
WMS	Weschler Memory Scale

To Alain, Elysa and Nicolas,

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Chapter 1

Introduction

Moderate and severe traumatic brain injuries (TBI) are a major public health problem disproportionately affecting young adults; the most common cause of severe cases of injury are motor vehicle accidents (Gordon et al., 2006). The general annual incidence in developed countries such as the United States and Canada is 200 per 100 000 population (Bruns & Hauser, 2003). Annual rates of potential brain injury requiring emergency care in Canada are higher for males (16 per 10 000) than for females (7 per 10 000) (Pickett, Ardern, & Brison, 2001). The incidence of severe TBI alone in Canada is estimated at 11.4 per 100 000 population (Zygun et al., 2005). A significant number of these individuals experience low levels of participation (Dawson & Chipman, 1995), and require long term assistance in instrumental activities of daily living (IADL) (Dawson & Chipman, 1995; Dutil, Vanier, & Lambert, 1995; Gordon et al., 2006; Kozlowski, Pollez, Thevenon, Dhellemmes, & Rousseaux, 2002; Whiteneck et al., 2004). The prevalence of disablement in Canada is estimated at 63 per 100 000 of the TBI adult population living in the community (Dawson & Chipman, 1995; Moscato, Trevisan, & Willer, 1994) with about 35% of hospitalized survivors of TBI experiencing long-term disability (Thurman, Alverson, Dunn, Guerrero, & Sniezek, 1999). TBI can result in multiple disabilities of a sensorimotor nature (such as problems with balance, coordination and dexterity) and of a psychological nature (such as problems with self-awareness, impulsivity, depressive mood, anxiety, initiative, motivation, mental fatigue, speed of information processing, memory, attention, and planning) (Burgess, 2000; Lezak, Howieson, & Loring, 2004a; Mazaux et al., 1997; Olver, Ponsford, & Curran, 1996; Sohlberg & Mateer, 2001; Stuss et al., 2002). A number of authors have shown that in the long term post-injury, physical impairments and locomotion disabilities do not constitute major areas of practical and emotional concern for these patients (Hoofien, Gilboa, Vakil, & Donovick, 2001; Kozlowski, Pollez, Thevenon, Dhellemmes, & Rousseaux, 2002; Olver et al., 1996). Deficits suggested as having the most devastating long-term impact on independence in IADL have been related to executive functions (Fleminger & Ponsford, 2005; Lezak, Howieson, & Loring, 2004b; Mazaux et al., 1997; Olver et al., 1996). Environmental factors such as needing a special bus to take short trips or needing aids to enter or leave their residence have also been associated with decreased participation in instrumental activities of daily living (IADL) (Ashley, Persel, & Clark, 2001; Dawson & Chipman, 1995; Kozlowski et al., 2002). The lifetime costs for persons with a severe TBI who require continued assistance for everyday activities and who are unable to resume work activities in the province of Quebec (Canada) has been estimated by the *Société de l'assurance automobile du Québec* at approximately $8 million (Société de l'assurance automobile du Québec, 2001). Moreover, the burden on families can be considerable as large numbers of adult individuals with moderate to severe TBI rely heavily on their parents for long-term care even 4 to 9 years post injury (Brzuzy & Corrigan, 1996). In individuals with severe TBI, large percentages have been shown to still be living with their parents even at 14 years post-injury, despite some of them being between 30 and 50 years of age (Hoofien et al., 2001). Primary caregivers experience significant levels of stress, burden and depression (McCabe et al., 2007) and report having the most difficulty coping with the TBI individuals' cognitive, behavioral and emotional changes (Ponsford, Olver, Ponsford, & Nelms, 2003). Quality of life of individuals living with a severe TBI and of their primary caregivers has been shown to be mostly influenced by TBI individuals' behavioural and cognitive deficits accompanied by their need for assistance in IADL (Kozlowski et al., 2002).

Reduced IADL independence secondary to TBI can typically occur in any number of IADL [e.g., shopping (Chevignard et al., 2000; Dawson & Chipman, 1995; Fortin, Godbout, & Braun, 2003; Mazaux et al., 1997; Ponsford, Olver, & Curran, 1995), meal preparation (Chevignard et al., 2000; Dawson & Chipman, 1995; Fortin et al., 2003), personal finances (Dawson & Chipman, 1995; Mazaux et al., 1997; Ponsford, Olver et al., 1995)] and has been frequently shown to be particularly related to deficits in executive functions (EF) (Burgess, 1997; Bush, McBride, Curtiss, & Vanderploeg, 2005; Lezak, 1989; Lezak et al., 2004b; Miyake, Friedman, Emerson, Witzki, & Howerter, 2000; Rabbitt, 1997) such as goal formulation (Dutil, Bottari, Vanier, & Gaudreault, 2005; Sirigu et al., 1996), planning (Chevignard et al., 2000; Fortin et al., 2003; Le Thiec et al., 1999; Sirigu et al., 1996), carrying out the task (Forde & Humphreys, 2000, 2002; Humphreys & Forde, 1998; Schwartz, Mayer, FitzpatrickDeSalme, & Montgomery, 1993; Schwartz, Ochipa, Coslett, & Mayer, 1995; Schwartz, Reed, Montgomery, Palmer, & Mayer, 1991), and verifying whether the initial goal has been attained (Dutil et al., 2005; Goldstein, Bernard, Fenwick, Burgess, & McNeil, 1993; Langevin & Le Gall, 1999; Lezak, 1989; Prigatano & Altman, 1990; Sirigu et al., 1996). Performance of multi-step everyday tasks is also frequently hampered by individuals' inability to keep in mind their intended goal throughout task performance (Humphreys, Forde, & Riddoch, 2001; Schwartz, Reed, Montgomery, Palmer, & Mayer, 1991). This is accomplished via action working memory, an important component of EF frequently impaired subsequent to frontal lobe lesions (Forde & Humphreys, 2002; Humphreys & Forde, 1998; Humphreys & Riddoch, 2000, 2001). Although studies cited in the previous references have shaped our current understanding of the role of EF in the performance of IADL, they typically failed to use IADL measurement instruments with demonstrated psychometric properties. Moreover, these studies have only partly integrated criteria required for the measurement of executive functioning deficits that will be adressed later. For instance, assessment approaches have been largely overly structured leading to an underestimation of repercussions of deficits related to such EF components as goal formulation and planning. Also, few studies have been based within real-world environments where the repercussions of executive functioning deficits on IADL task performance have been said to be most evident (Burgess et al., 2006). It has nonetheless been argued that executive deficits may be the most important source of deficits of IADL in brain lesioned patients (Godbout & Doyon, 1995; Grafman, Sirigu, Spector, & Hendler, 1993; Mazaux et al., 1997; Shallice & Burgess, 1991) particularly given the complexities and cognitive requirements of modern society (Lehtonen et al., 2005). Understanding the underlying causes of reduced independence in instrumental activities of daily living (IADL) requires the use of psychometrically sound measurement tools of IADL independence that are capable of both capturing and analyzing the complex interactions between personal and environmental factors.

To date, few researchers have addressed the methodological challenges involved in developing and validating performance-based IADL tests that consider EF and are administered in such complex, highly individualized, unpredictable, and multidimensional environments as subjects' home and community environments (Burgess et al., 2006; Gitlin, 2003; Rempfer, Hamera, Brown, & Cromwell, 2003). However, this challenge was clearly addressed by related work on an instrument called the ADL Profile (Dutil & Bottari, 2001; Dutil, Bottari, & Vanier, 2002; Dutil et al., 2005; Dutil, Forget, & Gaudreault, 1991; Dutil, Forget, Vanier, & Gaudreault, 1990; Dutil et al., 1996; Dutil, Vanier, Lambert, Crépeau, & Deland, 1993), an analytic observation-based measure of ADL independence that also documents the repercussions of EF deficits on 17 personal activities of daily living (PADL) and IADLs.

The present dissertation aimed to expand upon this previous work as we developed and validated an alternate version of the ADL Profile, the *IADL Profile,* which considers recent advances in the field of EF, more specifically in the area of ecological assessment. More precisely, the *IADL Profile,* aimed to provide fewer tasks, a greater degree of task complexity, increased consideration of the complex interactions between environmental demands and the person's abilities, task definitions that consider components of EF, task analysis based on more explicitly defined operations related to EF, and an improved rating scale. This test was designed to be applicable throughout a large part of the continuum of services (from inpatient rehabilitation to community living). It aims to provide crucial information for treatment and discharge planning for rehabilitation professionals and third party payers. Psychometric studies regarding this new test's content validity, intra and interrater reliability, generalizability, internal consistency, factorial validity and criterion-related validity were completed in the present study.

In the chapters that follow, we will examine each aspect of some of the psychometric properties of the test. Results will be presented in the form of four articles (Chapters 4 to 7). In Chapter 5, we will present the development of the *IADL Profile*, and the results of the content validity, intra and interrater agreement and generablizability studies. Content validity is a first step in the validation of a tool. In this first step, we examined experts' opinions on the pertinence and clarity of task definitions, instructions, definitions of operations underlying task analysis and rating scale of the test. Intra and interrater agreement, an important aspect of the tool's reliability, then examines the concordance between raters' scoring of observed IADL performance in consideration of the repercussions of EF deficits on everyday tasks in real-world environments. The generalizability study estimates the reliability of a measurement and captures relevant sources of variation or measurement error. Subsequently, in Chapter 6, we will present results of both the exploratory and confirmatory factorial validity and internal consistency studies. Factor analytic techniques are used to determine whether items cluster together in patterns that are compatible with the theoretical structure of the constructs of interest. Two constructs, considered in the development of the test, were explored: independence in IADL (tasks) and independence in relation to the operations based on four components of EF (formulate a goal, plan, carry out the task and verify attainment of the initial goal). Internal consistency of factors and of a composite total score was also examined. Finally, in Chapter 7, we will present the results of a criterion related validity study. As the *IADL Profile* was developed to document both IADL independence and the repercussions of executive deficits on everyday tasks in real-world environments, it was essential that we document the extent to which inferences about EF can be drawn from test scores on the *IADL Profile*. Hence, we will examine measures of relationships between the *IADL Profile* and selected tests of EF. Moreover, as will be presented in Chapter 7, trauma severity, sociodemographic characteristics such as age, level of education, and gender and certain environmental characteristics have been shown to influence IADL independence secondary to TBI. Thus, we will also examine correlations between the *IADL Profile* and these variables. Through this series of steps in the validation of the instrument, this thesis will provide a more adequate measure of IADL independence based on EF, a test administered in subjects' home and community environments. We expect that use of this test will permit more targeted treatment interventions aimed at maximizing participation subsequent to moderate and severe TBI and provide essential information regarding home safety, ability to live independently, continued need for supervision and attendant care needs.

Prior to presenting the results of the aforementioned studies, we will first present a review of the literature to situate our work amidst current scientific knowledge on TBI, on EF and on IADL independence. Following a brief introduction we will look at the known consequences of TBI on IADL independence. Large proportions of the TBI population requiring long-term support for IADL will be in fact considered as underestimations of the actual prevalence of need. Then we will look at the definition of IADL independence and propose EF as the cornerstone of independence. Next, we will present the known repercussions of EF on IADL independence. The contribution of neuropsychological studies to our current understanding of the manifestations of EF deficits in everyday activities will be examined with particular consideration given to the Action Disorganisation Syndrome and to the "action coding system". Next, we will present the challenges involved in developing quality performance based IADL measurement instruments for individuals with a TBI. More specifically, three key elements will be examined: task novelty and complexity, non-structured approach and real-world environments. Reasons underlying our decision to administer the test within subjects' home and community environments will then only be briefly examined as a complete review will be presented in Chapter 4. This will be followed by a detailed analysis of certain performance based IADL tests reported in the literature with respect to the optimal characteristics of such measurement instruments. Particular consideration will be given to the ADL Profile, an inherently ecologically valid performance-based measure of ADL independence based on executive functions and validated with severe TBI. This review will serve to present justification arguments in favor of our selecting to add to previous studies on the ADL Profile.

Chapter 2

Literature Review

Rehabilitation clinicians frequently rely on data obtained from questionnaires about IADL to evaluate the effectiveness of interventions, monitor recovery, and measure participation and outcome subsequent to TBI. However, there are serious limitations to their use with individuals with cognitive impairments as IADL questionnaires and self-assessment scales are subject to deficits in respondent awareness (Abreu et al., 2001) and typically overestimate levels of independence (Fischer, Trexler, & Gauggel, 2004; Hart, Giovannetti, Montgomery, & Schwartz, 1998; Knight, Alderman, & Burgess, 2002). Interviewees' limited ability to judge whether they carry out their IADL safely and whether they require assistance to formulate goals, plan and initiate tasks appropriately, may seriously compromise the validity of the data. Hence, performance-based IADL tests are increasingly being used by rehabilitation professionals, such as occupational therapists (e.g. ADL Profile, Assessment of Motor and Process Skills) (Dutil, Bottari, Vanier, & Gaudreault, 2005; Fisher, 2003) to guide treatment interventions. Rehabilitation professionals and third party payers rely on data obtained from these tests for a variety of purposes including treatment and discharge planning decisions as well as outcome studies that consider the nature and severity of the consequences of residual deficits. These tests are expected to provide essential information for the development of life care plans detailing patients' home safety, attendant care needs, continued need for supervision, ability to live independently, and continued need for rehabilitation services (Sherer, Madison, & Hannay, 2000). Due to the wide use of information derived from IADL tests and to the crucial consequences of decisions derived from them on patients' lives, selected measures must ensure an accurate appraisal of deficits specific to TBI in relation to the demands of the environment in which the person lives.

Executive functions

Here, experts in the field agree that the principal cause of impaired independence in TBI is the range of complex behavioural and cognitive disturbances associated with EF (Eslinger & Damasio, 1985; Ponsford, Sloan, & Snow, 1995; Shallice & Burgess, 1991; Stuss & Benson, 1986; von Cramon & Matthes-von Cramon, 1994). EF are broadly defined as the capacity to plan and carry out complex goal-directed behaviour (Lezak, 1983; Stuss & Benson, 1986) that is appropriate to the context in which the activity is carried out (Collette, 2004). According to several authors, EF are required for adaptation to novel situations (Burgess, 1997; Rabbitt, 1997; Rainville et al., 2001). As such, EF involves such components as problem identification, goal setting, planning, choosing between alternative sequences of behaviour, initiating the selected plan, carrying it through, evaluating the final product, and detecting and if necessary correcting errors (Lezak, 1983; Luria, 1973). Lezak (2004), based on the seminal work of Luria (1973), suggests that EF can be conceptualised as consisting of four main components: 1) volition; 2) planning; 3) purposive action and 4) effective performance. Lezak (2004) adds that secondary to TBI, individuals may have deficits in any one or all of these components. Alternately, components of executive functioning have also been identified, based on a structural equation modeling approach, as mental set-shifting, information updating and monitoring (similar to working memory) and inhibition of prepotent responses (Miyake et al., 2000). Baddeley suggested that EF may be separable into such capacities as dual-task performance and task switching (Baddeley, 2002). Factor analytic studies of neuropsychological test data led other investigators to identify three factors of executive functioning in TBI: 1) productive fluency (self-initiation and sustained self-generative on-task behaviour) \ cognitive flexibility (set-shifing); 2) mental control (ongoing working memory) and 3) memory errors (self-monitoring of memory or failure to inhibit the reporting of inaccurate information) (Bush et al., 2005). Finally, functional imaging and electrophysiological studies suggest potential fractionation of the executive system (Gehring & Knight, 2000). This is supported by group studies on either neurological subjects or healthy controls where correlations between different measures of EF have typically been low (Miyake et al., 2000). Moreover, group studies have also shown that EF deficits cluster into several factors and not into one single entity (Burgess, Alderman, Evans, Emslie, & Wilson, 1998; Burgess & Robertson, 2002).

The term EF is a psychological construct, with no necessary relation to anatomical structure (although the frontal lobes are the most likely structures responsible for EF) (Stuss, 2006). However, we know from cumulated knowledge obtained from cerebral imaging studies that the dorsolateral prefrontal lobes have a crucial role in relation to executive functioning (Collette, 2004). Moroever, we now know that each component of

EF depends on a small number of circumscribed cerebral regions (Collette, 2004). This likely explains why individuals with frontal lobe lesions are not systematically impaired on frontal lobe tests as observation of deficits may not be apparent in the specific tests selected for measurement purposes. Finally, studies on normal subjects have also shown that an anterior posterior system is activated during EF tests including such regions as the parietal lobes (Collette, 2004).

Executive function deficits are at times overtly apparent (e.g. defective self control or self-direction such as rigidity or difficulty in making shifts in ongoing behaviour) or more subtle (e.g. impaired capacity to initiate activity or to plan the activity sequences related to goal-directed behaviour) (Lezak et al., 2004b). Data cumulated to date on EF have shown evidence that deficits are more severe in more complex and novel tasks (Burgess, 2000; Rainville & Passini, 2005), in poorly structured tasks (Le Thiec et al., 1999; Lezak et al., 2004) and in the presence of distracting stimuli in complex and dynamic environments (natural contexts) (Burgess et al., 2006; Humphreys & Forde, 1998; Zalla, Plassiart, Pillon, Grafman, & Sirigu, 2001). Given the complexities of modern society, it is thus implicitly expected that individuals with deficits in EF will experience important difficulties in home and community activities (Lehtonen et al., 2005) as well as in return to productive work activities.

However, as will be reviewed in subsequent sections, these abilities and the extent to which they impede performance in the realization of complex IADL are frequently not tested (Fortin, Godbout, & Braun, 2003). Observation of EF related deficits during assessments of IADL independence, though fundamental to an accurate assessment, requires that the test specifically target these deficits that by their very nature may pass undetected during structured tests (Lezak et al., 2004b). An important obstacle to adequate measurement lies in the fact that IADL tests, just like measures of EF, typically require the evaluator, as opposed to the patient, to complete many components of EF (e.g. the evaluator may specify the tasks to be performed, the equipment to be used, and at times a detailed plan of the task). Hence, goal formulating and planning, known EF deficits subsequent to a TBI, tend to be insufficiently considered in the measurement of IADL independence causing individuals with related deficits to be wrongly considered as independent when in fact their independence is conditional on someone having to provide prompts for goal formulation and planning. Also, as many such measurement instruments propose the use of controlled environments for performance based assessments, the extent to which the complex and dynamic demands of their home and community environments impede their performance is generally not documented. Use of measurement instruments with these limits *leads both to an inaccurate estimation of the severity of the consequences of TBI on IADL independence and perhaps more importantly to a poor analysis of essential causes of reduced independence and equivalently flawed recommendations regarding essential treatment interventions.* Thus a paradigm shift in the way of studying IADL independence is required. A measurement instrument, the *ADL Profile* (Dutil & Bottari, 2001; Dutil et al., 2002; Dutil et al., 2005; Dutil et al., 1991; Dutil et al., 1990; Dutil et al., 1996), was developed according to this new paradigm for individuals with a severe TBI. As will be further discussed in the following sections, the present study aims to expand upon previous work completed on the *ADL Profile.*

Activities of daily living and traumatic brain injury

Dawson et al (1995) reported results of a population based survey, i.e. the Canadian Health and Activity Limitation Survey, using a sample of 454 TBI individuals (representing 12 290 people with TBI in the Canadian population) at an average of 13 years post-injury living in the community. They found that over 30% of individuals living with a TBI reported needing assistance with meal preparation, shopping, housework, and personal finances. Fifteen percent reported needing assistance with personal care. Information regarding TBI injury severity was not presented. Olver et al, in a cohort study of 103 mostly moderate and severe TBI at 5 years post-injury in Melbourne (Australia), found that IADL tasks for which the largest number of subjects continued to require assistance were using transport (52%), and shopping and banking (30%) (Olver et al., 1996). Whiteneck et al, in a population based survey in Colorado (United States), using a sample of 1591 adults with mild (80%), moderate (7%) and severe (13%) TBI found that 37% of all individuals reported needing the assistance of another person in what they termed as physical and/or cognitive ADL (personal care activities) (Whiteneck et al., 2004). In the severe TBI subgroup, 54 % reported requiring assistance for self care. This was measured via phone interview with subjects and significant others using the Functional Independence Measure

(FIM) (Uniform Data Set for Medical Rehabilitation, 1995). Those with severe injuries were found to require more assistance than those with moderate TBI and respondents 65 years or older were more likely to need assistance than younger respondents. The average age of the sample was 41 years (range 16-96 years). Overall, the FIM cognitive subscale showed higher percentages of people requiring assistance (31%) than the FIM physical subscale (15%). In the severe TBI subgroup, 47 % of people reported requiring assistance on the FIM cognitive subscale and 27% on the FIM physical subscale. Regarding IADL, the needs for assistance that were most frequently reported by a sub sample of 242 TBI subjects included: managing money and paying bills (23%) and traveling in the community (20%). Kozlowski et al based on 33 severe TBI assessed in their homes using the European Brain Injury Society document or questionnaire for TBI found similar results with more important deficits being noted in IADL (e.g. running errands, financial tasks) than personal care activities (e.g. dressing, eating) (Kozlowski et al., 2002). In a population-based study of 79 mild, moderate and severe TBI five years post-injury, Mazaux et al., also based on the European Brain Injury Society document, found that 8% of the sample required continuous all day long assistance (Mazaux et al., 1997). Alternately, the most impaired abilities for the whole sample related to the performance of administrative tasks and financial management. De Guise et al (2006) based on 339 subjects (239 mild, 48 moderate and 52 severe) using the Extended Glasgow Outcome Scale (Jennett & Teasdale, 1981) scored by an interdisciplinary team upon discharge from the acute care hospital, found that only 63 subjects had an Extended Glasgow Outcome score of 1 which corresponds to good recovery or normal participation in social, vocational, and physical life (de Guise, LeBlanc, Feyz, & Lamoureux, 2006). The majority of subjects (n=253) were found to have an Extended Glasgow Outcome score of 2 or 3 corresponding to a moderate disability (independent but physically or cognitively disabled and requiring an altered physical, social, psychological, or vocational environment for participation). In a retrospective cohort study, Colantino et al interviewed 306 moderate and severe TBI at an average of 14.2 years post injury (Colantino et al., 2004) using subsets of the OARS (Older Americans Resources and Services) Multidimensional Functional Assessment Questionnaire (Fillenbaum, 1975). Average age at the time of injury was 29.9 years and 44 years (range 23-90) at follow-up. At least 88% of participants could bathe, dress, eat, transfer, use the toilet and telephone independently. Only 4-6 % were totally dependent for these basic activities of daily living.

The greatest limitations were reported in instrumental activities of daily living with 29% reporting either requiring help or being unable to get to places out of walking distance, 28% either requiring help or being unable to manage money and 27% either requiring help or being unable to shop.

We consider that these percentages underestimate the true prevalence of individuals with a TBI requiring assistance with IADL as data were frequently cumulated via questionnaires addressed to TBI individuals and assistance required for task components related to EF (e.g. task initiation and planning) were either not specifically asked by interviewers or alternately, were not rated as assistance. One study, based on the ADL Profile, considered the four main components of EF, i.e. goal formulation, planning, carrying out the task and verifying whether the initial goal was attained, and showed a higher prevalence of individuals requiring assistance than what was shown previously (Dutil, Vanier, & Lambert, 1995). This study was based on 44 severe TBI subjects at 24 months post-trauma and showed that more than 80% of the sample either required assistance or were dependent for shopping. In this same study, 90% either required assistance or were dependent to use public transportation. Findings were similar for tasks such as doing laundry, preparing a hot meal and doing daily house cleaning. Performance was shown to be only slightly better for bathing as over 75% were shown to either require assistance or to be outrightly dependent on the task.

Determinants of IADL independence in TBI

Finally, despite the large proportion of survivors of TBI known to require long term assistance for IADL, few studies have analysed underlying causes. Moreover, minimal data are available regarding the correlation between the types of deficits, characteristics of the living environment and resulting participation. Investigations of the determinants of IADL independence in TBI have shown that reduced IADL independence, present in significant numbers of persons with TBI, is associated to more severe injury as measured by duration of post-traumatic amnesia (PTA) (de Guise et al., 2006; Doig, Fleming, & Tooth, 2001; Gordon et al., 2006; Winkler, Unsworth, & Sloan, 2006) Glasgow Coma Scale (GCS) score, and coma duration (Connelly, Chell, Tennant, Rigby, & Airey, 2006; de Guise et al., 2006; Doig et al., 2001; Gordon et al., 2006; Hoofien, Vakil, Gilboa, Donovick, & Barak, 2002); coma duration alone was shown to be a good predictor for more severe injuries only (Wilson, Vizor, & Bryant, 1991). Injury severity in moderate and severe TBI has been argued by some to have an indirect rather than a direct relation to functional outcome with information processing speed shown to be a strong mediator between TBI injury severity and functional outcome (Rassovsky et al., 2006b). Sociodemographic variables such as education level, age, and sex have also been found to be associated with outcomes related to IADL independence (Dawson & Chipman, 1995; Gordon et al., 2006; Hoofien et al., 2001). Increasing age (Gordon et al., 2006; Novack, Bush, Meythaler, & Canupp, 2001; Whiteneck et al., 2004) and the female gender (Whiteneck et al., 2004) have been associated by some to generally poorer outcomes (Gordon et al., 2006) though age has been shown not to be independently predictive (Connelly, Chell, Tennant, Rigby, & Airey, 2006). Environmental barriers, including transportation and the characteristics of the surroundings, have also been found to be associated with lower levels of participation (Gordon et al., 2006; Whiteneck et al., 2004). Overall, however, the extent to which individuals with cognitive deficits adapt to the demands of their home and community environments has not been widely documented.

Definition of IADL independence

As a comprehensive discussion of independence in IADL is presented in Chapter 4, we will limit this section to its definition. 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 (Hamonet & 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, in the home and in the surrounding community, include 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).

Though independence has frequently been thought of from the perspective of the physical ability to carry out a task (Tamaru, McColl, & Yamasaki, 2007), Rogers (1982), defines independence in IADL as resulting from the competence of individuals to do things for themselves in interaction with the environment in which they live. Most importantly, Rogers (1982) highlights the notion that the competence required to be independent 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 (Rogers, 1982). Essentially, this definition of independence presents EF as the cornerstone of IADL independence. More recently, the pivotal link between abilities such as choosing amongst options and deciding what one wishes to do and the concept of independence has been reiterated in the literature (Tamaru et al., 2007). Definitions of EF and IADL independence visibly overlap in so far as deciding what one wants to do, planning a course of action and assessing the outcomes are critical elements of both EF and of IADL independence. Moreover, it clearly adds incentive for use of a much broader consideration of behaviours not formerly included when documenting IADL independence such as the ability to formulate a goal and plan a course of action in interaction with the demands and expectations of their home and community environments. As this definition of independence in IADL provides an accurate appraisal of a person's abilities in interaction with the environment in which they live, it will be retained in this dissertation.

Manifestations of executive functions in everyday activities

Our current understanding of the long-term impact of executive function deficits on independent living has been largely influenced not by population-based epidemiological studies but rather by seminal single case studies of patients with prefrontal lobe lesions, some of whom despite severe multitasking deficits otherwise function within normal limits on traditional tests of intelligence, language, perceptual abilities and EF (Burgess, 2000; Eslinger & Damasio, 1985; Shallice & Burgess, 1991). Based on a series of in-depth qualitative interviews with patients and significant others several years post-injury, reports of lack of initiative, indecisiveness and repetitive loss of jobs due to chronic tardiness and disorganisation have been shown to reflect executive function deficits (Eslinger & Damasio, 1985). Moreover, behavioural manifestations associated to executive function deficits have been described in different syndromes such as *Environmental Dependency Syndrome* (Lhermitte, 1986), *Strategy Application Disorder* (Burgess, 2000; Goldstein et al., 1993; Shallice & Burgess, 1991), *Frontal apraxia* (Luria, 1966), *Action Disorganisation Syndrome* (Humphreys et al., 2001; Schwartz, 2006) and *Task inefficiency* (Schwartz, Mayer, FitzpatrickDeSalme, & Montgomery, 1993). These studies provide markers for the identification of errors of action reflective of EF deficits in everyday activities (Table 1).

Table 1: Summary of case studies of individuals with deficits in executive functions

Authors	Description of cases	Examples of reported ADL errors of action
Luria (1966;1973)	Multiple cases with massive bilateral frontal lobe lesions (with marked perifocal or general cerebral damage) (exact n unknown)	Not even a state of hunger can rouse them to take necessary action
Eslinger & Damasio (1985)	Removal of large orbitofrontal meningioma compressing both frontal lobes / IQ > 130 (prior occupation: comptroller in an accountant firm) (n=1)	Deciding where to dine might take hours as he discussed each restaurant's seating plan, particulars of menu, atmosphere, and management
Shallice & Burgess (1991)	Serious open head injury 4.5 years prior with extensive bifrontal damage (23 years old) (n=1)	Unable to shop for himself
		Buys one item at a time and returns to his car after every purchase
		Though his room was previously immaculate, he is now untidy
		Shopping, cleaning and laundry are done for him
Shallice & Burgess (1991)	Serious head injury 22 years prior with (R) frontal depressed fracture / intracerebral hematoma treated surgically/ (R) frontal lobe with extensive low attentuation / severe left hemiparesis (n=1)	Only bathes if going somewhere important
		Must be told to shave, change clothes or undergarments, wash his hair, and have his hair cut
		Hardly ever spontaneously tackles any domestic chores (laundry, cleaning, cooking)
		Leaves preparation of meal to 10 year old son
		Omits items on shopping list prepared by his wife
		Wife organises all trips / outings / social contacts with relatives

Authors	Description of cases	Examples of reported ADL errors of action
Shallice & Burgess (1991)	Two separate head injuries one of which was 2 years prior / extensive lesions and atrophy of (L) frontal lobe / some atrophy in (L) temporal lobe / aphasic (n=1)	Lives alone in a single room
		Undertakes virtually no inessential or novel activities
		Virtually never travels away from her home town
		Never visits supermarkets
Lhermitte (1986)	(L) frontal glioma / lobectomy of (L) frontal pole to remove all visible tumour/ frontal syndrome (prior occupation: construction engineer) (n=1)	While visiting doctor's apartment, he hears the word "museum" and acts as though he is in a museum
		While visiting doctor's apartment he sees a pistol and revolver on the table, picks up the pistol and loads it with cartridges (Note: The experiment was then stopped)
Lhermitte (1986)	Astrocytoma in (L) frontal lobe / lobectomy of (L) frontal pole (prior occupation: domestic work) (n=1)	While visiting doctor's office sees medical instruments on his desk and proceeds to examining the doctor
		While taking a walk in the garden with her doctor, sees bottles of water in the doctor's hands and painstakingly waters alll the flowers in the bed
		Prepares meal in normal way if told by her husband to prepare a meal
Lezak (1995)	Hypoxic episode secondary to cardiac arrest (prior occupation: successful private practice surgeon) (n=1)	Niece bought all his clothing and selected his wardrobe for important occasions
		Did not know where niece bought his clothes, the cost, nor where money came from to pay for them
		No idea of cost of room and board or where money came from for his support. Did not exhibit any curiosity or interest.
		Required several years of rigorous rule setting from his sister in law to bathe and change his underclothing each morning
		Changes his outer clothing only when instructed to do so

Authors	Description of cases	Examples of reported ADL errors of action
Goldstein (1993)	(L) frontal lobectomy (orbitofrontal and dorsolateral cortex) (n=1)	Took two weeks to decide which slides to use for a work presentation; the decision was never finally reached
		Stuck stamp on the wrong card
		Very conspicuously climbed onto the fruit display outside the shop and peered in through the shop window to find the price of tomatoes which he'd omitted on his previous visit to the grocers
Lezak (1989)	Inoperable shrapnel lodged in (R) frontal lobe (n=1)	Was talked into buying an expensive set of kitchen utensils by a door-to-door salesman although his kitchen was already well supplied
		Sold a newly purchase motorised lawn mower for about one-tenth of its value to a neighbour because he thought the neighbour needed it
Schwartz et al. (1993)	Multiple cases in early stages of recovery from TBI (exact n unknown)	Pours coffee grinds into the orange juice
		Attempts to pour milk before opening the container
		Drinks from a tea cup before tea and sugar have been added
		Repeatedly wets already wet toothbrush

Errors of action are essential elements in the diagnosis of these syndromes. Certain investigators characterise errors of action observed in one of these syndromes, i.e. *Action Disorganisation Syndrome (*ADS), as an incoherence or fragmentation of the action planning system and a tendency to use objects in novel and bizarre ways (Schwartz et al., 1993; Schwartz et al., 1991). For instance, errors of action observed in individuals with ADS may consist of repeatedly wetting an already wet toothbrush (perseverative error), putting cheese on the bread before buttering the bread (sequential error) and failing to add milk to the tea (omission errors) (Humphreys & Forde, 1998). Errors of action observed in individuals with an *Environmental Dependency Syndrome* refer to customarily performed actions that are executed in the presence of familiar objects, even in the face of restraining instructions (Lhermitte, 1986). For instance, errors of action noted in individuals with *Environmental Dependency Syndrome* include that of an individual who upon hearing the word museum prior to entering his doctor's office proceeds to observing and commenting on the paintings on the walls as though he was in a museum. Errors of action associated with *Task inefficiency* include proceeding to brush one's hair in the midst of brushing one's teeth subsequent to a glance at the mirror (Schwartz et al., 1993). In this instance, a temporary distraction to an environmental stimulus triggers an automatic response in the absence of an intention to perform the action reflecting a failure to inhibit irrelevant actions.

One might argue that errors of action attributed to impairment in the system`s ability to inhibit irrelevant actions traditionally associated to frontal lobe lesions (Lhermitte, 1986; Schwartz et al., 1993; Tanaka, Albert, Hara, Miyashita, & Kotani, 2000) could also be observed in healthy adults. According to Reason (1984), healthy adults make errors on familiar ADL or IADL tasks when they are pre-occupied or distracted. In this instance, an automatic or frequently executed action (a strong habit), but unintended at the time, is performed upon sight of a given object in the environment. For example, the person puts the coffee jar in the refrigerator instead of the pantry or adds seven or eight spoonfuls of sugar to his or her coffee. Discriminating between errors of action that can be directly related to EF deficits and behaviours observed in healthy adults may therefore be difficult.

The pertinence of discriminating between these errors warrants a closer examination of both normal and pathological errors.

Everyday *slips of action* in healthy adults frequently occur at decision points where previously performed tasks bear striking resemblance to subsequent behaviour (Botvinick & Plaut, 2002). S*lips of action* can be viewed as task sequences performed correctly but in the wrong context. According to Botvinick and Plaut (2002), increasing disruption to a connectionist model representation of the error types observed in everyday *slips of action* leads to increasingly fragmented behaviour closely resembling *Action Disorganisation Syndrome*. Loss of the ability to rapidly detect and correct errors of action in ADS and other such manifestations of EF deficits is an essential element that discriminates healthy from pathological performance. This impaired ability to correct erroneous actions (self-correction) secondary to frontal lobe lesions has been well documented (Luria, 1966; Prigatano & Schacter, 1991) though the link between these studies and those on participation secondary to TBI is rarely noted.

A number of small sample studies have examined errors of action in individuals with various EF deficits and compared these to the performance of healthy control subjects (Chevignard et al., 2000; Fortin et al., 2003; Schwartz, Segal, Veramonti, Feraro, & Buxbaum, 2002). These largely qualitative studies based their analyses of IADL performance on error coding schemes. An error-coding scheme can be defined as the framework that guides the qualitative analysis of observable behaviours (namely errors) during everyday task performance. A number of error-coding schemes have recently been developed, all of which have different categories and definitions of errors (Baum & Edwards, 1993; Boyd & Sautter, 1993; Chapparo & Ranka, 1996b; Chevignard et al., 2000; Crépeau, Scherzer, Belleville, & Desmarais, 1997; Dutil et al., 2005; Dutil et al., 1990; Fortin, Godbout, & Braun, 2002; Fortin et al., 2003; Humphreys & Forde, 1998; Knight et al., 2002; Le Thiec et al., 1999; Neistadt, 1992; Passini, Rainville, Marchand, & Joanette, 1995; Rainville & Passini, 2005; Schwartz, 2006; Schwartz et al., 1991; Shallice & Burgess, 1991; Sirigu et al., 1996). A frequently cited error coding system, the *action coding system,* was developed by Schwartz (1991) to account for errors observed in patients with severe deficits in the performance of routine actions such as tooth brushing and preparing a cup of coffee secondary to mesial frontal infarction (Schwartz et al., 1991), and closed head injury (Schwartz et al., 1993; Schwartz, Ochipa, Coslett, & Mayer, 1995). It provides the structure for the systematic (qualitative and quantitative) analysis of performance (efficiency and accuracy) of simple everyday tasks for individuals with ADS. These authors documented the "normal" sequence of steps required to successfully carry out a number of ADL and IADL tasks using a method called script generation. Here, normal subjects are asked to write a recipe like ordering of the actions that must be performed to complete an everyday task such as making a cup of tea. Standard task components and the temporal order of actions required to attain initial goals are thus identified. Actions consistently enumerated by a minimum of 80% of normal subjects are labelled as *basic level actions*. Such actions are crucial to attainment of the task goal and have been shown to be constant across subjects (Humphrey's & Forde, 1998). Moreover, basic level actions are almost all produced in the same temporal order (Humphrey's & Forde, 1998). Independent actions or actions that are not related to the attainment of the immediate goal of the task are coded as errors. The proportion of actions unrelated or unnecessary to the accomplishment of the task goal, labelled A-1 steps, is used as a measure of the coherence or incoherence of the patient's performance (e.g. spooning butter into a cup of coffee). Errors are attributed to any one of six categories: *place substitutions, object substitutions, anticipations, tool substitutions, quality errors,* and *omissions*. Hence, analyses based on this framework score performance according to predetermined normative schemas for tasks, given that normal subjects perform routine tasks in relatively stereotyped ways (Humphreys et al., 2001). Based on this coding scheme, Schwartz et al (1991; 1995) observed high proportions of *omission* and *sequence errors* in everyday tasks such as tooth brushing and making a cup of coffee in individuals in the acute stages of recovery from closed head injury. Alternately, Sirigu et al (1996) observed that individuals with frontal lobe lesions had problems retrieving the components of familiar action sequences such as washing one's hair, boiling an egg, making a phone call, and shaving.

In its current form, this error-coding scheme has certain limits. First, it remains a descriptive listing of errors (e.g. % sequence errors, % omission errors) unattached to a theoretical interpretation framework that permits a precise identification of the stage at which EF breakdown occurs. Also, studies based on this error coding scheme have not to our knowledge yet addressed the documentation of errors observed during the performance of IADL tasks in subjects' home and community environments. Moreover, we have been unable to identify studies that demonstrate the consequences of errors documented in this manner on independence in real-world activities performed by subjects in their home and community environments. We thus suggest that this limits the extent to which information derived from this error-coding scheme can be used to improve our understanding of the manifestations of EF deficits in everyday activities. Second, all four essential components of EF [i.e. breakdown in the ability to 1) formulate goals; 2) plan an activity; 3) carry out the task; and 4) evaluate performance in relation to the articulated goal], are not documented, making the information obtained partial at best. Adding goal formulation and evaluation of performance to the coding scheme is crucial for a more comprehensive study of ADS and other EF related syndromes as specific deficits in these components have been identified in individuals with prefrontal lobe lesions (Sirigu et al., 1995; 1996). Third, the applicability of this error coding scheme for the analysis of more complex everyday tasks pertinent to higher functioning TBI individuals (e.g. going to the grocery store) has not, to our knowledge, been investigated.

The challenges inherent to analysing errors related to EF deficits in the context of IADL task performance and their repercussions on independence in everyday activities was highlighted in a recent study (Bottari, Swaine, & Dutil, 2007). Here the authors investigated the ability of occupational therapists to discriminate between errors committed by individuals with neurological impairments from those committed by healthy control subjects. They found that only 50% of errors were related to the correct source population by more than 70% of occupational therapists (n=82), 41.5 % of whom had 10 or more years of clinical experience and 30.5% of whom had five to nine years of clinical experience. In addition, approximately 47% of the errors compiled from studies on healthy adults were thought to be associated with a neurological population by more than 70% of the respondents. More importantly, of these, four were identified as having a direct impact on independence by more than 50% of respondents. These results highlight the extent of the work that remains to be done in this field of research. We suggest that targeted treatment interventions and appropriate discharge recommendations first require that therapists be able to discriminate healthy from pathological errors and second that they identify the stage at which EF breakdown occurs. For instance, clients may forget to turn off the stove during an observation of the person's ability to prepare a meal. Occupational therapists must then decide, based on this and other observations, whether the person can be safely discharged home alone or whether supervision will be required. The extent to which this error occurs in healthy adults should be considered in the therapist's final recommendations as the repercussions of the therapist's interpretation of such an error could directly influence the rehabilitation team's discharge planning and ultimately, the client's overall well being. Beyond this, determining why this error occurred, whether it is related to EF deficits and if so at which stage breakdown occurred is crucial if environmental modifications and other such interventions are to be considered to increase home safety. In other words, optimal recommendations regarding home safety and ability to live independently depend on an accurate analysis of ADL and IADL errors of action. Optimizing clinicians' ability to analyse and interpret errors in performance may require that measurement instruments provide more exhaustive guides for error analyses and interpretation.

Elements of fundamental importance to tests of IADL independence

In some of our previous work (Bottari, 2001), we identified three elements of fundamental importance to tests of IADL independence for individuals with a TBI: task novelty and complexity, non-structured approach and real-world environment. All three will be reviewed in this section.

If IADL tests are to consider EF, they must first be composed of tasks that solicit EF. However, though there is a general agreement that EF deficits are most apparent in novel and complex tasks (Burgess, 2000; Crépeau et al., 1997; Goel, Grafman, Tajik, Gana, & Danto, 1997), there is a pending divergence of opinion on this issue. For instance, Forde & Humphreys (2000) showed that errors of action observed in individuals with an *Action Disorganisation Syndrome* (Schwartz et al., 1993) occur during the performance of familiar multi-step tasks such as making a cup of tea. However, Norman and Shallice (1986) suggest instead that EF are specifically required for the adaptation to novel situations (Shallice & Burgess, 1991).

The extent to which a task is complex depends on the number of steps involved, the sequencing and interrelation of these steps, the environmental context in which the task is performed and most importantly the number of times the task has previously been performed (Bottari, 2001; Rainville & Passini, 2005). If an individual performs a complex task a thousand times, it becomes automatic for him. Task complexity is therefore not inherent to the task itself, but rather in the perspective of a subject / environment continuum, a result of the extent of adaptation required for the individual to perform the specific task. Alternately, task novelty and complexity is not only dependent on previous experience with related tasks but also on any recent changes in physical and /or cognitive status. The latter may transform previously familiar tasks such as dressing and personal hygiene into novel and complex ones as individuals may be required to dress with one hand for the first time and this potentially compounded by a recently acquired impairment in sitting balance and / or perceptual skills. However, few studies document, the degree of novelty and complexity of IADL tasks for specific individuals making the identification of the optimal tasks to be included in IADL tests for individuals with TBI considering EF deficits more difficult.

Chevignard et al (2000) analysed planning related deficits of individuals with severe brain injury on three everyday tasks: shopping for groceries, cooking and answering a letter and finding the way to post the reply. Planning deficits, as defined by these authors, were shown to be more apparent during execution of the cooking task (tactical planning) than in the elaboration of a script of the cooking task (strategic planning) and in the execution and script elaboration of the other two tasks illustrating that these three tasks differentially solicited EF. This suggests that performance on one complex task does not necessarily predict functioning on other complex tasks. Moreover, these results may have also been influenced by the novelty of the different tasks to the individuals tested though this was not reported as such. Hence, an optimal measurement instrument may need to consider functioning in several complex tasks. Alternately, the manner in which a task is operationalized may also influence its sensitivity to EF deficits. For instance, though Chevignard et al (2000) failed to identify planning deficits in a "shopping for groceries" task, Lethiec et al (1999) showed the greater sensitivity of a complex shopping task (Multiple Errands Test) (Shallice & Burgess, 1991) to EF deficits after a severe TBI when compared to traditional frontal lobe tests. The lesser sensitivity of the shopping task administered by Chevignard et al (2000) may be explained by its lesser degree of complexity. More specifically, in this study, examiners completed important components of the planning process for the subjects. For example, examiners specified the required purchases (ingredients required to cook scrambled eggs for two people and bake a chocolate cake) and where the purchases were to be made (supermarket not far from the hospital). Moreover, examiners removed all potential to identify planning deficits related to selecting the most adequate place to complete purchases and the most feasible manner of going to the grocery store when they told subjects that they would bring them to the supermarket. Alternately, the complex shopping task proposed in the Multiple Errands Test (Shallice & Burgess, 1991) requires that subjects purchase several items, be at a specified meeting place 10 minutes into the test, obtain a series of information and respect a number of rules during task execution.

Developing a validated IADL test with novel and complex tasks is further hampered by the known fact that novel tasks are only novel once (Rabbitt, 1997). Test-retest stability of the instrument tends to be reduced as subjects' performance on second testing is better than on initial testing as novel tasks are no longer novel and the degree of task difficulty is implicitly lessened. Also challenging for such measurement instruments is the fact that task novelty is specific to each individual's previous experiences. Developing a measurement instrument with the idea of having a uniform degree of task difficulty and novelty across populations of individuals is therefore difficult particularly in the context of everyday tasks.

For IADL tests to document all components of EF i.e. goal formulation, planning, carrying out the task and verifying whether the initial goal has been attained, it is imperative that the approach permit the observation of all related task components, i.e. that the approach used be a non-structured one (Bottari, 2001; Lezak et al., 2004b). To this end, it is now well accepted that individuals should be encouraged to act on their own initiative, and not simply respond to an examiner's instructions regarding what to do, how, and when (Lezak, 1989; Lezak et al., 2004). A number of case studies of individuals with known EF deficits clearly illustrate the necessity of using such an approach. Eslinger & Damasio (1985) present the case of EVR, a patient who underwent the removal of a large bilateral orbitofrontal meningioma compressing both frontal lobes. Though EVR was known to have significant difficulties formulating goals related to such simple tasks as his personal hygiene (only showered for special occasions), he performed very well in highly structured situations. In fact 'when the environment failed to challenge him with situations that demanded a response, he resumed his relatively goal-less, unpressured existence (p.1739)' (Eslinger & Damasio, 1985). Use of an IADL test in which the therapist used a structured or directive approach would have led to a gross overestimation of this individual's level of independence.

Albeit the importance of using non-structured approaches, traditionally, performance-based IADL tests (Baum & Edwards, 1993; Fisher, 2003; Neistadt, 1992) have relied upon structured approaches, i.e. examinees are told what to do, how and when. These tests have thus inherently failed to consider EF deficits as a whole when documenting IADL independence. Though a recent study by Chevignard et al (2000) illustrates the feasibility of a less structured approach, most studies reviewed failed to use such an approach. In fact, many studies limit their examination to the carrying out or execution component of the task. For example, in a study of individuals with *Action Disorganisation Syndrome* (Humphreys & Forde, 1998), subjects were seated at a table where task relevant materials were laid out and they were asked to perform a specific series of tasks (e.g. wrapping a gift). Here, the examiner formulated goals and completed a significant portion of the planning (e.g. to wrap a gift subjects were given wrapping paper, the gift, scissors, sellotape and a bow). No information was provided on the subjects' ability to verify attainment of the initial goal.

Finally, the third criterion recommends that IADL tests be administered in environments that contain multiple sources of distraction (i.e. real-world environments) (Burgess et al., 2006; Burgess & Robertson, 2002). Though this fundamental aspect of IADL assessments for individuals with a TBI will be discussed in detail in Chapter 4 and later in this literature review, it is important to mention its particular relevance to the assessment of EF related deficits. Fundamentally, a central feature of EF deficits is an impaired ability to inhibit irrelevant stimuli. Deficits of inhibition are known to be most apparent, especially in milder cases, in environmental contexts with numerous distractions. People may, especially in activities of daily living, have automated everything over time. However, what may transform the status of these tasks is the presence of distracting stimuli.

These distracters are central as a single interference may cause the person's behaviour to deviate onto something else, or the task is left incomplete.

Natural contexts or real-world environments are inherently characterized by their extensive and diverse distractions. In these contexts, maintenance of goal-directed activity implicitly requires that irrelevant stimuli be inhibited. However, with few noteworthy exceptions (Chevignard et al., 2000; Fortin et al., 2003), most studies maintain a preferential use of controlled environmental settings with limited numbers of distracters (Humphreys & Forde, 1998; Schwartz et al., 2002). Failure to use measurement instruments administered in real-world environments can potentially lead to gross underestimations of the repercussions of EF deficits on task performance as has been repetitively demonstrated in studies examining the ecological validity of traditional measures of EF (Alderman, Burgess, Knight, & Henman, 2003; Burgess et al., 2006). Alternately, performance-based measurement instruments administered in real-world environments are inherently ecologically valid as they are little more than formalized versions of activities in which people naturally participate (Alderman et al., 2003). However, though there has been a widely held assumption that these measures would be psychometrically unsound due, in part, to the presence of numerous uncontrolled influences that can potentially intervene on test results, Burgess et al (2006) have shown that this assumption is not supported by recent research data on tests such as the Multiple Errands Test (Shallice & Burgess, 1991). Finally, IADL tests that restrict their observations to more controlled settings (e.g. hospital or laboratory based) fail to consider individuals in interaction with their home and community environments and the distractions therein. More importantly, they fail to consider the person's ability to maintain goal-directed behaviour in the presence of these specific elements of distraction.

Performance-based IADL tests administered in real-world environments

The environment in which the person lives has an enormous impact (positive or negative) on EF and on return to independent living. It is an important factor to be addressed both in IADL tests and in treatment interventions (Darragh, Sample, & Fisher, 1998; Hayden, Moreault, LeBlanc, & Plenger, 2000; Mateer, 1999). In Chapter 4, we examine the issue of context in IADL tests according to specific criteria. Literature reviewed in that chapter will not be reviewed again but we will briefly summarize some salient issues. A significant number of studies have shown the interdependence between IADL ability and environmental factors (Gitlin, Corcoran, Winter, Boyce, & Hauck, 2001; Hoppes, Davis, & Thompson, 2003; Lysack, MacNeill, & Lichtenberg, 2000; MacNeill, Gerskovich, Caron, & Lichtenberg, 1997; MacNeill, Lichtenberg, & LaBuda, 2000) even though few studies have investigated the specific influence of the context (home, hospital) in which IADL tests are administered on conclusions derived from these measurement instruments (Bottari, Dutil, Dassa, & Rainville, 2006). Nonetheless, a number of theoretical and practice person-environment models (Dunn, Brown, & McGuigan, 1994; Fougeyrollas et al., 1998; Gitlin, 2003; Law et al., 1996; Polatajko, Craik, Davis, & Townsend, 2007; World Health Organization, 2001) and a number of studies on ecological validity (Cripe, 1996; Sbordone & Guilmette, 1999) have strongly suggested that independence in IADL is best understood in context (Bottari et al., 2006; Johnson & Lewis, 1991). Tests administered in real-world environments are increasingly considered as the optimal manner in which to document the interplay between individuals' neuropsychological deficits and the requirements of their daily lives for a better appreciation of everyday functioning (Ponsford, Sloan, & Snow, 1995). However, few researchers have addressed the methodological challenges involved in developing and validating performance-based IADL tests to be administered in such complex, highly individualized, unpredictable, and multidimensional environments as subjects' home and community environments (Gitlin, 2003; Rempfer et al., 2003). We conclude that the issue of context in IADL tests has been minimally addressed and that the complexity of data collection methods may partly explain the limited number of studies on the topic.

Analysis of performance-based IADL tests in consideration of EF deficits

As information derived from IADL tests is crucial in orienting treatment interventions, it is essential that these tests provide an accurate appraisal of the specific needs of individuals with a TBI. Moreover, though this target population is likely to have numerous physical and psychological deficits, a number of studies have shown that independence in IADL is most influenced by deficits in executive functioning (Evans, Chua, McKenna, & Wilson, 1997; Perry & Hodges, 1999; Shallice & Burgess, 1991; Zalla et al., 1998). Hence, particular attention will need to be given to the observation of deficits in EF and their related impact on IADL independence.

IADL tests that aim to document the repercussions of EF deficits on IADL independence for individuals with a moderate or severe TBI should, based on our review of the literature, have the following: 1) tasks that are sensitive to EF deficits, i.e. novel and complex tasks; 2) a non-structured approach to ensure that all four components of EF (goal formulation, planning, carrying out of the task, verifying that the initial goal was attained); 3) an error analysis system that considers all four components of EF; 4) be based in real-world environments so as to consider the influence of the person's environment on performance; 5) quality psychometric properties of reliability and validity for a moderate and severe TBI population.

With the intent of identifying the optimal measurement instrument of IADL that considers EF, below we will only review tests that meet the largest number of criteria. Only performance-based measures will be reviewed as a number of studies have shown the greater accuracy, as compared to interviews that either over or underestimate difficulties, of performance-based IADL measures for individuals with TBI and cerebral damage (Atwood, Holm, & James, 1994; Cotter, Burgio, Stevens, Roth, & Gitlin, 2002; Doble, Fisk, & Rockwood, 1999). In addition, performance-based measures provide more detailed observations regarding the manner in which the activity is performed (Schenkman, Scherer, Riegger-Krugh, & Cutson, 2002), an aspect that is congruent with the goal of the tool under study.

In this section we review measures of personal activities of daily living and IADL which may be considered for use in the evaluation of individuals with a TBI. These tests have a number of commonalities i.e. performance-based tests that analyse underlying task related performance deficits. However, a number of differences that are not overtly apparent to the uninformed observer must be considered in relation to the particular objectives targeted by these different tests. For instance, certain studies use IADL tasks administered in real-world environments to measure EF related deficits (Burgess et al., 2006; Chevignard et al., 2000; Fortin et al., 2002; Fortin et al., 2003; Godbout & Doyon, 1995; Shallice & Burgess, 1991). Here IADL tasks are particularly used to "diagnose" the presence or absence of EF related deficits. The authors of these studies will only rarely refer to the IADL tasks as "tests" though qualitative observations (errors) are compiled and at times, scores are attributed to the results. With few exceptions, psychometric studies of these test situations have largely been limited to discriminant validity studies aimed at determining whether IADL performance can discriminate between individuals with and without cerebral impairments.

The Executive Function and Performance Test (EFPT) (Baum & Edwards, unpublished manuscript) uses a cooking task to document EF related deficits such as initiation, planning and sequencing. This test has the added interest of documenting types and amounts of assistance required to perform the task. Psychometric studies of this test have been principally conducted with individuals with Alzheimer type dementia (Baum & Edwards, 1996; Baum & Edwards, 1993) and to our knowledge, studies have not yet been done with moderate or severe TBI. Tests with more extensively documented psychometric properties include the Arnodottir OT-ADL Neurobehavioral Evaluation (A-ONE) (Arnadottir, 1990), the Assessment of Motor and Process Skills (AMPS) (Fisher, 2003), and the ADL Profile (Dutil et al., 2005; Dutil et al., 1991; Dutil et al., 1990; Dutil et al., 1996). The AMPS is a performance-based test that documents performance on two or three everyday tasks, selected from a list of approximately 83 task choices. Its intended goal is the precise measurement of underlying task related motor and processing abilities. The focus is thus placed directly on the person's abilities. This test claims to be "task free" in so far as any task can be used to measure underlying motor and process skills as long as the task selected for observation is of an acceptable degree of difficulty for the person being tested. It therefore attributes little specific interest to the person's level of independence in relation to the particular tasks selected to complete the test. Although at least one study using the AMPS examined whether tests administered in a TBI subject's home environment differs from those administered in a hospital (Darragh, Sample, & Fisher, 1998), descriptive information of the particular demands of the subjects' home environment on task performance was not reported. The A-One (Gudrun Arnadottir, 1990), particularly developed for individuals having had a stroke, aims to document two separate aspects. First, similarly to the aforementioned tests, underlying task related deficits are identified. However, this measurement instrument has the added intent of documenting the person's level of independence in each of the observed tasks. Finally, the ADL Profile, also a performance-based test, documents both underlying task related deficits and level of independence but adds a third and a fourth aspect. The ADL Profile considers the person's interaction with the environment in which the task is performed and provides a final interpretation of independence in consideration of task performance, task related deficits and interactions with numerous elements (human and non-human) present in the person's home and community environment. Hence, only the three latter tests, i.e. Arnodottir OT-ADL Neurobehavioral Evaluation (A-ONE) (Gudrun Arnadottir, 1990), Assessment of Motor and Process Skills (AMPS) (Fisher, 2003), and the ADL Profile (Dutil et al., 2005) will be reviewed and the advantages and disadvantages of each will be discussed.

Arnodottir OT-ADL neurobehavioural evaluation

The Arnodottir OT-ADL Neurobehavioral Evaluation (A-ONE) (Gudrun Arnadottir, 1990) is a performance-based measure of ADL that also aims to examine how neurobehavioral dysfunctions interfere with task performance and to localize central nervous system dysfunctions. According to the authors, it is both a criterion and norm referenced test (G. Arnadottir, 2002). The target population is any person 16 years and older with behavioural dysfunctions of cortical origin. The A-ONE consists of 5 personal activities of daily living (PADL) domains (dressing, grooming & hygiene, transfers & mobility, feeding and communication) and is administered at the patient's bedside in any setting where occupational therapy is provided. PADL task domains are scored using 22 ADL items (Functional Independence scale) and 46 neurobehavioral items (Neurobehavioral specific impairment subscale). Each item is scored using a five-level ordinal scale based on amount and type of assistance required. Scores are not added across domains. Three conceptual / theoretical models underlie this test: 1) neurobehavioral literature (with a noticeable influence exerted by the work of Luria), 2) Occupational Performance Frame of Reference (Pedretti & Pasquinelli-Estrada, 1985), and 3) Factor-

Relating Theory (A-ONE) (Arnadottir, 1990). A five-day training seminar is recommended to ensure proper administration and analysis of the measurement instrument.

Published psychometric studies are limited to a single article (Gardarsdottir & Kaplan, 2002) though a conference abstract (Arnadottir, 2002) and the administration manual (Arnadottir, 1990) describe, though incompletely, results of a number of other studies. Overall, very small sample studies provide preliminary evidence of inter-rater (average kappa = .84 across all items) and test-retest reliability after a one-week interval (r= .85). Results of a factorial validity study are mentioned in the administration manual however due to the absence of a complete description of the study (data analysis and results) the quality of the findings cannot be commented on. Moreover, an unpublished internal homogeneity study fails to report Cronbach's alpha coefficient. A-ONE scores can, however, effectively differentiate patients with a right CVA from those with a left CVA (Gardarsdottir & Kaplan, 2002).

Advantages and Disadvantages

The A-ONE has the advantage of being a performance-based observational test based on theoretical underpinnings that are appropriate for individuals with cerebral damage. However, psychometric studies of this tool have been very rudimentary and scores must be interpreted with caution due to the high probability of measurement error. In addition, no studies were found specific to individuals with moderate and severe TBI. As the A-ONE consists exclusively of personal care tasks, the absence of more complex IADL tasks limits the instrument's potential to document the repercussions of EF deficits on IADL independence. In addition, the highly structured approach of the A-ONE prevents the observation of all four components of EF related deficits (i.e. goal formulating, planning, initiation, and self-correction are guided by the examiner). Finally, the test is administered within a hospital-based environment that does not reflect the complex demands of a real-world environment or the interactions of the person with his or her own home environment. Moreover, though this test may observe pathological behaviours in severely impaired individuals, it would very likely be insensitive to higher functioning individuals.

The Assessment of Motor and Process Skills

The Assessment of Motor and Process Skills (AMPS) (Fisher, 2003) is a criterion-referenced performance-based observation test that measures both personal activities of daily living (PADL) and IADL and underlying skills performance. It includes 83 task choices (nine PADL and 74 IADL tasks), two or three of which are administered by an occupational therapist to any one patient. Observed tasks are selected on the basis of familiarity for the patient and acceptable level of difficulty. The criterion of reference against which the client is evaluated is a criterion of competence. Competence is defined as the absence of observable impact on the goal-directed action being performed. The target population is all individuals for whom there is concern of occupational performance (aged three years and older). The goal of the test is to determine whether a person has the necessary motor and process (organizational / adaptive) skills to perform ADL tasks effortlessly, efficiently, safely and independently. Moreover, based on information obtained with the process skills scale, inferences can be made regarding the persons' overall ability to live independently and safely in the community. According to the authors, the ideal context for the evaluation is the patient's own home. However, the environment should be "distraction-free" (though both logical and illogical extra tools and materials not needed for task performance should be present in the task environment). The conceptual model of the AMPS is derived from the Model of Human Occupation (Kielhofner, 1995). This model illustrates the complex relationship between five essential components of occupational performance: 1) the person; 2) the task to be performed; 3) the environment; 4) the person's culture, and 5) occupational performance. The underlying assumption is that occupational performance is best understood through the observation of persons performing specific tasks in dynamic interaction with their natural context (Fisher, 1997).

Sixteen motor and 20 process skills are rated on a four point rating scale: (1) deficit; (2) ineffective; (3) questionable; and (4) competent. These are later converted into interval level data (logits) using a many-faceted Rasch model (Linacre, 1983). This permits the development of two linear unidimensional hierarchical scales (motor skills and process skills) of increasing IADL ability. Assumptions of the Rasch model are that "1) persons of higher ability are more likely to obtain higher skill item scores than are persons of lower ability; 2) easy skill items and less challenging tasks are more likely to be easier for all persons; 3) severe raters are more likely to give lower scores to all persons" (Fisher, 2003, p. 206). Based on the level of difficulty of the task performed competently, it is possible to predict which other tasks (i.e. those of lesser challenge) the person will also be able to perform. Individuals with process logit scores < 1.0 are predicted to require assistance to live in the community (Doble, Fisk, Fisher, Ritvo, & Murray, 1994a). The time to administer and score the test (two or three tasks) is between 30 and 60 minutes. The training manual provides a very clear guide for task observation and scoring. A five-day training session is required to become a certified evaluator. Required material is generally available in any home environment or occupational therapy department.

Goodness of fit statistics, based on Rasch analyses, have confirmed that test items fit the many- faceted Rasch model (Bray, Fisher, & Duran, 2001; Fisher, 1997) and high inter and intra-rater reliability among more than 900 calibrated raters (97% of raters demonstrate goodness of fit statistics indicative of consistent scoring) (Fisher, 1997). AMPS' scores effectively differentiate groups of people with disabilities (e.g. dementia of the Alzheimer's type, multiple sclerosis, CVA, and psychiatric disorders) from people without disabilities (Bernspang & Fisher, 1995; Doble et al., 1994a; Doble, Fisk, MacPherson, Fisher, & Rockwood, 1997a; Pan & Fisher, 1994b). Gender contributed to statistically significant differences in process skills, with women being slightly more able than men (Duran & Fisher, 1996a). Age group contributed statistically significant differences in both process and motor scales, with younger women being more able than older women (Dickerson & Fisher, 1997). AMPS' scores are said to not be significantly affected by culture (Magalhaes, Fisher, Bernspang, & Linacre, 1996) as culture specific tasks have been added. However, potential cultural biases of raters may persist. Based on small sample studies (n=20), there are statistically significant differences in process skills related to whether the test is administered in the client's familiar home environment versus an unfamiliar clinic, with significant differences in process being reported (Darragh et al., 1998; Park, Fisher, & Velozo, 1994). Differences in motor ability performance measures between the two settings were not significant. The authors conclude that individuals with TBI may be influenced by their environment when performing household tasks, although further studies are recommended to determine the extent of the environmental effect. With the exception of one study (Nygard, Bernspang, Fisher, & Winblad, 1994), persons living in the community (with and without a disability) were shown to perform better in a familiar home environment. AMPS process skill scores have been shown to be moderately correlated (r= 0.67 and r= 0.65) with screening tests of general cognitive ability (Mini-Mental State Examination and the Cognitive component of the Cambridge Examination of Mental Status in the Elderly) and the AMPS motor skills scores with the Functional Independence measure physical scale (r= 0.62) (Robinson & Fisher, 1996). Finally, cognitive factors (including a measure of planning ability, the Tower of London) explained only 12.9% of the variance in AMPS scores in a sample of 100 stroke patients (Mercier, Audet, Hébert, Rochette, & Dubois, 2001). The motor factor explained most of the variance (53.3%) in functional performance.

Advantages and Disadvantages

The clear advantage of the AMPS over other IADL tests is its use of the many-faceted Rasch model (interval level data) and its well-established psychometric properties. However, despite its breath of potential IADL tasks, evaluation of IADL in the community is incomplete, as several important tasks have not been calibrated, e.g. use of public transportation, handling money, crossing roads. Considering that this evaluation aims to document the underlying causes of impaired performance, its principal weakness among TBI persons, is the absence of a theoretical model of cerebral functioning. Important aspects of EF related deficits (and the impact of independence in IADL) may go undetected as the approach is overly structured. Tasks selected for observation are not novel or overly complex, multitasking is not observed and the observation of performance takes place over a very short period of time. Thus, independence in IADL may be overestimated causing decreased access to important treatment interventions. Certain studies have shown that IADL tasks are not all equally sensitive to deficits in planning ability for individuals with cerebral damage (Chevignard et al., 2000). Hence, as performance on one task does not uniformly predict functioning on other tasks, studies based on the AMPS would need to more clearly demonstrate how observing only two or three tasks is sufficient to evaluate IADL independence in its broadest sense. Finally, based on the administration manual, for AMPS scores to guide treatment interventions, additional dimensions must be evaluated (roles, motivation, available resources, past routines, etc.) using measures other than the AMPS or non-standardized questionnaires.

ADL Profile

The *ADL Profile* (Dutil et al., 2002; Dutil et al., 2005; Dutil et al., 1991; Dutil et al., 1990; Dutil et al., 1996) was developed to provide a criterion-referenced measure of independence in everyday activities (PADL and IADL) for individuals with a TBI. Two conceptual / theoretical models underlie the ADL Profile: 1) the Model of Cerebral Functioning (Luria, 1973), and 2) the conceptual model of the Disability Creation Process (Fougeyrollas et al., 1998). This clinical tool consists of two parts, a performance-based test and a questionnaire administered through semi-structured interviews to the patient and a significant other. Version 5.0 includes twenty-one tasks of which 17 are used for the performance-based observation. Each task is scored using a four-level ordinal scale that relates independence in task performance (task score) and the manner in which the task is performed (operation score). The task score reflects the lowest score on any of the four operations i.e. goal formulation, determination and organisation of steps and means of attaining the goal (planning), execution of the action plan and verification of its appropriateness in relation to the goal (quality control). Difficulty with any one of the operations therefore directly influences independence in the task as a whole. Scores are not added across tasks or across operations. The questionnaire measures the individual's perception on variables such as life habits pre and post-injury and satisfaction with present level of functioning. Based on data obtained via all three approaches, the examiner determines whether there is a presence of a handicap situation.

For verion 2.0 of the tool, test-retest reliability coefficients for the global score indicate good stability upon repeated measurements two weeks apart (kappa coefficients for the global score ranging from 0.53 to 0.93) (Dutil et al., 1994). Rousseau et al calculated inter-rater reliability on task scores on a small sample (n=19) of patients with TBI with four occupational therapists with minimal training on the ADL Profile (Rousseau, Dutil, & Lambert, 1994a). Kappas ranged from 0.23 to 0.72. Kappa coefficients were below 0.4 for nine of the 21 tasks, which indicate, poor to fair agreement (Landis & Koch, 1977). Internal homogeneity is good among tasks represented to select everyday activities (Cronbach's alpha: 0.94 for the global score) and among the three subscales (Cronbach's alpha: 0.93 personal care, 0.85 home management, and 0.82 community management). In an unpublished study of 92 severe TBI patients, Dutil et al (1994) identified, using a principal component analysis (varimax rotation), three factors that represent 69% of the variance of the 21 tasks. More automatic and routine activities, such as self-care, converge under one factor and seemingly more complex tasks are linked to two separate factors, one requiring higher-level physical skills and the other more complex cognitive skills. A separate analysis, using principal component analysis (varimax rotation), of operations' scores indicated that most tasks loaded on a single factor for each operation. A study establishing norms (n=183) was carried out for two tasks related to financial management (Dutil, Auger, Gaudreault, Bellemare, & Lambert, 1991). The preliminary results of this study indicated the importance of documenting healthy performance to better interpret errors made by individuals with a TBI. More specifically, sex, level of education and age were found to influence IADL performance. Three revisions of the instrument have since been completed and therapists now receive a three, four or five day training session on version 5.0 of the tool (Dutil et al., 2005).

Advantages and Disadvantages

Few psychometric studies of this tool have been published in peer-reviewed journals and certain studies (inter-rater) are based on small samples. Inter-rater reliability is problematic for certain tasks and is linked to high probabilities of measurement error. Studies to date have principally considered two patient groups, TBI and stroke. The ADL Profile has the advantage of being a performance-based observational test based on theoretical underpinnings that are appropriate for individuals with cerebral damage. Additionally, use of semi-structured interviews permits a greater approximation of real world functioning outside of the testing situation. The presence of PADL and IADL tasks (including both domestic and community related tasks) is representative of tasks required for independent living in the community. Moreover, the test protocol emphasizes the importance of a non-structured approach allowing for the observation of important components of executive functions (e.g. goal formulation and planning). Also, the observation of routines rather than individual tasks creates the possibility of observing multi-tasking.

Among the performance-based IADL tests, the ADL Profile corresponds to the largest number of our selection criteria. It contains both novel and complex tasks and considers all four components of EF due to its non-structured approach. The task analysis identifies EF related deficits and the test considers persons' interactions with their home and community environment. Finally, it has documented psychometric properties with individuals with severe TBI and, most importantly, is a measure of IADL independence in its broadest sense. However, results of psychometric studies on this test indicate a need for further study. For instance, kappa coefficients of the interrater reliability study completed on version 2.0 of the tool indicated only poor to fair agreement among four raters on nine of the 21 tasks. Moreover, inter-rater reliability was lower for the operations' scores based on components of EF (kappa: 0.10 to 0.62). This relatively low inter-rater reliability on a number of tasks and related operations' scores justifies the need for the development of a clearer coding system to support a task analysis based on the four components of EF. This will require that specific errors of action related to each component of EF for every ADL task in the test be identified and validated.

In conclusion, the ADL Profile possesses several interesting qualities and is the measure that most clearly meets the criteria of an IADL test that provides an accurate appraisal of the specific needs of individuals with a TBI. The present study thus aims to expand upon this previous work. We propose to develop and validate an alternate version of the ADL Profile, the *IADL Profile*, which considers recent advances in the field of EF particularly in the area of ecological assessment (Burgess et al., 2006). More precisely, the *IADL Profile* aims to provide a greater degree of task complexity (e.g. sequence of six tasks linked to the goal of preparing a hot meal), task definitions that consider components of EF, task analysis based on more explicitly defined operations related to EF, and an improved rating scale. The psychometric properties of this new IADL instrument must be established.

General Objective

The objective of this study was to develop an alternate version of the ADL Profile, the *IADL Profile*, a measure of IADL independence for persons with a TBI, and to establish some essential psychometric properties of this test.

Specific objectives

1. To develop an alternate version of the ADL Profile, the *IADL Profile*.
2. To determine the content validity of the *IADL Profile*.
3. To determine the reliability (intra and inter-rater agreement, generalizability, and internal consistency) of the *IADL Profile*.
4. To determine the factorial validity of the *IADL Profile*.
5. To determine the criterion-related validity of the *IADL Profile* with indices of injury severity (Glasgow Coma Scale scores, duration of posttraumatic amnesia, coma duration), sociodemographic characteristics (age, sex, level of education) and measures of EF (Tower of London, Stroop and Working Memory Index of the Weschler Memory Scale III).

Chapter 3

Methodology

Reliability and validity are required psychometric properties of measurement instruments. In this study we developed an alternate version of the ADL Profile, the *IADL Profile,* and investigated the intra and interrater agreement, generalizability, and internal consistency as well as the tool's content, factorial, and criterion validity. This study used a "measurement development research" design (Contandriopoulos, Bélanger, & Nguyen, 1990). The development and validation process included a series of steps (Table 1). Each step is described in this section in terms of design, sample, method, and statistical analyses.

Table 1: Overview of methodology

Step	Sample	Method	Statistical Analyses	Chapter where results are described
1. Development of the *IADL Profile*		Three phases: 1) Planning (literature review; etc.); 2) Construction (elaboration of the user's guide of the first prototype of the *IADL Profile);*		Chapter 5
	Eight TBI (Moderate or severe)	3) Pilot testing of the tool (new and revised tasks, duration, comprehension of instructions, etc).	Qualitative analysis of administration time, clarity of instructions, ease / difficulty of administering *IADL Profile* in person's home, ease of scoring, etc.	

Step	Sample	Method	Statistical Analyses	Chapter where results are described
2. Content validity	Eight experts	Experts in EF, IADL independence and TBI (four occupational therapists, one neuropsychologist, two physicians, and one specialist in research methodology and instrument development) were asked to judge the pertinence and clarity of the *IADL Profile*.	Percent frequencies of ratings using a three-point rating scale were calculated. A qualitative analysis of experts' comments was completed.	Chapter 5
3. Reliability study: Intra and interrater agreement	30 TBI (Moderate or severe)	The *IADL Profile* was administered by a trained occupational therapist in subjects' home and community environments. Video recordings were assessed on two occasions (t1, t2) by three raters (R1, R2, R3). The interval between the test sessions was 30 days.	Cohen's kappa, percent agreement and generalizability coefficients were used to calculate the intra and interrater reliability associated with the tool.	Chapter 5
4. Reliability study: Internal consistency	100 TBI (Moderate or severe)	The *IADL Profile* was administered by one of three trained occupational therapists in subjects' home and community environments to 100 subjects, 30 of whom participated in the intra and inter-rater agreement portion of the reliability study.	Cronbach's coefficient alpha was estimated for the total score. Subsequent to the factorial validity study (Step 5), Cronbach's coefficient alpha was also estimated for sub scores regrouping items under each factor.	Chapter 6

Step	Sample	Method	Statistical Analyses	Chapter where results are described
5. Factorial validity	100 TBI (Moderate or severe)	The *IADL Profile* was administered by one of three trained occupational therapists in subjects' home and community environments to 100 subjects, 30 of whom participated in the intra and inter-rater agreement portion of the reliability study.	A two-stage approach to factorial validity was used: exploratory factor analysis (EFA) followed by confirmatory factor analysis (CFA).	Chapter 6
6. Criterion validity	100 TBI (Moderate or severe)	Measures of injury severity were extracted from subjects' health records at the time of injury. Trained examiners administered three measures of EF to all subjects: Tower of London, Stroop, and Working Memory Index of the Weschler Memory Scale III. Measures of relationships between the *IADL Profile,* tests of EF, indices of injury severity and sociodemographic characteristics were examined.	Measures of relationships (Pearson's correlations) and comparison of means (t-tests) were examined between scores obtained on the *IADL Profile* (factor and total scores) and concomitant variables related to injury severity (Glasgow Coma Score, duration of posttraumatic amnesia, and coma length), demographic characteristics (age, gender, level of education), and measures of EF (Tower of London, Stroop, Working Memory Index of the Weschler Memory Scale III).	Chapter 7

Step 1: Development of the *IADL Profile*

The present study aimed to expand upon previous work completed on the ADL Profile as we developed an alternate version of the ADL Profile, the *IADL Profile.* This instrument was developed to consider recent advances in the field of EF, more specifically in the area of ecological assessment.

The first prototype of the user's guide of the *IADL Profile* (version 1.0) maintained certain key aspects of the ADL Profile (e.g. overall structure, underlying conceptual models, goals, non-structured approach), and proposed several new features (e.g. task selection, task definitions, administration context, task specific instructions, and rating scale).

Development of the prototype was completed in three phases: 1) planning; 2) construction, and 3) pilot testing. The first phase, planning, included five main steps of which the first two were completed within the context of my master's degree (Bottari, 2001): 1) extensive review of the literature on EF, IADL, and TBI; 2) elite interviews with experts (neuropsychologist and occupational therapist) with extensive research and clinical experience related to EF to identify criteria needed for the evaluation of IADL independence in consideration of EF for individuals with a TBI; 3) updated review of the literature on EF, IADL, TBI, ecological validity, and influence of context on IADL assessments; 4) indepth review of quantitative and qualitative data cumulated during earlier validation studies on the ADL Profile with 90 severe TBI (Dutil, Auger et al., 1991; Dutil et al., 2005; Dutil, Forget, & Gaudreault, 1991; Dutil et al., 1994; Dutil, Forget, Vanier, & Gaudreault, 1990; Dutil et al., 1995; Dutil, Vanier, Lambert, Crépeau, & Deland, 1993; Rousseau et al., 1994a; Rousseau, Dutil, & Lambert, 1994b); 5) identification of tasks from the ADL Profile that were judged pertinent for the evaluation of IADL independence in consideration of EF for individuals with a moderate or severe TBI in their home and community environment.

Phase 2, construction of the tool, consisted of four steps: 1) developed a complex sequence of inter-related tasks related to the overarching goal of hosting a meal for unexpected guests to increase overall task complexity and provide a greater opportunity to document the complex interactions between environmental demands and the person's abilities; 2) updated the task of "telephoning for information" from the ADL Profile to include more recent options including use of the Internet; 3) revised the task "making a budget" from the ADL Profile to increase its overall level of complexity (yearly rather than monthly budget) and created a second equally complex financial problem (modifying a budget); 4) elaborated the user's guide of the first prototype of the *IADL Profile* (version 1.0). The user's guide of the *IADL Profile* also presents revised task definitions that consider components of EF, task analysis based on more explicitily defined operations related to EF, and an improved rating scale with extensive descriptions of each level of the rating scale for each of the four operations (goal formulation, planning, carrying out the task, verifying attainment of the initial goal). Also, the administration context of each task was modified to provide therapists with clearer guidelines regarding the non-structured approach to be used when testing. Specific instructions to be given to subjects were elaborated for each task to ensure that the information provided to subjects regarding the goal formulation and planning components of each task was consistently kept at a minimum across all subjects.

Phase three of the development of the *IADL Profile* (version 1.0) involved a pilot testing of the prototype with eight moderate and severe TBI. The tool was tested for feasibility (clarity of instructions; applicability of selected tasks; acceptability of test for subjects in terms of non-structured approach, administration of the tool within their home and community environment, administration time, etc). The *IADL Profile* was administered by a trained occupational therapist familiar with the tool.

Inclusion criteria:

Patient ages between 16 and 65 years and evidence of a moderate or severe TBI. A moderate TBI was defined by a score ranging between 9 and 12 on the Glasgow Coma scale (GCS) (Teasdale & Jennett, 1974), duration of loss of consciousness anywhere between 30 minutes and 6 hours but less than 24 hours, post-traumatic amnesia varying between 1 and 14 days, and generally positive scan. A severe TBI was defined by a score ranging between 3 and 8 on the GCS, duration of loss of consciousness greater than 6 hours, post-traumatic amnesia of several weeks, and positive scan.

Exclusion criteria:

Persons were excluded if they had / were:

- Disoriented (i.e., a score of 65 points or less on the Galveston Orientation and Amnesia Test) and thus unable to collaborate with the testing situation;
- Mobility deficits severe enough to limit participation in the study (score < 3 on the transfer item: bed, chair, wheelchair of the Measure of Functional Independence);
- Language deficits severe enough to limit participation in the study (score < four on the communication item of the Measure of Functional Independence);
- A history of hospitalisation for psychiatric disorder noted in the medical chart;
- Unable to comprehend and speak French.

Criteria were consistent with information available in medical charts in TBI programs in Quebec. The first three exclusion criteria were meant to ensure that patients were capable of undergoing the test and the fourth criteria restricted the study to TBI in the absence of an alternate diagnosis. Clinicians working with this clientele identified potential subjects and referred them to the research team. Subjects who met the inclusion criteria and accepted to participate were filmed as they completed the test in their home and community environments.

Step 2: Content validity

The user's guide of the *IADL Profile* (version 1.0) was submitted to an international committee of experts identified by university professors as having the required expertise either in EF, IADL or instrument development and validation. Experts were contacted via email and invited to participate in the study. They were also invited to propose other individuals judged to meet the study's selection criteria. Selected content specialists (occupational therapists, neuropsychologists, neurologists and physiatrists) were required to have five years or more of research or clinical experience with individuals with a TBI or frontal tumors and recognized expertise in relation to EF and IADL. At least one expert was required to be a specialist in research methodology and instrument development. Content specialists were asked to judge the pertinence and clarity of the following aspects of the tool: task definitions, instructions given to the person by the examiner, definitions of operations underlying task analysis and rating scale (appendix I). Specialists in research methodology and instrument development were only asked to judge the clarity of the aforementioned aspects of the tool. A three point rating scale was used: 1) not pertinent \ not clear; 2) more or less pertinent \ more or less clear; 3) pertinent \ clear. Both quantitative (frequencies) and qualitative (experts' comments) analyses were completed. Results were reviewed by our research team with particular attention given to items judged as either not clear or not pertinent by one or more experts. Items judged as more or less pertinent or relevant were also carefully reviewed. Decisions regarding required tool modifications were arrived at by consensus of our research team using the theoretical framework and goals of the tool as a guide. Information obtained from this study combined with those of the pilot testing of the tool with moderate or severe TBI subjects was then used to prepare necessary revisions for a second version of the instrument to be submitted to the reliability and validity studies.

Steps 3 to 6: Reliability and validity studies

Design

A cross sectional design was employed.

Subjects

The sample was one of convenience because the subjects' participation was voluntary. Inclusion and exclusion criteria were the same as that which was described earlier in the pilot study.

Setting

Subjects were recruited from 12 post-acute TBI programs in the province of Quebec.

Step 3:

Reliability: Intra and interrater agreement and generalizability

Description of the study methods

All subjects were evaluated with the *IADL Profile* (version 2.0) (appendix II) by the primary investigator in their home and community environments to reduce error variance attributable to the raters. Assessment video recordings were scored independently on two occasions (t1, t2) by three raters (R1, R2, R3). The two ratings of each video were separated by a one month interval, time enough to reduce the effect of memory on the ratings. Due to recruitment difficulties, the evaluations and video-based ratings took place over an eight month period. Raters did not discuss ratings amongst themselves throughout the duration of the project.

Video recordings were used to allow raters to score the test on two separate occasions. Video recordings were privileged over repeated testing as it would have been unreasonable to ask subjects with known problems of fatigue to repeat such a lengthy evaluation. Having four raters in the subject's home at any one time would have been overly intrusive and generally not possible. Use of video recordings also minimised the error associated with changes in IADL performance secondary to a learning effect. This is particularly important in relation to EF as tests are most sensitive during the initial administration when the tasks are less familiar. The use of video recordings also ensured that IADL performance did not vary across the assessment times due to changes in neurological status (maturation) as is typical during the first six months post-trauma. Video recordings of the test sessions were made by a research assistant.

Interviewer training

The four occupational therapists who participated as raters had been practicing occupational therapy for a mean of 5.25 years (range 0-11) and had been working in TBI programs for a mean of four years (range 0-8). Rater one (R1) had 10 years of experience working with a TBI population, rater two (R2) had no prior clinical experience with this clientele and rater three (R3) had five years of clinical experience with a TBI population. Raters underwent a standardized training regimen; a four-day training session given by the primary investigator (CB-R4), and also primary author of the *IADL Profile.* Here raters were introduced to the architecture of the test (objectives, conceptual frameworks, variables, administration procedure, scoring and interpretation) and practiced task analysis and scoring supported by videotaped administrations of the tool with TBI patients presenting various degrees of severity.

Sample size determination

Sample size for the reliability study was based on general guidelines proposed by Donner and Eliasziw (Donner & Eliasziw, 1987). A sample size of 30 subjects was thus judged sufficient for a generalizability study. This corresponded to the maximum number of subjects that was feasible to recruit to participate in this portion of the study. Finally, for reasons of costs, we were not able to evaluate more than 30 subjects.

Data analysis

To examine the reliability of the instrument, Cohen's unweighted kappa statistics (κ), percent agreement (PA) and generalizability coefficients (G coefficients) were computed. Cohen's κ serves to establish the concordance between raters correcting for concordance by chance on ordinal data (Landis & Koch, 1977). PA describes the number of occurrences where raters are in agreement by chance or not and provides useful information that complements information obtained from kappa statistics (see Cicchetti, 1988). The generalizability theory (G-study) is "concerned with the extent to which a sample of measurements generalises to a universe of measurement" (Crocker & Algina, 1986) and the computed statistic, a G coefficient, estimates the reliability of a measurement. In order to do so, the universe is defined in terms of measurement conditions called *facets* that capture relevant sources of variations. In this study two random facets were examined, *raters* and *occasions*. In keeping with generalizability theory, the variation due to the subjects is the basis of the universe score and as such is not considered as a facet. A typical G coefficient is the ratio of universe score variance to expected observed score variance. Two types of G coefficients are computed, relative and absolute; the absolute coefficient is based on the "error involved in using an examinee's observed mean score as an estimate of his or her universe score" (Brennan, 2001) whereas the relative coefficient depends upon "the error associated with using an examinee's observable deviation score as an estimate of his or her universe deviation score" (Brennan, 2001). Two designs were used: a single-facet design with four raters (the three trained raters at time one and the primary investigator) assessing all subjects and a two-facet design with three trained raters assessing all subjects on two occasions (t1, t2). For each design the G coefficients were averaged over the exact raters and occasions (the so-called G-study), then for a number of relevant designs aimed at optimizing decision making (D-study). The D-study was used to calculate dependability coefficients (D coefficients) that reflect clinical reality, that is, in the clinical setting a single therapist assesses each subject on one occasion. We also calculated D coefficients for a situation where the therapist is assisted by a student, thus two examiners on one occasion. We then considered a teaching situation where as many as 15 therapists may rate video-based tests on a single occasion. Finally, we considered a test-retest situation, where a single therapist tests a subject on two occasions. All generalizability analyses were performed using EduG (2.0) (Cardinet & Tourneur, 1985). Other analyses will be performed using SPSS (14.0) and SAS (9.0).

Kappa coefficient values between 0.81 and 1.00 represent almost perfect agreement beyond chance, values between 0.61 and 0.80 substantial agreement, values between 0.41 and 0.60 moderate agreement, values between 0.21 and 0.40 fair agreement, values between 0.00 and 0.20 slight agreement, and values below 0.00 poor agreement (Landis & Koch, 1977). G coefficients greater than or equal to 0.8 are generally considered satisfactory (Bain & Pini, 1996). In the context of this study, G coefficients less than 0.6 were interpreted as indicating that agreement was not acceptable..

Step 4: Reliability: Internal consistency

To address the objective of determining the internal consistency of the instrument, the *IADL Profile* (version 2.0) was administered by one of three trained occupational therapists to 100 TBI subjects in their home and community environments. Thirty of these had previously participated in the intra and inter rater agreement component of the reliability study. Cronbach's alpha coefficient was estimated for the total scale on data obtained on these subjects. An alpha coefficient is used to estimate the reliability of a summation of items (Bravo & Potvin, 1991). It uses data obtained from a single administration of the test to verify the consistency of responses over items. Alpha coefficients of 0.7 or higher are usually regarded as indicative of acceptable internal reliability (De Vellis, 1991); values above 0.8 are conventionally considered high and values above 0.9 as very high. This analysis was completed using SPSS (14.0) for Windows.

To determine the internal consistency of the sub-scales identified by factor analyses (Step 5), Cronbach's alpha coefficients were estimated based upon scores obtained by the 100 TBI subjects for items grouped under each factor.

Step 5: Factorial validity

To determine the factorial validity of the instrument, data obtained on the 100 TBI subjects in step 4 were analysed.

Sample size determination

Sample size for this step was based on general guidelines requiring a minimum of 100 subjects for factor analytic studies (Pedhazur & Schmelkin, 1991). A sample of 100 moderate or severe TBI subjects was also judged to be the largest that could feasibly be recruited for an observational study carried out in subjects' home and community environments.

Data analysis

A two-stage approach to factorial validity was used: exploratory factor analysis (EFA) followed by confirmatory factor analysis (CFA). EFA has been shown to be a useful heuristic strategy for model specification prior to cross-validation with CFA (Gerbing & Hamilton, 1996). Hence, the models shown to best fit the data in EFA were subsequently tested with CFA, as well as theoretically founded alternate models. All analyses were performed on scores obtained on the *IADL Profile* (version 2.0) by the 100 TBI subjects.

Factor analytic techniques were used to identify the underlying dimensions (or factors) that best explain the variance in the original set of variables (Pedhazur & Schmelkin, 1991). These techniques explore the clustering of responses to different items and the extent to which these clusters correspond to hypothesized theoretical constructs. In this study, the two constructs that were analyzed were IADL (tasks) and four operations related to EF. The analyses included several steps. First, exploratory principal axis factoring, with varimax (orthogonal) and oblimin (oblique) rotations, were used to identify the most conceptually meaningful factors (and hence the most pertinent sub-scales). Factor patterns, communalities, Bartlett's Test of Sphericity and the Kaiser-Meyer-Olkin Measure of Sampling Adequacy were used as indicators of the quality of the factor structure. The communality of a variable is defined as the proportion of the variance of the variable that is accounted for by the common factors (Hogarty, Hines, Kromrey, Ferron, & Mumford, 2005). Values between 0.60 and 0.80 indicate high communality; values below 0.4 indicate low communality (Hogarty et al., 2005). Values inferior to 0.30 are considered poor. A p-value inferior to 0.05 for Bartlett's Test of Sphericity indicates that the correlation matrix significantly differs from an identity matrix (Tabachnick & Fidell, 1996). Kaiser-Meyer-Olkin Measure of Sampling Adequacy measures the factorability of the correlation matrix (Tabachnick & Fidell, 1996). Values above 0.80 are considered "meritorious" (Kaiser, 1974). Saturation loadings represent the regression coefficients of the items on the factors. Loadings in excess of .71 are considered excellent, .63 very good, .55 good, .45 fair and loadings less than .32 poor (Comrey & Lee, 1992; Tabachnick & Fidell, 1996). In this study, the cutoff was set at 0.35.

Second, CFA was performed in order to test the models that best fit the data in EFA as well as a set of alternate models. In CFA, regression coefficients of the items on the factors and the error variance of residuals are tested at a 0.05 significance level. These analyses were completed with Lisrel (8.72). In CFA, there is no single procedure that determines the adequacy of a model (Schermelleh-Engel, Moosbrugger, & Muller, 2003). Hence, a number of goodness-of-fit tests and indexes must be considered to determine model fit (Boomsma, 2000). The chi-square statistic is used to test the overall fit. A p-value greater than 0.05 indicates that the null hypothesis (the model tested) is not rejected and that the model fits the data. This test must be complemented by fit indices (Schermelleh-Engel et al., 2003). Fit indices, selected because of their appropriateness for this study, can be grouped into three categories: (1) descriptive measures of overall model fit (Root Mean Square Error of Approximation [RMSEA]; Standardized Root Mean Square Residual [SRMR]); (2) descriptive measures based on model comparisons (Non-normed Fit Index [NNFI]; Comparative Fit Index [CFI]) and (3) descriptive measures of model parsimony (Parsimonious Normed Fit Index [PNFI]) (Schermelleh-Engel et al., 2003). The RMSEA (Steiger, 1990) is relatively independent of sample size and is a measure of approximate fit in the population. According to Hu & Bentler (Hu & Bentler, 1999), RMSEA values less than 0.6 indicate a good fit. The SRMR (Bentler, 1995) is an overall badness of fit measure. Values less than 0.05 indicate a good fit and values smaller than 0.10 can be considered acceptable (Schermelleh-Engel et al., 2003). NNFI and CFI values of 0.97 indicate good fit relative to the independence model and values greater than 0.95 indicate acceptable fit (Schermelleh-Engel et al., 2003). PNFI range "between 0 and 1 with higher values indicating a more parsimonious fit" (p.44) (Schermelleh-Engel et al., 2003).

Step 6: Criterion-related validity

As the *IADL Profile* was developed to document both IADL independence and the repercussions of executive deficits on everyday tasks in real-world environments, this portion of the study examined the relationship between the *IADL Profile* and tests of EF.

More precisely, we looked at the correlations between the tool and a measure of planning ability i.e. the Tower of London (Shallice, 1982), a measure of inhibition, i.e. the Stroop, (Golden, 1978a; Stroop, 1935), and a measure of working memory, i.e. the Working Memory Index of the Working Memory Scale III (Wechsler, 1997). We also examined the correlations between *IADL Profile* scores and trauma severity, sociodemographic characteristics such as age, level of education, and, gender and certain environmental characteristics (e.g. distance to the grocery store). The analyses were conducted using data obtained on the 100 TBI subjects in step four.

Criterion measures

Trauma severity:

The **Glasgow Coma Scale (GCS)** (Teasdale & Jennett, 1974) is an internationally recognized criterion measurement of TBI injury severity. It is a measure of level of consciousness. Three indicators of level of consciousness have been retained: eye opening, best motor response and verbal response. The total score varies from 3 to 15. A score ranging between 3 and 8 indicates a severe TBI, between 9 and 12 a moderate TBI and between 13 and 15 a mild TBI. In our study, information regarding the GCS was extracted from the patients' medical files.

Coma duration: According to Jennett & Teasdale, altered consciousness is the most consistent indicator of brain damage (Jennett & Teasdale, 1981). These authors define coma as "not obeying commands, not uttering words, and not opening eyes" (p.80). A patient who fails to meet anyone of these three components is regarded as not being in a coma. Coma has also been defined as a pathological state of profound and sustained unconsciousness (Vanier & Dutil, 1998). According to Levin et al. (1988) and cited in Lezak et al. (2004), coma has been defined as occurring when the GCS score is less than or equal to eight in patients without spontaneous eye opening, ability to obey commands or comprehensible speech (Levin, Williams, & Crofford, 1988). In our study, information on coma duration was extracted from the patients' medical files.

Posttraumatic amnesia (PTA) is a criterion for severity of brain injury (Ahmed, Bierley, Sheikh, & Date, 2000). It is defined by some as the time of injury to when the patient resumes "continuous memory" (Russell & Nathan, 1946) whereas others suggest that the beginning of PTA should only be considered once the person is out of a coma (Levin, Benton, & Grossman, 1982). PTA varies from minutes to months, typically lasts about four times the length of coma (Brooks, 1989) and is considered one of the best predictors of outcome following TBI (Ahmed et al., 2000; Ropacki, 2000). PTA is frequently documented using prospective measures such as the Galveston Orientation and Amnesia Test (Levin, O'Donnell, & Grossman, 1979). Based on this measure of orientation, a client who obtains three consecutive daily scores of 75 or greater is considered to be out of PTA. According to the guidelines used within the clinical settings at the time of this study, a PTA varying between 1 and 14 days is indicative of moderate TBI and a PTA of several weeks is indicative of severe TBI (Ministère de la santé et des services sociaux, 1999). In our study, information on PTA was extracted from the patients' medical files.

Executive functions:

Though a wide variety of measures of EF are present in the literature, three measures were selected for use in this study: the Stroop, the Tower of London and the Working Memory Index of the Working Memory Scale-III. These measures were carefully selected to better capture unique EF (inhibition, planning, and working memory). All three measures are gold standards in the literature and have been extensively used to measure different aspects of EF (Cockburn, 1995; MacLeod, 1991; Phillips, Wynn, McPherson, & Gilhooly, 2001; Stuss, Floden, Alexander, Levine, & Katz, 2001; Tulsky & Ledbetter, 2000; Unterrainer, Rahm, Leonhart, Ruff, & Halsband, 2003). Strong evidence of psychometric properties has been documented and validated French translations are available.

The **Stroop** (Golden, 1978a; Stroop, 1935), more specifically the Stroop interference measure, is used as a measure of inhibition, i.e. it documents the extent to which a person can inhibit the strongly ingrained habitual response of reading in order to name the color in which a word is written. This deliberate, controlled suppression of prepotent responses is commonly labelled as an EF linked to the frontal lobes (Miyake et al., 2000). In the present study, a French translation and adaptation of the Golden version of the test was used (Vanier, 1991) as it is one of the versions with the most thoroughly documented psychometric properties (Canning, 2002). This version of the *Stroop* consists of three subtasks; a word reading test, a color naming test and a color word naming test. The person is instructed to read as many words or to say as many colors as possible within a time limit of 45 seconds. The Golden version produces an interference score that isolates the inhibition component. According to MacLeod (1991) the interference score is the most prevalent manner in which this test is scored (MacLeod, 1991). Test-retest reliability reported in the manual is acceptable (Golden, 1978b). Though the test manual presents normalized scores adjusted for age and level of education, raw scores were used in the present study as results obtained on the Stroop were compared to scores obtained on the *IADL Profile*. As the latter scores were not adjusted for age or education, use of normalized Stroop scores would have introduced a component of error into the estimated correlations between these two measures. We thus used raw scores of each subtask to calculate the interference score.

The **Tower of London** (ToL) test was developed by Shallice to identify deficits of planning, in individuals with frontal lobe lesions (Shallice, 1982). The test consists of 12 problems (reproduction of a model according to specific rules) of graded difficulty ranging from two to five moves. The task requires that the subject look ahead to determine the order of moves necessary to rearrange three colored balls from their initial position on three pegs of different heights to a new set of predetermined positions on the three pegs. A problem is scored correct if the solution is achieved within the minimum number of moves necessary, rules are not broken and the solution is attained within 60 seconds. Results are summarised in terms of the number of problems correctly answered on the first trial. The ToL has been shown to be sensitive to frontal lobe dysfunction (Owen, Downes, Sahakian, Polkey, & Robbins, 1990; Shallice, 1982; Shallice & Burgess, 1991) and functional imaging studies have shown a major role for the prefrontal cortex during task performance (Baker, Rogers, Owen, & al., 1996). Though the ToL remains a gold standard for the measurement of planning ability, certain studies have failed to show its ability to discriminate between TBI with and without frontal lobe lesions (n=20) (Cockburn, 1995).

The **Weschler Memory Scale** (WMS) is said to be the most widely used and most recognizable memory battery (Lezak et al., 2004b). The most recent version, the Weschler Memory Scale – III (WMS III) (Wechsler, 1997), consists of 8 indexes, only one of which, the Working Memory Index (WMI), was used in the present study. The WMI is made up of two primary subtests, the Letter-Number Sequencing and the Spatial Span subtests. In the Letter-Number Sequencing subtest, subjects hear lists of randomized numbers and letters (in alternating order) of increasing lengths (from two to eight units). Subjects are then asked to separately repeat numbers and letters from the lowest to the highest in each series; numbers must always be given first. In the Spatial Span subtest, subjects must reproduce a sequence of blocks identified by the examiner, first in a direct order and then in a reverse order. Raw scores of the Letter-Number Sequencing subtest range between 0 and 21 and between 0 and 32 for the Spatial Span subtest. These scores are then transformed into scaled scores corrected for age which are then converted into a WMI score. These scores range from 49 to 155. Reported reliability coefficients for the WMS III are acceptable (Lezak et al., 2004b).

Procedure

Research assistants trained and supervised by a qualified neuropsychologist administered three measures of EF to the subjects (n=100). Neuropsychological testing lasted between 45 minutes and one hour and took place in subjects' homes. The order of testing was constant in all cases with neuropsychological tests administered first, immediately followed by the *IADL Profile*. All tests were administered on the same day. The occupational therapist who administered the *IADL Profile* was blind to neuropsychological testing results. Information regarding trauma severity was extracted from health records at the time of injury.

Sample size determination

Sample size for the validity study was based on general guidelines requiring a minimum of 100 subjects for factor analytic studies (Pedhazur & Schmelkin, 1991). A sample of 100 moderate or severe TBI subjects was also judged to be the largest that could feasibly be recruited for an observational study carried out in subjects' home and community environments. These same subjects were analyzed for the criterion-related validity study.

Data analysis

Criterion-related validation is defined as the study of the relationship between test scores and a practical performance criterion (Crocker & Algina, 1986). To address the objective of criterion-related validation, measures of relationships (Pearson's correlations) and comparison of means (t-tests) were examined between scores obtained on the *IADL Profile* (factor and total scores) and concomitant variables related to injury severity (GCS, PTA, and coma duration), demographic characteristics (age, gender, level of education), and evaluation environment (distance to grocery store, urban / rural). Concurrent validity, a type of criterion-related validation, refers to the relationship between test scores and a criterion measurement made at the time the test was given (Crocker & Algina, 1986). In this study, scores obtained on the *IADL Profile* were compared, using Pearson's correlation coefficient for continuous measures, with scores obtained on EF measures of inhibition (Stroop), planning (ToL) and working memory (WMI). Pearson correlation coefficients are a measure of the degree of linear relationship between two sets of observations. The magnitude of the number represents the strength of the relationship between the two variables and the sign of the number indicates the positive or negative direction of the relationship (Crocker & Algina, 1986).

Next, for each of the variables of interest (e.g. age, gender, level of education, trauma severity, measures of EF) independent sample t-tests were conducted as a complement to the correlations. The mean *IADL Profile* scores (factor and total scores) of two subgroups, that is the 20 subjects with the highest independence scores and the 20 subjects with the lowest independence scores, were compared with the mean of these same subjects on all variables of interest. As these t-tests focused on contrasting the highest and lowest ends of independence with variables of interest, they provided information that was complementary to that obtained with correlations that are measures of relationship based on whole sample data.

Ethics

The research protocol was submitted to the institutional ethic's review board of all participating facilities (appendix III). Written consent was obtained from all subjects (appendix IV). Confidentiality of the information obtained was respected as evaluation results were kept under lock and key in the principal investigator's research laboratory and access was restricted to members of the research team.

Chapter 4

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

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

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Role of the candidate:

The candidate completed a full literature review to document known effects of evaluating activities of daily living in a home environment. She analyzed related studies to examine whether ADL assessments completed in the home environment have been shown to be superior in any way to hospital based assessments. She wrote a number of drafts of the manuscript that were commented on by her research directors. The article has been published in the following journal:

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Abstract

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: Ecological validity, activities of daily living evaluation, context, independence

Introduction

Occupational therapists frequently use performance-based evaluations of activities of daily living (ADL) (e.g. A-One, PRPP, ADL Profile, AMPS) (Gudrun Arnadottir, 1990; Chapparo & Ranka, 1996b; Dutil, Bottari, & Vanier, 2002; Dutil et al., 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, 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 which 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 (TBI) 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, 1998; Dutil et al., 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 leaving 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, 2003) and the Perceive, Recall, Plan and Perform System of Task Analysis (PRPP) (Chapparo & Ranka, 1996b) 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) (Gudrun 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 behavioral observations in the home with TBI patients 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 versus 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 (Hamonet & 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, in the home and in the surrounding community, include 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 one's mouth, the ability to transfer from one's wheelchair into one's 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 et al., 2001; Hoppes et al., 2003; Lysack et al., 2000; MacNeill & Lichtenberg, 1997; MacNeill et al., 2000).

Nosek and Fuhrer 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 (Nosek & Fuhrer, 1992). A complex interrelationship 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 persons' 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, 1996a), 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 (Organisation mondiale de la santé, 2001) and the Competence Environmental Press Framework (Gitlin, Corcoran, Winter, Boyce, & Hauck, 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 behaviors and have potentially detrimental consequences for the person. The Competence Environmental Press Framework (Gitlin et al., 2001) further postulates that as competency declines, an environmental approach to treatment will minimize 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 behaviors or situations other than those involved in the assessment procedure (i.e. behaviors that occur over long periods of time and in a variety of real-world settings) (Franzen & Wilhelm, 1996; Sbordone, 1997). Overlaps with other forms of validity include face validity (similarity between the test items and behaviors in the real-world environment) and predictive validity (extent to which test results predict behavior in the real-world environment) (Franzen & Wilhelm, 1996; Silver, 2000). However, predictive and ecological validity are two distinct concepts. Predicitive 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 (Sweet, 1999). In essence, to test ecological validity, two concurrent measures of performance are considered whereas in predicitve 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: 1) administration of the test in a quiet environment with few distractions where task demands are minimized; 2) assistance provided by the examiner for the maintenance of task focus, motivation and persistence; and 3) assistance in limiting frustration and fatigue (Cripe, 1996). These can be summarized 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, multi-tasking 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 functionning within a real-world setting. To address the issue of the ecological validity of neuropsychological tests, results obtained on these tests are generally compared to the person's overall functioning in everyday life. Peoples' performance on ADL assessments is used as the criterion of choice for this comparison (Farias, Harell, Neumann, & Houtz, 2003; Higginson, Arnett, & Voss, 2000).

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 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 which require the evaluator, as opposed to the patient, to complete 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, 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 described above, were used by our research team to develop an ADL assessment called the ADL Profile (Dutil et al., 2002; Dutil et al., 2005; Dutil et al., 1990; Dutil et al., 1996). 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 et al., 1994a, 1994b). 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 emphasizes 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 behavioral and cognitive disturbances associated with executive processes (Eslinger & Damasio, 1985; Gadoury, 2001; Shallice & Burgess, 1991; Stuss & Benson, 1986; von Cramon & Matthes-von Cramon, 1994). Also, the observation of routines rather than individual tasks creates the possibility of observing multi-tasking 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 favor 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 analyzes the methodological qualities and results of studies where persons with cerebral damage were administered a performance-based ADL assessment both in the hospital or clinic and in their home within a short time-period. The results obtained stem from a search of the following computerized 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, predicitive 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 due to the use of performance-based ADL observations outside of the context of a standardized ADL assessment (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). Moreover, the time elapsed in these latter studies between the two assessments was generally quite long (e.g. 2 years), since the studies measured rehabilitation outcomes and not the influence of context on ADL assessments. It is also important to note that Abreu et al. (2001) found evidence that persons with TBI judged their abilities higher than clinical ratings of actual performance.

Of the studies reviewed, only five met the following inclusion criteria: empirical studies that have administered, within a short time-interval, a standardized performance-based ADL assessment in both the home and in the clinic to persons with cerebral damage. Two included patients with dementia or suspected dementia (Hoppes et al., 2003; Nygard et al., 1994), and each of the following diagnoses were included in a single study: moderate or severe TBI (Darragh et al., 1998), older adults (average age 82 years) (Park, Fisher, & Velozo, 1994), and a mixed sample of psychiatric inpatients (Cooper-McNulty & Fisher, 2001).

Selection criteria and samples

All studies used small samples (12-20 subjects) and non-random selection of patients, methodological aspects which limit the interpretation of the results. Moreover, some samples, such as the study with mixed psychiatric inpatients, were highly heterogeneous (e.g. schizophrenia, dementia, bipolar affective disorder). For all studies, the degree and type of cognitive impairments was not documented beyond the general diagnosis. McNulty et al (2001) was the only study to have included barely detectable to severe cognitive deficits. In three of the studies (Darragh et al., 1998; Nygard et al., 1994; Park et al., 1994) there was a probable selection bias for patients who were less cognitively impaired as they were all living in the community alone or with a significant other. Moreover, as four of the five studies were with subjects living in the community at the time of evaluation, these results cannot be generalized to hospitalized patients awaiting discharge, as the home environment, in these cases, has most likely been adapted to the person's needs prior to assessment. Also, the degree of novelty of the home environment would be greater for patients hospitalized for weeks or months prior to assessment. Also, due to the profound physical or cognitive changes which can occur after TBI, persons may not recognize their home environment (Darragh et al., 1998). This would likely modify the results of the assessment. Only one study (Cooper-McNulty & Fisher, 2001) was with hospitalized 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 standardized task choices. Performance on each of 16 motor skills and 20 process (organizational / 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, 1994b; Doble, Fisk, MacPherson, Fisher, & Rockwood, 1997; Duran & Fisher, 1996b; Fisher, 1997; Pan & Fisher, 1994). However, it has certain limits. First, as only one task is performed at a time, multi-tasking is not observed. Second, the assessment is relatively brief (between 30 and 60 minutes) 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 which 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, or 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 fifty 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 dialing 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 is inter-rater reliability ($r=.99$ for both total score and motor time) obtained on ten subjects with Alzheimer's disease by two raters and test-retest ($r=.81$ for the total score and $r=.97$ for the motor time) obtained on ten control subjects at a one 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 two hours (Park et al., 1994) to anywhere between five and 29 days after discharge (Cooper-McNulty & Fisher, 2001). Trained AMPS raters (five 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., 1998; Park et al., 1994).

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). One study (Cooper-McNulty & Fisher, 2001) used Pearson product moment correlations to compare performance on the AMPS with results on a standardized 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 standardized 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 performances 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 ($t=2.925$, $p=.01$). In this study, the environment was not shown to have an effect on cognitive, instrumental activities of daily living 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. (1998) found the IADL mean process ability measure to be significantly better ($t= -4.28$, $p= .025$) 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 familiarized, 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-McNaulty et al (2001) reported moderate positive relationships between the clinic assessment of the AMPS and safety ($r=0.73$, $p=.002$) and between the home assessment and safety ($r=0.75$ $p=.01$). 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 which meet these characteristics and allow for the observation of behavior 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 hospitalized 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 realize that, prior to considering a home based assessment, the therapist must ascertain that the person has the necessary pre-requisite skills. Specifically, the person cannot be acutely ill, not at any great risk of injury (e.g. safety risk due to 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 by hypothesized that ADL assessments administered within the home would provide information which is more meaningful to the person, as compared to assessments which rely upon 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 will be well upon their discharge home. ADL 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.

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Chapter 5

A measure of IADL independence based on executive functions: development, interrater agreement and generalizability

A measure of IADL independence based on executive functions: development, interrater agreement and generalizability

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Abstract

Objectives: To study the intra and interrater reliability and the generalizability of the *IADL Profile*.

Design: The *IADL Profile* was administered by a trained occupational therapist (R4) in subjects' home and community environments. Video recordings were assessed on two occasions (t1, t2) by three raters (R1, R2, R3). The interval between the assessment sessions was 30 days.

Setting: Patients were recruited from eight rehabilitation hospitals in the province of Quebec.

Patients: Thirty patients with a moderate or severe traumatic brain injury aged 16 to 65 years (convenience sample).

Intervention: Not applicable

Main outcome measures: The Cohen κ, percent agreement and generalizability coefficients were used to calculate the intra and interrater reliability of the data.

Results: An eight-task (30-item) performance-based test of IADL independence based on executive functions was developed. Kappa coefficients comparing ratings of R1, R2, and R3 with main rater (R4) indicated fair to almost perfect agreement (82%). A high percentage of generalizability coefficients (60%) indicated satisfactory or perfect agreement. Raters were identified as the greatest source of measurement error.

Conclusions: The *IADL Profile* provides a reliable set of measures of IADL independence for use by occupational therapists.

Key words: Brain injuries, activities of daily living, psychometrics, home visits

Several outcome studies have shown that individuals who have sustained a moderate or severe traumatic brain injury (TBI) are at increased risk of life-long disability affecting social participation, particularly independence in instrumental activities of daily living (IADL), leisure and work skills (Brzuzy & Corrigan, 1996; Colantino et al., 2004; Dawson & Chipman, 1995; Gordon et al., 2006; Kozlowski et al., 2002; Whiteneck et al., 2004). These findings have been largely based on questionnaire type tests of independence in IADL that are subject to deficits in respondent awareness (Abreu et al., 2001) and typically overestimate levels of independence (Fischer et al., 2004; Hart et al., 1998). Furthermore, self-reported measures of IADL independence in TBI do not provide accurate estimates of specific areas of difficulty, nor of the type and amount of assistance required.

Observational studies of TBI subjects provide clearer indications of underlying deficits. Such studies have shown that the principal cause of impaired independence in TBI is the range of complex behavioral and cognitive disturbances associated with executive functions (EF) (Eslinger & Damasio, 1985; Gadoury, 2001; Shallice & Burgess, 1991; Stuss & Benson, 1986; von Cramon & Matthes-von Cramon, 1994). EF are broadly defined as the capacity to plan and carry out complex goal-directed behaviour (Lezak, 1983; Stuss & Benson, 1986). Data cumulated to date on EF has shown evidence that deficits are more severe in more complex and novel tasks (Burgess, 2000), in poorly structured tasks (Le Thiec et al., 1999) and in the presence of distracting stimuli in complex and dynamic environments (natural contexts) (Humphreys & Forde, 1998; Zalla et al., 2001).

However, to our knowledge, limited attention has been given to re-examining performance-based IADL measurement instruments for the consideration of components of EF in the measurement of IADL independence. Rogers (1982) defines independence in IADL as resulting from the competence of individuals 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 (Rogers, 1982). Moreover, Roger's definition of independence further argues in favor of an IADL test that considers the person in interaction with the environment in which they live (Bottari et al., 2006). The visible overlap between the concepts of EF and independence in IADL suggests that the use of IADL tests that do not consider EF may lead both to an *inaccurate estimation of the severity of the consequence of the TBI on ADL and* *perhaps more importantly to a poor analysis of the person's underlying deficits and of essential treatment interventions.* Thus a paradigm shift in the approach used to study IADL independence is required. A measurement instrument, the ADL Profile (Dutil et al., 2005; Dutil et al., 1990), was developed according to this new paradigm.

The *ADL Profile* documents independence in 20 personal and instrumental ADLs, in consideration of EF, within a real-world environment for individuals with a TBI. Tasks are scored using a four-level ordinal scale (dependence, verbal and / or physical assistance, independence with difficulty, independence) that relates independence in task performance and the manner in which tasks are performed. Tasks are analysed according to four operations (formulate goal, plan, carry out the task, and verify attainment of the initial goal), all of which consider separate but interrelated components of EF. To score the test, therapists associate observed behaviors to appropriate operations, analyse related underlying difficulties and determine whether assistance was required to complete actions related to each operation. A first study was conducted on a sample of 19 severe TBI subjects to explore the interrater reliability of the ratings of three trained raters on these operations (Rousseau et al., 1994b). Results showed that 82% of Cohen's kappa coefficients varied between fair (0.21-0.40) and almost perfect agreement (0.81-1.00) beyond chance (Landis & Koch, 1977) (36.1% fair, 34.4% moderate, and 11.5% substantial).

The present study aims to expand upon this previous work as we propose to develop and validate a new version of the *ADL Profile*, the *IADL Profile*, which considers recent advances in the field of EF, more specifically in the area of the ecological assessment of EF (Burgess et al., 2006). More precisely, the *IADL Profile* aims to provide a greater degree of task complexity (e.g. sequence of six tasks linked to the goal of preparing a hot meal), task definitions that consider components of EF, task analysis based on more explicitly defined operations related to EF, and an improved rating scale.

As IADL tests used to guide treatment interventions must have evidence of satisfactory psychometric properties to ensure that tools give consistent answers (test-retest reliability, interrater reliability) and that they measure what they purport to measure (validity) (Andresen, 2000), this article will present the first step in the validation of this two other tasks that we considered complex, i.e. telephoning for information, and managing one's finances. Both tasks were somewhat modified from the earlier version used in the ADL Profile in order to further increase task complexity. For instance, subjects were asked to plan a yearly rather than a monthly budget. The final task, "using public transportation", was selected for its potential to document subjects' ability to plan a bus route to get to a specific destination and to carry out their plan. This selection of tasks was then corroborated by a review of the literature covering IADL tasks used for the ecological assessment of EF and IADLs required for independent living (Ashley et al., 2001; Chevignard et al., 2000; Fortin, Godbout, & Braun, 2002; Fortin et al., 2003; Godbout & Doyon, 1995; Goel, Grafman, Tajik, Gana, & Danto, 1997; Huebner, Johnson, Miller, & Schneck, 2003; Le Thiec et al., 1999; McColl et al., 1999; Powell, Heslin, & Greenwood, 2002; Shallice & Burgess, 1991).

Next, we revised task definitions to include aspects related to all four components of EF (formulate goal, plan, carry out task, and verify attainment of initial goal) (appendices 1 and 2). The latter are used to guide the qualitative analysis of each task. Also, we modified the administration context of each task to provide therapists with clearer guidelines regarding the non-structured approach to be used when testing. For instance, examiners were instructed to arrive at subjects' homes, one or two hours prior to meal time in order to facilitate the observation of the goal formulation of tasks related to the overarching goal of preparing a hot meal. Further, specific instructions to be given to subjects were elaborated for each task to ensure that the information provided to subjects regarding the goal formulation and planning components of each task was consistently kept at a minimum across all subjects. Finally, we modified the scoring system. One of the problems identified with the scale of the ADL Profile related to the assistance score. Here, we estimated that an overly broad variety of subject profiles were included in this rating as the definition of assistance in the ADL Profile referred to the need for verbal assistance or for physical assistance or for both verbal and physical assistance. We therefore proposed a six-level rating scale (independence, independence with difficulty, need for physical assistance, need for verbal assistance, need for physical and verbal assistance, dependence). Moreover, in order to further operationalize EF within the *IADL Profile*, the rating scale was refined to the extent that for each operation, specific definitions were given for each level of independence. In addition, examples of behaviors illustrating each of these levels of functioning on each operation were given.

Next, we pilot tested the prototype with eight individuals with moderate or severe TBI within their home and community environments. From this, the need for further modifications to the prototype of the *IADL Profile* was identified. For instance, the duration of the test was too long for most TBI subjects due to important problems related to fatigue, necessitating the removal of the task with the longest administration time, i.e. using public transportation. Moreover, it was noted that several subjects could not be evaluated on this task either due to the absence of public transportation in the vicinity of their homes or because they out rightly refused to use the bus.

To examine the tool's content validity, the user's guide of the *IADL Profile* (version 1.0) including the tool's description, task definitions, and rating scale was submitted to an international committee of multidisciplinary experts. Selected experts were required to have five years or more of research or clinical experience with individuals with a TBI or frontal tumors and recognized expertise in relation to EF and IADL. Of the 14 selected experts, eight responded to our questionnaire. Among the eight experts who responded, one was a specialist in research methodology and instrument development and seven were content specialists (occupational therapists, neuropsychologists, neurologists and physiatrists). Their research experience was on average 14 years (range of 5 to 23 years) and their clinical experience with TBI was on average 18 years (range of 9 to 23 years). Experts were asked to judge the pertinence and clarity of the following aspects of the tool using a three-point rating scale: task definitions, instructions, definition of operations underlying task analysis and rating scale. A high percentage of experts judged task and operation's definitions, rating scale and instructions as both clear and pertinent. However, experts recommended that certain modifications be made to the prototype. For instance, it was suggested that "managing one's finances" be split into two separate tasks to reflect the different demands of the two finance-related questions. This task was therefore removed and replaced with "making a budget" and "modifying a budget". Also, instructions for the "doing daily house cleaning" task were judged to be unclear. We therefore removed the task and replaced it with "cleaning up after the meal" which was integrated into the series of tasks linked to the goal of preparing a hot meal. Forty-three percent of the experts judged the new six-level rating scale (modified from the original four-level scale of the ADL Profile) as not clear. Experts particularly questioned the appropriateness of the proposed scale modification representing a need for verbal assistance as a greater state of dependence than a need for physical assistance. Hence, the rating scale of the final prototype (version 2.0) submitted to the reliability study was a five-level ordinal scale (dependence, verbal and physical assistance, verbal or physical assistance, independence with difficulty and independence) (appendix 2).

Based on data obtained in the preliminary steps of this study (i.e. pilot test and content validity) a final prototype of the *IADL Profile* (version 2.0) (appendix 2) was prepared and submitted to the reliability study. The *IADL Profile* (version 2.0) consists in 33 items, i.e. 30 scores for six tasks with four operations and three tasks with three operations each and is rated used a five-level ordinal scale. Additionally, non-observed behaviours or actions are rated 8 (not observed for reasons intrinsic to the person) or 9 (not observed for reasons extrinsic to the person). The final selection of six tasks linked to the overarching goal of preparing a hot meal were labeled as follows: dressing to go outdoors, going to the grocery store, shopping for food, preparing a hot meal, having a meal with guests, and cleaning up after the meal. The final three tasks (obtaining information, making a budget, modifying a budget) are complex single tasks. The latter are rated on only 3 operations: the goal formulation operation is not rated as it is the examiner who formulated these goals. The test is administered within the person`s home and community environment within a three-hour session.

Participants

Subjects were recruited from eight post-acute TBI programs in Quebec. Inclusion criteria were patient age between 16 and 65 years and a moderate or severe TBI. A moderate TBI was defined by a score ranging between 9 and 12 on the Glasgow Coma scale (GCS) (Teasdale & Jennett, 1974), duration of loss of consciousness less than 6 hours, post-traumatic amnesia varying between 1 and 14 days, and generally positive scan. A severe TBI was defined by a score ranging between 3 and 8 on the GCS, duration of loss of consciousness greater than six hours, post-traumatic amnesia of several weeks, and positive scan. Exclusion criteria were disorientation (i.e., a score of 65 points or less on the Galveston Orientation and Amnesia Test (Levin et al., 1979)), severe mobility deficits (score < 3 on the transfer item of the Functional Independence Measure, FIM (Keith, Granger, Hamilton, & Sherwin, 1987)), severe language deficits (score < 4 on the communication item of the FIM) and history of hospitalisation for psychiatric disorders. Sample size for the reliability study was based on general guidelines proposed by Donner and Eliasziw (1987). It was thus estimated that a sample size of 30 subjects would be sufficient for a generalizability study (Donner & Eliasziw, 1987). Moreover, this corresponded to the maximum number of subjects that could feasibly be recruited. Prior to the evaluation, subjects were given verbal and written information on the study and signed statements of informed consent. Subjects were informed that they were free to withdraw from the study at any time. The study was approved by the ethical review boards of participating centres.

Raters

The four OTs who participated as raters in this study had been practising OT for a mean of 5.25 years (range 0-11) and had been working in TBI programs for a mean of four years (range 0-8). Raters underwent a standardized training regimen, a four-day training session given by the primary investigator (R4), and also primary author of the *IADL Profile.* Here raters were introduced to the architecture of the test (objectives, conceptual frameworks, variables, administration procedure, scoring and interpretation) and practised task analysis and scoring supported by videotaped administrations of the tool with TBI patients presenting various degrees of severity.

All subjects were evaluated with the *IADL Profile* by the primary investigator in their homes to reduce error variance attributable to the raters. The ADL evaluation was recorded with a video camera by a research assistant and subsequently analyzed by the three other raters (R1-R3) who completed independent ratings of the evaluations, blind to the others' test results. Three raters viewed videos (R1-3) of the test on two occasions (t1, t2). The two ratings of each video were separated by a one month interval, time enough to reduce the effect of memory on the ratings. Due to recruitment difficulties, the evaluations and video-based ratings took place over an eight month period. Raters did not discuss ratings amongst themselves throughout the duration of the project.

Procedures

Data collection took place between February 2005 and October 2005. IADL tests were administered on a single occasion and lasted approximately three hours. Repeated testing was not feasible as it would have been unreasonable to ask subjects with known problems of fatigue to repeat such a lengthy evaluation more than once and having four raters in the subject's home at any one time would have been overly intrusive and generally not possible. Hence, video recordings were used to allow raters to score the test on two separate occasions. Use of video recordings also minimised error associated to changes in IADL performance secondary to learning (particularly important in relation to EF as tests are most sensitive to EF deficits during initial testing when the test situation is most novel). Video recordings of the test sessions were made by a research assistant.

Data analysis

To examine the reliability of the instrument, Cohen's unweighted kappa statistics (κ), percent agreement (PA) and generalizability coefficients (G coefficients) were computed. Cohen's κ serves to establish the concordance between raters correcting for concordance by chance on ordinal data (Landis & Koch, 1977). PA describes the number of occurrences where raters are in agreement by chance or not. The generalizability theory (G-study) is "concerned with the extent to which a sample of measurements generalises to a universe of measurement" (Crocker & Algina, 1986) and the computed statistic, a G coefficient, estimates the reliability of a measurement. In order to do so, the universe is defined in terms of measurement conditions called *facets* that capture relevant sources of variations. In this study two random facets were examined, *raters* and *occasions*. In keeping with generalizability theory, the variation due to the subjects is the basis of the universe score and as such is not considered as a facet. A typical G coefficient is the ratio of universe score variance to expected observed score variance. Two types of G coefficients are computed, relative and absolute; the absolute coefficient is based on the "error involved substantial agreement, values between 0.41 and 0.60 moderate agreement, values between 0.21 and 0.40 fair agreement, values between 0.00 and 0.20 slight agreement, and values below 0.00 poor agreement (Landis & Koch, 1977). We completed this coherence analysis with a G-study on the ratings of the three raters who observed the video (R1-3), at t1, t2. G coefficients greater than or equal to 0.8 are generally considered satisfactory (Bain & Pini, 1996). In the context of this study, G coefficients less than 0.6 indicate that agreement is not satisfactory.

Once the coherence of the observations (observed / not observed) had been completed, the reliability analyses were calculated. Here, Cohen's κ were calculated on the ratings of R1-R4 on the scales' 33 items to identify items where agreement was poor to fair between the three raters (R1-R3) and the main evaluator (R4), considered as the norm, so as to bring necessary corrections to the rating criteria. PA was calculated on all items to complete information obtained with Cohen's κ. Analyses with Cohen's κ and PA were based on all levels of the scale including a non-observed category (grouping of both non-observed categories) and the sample size was uniform for all items (n=30). Finally, analyses based on the generalizability theory compared raters R1-R3 at t1 and t2 and R1-R4 at t1. Here the sample size varied for each item as analyses with the G coefficients were based solely on observed behaviors, that is scores ranging between 0 and 4.

As a final step, we examined the effect of recoding non-observed data based on the recommendations of an expert committee (who established revised rating guidelines) on the reliability of the instrument. To this end, Cohen's κ, PA and generalizability theory were re-examined on the four items with the greatest number of kappas inferior to 0.4 in the analysis of the coherence of the observations (observed / not observed), that is putting on clothes to go outdoors (planning), having a meal with guests (planning) and cleaning up after the meal (planning and verifying attainment of initial goal). For these four items, the expert committee's rating criteria were applied to existing data; items with ratings of 8 and 9 were recoded on a scale of 0-4 according to the committee's guidelines.

Results

Sociodemographic and clinical characteristics of the TBI sample are depicted in Table 1. As illustrated, the average age of the subjects was 40.9 years and the majority of them were men (77%). Sixty-three percent had a severe TBI and the average time post-injury was 12.9 months. One outlier at 240 months post-injury was removed to avoid skewing the results.

A preliminary examination of the coherence of the observations (observed / not observed) revealed that when the ratings of R1-R3 were compared to the ratings of the main evaluator (R4) at t1, 71.8% of kappa coefficients varied between fair and almost perfect agreement (19.2% fair, 9.1% moderate, 25.3% substantial, 18.2% almost perfect). When R1-R3 were compared with each other (t1, t2), 69.2% of kappa coefficients varied between fair and almost perfect agreement (19.7% fair, 12.6% moderate, 19.2% substantial, 17.7% almost perfect). When the ratings of each rater (R1-R3) were compared at t1, t2 (intra-rater), 82.8% of kappa coefficients varied between fair and almost perfect agreement (2.0% fair, 13.1% moderate, 36.4% substantial, 31.3% almost perfect). In the G study, when the ratings of R1-R3, at t1, t2 were analyzed, 66.7% of relative G coefficients indicated either satisfactory (G> 0.8) or perfect agreement (Table 2). As absolute G and D coefficients present distributions that are similar to those of relative coefficients, though slightly smaller in value, only relative coefficients will be presented so as to simplify the text.

Next, results of the reliability study proper on the tool's 33 items showed that when the ratings of R1-R3 (t1) were compared to the main evaluator (R4), 82% of kappa coefficients varied between fair and almost perfect (35% fair, 25% moderate, 15% substantial, 4% almost perfect) (Table 3). Paradoxically, certain kappas considered as poor (<0.00) or slight (0.00-0.20) had a high percent agreement (e.g. item 504: kappa: -0.02; percent agreement: 96.6). This is in line with a known behavior of the kappas (Cicchetti, 1988). In our study it represents near perfect homogeneity of the rating. That is for an item such as item 504 (having a meal with guests: attainment of the initial goal), subjects were nearly systematically (98%) rated "independence without difficulty" by all raters. There was no variance in the ratings. This first analysis permitted the identification of more problematic items (kappas inferior to 0.40) which, after examination, resulted in the removal of three items related to the task "modifying a budget" due to the evident lack of clarity of rating criteria. Subsequent analyses will therefore be reported on the remaining 30 items of the *IADL Profile.*

Results of the G-study based on the main evaluator's ratings (R4) compared to the ratings of R1-3, showed that a high percentage of relative G coefficients (60%) indicated either satisfactory (G>0.8) or perfect agreement (Table 4). Results of the D-study indicated that the largest number of relative D coefficients inferior to 0.6 that is 60%, were present when a single rater evaluates on a single occasion. Adding a second rater decreased the number of coefficients inferior to 0.6 to 26.7%. With 15 raters (1 occasion), no coefficients were inferior to 0.6. When the ratings of R1-R3 were analyzed at t1 and t2, 58.6% of G coefficients indicated either satisfactory (G>0.8) or perfect agreement (Table 5). Results of the D-study showed that the largest numbers of relative D coefficients indicating non-satisfactory agreement (D<0.6), that is 51.7%, were present when a single rater evaluates on a single occasion. Adding a second occasion only decreased this number to 48.3%. However, when the number of raters was increased to two, the number of D coefficients indicating non-satisfactory agreement was reduced to 34.5%. With 15 raters (1 occasion) this number was further reduced to 3.4%. Hence, results of both the G-study and the D-study indicate three things: 1) raters are the greatest source of variance with occasions adding little variance; 2) since in a clinical situation the norm is one or two raters and that several G coefficients are low in this situation, raters will require a mandatory training. This training will be modified from the training received by the raters who participated in the current study. Future training sessions will be substantially enhanced by providing broader representations of potential evaluation contexts and an examination of raters' comprehension of rating criteria. The new training sessions will also provide clearer guidelines regarding the scoring of non-observed behaviours; 3) the test is optimally reliable in a teaching situation when a greater number of raters are involved.

In the final series of analyses, we examined the effect of the expert committee's revised rating criteria for observed / non-observed behaviors on the reliability of the data for the four items (602, 604, 502 and 102) with the greatest number of kappa coefficients inferior to 0.4 in the analysis of the coherence of the observations (observed / not observed). Before recoding (scale 0-4), 42 % of kappa coefficients indicated fair to almost perfect agreement; PA ranged between 30 and 79.3% (Table 6). Results of a reanalysis of these four items after recoding of non-observed behaviors subsequently showed that 71% of kappa coefficients indicated fair to almost perfect agreement; PA ranged between 60 and 100%.

Discussion

The present study was prompted by the need to establish the reliability of a new performance-based measure of IADL independence (the *IADL Profile*) in adults with moderate and severe TBI. Results indicate that ratings are coherent (i.e. agreement between raters' judgments regarding whether behaviors were observed or not observed) for the majority of cases. Regarding the interrater agreement of the scoring of observed behaviours, 82% of kappa coefficients varied between fair (0.21-0.40) and almost perfect (0.81-1.00) agreement between R1-R3 and the main evaluator (R4). The generalizability study showed that 60% of G coefficients indicated satisfactory (G>0.8) or perfect agreement. As expected for this type of study, results of both the G and D studies provide substantial evidence that the greatest source of measurement error is the raters (Bottari et al., 2007). Explanations of the weakest coefficients could be attributed to a number of factors each of which are discussed below: the instrument itself, the evaluation context, video effects and the raters.

The *IADL Profile*

Two fundamental challenges were considered in the development of the *IADL Profile*. First, investigators sought to provide a measure in which each of four fundamental components of EF were not only included in the definitions of each task of the *IADL Profile* but were also the core elements of task analysis and implicitly of the rating scale. Hence, given the complexity of TBI, of EF and of the interactions of persons with their real-world environment, it is not surprising that interrater reliability was not optimal in all instances. However, inspection of the data enabled a committee of experts to identify areas of disagreement between the raters and thus to propose rating criteria modifications, later shown to improve reliability. Of particular relevance, was measurement errors associated with items that were not performed. For instance, all task definitions included a component of verbalizing one's intent prior to carrying out the task. As in several instances individuals were observed to proceed with carrying out the task without a priori stating their intent, new rating criteria stipulate that the ability to carry out the task is to be considered a reflection of the ability to formulate an intent, in instances when the rater clearly does not formulate the goal in situ. Such items should be rated independent without difficulty.

Second, certain items (e.g. having a meal with guests, planning) lacked difficulty for the subjects in this study. This led to occurrence of a seemingly paradoxical situation whereby agreement was very high but reliability was low (Cicchetti, 1987). To improve the reliability of items such as these would require that future validation samples contain subjects with a broader spectrum of abilities. Alternately, this may also suggest that a task as simple and familiar as "having a meal with guests" may need to be removed from the test. These results also support the premise that only complex and novel tasks are sensitive to deficits in EF.

Third, with the intent of measuring real-world performance, raters had to contend with evaluation contexts that differed for each subject evaluated. This added to measurement error. Rating criteria have been modified accordingly to reduce this effect. For example, as the test is administered in subjects home and community environments, certain individuals may, upon hearing the initial test instructions, rightly state that they have all ingredients required to prepare a meal for three people. They may thus not formulate the goal of going to the grocery store and shopping for groceries and proceed directly to formulating the goal of preparing a meal. New administration guidelines will state that in these instances the examiner should provide the subject with the following supplementary information: "It would allow us to see you doing more things if you used the 20$ that we provided". New rating criteria will stipulate that providing this supplementary information will not be considered as helping the subject formulate goals but rather as a clarification of the evaluation context.

Evaluation context

Despite the expected benefits of real-world tests reported in Chapter 4, evaluations that are administered within a real-world environment are subject to a wide variety of influences that are not controlled by the examiner and that thus can become important sources of measurement error. For instance, real-world environments include the presence of people other than the examiner such as spouses, parents and children. Though the evaluation protocol included specific guidelines regarding information given to these individuals (i.e. all were invited to observe but were asked not to intervene during the test), certain individuals nonetheless intervened. These interactions were a source of error and rating criteria have been expanded to reduce their effects. For instance, new rating criteria will stipulate that in all instances where the subject requests help from a family member, the item will be rated as "requires assistance" either verbal or physical. Alternately, when family members offer unsollicited help, this will be considered in the overall analysis of task performance but will not outrightly be identified as a need for assistance.

Also, 63% of evaluations took place in urban settings and 37% in rural settings. As availability of food for meal preparation, distance to the grocery store and means of getting to the grocery store were voluntarily not controlled in the evaluation process, this led to large variability in the spectrum of behaviors to be analyzed and to measurement error. For instance, in certain instances, subjects opted to be driven to the grocery store, due to the distance to the grocery store and to their inability to drive. New rating criteria now address each of these situations. No changes to the evaluation process were deemed necessary.

Video effects

Also noteworthy is the difficulty for research assistants to film test situations that take place in public spaces and outdoor areas (video effect) and its evident contribution to measurement error. As consent was not always obtained from store managers (camera had to be turned off), weather conditions were at times poor (camera had to be turned off) and evaluation environments were at times complex (e.g. difficulty capturing all elements of task environments required to judge individuals' ability to carry out tasks, such as crossing streets, safely), all of these variables evidently affected the reliability of the data.

Raters

As raters were identified as the greatest source of measurement error, this suggests that their clinical experience with TBI and the four-day training session that was offered did not provide raters with sufficient guidelines for the scoring of subjects' performances. The specialized training session that was offered will therefore need to be revised so as to provide clearer guidelines for the rating of the numerous situations that can be observed when testing subjects in their own home and community environments. Moreover, a mandatory test of clinicans' understanding of the measurement instrument may be beneficial to further minimize measurement error associated with their scoring of subjects' performances.

Study limitations

Two limitations of this study should be considered in future research. First, though raters received a four-day training session, they were not tested to verify their understanding of the tool's rating criteria. Second, due to recruitment difficulties, the feasibility of the instrument was only tested on eight TBI subjects. This may have influenced the results in so far as the full range of situations to which the raters were confronted during this study had not been anticipated by the researchers nor integrated into the rating guidelines. Future training sessions will be substantially enhanced by providing broader representations of potential evaluation contexts, possibility for discussion between clinicians with a search for consensus on the rating of performances, and an examination of clinicians' comprehension of rating criteria.

Conclusion

The *IADL Profile*, after revision of the rating criteria, can be used with confidence as it demonstrates acceptable interrater agreement and generalizability estimates for its intended use with persons with a moderate or severe TBI. Use of this measure may help OTs more precisely measure IADL independence. The *IADL Profile* has the potential to yield pertinent information that will help develop better treatment interventions for this patient population. Further psychometric studies, such as factorial and criterion-related validity, will be reported elsewhere.

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Table 1- Description of sample for reliability and generalizability study (n=30)

Variable	Values
Age	40.9 ± 16.6
Gender, % men (n)	77 (23)
Education (years)	11.6 ± 3.4
TBI severity, % (n)	
Severe	63.3 (19)
Moderate	36.7 (11)
Time post-injury (months)	12.9 ± 10.6*
Mobility outdoors, % (n)	
Walked with / without orthosis	76.7 (23)
Walked with a cane or walker	16.7 (5)
Used a wheelchair	6.7 (2)
Living situation, % (n)	
Lived alone	27 (8)
Urban setting	63 (19)

Note: Values are mean ± standard deviation (SD) unless otherwise indicated.

* 1 outlier was removed

Table 2: Generalizability study

Three raters, two occasions: Codes observed / not observed (n=30)*

Item Number	Item description	Relative G	Absolute G
	Putting on outdoor clothes		
101	Formulate goal	**.829**	.760
102	Plan	.626	.514
103	Carry out task	**.935**	**.937**
104	Verify attainment of goal	**.935**	**.937**
	Going to grocery store		
201	Formulate goal	**.891**	**.887**
202	Plan	.556	.478
203	Carry out task	.648	.641
204	Verify attainment of goal	**.828**	**.826**
	Shopping for groceries		
301	Formulate goal	**.901**	**.896**
302	Plan	**.809**	.790
303	Carry out task	**.908**	**.898**
304	Verify attainment of goal	**.942**	**.941**
	Preparing a hot meal		
401	Formulate goal	*	*
402	Plan	.615	.595
403	Carry out task	*	*
404	Verify attainment of goal	.512	.505
	Having a meal with guests		
501	Formulate goal	*	*
502	Plan	.287	.137
503	Carry out task	*	*
504	Verify attainment of goal	*	*
	Cleaning up after meal		
601	Formulate goal	.445	.345
602	Plan	.231	.156
603	Carry out task	**.824**	**.813**
604	Verify attainment of goal	.630	.588
	Obtaining information		
702	Plan	**.973**	**.973**
703	Carry out task	**.879**	**.875**
704	Verify attainment of goal	**.880**	**.858**
	Making a budget		
802	Plan	**.902**	**.900**
803	Carry out task	**.934**	**.928**
804	Verify attainment of goal	**.866**	**.864**
	Modifying a budget		
902	Plan	**.886**	**.885**
903	Carry out task	.756	.713
904	Verify attainment of goal	.710	.663

*Perfect agreement

Table 3: Interrater agreement

Three raters (R1-R3) compared to main rater (R4): Scale 0-4 (n=30)*

Item Number	Item Description	Rater 1		Rater 2		Rater 3	
		kappa	% agreement	kappa	% agreement	kappa	% agreement
	Putting on outdoor clothes						
101	Formulate goal	**.790**	93.1	.240	55.1	**.630**	86.2
102	Plan	**.403**	70.0	.356	72.4	.210	52.7
103	Carry out task	**.422**	65.5	**.735**	82.8	**.431**	82.8
104	Verify attainment of goal	**.888**	96.6	**.888**	96.6	**.888**	96.6
	Going to grocery store						
201	Formulate goal	**.520**	79.3	.337	79.8	**.440**	75.9
202	Plan	.321	71.4	.368	75.1	.230	60.8
203	Carry out task	.340	44.7	**.403**	58.6	**.489**	55.2
204	Verify attainment of goal	**.785**	96.6	**1.000**	96.6	**.530**	89.7
	Shopping for groceries						
301	Formulate goal	.243	48.3	.398	62.1	.323	55.1
302	Plan	.162	41.3	**.580**	75.9	.258	55.1
303	Carry out task	.296	51.7	**.481**	65.5	.326	58.6
304	Verify attainment of goal	.318	79.3	.318	79.9	**.687**	89.7
	Preparing a hot meal						
401	Formulate goal	-.053	79.3	-.083	72.4	.368	86.2
402	Plan	.280	51.6	**.518**	72.4	.333	58.5
403	Carry out task	.322	47.9	**.653**	75.9	**.592**	69.0
404	Verify attainment of goal	-.074	79.3	.216	82.7	.147	75.8
	Having a meal with guests						
501	Formulate goal	.310	93.1	.260	68.9	.000	93.1
502	Plan	.069	51.7	.162	55.1	.098	51.7
503	Carry out task	**.437**	79.3	.341	72.4	.171	72.4
504	Verify attainment of goal	-.020	96.6	.000	96.6	.000	100
	Cleaning up after meal						
601	Formulate goal	**.785**	96.6	.223	58.6	**.722**	93.1
602	Plan	.319	65.5	.110	51.7	.160	55.2
603	Carry out task	**.489**	69.0	**.552**	72.4	**.409**	62.1
604	Verify attainment of goal	.119	58.6	**.438**	72.4	**.444**	79.3
	Obtaining information						
702	Plan	**.467**	62.1	**.520**	65.5	**.652**	72.4
703	Carry out task	**.502**	62.1	**.673**	75.9	**.800**	72.4
704	Verify attainment of goal	**.768**	72.4	**.712**	79.3	**.473**	65.5
	Making a budget						
802	Plan	**.536**	65.5	.357	51.6	**.675**	75.9
803	Carry out task	.330	44.8	**.474**	58.6	.318	44.8
804	Verify attainment of goal	.290	55.1	**.448**	58.6	**.630**	72.4
	Modifying a budget						
902	Plan	.254	41.4	.310	44.8	.375	51.7
903	Carry out task	.201	34.5	**.446**	55.2	.375	44.8
904	Verify attainment of goal	.106	34.5	.257	41.4	**.444**	55.2

* According to Landis & Koch (1977), items in bold represent moderate to almost perfect agreement beyond chance.

Table 5: Generalizability study: Three raters, two occasions (Scale: 0-4)*

Item Number	n	G-study		D-study							
				1 rater / 1 occasion		2 raters / 1 occasion		15 raters /1 occasion		1 rater / 2 occasions	
		Relative	Absolute	Relative	Absolute	Relative	Absolute	Relative	Absolute	Relative	Absolute
103	20	.578	.503	.278	.229	.435	.372	**.852**	**.810**	.313	.253
201	23	.159	.159	.053	.053	.096	.096	.328	.328	.343	.322
202	15	.364	.362	.126	.125	.224	.222	.684	.671	.304	.304
203	20	**.894**	**.894**	.686	.686	**.814**	**.814**	**.970**	**.970**	.607	.561
204	25	.667	.667	.303	.333	.500	.500	**.882**	**.882**	.333	.333
301	24	**.828**	**.824**	.539	.535	.673	.668	**.858**	**.852**	.491	.431
302	20	.789	.785	.445	.437	.610	.603	**.902**	**.900**	.564	.558
303	23	**.891**	**.876**	.631	.610	.764	.748	**.934**	**.931**	.750	.719
304	24	.400	.392	.152	.148	.263	.257	.728	.715	.182	.177
401	29	**.802**	.799	.418	.412	.585	.580	**.895**	**.894**	.594	.579
402	25	**.901**	**.898**	.657	.652	.793	.789	**.966**	**.964**	.751	.747
403	26	**.864**	**.859**	.648	.641	.771	.766	**.923**	**.922**	.703	.694
404	27	.725	.724	.442	.438	.602	.598	**.876**	**.875**	.481	.480
501	20	.428	.423	.171	.168	.292	.288	.755	.752	.199	.196
503	30	.559	.541	.258	.247	.410	.396	**.836**	**.828**	.297	.283
601	15	.667	.645	.325	.310	.491	.473	**.878**	**.871**	.400	.377
603	25	.772	.757	.481	.460	.646	.626	**.917**	**.912**	.536	.515
604	17	.510	.500	.204	.200	.339	.332	.794	.779	.257	.251
702	28	**.886**	**.885**	.655	.654	.777	.775	**.925**	**.923**	.747	.747
703	27	**.932**	**.927**	.772	.759	**.871**	**.863**	**.981**	**.979**	**.821**	**.809**
704	21	**.964**	**.963**	**.862**	**.861**	**.926**	**.925**	**.989**	**.989**	**.898**	**.898**
802	22	**.907**	**.861**	.680	.608	.797	.745	**.937**	**.926**	.788	.693
803	22	**.840**	**.825**	.541	.524	.702	.685	**.947**	**.932**	.637	.616
804	17	**.860**	**.823**	.610	.557	.757	.714	**.957**	**.944**	.673	.610

*Items in bold represent satisfactory generalizability (G>0.8)

Note: Items 101, 102, 104, 502 and 504 present a perfect agreement and are therefore not included in the analysis. Once the non-observed codes were removed listwise, item 602 could not be analysed due to a lack of observed scores (0-4)

Table 6: Comparison of interrater agreement on scores 0-4 of problematic items before and after recoding

Item Number	N	R1 and R4 Kappa before	R1 and R4 Kappa after	R2 and R4 Kappa before	R2 and R4 Kappa after	R3 and R4 Kappa before	R3 and R4 Kappa after	R1 and R2 Kappa before	R1 and R2 Kappa after	R1 and R3 Kappa before	R1 and R3 Kappa after	R2 and R3 Kappa before	R2 and R3 Kappa after
102	30	**.403**	**1.000**	.356	**1.000**	.210	**1.000**	**.416**	**1.000**	.167	**1.000**	.194	**1.000**
502	29	.069	-.047	.162	**1.000**	.098	.000	.048	-.047	.048	.000	.318	.000
602	30	.319	.318	.110	**.545**	.160	**.629**	-.006	**.444**	.213	**.531**	.091	**.841**
604	28	.119	**.462**	**.438**	**.435**	**.444**	.384	.216	.367	.041	.104	.161	.202
		Percent agreement before	Percent agreement after	Percent agreement before	Percent agreement after	Percent agreement before	Percent agreement after	Percent agreement before	Percent agreement after	Percent agreement before	Percent agreement after	Percent agreement before	Percent agreement after
102	30	70.0	100.0	72.4	100.0	52.7	100.0	66.7	100.0	60.0	100.0	50.0	100.0
502	29	51.7	90.0	55.1	100.0	51.7	96.7	30.0	90.0	30.0	93.3	73.3	96.7
602	30	65.5	80.0	51.7	86.7	55.2	90.0	40.0	86.7	53.3	90.0	66.7	96.7
604	28	58.6	70.0	72.4	66.6	79.3	66.7	53.3	66.6	53.3	60.0	56.7	60.0

According to Landis & Koch (1977), items in bold represent moderate to almost perfect agreement beyond chance ($k > 0.4$)

Appendix 1: Rating scale of the *IADL Profile*

	LEVELS	DEFINITION
4 :	**Independence without difficulty**	Capable of performing all components of the operation alone, without difficulty, in a reasonable amount of time, and in an acceptable manner. Can use technical aids or take advantage of an adapted environment.
3 :	**Independence with difficulty**	Capable of performing all components of the operation alone, but difficulties are observed with respect to the length of time required to carry out the operation or with how the operation is carried out. Can use technical aids or take advantage of an adapted environment.
2 :	**Requires verbal or physical assistance**	Capable of performing all components of the operation with verbal or physical assistance, in a reasonable amount of time, and in an acceptable manner. This therefore implies a level of difficulty sufficiently high to prevent execution of the operation without intervention by the evaluator.
1 :	**Requires both verbal and physical assistance**	Capable of performing all components of the operation with verbal and physical assistance, in a reasonable amount of time, and in an acceptable manner. This therefore implies a level of difficulty sufficiently high to prevent execution of the operation without intervention by the evaluator.
0 :	**Dependence**	Unable to perform the components of the operation in a reasonable amount of time or in an acceptable manner, despite verbal and physical assistance.
8 :	**Not observed (intrinsic cause)**	Operation not evaluated for reasons intrinsic to the person. (e.g., must stop the assessment as the subject must leave for another appointment).
9 :	**Not observed (extrinsic cause)**	Operation not evaluated for reasons extrinsic to the person. (e.g., unable to go to the grocery store as the road conditions are extremely icy and dangerous).

Appendix 2: Task specific instructions of the *IADL Profile*

ITEM NUMBER	TASKS	INSTRUCTIONS
101-104	**Putting on outdoor clothing**	*"Without knowing it, you invited my assistant and I to have lunch with you. Please get ready to receive us. We will assume any incurred expenses for a maximum of $20"* "Now, please tell me what you are going to do" Added information: If the person proposes a cold meal, the examiner adds the following information: *"We would prefer, if at all possible, that you prepare a hot meal."*
201-204	**Going to the grocery store**	
301-304	**Shopping for groceries**	
401-404	**Preparing a hot meal for guests**	
501-504	**Having a meal with guests**	
601-604	**Cleaning up after the meal**	
702-704	**Obtaining information**	*"I would like you to find information on the daily schedule of bus departures to Toronto" "Now, please tell me what you are going to do"*
802-804	**Making a budget**	*"Imagine that you have a net annual income of $20,000, that you live alone in an apartment and that you have all your furniture and appliances. You would like to put money aside to buy a car within the next year by paying a portion of it in cash. Can you write your annual budget and give the details?" " Now, please tell me what you are going to do."*
902-904	**Modifying a budget***	*"You received an interesting job offer. However, the salary is 20% lower than your current salary. How would you adjust your expenses? Give different scenarios."* *"Now, please tell me what you are going to do".*

* Removed in the final version

Appendix 3: Example of task definitions of the *IADL Profile*

TASKS	DEFINITION
Putting on outdoor clothing	Dressing to go outdoors. This includes verbalizing the intent to go outdoors, choosing appropriate clothing, coordinating necessary movements to dress all body parts (e.g. hat, coat, boots), making necessary adjustments and verifying that attire is appropriate to the occasion, other (specify) :
Going to the grocery store	Moving outdoors on foot or in wheelchair and going to the grocery store. This includes verbalizing the intent to go outdoors, considering potential alternative means of going to the grocery store, considering the distance and the time required to go to the grocery store, walking or propelling wheelchair, crossing a street in a safe manner, making necessary adjustments along the way, verifying that anticipated destination has been reached, other (specify):
Shopping for groceries	Purchasing from the grocery store required food and beverages for the preparation of a hot meal. This includes verbalizing the intent to go grocery shopping, verifying which ingredients must be purchased for the meal, deciding on where to go make necessary purchases, considering the time required, making sure to have necessary money, choosing items according to pre-established plan, paying, placing purchases in grocery bags, making necessary adjustments along the way, verifying that items required for the meal preparation have been purchased, other (specify):

Appendix 4: Definition of operations of the *IADL Profile*

OPERATION	DEFINITION
FORMULATE A GOAL	Capacity: - to find a solution to satisfy a need or solve a problem situation.
PLAN	Capacity : - to think about the initial conditions before acting ; - to identify alternatives ; - to choose most adequate alternatives ; - to develop a general strategic and tactical plan of actions (sequence of actions or steps).
CARRY OUT THE TASK	Capacity : - to initiate his or her action plan ; - to carry out the plan of action while adapting to errors or novel situations (includes the surveillance / ongoing monitoring of task execution in relation to initial goal, endurance, manipulation and utilization of material); - to perceive errors in planning (time and space estimation errors) and execution (manipulation errors, tool selection errors) ; - to adjust actions in relation to perceived errors and new or unforeseen situations .
VERIFY ATTAINMENT OF THE INITIAL GOAL	Capacity : - to verify that the task initially planned was carried out ; compare the final result to the initial goal ; - To accept or reject the results ; - To end the task or to start the process again when the result is not attained.

Chapter 6

The factorial validity and internal consistency of the Instrumental Activities of Daily Living Profile in individuals with a traumatic brain injury

The factorial validity and internal consistency of the Instrumental Activities of Daily Living Profile in individuals with a traumatic brain injury

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Role of the candidate:

The candidate completed the literature review. In collaboration with her research directors, she submitted a grant proposal and obtained funding for this project. She prepared ethics applications and obtained ethics approval from the numerous centers involved in the project. She administered the *IADL Profile* to the majority of the 100 TBI subjects in their home and community environments, covering a distance of more than 10 000 km. She completed indepth qualitative analyses of subjects' ability to carry out all aspects of the test and scored all items. In collaboration with her research directors, she prepared an intensive four-day training workshop for the two raters who collaborated on the project. She reviewed all qualitative observations documented with the *IADL Profile* by these two raters and ensured that the ratings attributed to related items were congruent with revised rating guidelines developed secondary to the reliability study. With the guidance of her research directors, she completed the internal consistency and exploratory factorial analyses. She prepared the data set that was submitted to a statistician for confirmatory factor analyses, collated the results and collaborated with her research directors on the interpretation of the data. She wrote numerous drafts of the manuscript that were intensely scrutinized and commented on by her research directors. The final version of the manuscript has been submitted to the following journal:

Brain Injury

Abstract

Objective: To investigate the factorial validity and internal consistency of the *IADL Profile*.

Design: The *IADL Profile* was administered in the subjects' home and community environments by a trained occupational therapist familiar with the tool.

Setting: Patients were recruited from 12 rehabilitation hospitals in Quebec.

Patients: Ninety-six patients with a moderate or severe traumatic brain injury aged 16 to 65 years (convenience sample).

Intervention: Not applicable

Main outcome measures: Cronbach's alpha, exploratory and confirmatory factor analyses

Results: Principal axis factoring and confirmatory factor analysis disclosed six correlated factors (F): (F1) going to grocery store / shopping for groceries, (F2) having a meal with guests / cleaning up, (F3) putting on outdoor clothing, (F4) obtaining information, (F5) making a budget, (F6) preparing a hot meal for guests. Total explained variance was 73.6%. Cronbach's alpha analysis revealed high to very high internal consistency for all scales ranging from .81 to .98; internal consistency of the total scale was very high (0.95).

Conclusions: Findings suggest that the *IADL Profile* is a promising means of documenting both IADL independence and the repercussions of executive function deficits on everyday tasks in real-world environments.

Key words: brain injuries, activities of daily living, factor analysis, home visits

Moderate and severe traumatic brain injuries (TBI) are a major public health problem disproportionately affecting young adults; the most common cause of severe cases of injury are motor vehicle accidents (Gordon et al., 2006). The average annual incidence in the United States is 200 / 100 000 (Kraus, McArthur, Silverman, & Jayaraman, 1996). A significant number of these individuals experience low levels of participation (Dawson & Chipman, 1995), and require long term assistance in instrumental activities of daily living (IADL) (Dawson & Chipman, 1995; Gordon et al., 2006; Whiteneck et al., 2004). The prevalence of disablement is estimated at 63/100 000 of the adult population living in the community (Dawson & Chipman, 1995) with about 35% of hospitalized survivors of TBI experiencing long-term disability (Thurman et al., 1999). Large numbers report requiring prompting to initiate tasks and persistent problems with speed of processing, memory, and planning (Olver et al., 1996). Contextual factors have also been associated with decreased participation in IADL (Ashley et al., 2001; Dawson & Chipman, 1995). Though the fundamental goal of TBI rehabilitation is to help persons resume optimal levels of participation in real-world everyday activities (Brown et al., 2004), there is a notable lack of rigorously validated community-based observational IADL tests upon which to base clinical decisions and evaluate the effectiveness of interventions (Ashley et al., 2001).

Reduced IADL independence secondary to TBI can typically occur in any number of IADL (e.g. shopping (Chevignard et al., 2000; Dawson & Chipman, 1995; Fortin et al., 2003; Mazaux et al., 1997; Ponsford, Olver et al., 1995), meal preparation (Chevignard et al., 2000; Dawson & Chipman, 1995; Fortin et al., 2003), personal finances (Dawson & Chipman, 1995; Mazaux et al., 1997; Ponsford, Olver et al., 1995)) and has been frequently shown to be particularly related to executive functions (EF) (Lezak, 1989; Luria, 1973) such as goal formulation (Dutil et al., 2005; Sirigu et al., 1996), planning (Chevignard et al., 2000; Fortin et al., 2003; Le Thiec et al., 1999; Sirigu et al., 1996), carrying out the task (Forde & Humphreys, 2000, 2002; Schwartz, 2006; Schwartz et al., 1993; Schwartz et al., 1991), and verifying whether the initial goal has been attained (Dutil et al., 2005; Goldstein et al., 1993; Langevin & Le Gall, 1999; Lezak, 1989; Prigatano & Altman, 1990; Sirigu et al., 1996). Successful performance of multi-step everyday tasks further requires that the goal of the task be maintained in an active state throughout task performance (Humphreys et al., 2001; Schwartz et al., 1991). This is accomplished via action working memory. Action working memory, an important aspect of EF, is frequently impaired subsequent to frontal lobe lesions (Forde & Humphreys, 2002; Humphreys & Forde, 1998; Humphreys & Riddoch, 2000, 2001). Although these studies have shaped our current understanding of the role of EP in IADL, they typically failed to use IADL measurement instruments with demonstrated psychometric properties rather than an arbitrary selection of everyday tasks. It has nonetheless been argued that executive deficits may be the single most important component of deficits of IADL in brain lesioned patients (Godbout & Doyon, 1995; Grafman et al., 1993; Mazaux et al., 1997; Shallice & Burgess, 1991). Hence, there is an urgent need to validate a test of IADL independence that documents the repercussions of deficits in EF on IADL independence.

Measures of IADL independence must also consider the known interdependence between IADL ability and environmental factors (Gitlin et al., 2001; Hoppes et al., 2003; Lysack et al., 2000; MacNeill & Lichtenberg, 1997; MacNeill et al., 2000). Though few studies have investigated the specific influence of the context (e.g. home, hospital) in which IADL tests are administered on conclusions derived from these tests (Bottari et al., 2006). Nonetheless, a number of theoretical and practice person-environment models (Dunn et al., 1994; Fougeyrollas et al., 1998; Gitlin, 2003; Law et al., 1996) and a number of studies on ecological validity (Cripe, 1996; Sbordone & Guilmette, 1999) have strongly suggested that independence in IADL is best understood in a real-world context (Bottari et al., 2006; Johnson & Lewis, 1991). Real-world assessments are increasingly considered as the optimal manner in which to document the interplay between individuals' neuropsychological deficits and the requirements of their daily lives for a better appreciation of everyday functioning (Ponsford et al., 1995). However, few researchers have addressed the methodological challenges involved in developing and validating performance-based IADL tests to be administered in such complex, highly individualized, unpredictable, and multidimensional environments as subjects' home and community environments (Gitlin, 2003; Rempfer et al., 2003).

This challenge was clearly addressed by related work on an instrument called the ADL Profile (Dutil & Bottari, 2001; Dutil, Bottari, & Vanier, 2002; Dutil et al., 2005; Dutil, Forget, & Gaudreault, 1991; Dutil, Forget, Vanier, & Gaudreault, 1990; Dutil et al., 1996; Dutil, Vanier, Lambert, Crépeau, & Deland, 1993), an analytic observation-based measure of ADL independence that also documents the repercussions of EF deficits on 17 personal activities of daily living (PADL) and IADLs. Tasks are assessed via direct observation by occupational therapists either in an inpatient setting or in subjects' home and community environments. Both the type of difficulties encountered and the type and amount of assistance required to safely and adequately attain related goals are documented. Tasks are scored using a four-level ordinal scale (dependence, verbal and / or physical assistance, independence with difficulty, independence) that relates independence in task performance and the manner in which tasks are performed. To attribute scores, examiners first qualitatively document behaviours that provide information on the person's ability, or need for assistance, in each of four components of EF underlying each task (formulate goal, plan, carry out the task, and verify attainment of the initial goal), and then attribute an independence score. This analytic process based on observations obtained in individual's home and community environments provides crucial treatment planning information to patients, families, treatment teams and funding sources. Psychometric studies of this test have been reported elsewhere (Bottari, 2001; Dutil, Auger et al., 1991; Dutil et al., 2005; Dutil, Forget et al., 1991; Dutil et al., 1993; Gervais, 1995; Rousseau et al., 1994a, 1994b).

The present study aims to expand on this previous work as we propose to examine the factorial validity and internal consistency of an alternate version of this test, the *IADL Profile* (Bottari, Dutil, Dassa, & Rainville, 2004). The *IADL Profile* documents independence in eight IADL, six of which are linked to the goal of preparing a hot meal for guests (dressing to go outdoors, going to the grocery store, shopping for groceries, preparing a hot meal, having a meal with guests, cleaning up after the meal) and two of which are single tasks (obtaining information, and making a budget). The first series of six tasks was selected to represent a normal daily routine of tasks and involves the scheduling of multiple tasks within certain time constraints. Tasks are assessed via direct observation by occupational therapists in subjects' home and community environments and both the type of difficulties encountered and the type and amount of assistance required to safely and adequately attain related goals are documented.

EF deficits have been shown to be most evident in more complex and novel tasks (Burgess, 2000; Crépeau et al., 1997; Goel et al., 1997), multi-step tasks (Humphreys & Riddoch, 2001), poorly structured situations (Chevignard et al., 2000), and in the presence of distracting stimuli (Humphreys & Forde, 1998; Luria, 1973). Hence, the overall structure of the *IADL Profile* (e.g. tasks, instructions for examinees, evaluation environment) was operationalised based on these theoretical guidelines. For instance, in order to maximize the possibility of observing EF deficits, examinees are given minimally structured instructions to introduce tasks (Appendix 3). When compared to similar studies (Chevignard et al., 2000; Fortin et al., 2003; Rempfer et al., 2003; Semkovska, Bédard, Godbout, Limoge, & Stip, 2004), this less structured evaluation context permits the observation of a broader range of behaviors related to EF. Also, with the intent of documenting IADL independence on a continuum of independence, subjects deemed unable to pursue any task operation are provided with necessary graded assistance.

The *IADL Profile* consists in 30 items i.e. 30 scores for six tasks with four operations each and two tasks with three operations each (Appendix 1). The final two tasks (obtaining information, making a budget) are rated on only three operations; the goal formulation operation is not rated as it is the examiner who formulates these goals. Tasks are qualitatively analyzed according to four operations (formulate goal, plan, carry out task, and verify attainment of initial goal) related to EF (Appendices 1 and 4). Items are scored using a five-level ordinal scale (dependence, requires verbal and physical assistance, requires verbal or physical assistance, independence with difficulty, independence without difficulty) (Appendix 2). To attribute scores, therapists first determine whether difficulties were observed in relation to each operation and whether assistance was required to complete related actions. In order to ensure optimal scoring quality, the procedure manual provides theoretically based definitions of all four operations and numerous examples of behaviors related to each operation. Intra and interrater agreement and generalizability studies with individuals having sustained a moderate or severe TBI have been reported. The latter have shown that a high percentage of generalizability coefficients (60%) indicated satisfactory or perfect agreement (Bottari, Dassa, Dutil, & Rainville, in preparation-b).

In the present study, factor analytic techniques were conducted to develop unidimensional scales reflecting major content domains of the *IADL Profile*. Factor analytic techniques are used to determine whether items cluster together in patterns that are compatible with the theoretical structure of the constructs of interest (Crocker & Algina, 1986). Two constructs, considered in the development of the test, were explored: IADL (tasks) and operations related to four components of EF (goal formulation, planning, carrying out task, and verifying attainment of initial goal). Internal consistency of factors and of a composite total score was also examined.

Methods

Participants:

Subjects were recruited from 12 post-acute TBI programs in the province of Quebec. Inclusion criteria were patient age between 16 and 65 years and a moderate or severe TBI. A moderate TBI was defined by a score ranging between 9 and 12 on the Glasgow Coma scale (GCS) (Teasdale & Jennett, 1974), duration of loss of consciousness anywhere between 30 minutes and six hours but less than 24 hours, post-traumatic amnesia varying between one and 14 days, and generally positive scan. A severe TBI was defined by a score ranging between three and eight on the GCS, duration of loss of consciousness greater than 6 hours, post-traumatic amnesia of several weeks, and positive scan. Exclusion criteria were disorientation (i.e., score of 65 or less on the Galveston Orientation and Amnesia Test (Levin et al., 1979)), severe mobility deficits (score < three on the transfer item of the Functional Independence Measure, FIM (Keith et al., 1987)), severe language deficits (score < four on the communication item of the FIM) and history of hospitalization for psychiatric disorders. Sample size for the validity study was based on general guidelines requiring a minimum of 100 subjects for factor analytic studies (Crocker & Algina, 1986; Pedhazur & Schmelkin, 1991). A sample of 100 moderate or severe TBI subjects was also judged to be the largest that could feasibly be used for an observational study carried out in subjects' home and community environments. Prior to the evaluation, subjects were given verbal and written information on the study and signed statements of informed consent. Subjects were informed that they were free to withdraw from the study at any time. The study was approved by the ethical review boards of participating centers.

Procedures

Patients were all evaluated with the *IADL Profile* in their homes and community environments. Tests were administered by one of three trained occupational therapists and lasted about three hours. Prior to data analysis, the primary investigator reviewed the qualitative behavioural descriptions for all test items and ascertained that scores attributed by the raters across all subjects was consistent with revised rating guidelines developed subsequent to the intra and interrater agreement and generalizability studies (Bottari et al., in preparation-b).

Data analysis

A two-stage approach to factorial validity was used: exploratory factor analysis (EFA) followed by confirmatory factor analysis (CFA). EFA has been shown to be a useful heuristic strategy for model specification prior to cross-validation with CFA (Gerbing & Hamilton, 1996). Hence, the models shown to best fit the data in EFA were subsequently tested with CFA, as well as theoretically founded alternate models. All analyses were performed on scores obtained on the *IADL Profile* by the 100 TBI subjects; final results were reported on 96 subjects due to listwise deletion of missing data. The size of the sample being relatively small, we could not split it to produce a CFA with an independent sample. However, for completion, we are presenting the results of CFA with the same sample.

Factor analytic techniques were used to identify the underlying dimensions (or factors) that best explain the variance in the original set of variables (Pedhazur & Schmelkin, 1991). These techniques explore the clustering of responses to different items and the extent to which these clusters correspond to hypothesized theoretical constructs. In this study, the two constructs that were analyzed were eight IADL (tasks) and four operations related to EF. The analyses included several steps. First, exploratory principal axis factoring, with varimax (orthogonal) and oblimin (oblique) rotations, was used to identify the most conceptually meaningful factors (and hence the most pertinent sub-scales). Factor patterns, communalities, Bartlett's Test of Sphericity and the Kaiser-Meyer-Olkin Measure of Sampling Adequacy were used as indicators of the quality of the factor structure. The communality of a variable is defined as the proportion of the variance of the variable that is accounted for by the common factors (Hogarty et al., 2005). Values between 0.60 and 0.80 indicate high communality; values below 0.4 indicate low communality (Hogarty et al., 2005). Values inferior to 0.30 are considered poor. A p-value inferior to 0.05 for Bartlett's Test of Sphericity indicates that the correlation matrix significantly differs from an identity matrix (Tabachnick & Fidell, 1996). Kaiser-Meyer-Olkin Measure of Sampling Adequacy measures the factorability of the correlation matrix (Tabachnick & Fidell, 1996). Values above 0.80 are considered "meritorious" (Kaiser, 1974). Saturation loadings represent the regression coefficients of the items on the factors. Loadings in excess of .71 are considered excellent, .63 very good, .55 good, .45 fair and loadings less than .32 poor (Comrey & Lee, 1992; Tabachnick & Fidell, 1996). In this study, the cutoff was set at 0.35.

To determine the internal consistency of the sub-scales identified by factor analyses, Cronbach's coefficient alpha was estimated based upon the scores obtained by the 96 TBI subjects for items grouped under each factor and for the total score. Alpha coefficients of 0.7 or higher are usually regarded as indicative of acceptable internal reliability (De Vellis, 1991); values above 0.8 are conventionally considered high and values above 0.9 as very high. This analysis was completed using SPSS (14.0) for Windows.

Second, CFA was performed in order to test the models that best fit the data in EFA as well as a set of alternate models. In CFA, regression coefficients of the items on the factors and the error variance of residuals are tested at a 0.05 significance level. Parameters were estimated by the method of maximum likelihood; all analyses were performed on the covariance matrices. Robust maximum likelihood estimators based on the Satorra-Bentler scaled chi-square statistic were computed (Satorra & Bentler, 1994) (Schermelleh-Engel et al., 2003).

In CFA, there is no single procedure that determines the adequacy of a model (Schermelleh-Engel et al., 2003). Hence, a number of goodness-of-fit tests and indexes must be considered to determine model fit (Boomsma, 2000). The chi-square statistic is used to test the overall fit. A p-value greater than 0.05 indicates that the null hypothesis (the model tested) is not rejected and that the model fits the data. This test must be complemented by fit indices (Schermelleh-Engel et al., 2003). Fit indices, selected because of their appropriateness for this study, can be grouped into three categories: (1) descriptive measures of overall model fit (Root Mean Square Error of Approximation [RMSEA]; Standardized Root Mean Square Residual [SRMR]); (2) descriptive measures based on model comparisons (Non-normed Fit Index [NNFI]; Comparative Fit Index [CFI]) and (3) descriptive measures of model parsimony (Parsimonious Normed Fit Index [PNFI]) (Schermelleh-Engel et al., 2003). The RMSEA (Steiger, 1990) is relatively independent of sample size and is a measure of approximate fit in the population. According to Hu & Bentler (Hu & Bentler, 1999), RMSEA values less than 0.6 indicate a good fit. The SRMR (Bentler, 1995) is an overall badness of fit measure. Values less than 0.05 indicate a good fit and values smaller than 0.10 can be considered acceptable (Schermelleh-Engel et al., 2003). NNFI and CFI values of 0.97 indicate good fit relative to the independence model and values greater than 0.95 indicate acceptable fit (Schermelleh-Engel et al., 2003). PNFI range "between 0 and 1 with higher values indicating a more parsimonious fit" (p.44) (Schermelleh-Engel et al., 2003). Finally, a hierarchical analysis was used to compare nested models.These analyses were completed with Lisrel (8.72).

Results

Participant characteristics

Sociodemographic and clinical characteristics are depicted in Table 1. As illustrated, the average age of the subjects was 37.0 years and the majority were male (78%). Sixty-nine percent had a severe TBI and the average time post-injury was 14.2 (± 13.6) months.

Exploratory factor analysis and internal consistency

Table 2 provides descriptive statistics (overall mean ± standard deviation) for the 30 items of the *IADL Profile*. Review of Table 2 reveals that items 501, 502 and 504, all related to "having a meal", have the least amount of variance.

The following conceptually meaningful oblique and orthogonal models were determined by EFA: (1) a four-factor model (F1: going to grocery store & shopping; F2: preparing meal, having meal (plan, carry out) & cleaning up; F3: putting on outdoor clothing & verifying goal for having meal; F4: obtaining information & making a budget; M2), (2) a five-factor model (F1: going to grocery store & shopping; F2: preparing meal, having meal (plan, carry out) & cleaning up; F3: making a budget; F4: obtaining information; F5: putting on outdoor clothing & verifying goal for having meal; M4) (3) a six-factor model (F1: going to grocery store & shopping; F2: having meal & cleaning up; F3: putting on outdoor clothing; F4: obtaining information; F5: making a budget; F6: preparing meal; M6). Though the four and five-factor models were problematic due to the separation of items related to "having a meal" into different factors, they were nonetheless retained for further analyses with CFA because they are congruent with the idea of sequences of tasks rather than unique tasks and with the grouping of complex tasks, basic tenants of the *IADL Profile*. The six-factor model, hypothesized to be the best model, is task based and does not separate items related to any one task into separate factors.

Following this series of exploratory analyses on four, five and six factors, the best solution (see Table 3) was the six-factor oblique one. These six factors explained 73.6% of the variance in the subjects' scores on the factors. Bartlett's test of Sphericity had a p-value of 0.000 and the Kaiser-Meyer-Olkin Measure of Sampling Adequacy had a value of 0.86. This indicates that the correlation matrix significantly differed from an identity matrix and that the correlation matrix was adequate for EFA. Review of Table 3 reveals that most communalities were high (0.60 to 0.95); another five were low (0.33 to 0.55) and only one communality was poor (0.19). Most saturation loadings were superior to 0.63 (very good to excellent) with only four loadings ranging between 0.35 and 0.48 (fair). Review of the correlations between the factors (Table 4) reveals that correlations were relatively low (below 0.35) with the exception of F5-F1 and F3-F4. Cronbach's alpha analysis performed on factor scores defined by averaging scores on items that load highly on each factor revealed high to very high internal consistency for all factors ranging from .81 to .98; internal consistency of the total scale was very high (0.95).

Finally, EFA did not produce an operation-based solution. Hence, a heuristic approach based on the theoretical framework related to EF and geared towards identifying highly reliable groupings of items led to the definition of three *ad hoc* composite scores labeled as follows: complex planning (items 202, 302, 402, 702, 802, 201, 301), carry out task (items 103 - 803) and action working memory (items 201, 301, 302, 303, 304, 402, 403, 404, 702, 703, 704, 802, 803, 804). As these items and subsequent groupings of items based on EF were measured within everyday tasks that were carried out within the context of subjects' home and community environments, we propose to define these composite scores as ecological indexes. Review of Table 5 reveals that the internal consistency of these indexes was high to very high with respective values of 0.87, 0.83 and 0.91.

Confirmatory factor analysis

Eventhough the six-factor model was hypothesized to be the best model by EFA, in order to allow for a systematic testing and comparison of all models, for completion CFA was performed on all six task-based models (four, five and six factors; orthogonal and oblique rotations). Finally, we also examined a four-factor oblique operation-based model (M7) grouping items related to each of the four operations of the *IADL Profile*, that is formulating a goal (items 101-601), planning (items 102-802), carrying out task (items 103-803), and verifying attainment of goal (items 104-804). Though this model did not result from the EFA, it was included in the CFA due to its importance in relation to the theoretical constructs related to EF underlying the structure of the tool. For all analyses with CFA, item 501 (formulate goal for having meal) was removed due to the item's low variance. Analyses were thus completed on the *IADL Profile's* 29 items.

All patterns of loadings had a factorial complexity of 1. Table 6 provides the goodness of fit statistics for the models estimated in this study. Examination of chi-squared tests indicates that all tests are significant at a 0.05 level. Thus, assessment of the models was based on the goodness of fit indices and on the hierarchical analysis of nested models. Examination of CFI revealed an acceptable fit to the data for M6. Examination of NNFI indicated that M6 is the closest to the cutoff score (0.95) indicating acceptable fit. M6 is the only model to present an acceptable fit (0.91) on GFI. The largest PNFI, indicating the best model fit, was M6. M6 had the lowest RMSEA (0.058) indicating acceptable fit of the model to the data. SRMR of orthogonal models all indicated unacceptable fit whereas oblique models had acceptable fit as the value M6 (0.051) closely approximated the minimum criterion of 0.05 for good fit. In fact, as expected, oblique models presented better fit than orthogonal models. In consideration of the goodness of fit statistics for all seven models, M6 presented the best fit. Thus, the grouping of items that presented the best factorial validity consisted of the following six factors: (F1) going to grocery store & shopping (eight items), (F2) having meal and cleaning up (seven items), (F3) putting on outdoor clothing (four items), (F4) obtaining information (three items), (F5) making a budget (three items), and (F6) preparing meal (four items). Correlations among the six factors of M6 ranged from 0.328 to 0.855. These were predictably larger than corresponding correlations in EFA. This can be explained by the stringent constraints imposed on the matrix of regression coefficients of CFA (factorial complexity of 1). Comparison of nested models based on chi-squared differences and degrees of freedom between pairs of models were also obtained. Results comparing the chi-squared tests of M1 vs. M2 ($\chi^2 = 417.64$, df= 6, p=0.000), M3 vs. M4 ($\chi^2 = 553.43$, df= 10, p=0.000) and M5 vs. M6 ($\chi^2 = 737.95$, df=5, p=0.000) confirmed that for a given number of factors (four, five, or six), orthogonal and oblique models were significantly different. As oblique models had previously been shown to have a better fit than orthogonal models, this confirmed that the oblique model (M6) was the best solution. Model seven explored an operation-based model. However, this model did not fit the data.

Discussion

Results suggested that the model that best fit the data in this study was Model 6. CFA thus provided support for the presence of six underlying factors in the *IADL Profile*. Each of these factors is related either to single tasks (F3-F6) or to groupings of tasks (F1-F2). Factors are correlated, potentially indicating that each factor documents specific but complementary aspects of IADL independence. Moreover, internal consistency results are high for the total scale, six factors, as well as three indexes.

Overall, these findings are consistent with related studies of EF (Luria, 1973) in so far as these empirical results support theoretical propositions stating that the four components of EF measured in this study are highly intertwined in task related performance as all of these operations are required for the successful performance of goal-directed activities (Lezak, 1989, 1995; Luria, 1966). Theoretically, these results also support known definitions of ADL independence, that state that 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 (Rogers, 1982). Moreover, these results strengthen the underlying premise of the *IADL Profile* as they support the pertinence of documenting all four operations in relation to the performance of each task. Not rating each operation would result in an incomplete evaluation of potentially important deficits in goal-directed activity. Alternately, the presence of six distinct factors likely reflects that the use of several IADL for assessment in TBI rehabilitation is a more accurate measure of IADL independence than use of only one or two tasks, as each factor (task or grouping of tasks) defines a unidimensional construct that provides complementary information for clinical decision making. These results are important, particularly in the current clinical context where time and financial constraints are being used to justify the use of shorter tests.

Though a detailed discussion of each factor's likely contribution to clinical decision making is beyond the scope of this article, a number of empirical examples may serve to illustrate certain salient features. For instance, F1 (going to grocery store / shopping) captured important deficits related to goal formulation. Neuropsychological studies have previously reported that individuals with a TBI have a diminished capacity for defining goals for themselves and for undertaking actions in pursuit of such goals (Lezak, 1989). However, research methodologies aimed at documenting the repercussions of deficits in EF in everyday activities have largely failed to capture deficits related to goal formulation as goals have generally been formulated by examiners (Lezak, 1989). The present research thus extended the study of EF by proposing a new methodology to capture important deficits related to this operation.

F2 (having meal / cleaning up) grouped items with a minimal level of complexity, items that subjects were generally able to accomplish with ease. The interest of the task having a meal with guests lied within the contextual influence it provided to the sequence of tasks related to meal preparation. The need to prepare a meal for three people (subject, examiner and assistant) provided an increased level of complexity to the task, particularly regarding planning. Furthermore, the notion of having to serve the meal to their guests added a dimension of self-assessment to the meal preparation task which would otherwise not have been emphasized.

F3 (putting on outdoor clothing) was assessed not as a single task but rather as a subtask linked to the more complex goal of going to the grocery store and shopping. This added degree of complexity increased the cognitive demands of the task and revealed goal formulating deficits comparable to that documented in F1 (going to grocery store / shopping).

F4 (obtaining information) was a more structured, complex and novel task requiring subjects to obtain a daily bus schedule. Plans elaborated by the examinees to obtain the required information either involved calling the bus terminal or using the Internet. The automated service was rarely adapted to the needs of individuals with slowed information processing abilities which frequently discouraged subjects from calling back to retrieve complete information. Mazaux et al showed that slowed information processing is a major factor associated with loss of social autonomy and inability to return to work long after TBI (Mazaux et al., 1997). Alternately, use of the Internet was complex because of the sheer volume of information to be processed and the high level of abstract thinking required doing so. Many subjects unknowingly navigated towards irrelevant sites and had difficulty detecting and correcting errors so as to complete the task.

F5 (making a budget) was a complex and novel task that solicited a number of cognitive processes including planning; its difficulty confirmed by overall average scores. However, always administered last, results also highlighted the effect of accumulated fatigue on task performance. For many, fatigue led to performance breakdown, several errors and need for assistance. The extent to which fatigue was present after carrying out an everyday routine highlighted difficulties that will possibly impact work reintegration, particularly if one considers the need to balance both areas of responsibilities.

F6 (preparing meal) provided the overarching goal to the routine of tasks documented with the *IADL Profile*. Having been informed at the onset of the assessment that they were to prepare a meal for themselves and two guests, subjects had to initiate a planning sequence that included a number of decisions: menu selection, consideration of amounts and guest preferences, consideration of cooking time and overall feasibility of cooking process (Burgess, 2000). Carrying out the task involved preparing and cooking all components of the meal, problem solving as needed along the way, and maintaining their goal until completion. In the presence of unforeseen events, carrying out of the task may have had to be interrupted and planning of the task revised accordingly. Finally, subjects had to decide whether their performance was adequate with minimal external input from the examiners. Level of task complexity varied as subjects chose the meal they wished to prepare. However, all were asked to prepare a hot meal for three people and were expected to choose their own menus, combined with identifying and purchasing necessary ingredients. A wealth of information was documented covering all aspects of task performance but planning difficulties were particularly evident. In contrast to related studies that have proposed uniform menus of limited complexity (e.g. prepare toast (Hart, Giovannetti, Montgomery, & Schwartz, 1998)) to all subjects, we suggest that use of the *IADL Profile* may reveal a broader spectrum of planning deficits associated with IADL independence.

Internal consistency of a composite score for the total scale was very high. Hence, a total score can be calculated, providing a reliable global indicator of IADL independence and indicating where on a continuum from totally dependent (total score: 0) to totally independent (total score: 116) the ability of an individual is located. Future studies will be required to document the concomitant validity of this score with measures of injury severity, other measures of IADL and neuropsychological measures of EF.

Finally, EFA and CFA did not produce an operation-based solution because the operations related to EF were more highly correlated within tasks than across tasks. This highlights extreme variations in levels of difficulty present within single operations across tasks. For example, planning requirements of having a meal were completely distinct from those of preparing a hot meal. Since the initial operation-based grouping of items based on EF was not confirmed by CFA, further reliability analyses (internal consistency) was conducted on other hypothesized selected theoretical groupings of the items related to components of EF. Minimal internal consistency requirements for groupings to be retained were set at 0.80. Three reliable ecological indexes were thus defined. Indexes were termed ecological to reflect the manner in which items were measured that is within the context of everyday tasks carried out within subjects' home and community environments. The first such index defined an ecological index of complex planning, a grouping of the planning operations of complex tasks (e.g. shopping for groceries, obtaining information) and of the goal formulating operations of two tasks related to the overall planning of the meal preparation task (going to grocery store, shopping for groceries). Planning deficits and their repercussions on IADL independence have been well documented in individuals with a TBI (Fortin et al., 2003; Godbout & Doyon, 1995; Shallice & Burgess, 1991). However, the demands on planning in a real-world environment far exceed those reproduced in testing situations. The present research protocol thus involved a complex and long lasting multitask IADL completed without provision of any materials, enumeration of subtasks, nor control of environmental factors. Second, we defined an index of carrying out operations across all eight tasks. This operation often reflected the lowest level of independence. Third, we defined an ecological index of action working memory, a grouping of items overarching all four operations of the *IADL Profile*, particularly operations related to complex or multi-step tasks. Working memory deficits are one of the most frequently postulated EF deficits reported in the literature (Baddeley & Della Sala, 1996; Grafman et al., 1993; Hart et al., 1998; Humphreys et al., 2001; Humphreys & Forde, 1998; Kimberg & Farah, 1993; McDowell, Whyte, & D'Esposito, 1997; Miyake et al., 2000). In order to validate inferences about EF that may be derived from use of the *IADL Profile,* future studies will be required to document the concomitant validity of these indexes with neuropsychological measures.

It is important to elucidate certain limitations of the present study. First, though the sample size was appropriate for factorial validity studies, the sample was at the lower limit of acceptability. Moreover, the EFA and CFA should have ideally been based on two separate samples of at least 100 TBI subjects each. As two years of intense recruiting were required to obtain a first sample of 100 moderate and severe TBI subjects and this through the collaboration of numerous clinical settings, it was not feasible to recruit a second sample of this size for CFA. CFA was therefore only provided for completion of the EFA. Finally, the challenge involved in validating ecological observation-based measures of independence in IADL is to obtain samples that reflect the many different facets of complex home and community environments and their respective influences on IADL independence. Future studies should be designed to better differentiate the influence of the environment on IADL independence for different subgroups of individuals (e.g. rural versus urban dwellers). Further, future studies will be required to verify the operation-based solution and to further investigate the proposed ecological indexes on other, ideally larger, samples of subjects. Association of scales of the *IADL Profile* to measures of EF, indices of injury severity and sociodemographic variables are also recommended avenues for future research. Finally, we expect that use of this measurement instrument in clinical and research settings may contribute to the development of more targeted rehabilitation interventions.

Conclusion

This study described the factorial validity and internal consistency of a new performance-based test of IADL independence administered in a real-world environment. Factor analytic studies identified six unidimensional scales related to IADL though additional study would be required to confirm these findings. Internal consistency was high for the six factors, the composite total score and for three ecological indexes. Despite widely reported challenges regarding the development and validation of such ecological tests, the *IADL Profile* proposes a promising methodology to document the repercussions of EF deficits in real-world functioning.

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Table 1- Description of sample (n=100)

Variable	Values
Age (years)	37.0 ± 13.7
Gender, % male	78%
Education (years)	11.6 ± 3.4
TBI severity, %	
Severe	69%
Moderate	31%
Glasgow Coma Score at emergency (n=96)	
3 - 8	63.5%
9 - 12	16.7%
13 -15	19.8%
Positive scan	96.0%
Post-traumatic amnesia (days) (n=73)	34.0 ± 50.3
Less than 1 day	6.8%
Between 1 and 14 days	27.4%
Greater than 14 days	63.0%
Coma duration % (n = 61)	
No coma	41.0% (25)
2- 7 days	14.8% (9)
8-14 days	16.4% (10)
> 14 days	27.9% (17)
Cause of TBI	
Motor vehicle accident	61%
Pedestrian accident	16%
Falls	6%
Work accident	5%
Sports injury	5%
Other	7%
Time post-injury (months)	14.2 ± 13.6
Mobility outdoors, %	
Walked with / without orthosis	78%
Walked with a cane or walker	14%
Used a wheelchair	8%
Living situation	
Lived alone	19 %
Urban setting	65 %

Note: Values are mean ± standard deviation (SD) unless otherwise indicated.

Table 2- Descriptive statistics of *IADL Profile* 30 items (n=96)

Item Number	Item Description	Mean	Standard Deviation
	Putting on outdoor clothing		
101	Formulate goal	3.610	1.137
102	Plan	3.630	1.126
103	Carry out task	3.330	1.139
104	Verify attainment of goal	3.580	1.130
	Going to grocery store		
201	Formulate goal	2.640	1.452
202	Plan	2.980	1.494
203	Carry out task	2.300	1.570
204	Verify attainment of goal	3.180	1.522
	Shopping for groceries		
301	Formulate goal	2.660	1.420
302	Plan	2.770	1.425
303	Carry out task	2.740	1.467
304	Verify attainment of goal	3.080	1.506
	Preparing a hot meal for guests		
401	Formulate goal	3.700	.860
402	Plan	3.100	1.081
403	Carry out task	2.630	1.117
404	Verify attainment of goal	3.430	.926
	Having a meal with guests		
501	Formulate goal	3.960	.201
502	Plan	3.950	.223
503	Carry out task	3.530	.648
504	Verify attainment of goal	3.810	.466
	Cleaning up after meal		
601	Formulate goal	3.640	.930
602	Plan	3.600	1.081
603	Carry out task	2.810	1.379
604	Verify attainment of goal	2.940	1.390
	Obtaining information		
702	Plan	2.970	1.252
703	Carry out task	2.000	1.376
704	Verify attainment of goal	2.150	1.436
	Making a budget		
802	Plan	1.230	1.192
803	Carry out task	1.490	1.422
804	Verify attainment of goal	1.160	1.225

Table 3- Exploratory factor analyses and internal consistency of *IADL Profile* 29 items: Final 6 factor oblique solution (n=100)

Item Number	Item Description	Cronbach's alpha	Saturation loading *						Communalities
			F1	F2	F3	F4	F5	F6	
	F1: GOING TO GROCERY STORE / SHOPPING FOR GORCERIES	0.96							
201	Formulate goal		0.826						0.746
202	Plan		0.832						0.860
203	Carry out task		0.563						0.551
204	Verify attainment of goal		0.893						0.914
301	Formulate goal		0.783						0.713
302	Plan		0.850						0.854
303	Carry out task		0.757						0.809
304	Verify attainment of goal		0.887						0.909
	F2:HAVING A MEAL WITH GUESTS / CLEANING UP AFTER MEAL	0.84							
502	Plan			0.395					0.189
503	Carry out task			0.613					0.600
504	Verify attainment of goal			0.357					0.334
601	Formulate goal			0.480		0.346			0.605
602	Plan			0.699					0.723
603	Carry out task			0.601					0.770
604	Verify attainment of goal			0.631					0.719
	F3: PUTTING ON OUTDOOR CLOTHING	0.98							
101	Formulate goal				0.871				0.925
102	Plan				0.923				0.953
103	Carry out task				0.892				0.860
104	Verify attainment of goal				0.936				0.973
	F4: OBTAINING INFORMATION	0.91							
702	Plan					0.644			0.620
703	Carry out task					0.979			0.950
704	Verify attainment of goal					0.961			0.888
	F5: MAKING A BUDGET	0.94							
802	Plan						0.949		0.899
803	Carry out task						0.853		0.744
804	Verify attainment of goal						0.950		0.902
	F6: PREPARING A HOT MEAL FOR GUESTS	0.81							
401	Formulate goal							0.650	0.463
402	Plan							0.796	0.880
403	Carry out task							0.472	0.544
404	Verify attainment of goal							0.394	0.446
TOTAL EXPLAINED VARIANCE 1) Factor analysis:73.6% 2) Principal component analysis: 78.5%		0.94							

* Saturation loadings below 0.35 are not reported

Table 4- Exploratory factor analyses: Factor correlation matrix (final 6 factor oblique solution)

Factors	F1	F2	F3	F4	F5	F6
F1: Going to grocery store / shopping for groceries	1.000					
F2: Having a meal with guests / cleaning up after meal	0.201	1.000				
F3: Putting on outdoor clothing	0.327	0.277	1.000			
F4: Obtaining information	0.262	0.340	0.461	1.000		
F5: Making a budget	0.521	0.247	0.215	0.287	1.000	
F6: Preparing a hot meal for guests	0.171	0.263	0.268	0.250	0.081	1.000

Table 5- Definition and reliability of three ecological indexes

Item Number	Item Description	Cronbach's alpha
	INDEX 1: ECOLOGICAL INDEX OF COMPLEX PLANNING	0.87
202	Going to the grocery store: plan	
302	Shopping for groceries: plan	
402	Preparing a hot meal for guests: plan	
702	Obtaining information: plan	
201	Going to the grocery store: formulate goal	
301	Shopping for groceries: formulate goal	
	INDEX 2: CARRY OUT TASK OPERATIONS	0.83
103	Putting on clothes to go outdoors	
203	Going to the grocery store	
303	Shopping for groceries	
403	Preparing a hot meal for guests	
503	Having a meal with guests	
603	Cleaning up after the meal	
703	Obtaining information	
803	Making a budget	
	INDEX 3: ECOLOGICAL INDEX OF WORKING MEMORY	0.91
	Going to the grocery store:	
201	Formulate goal	
	Shopping for groceries:	
301	Formulate goal	
302	Plan	
303	Carry out task	
304	Verify attainment of goal	
	Preparing a hot meal for guests:	
402	Plan	
403	Carry out task	
404	Verify attainment of goal	
	Obtaining information:	
702	Plan	
703	Carry out task	
704	Verify attainment of goal	
	Making a budget:	
802	Plan	
803	Carry out task	
804	Verify attainment of goal	

Table 6- Goodness-of-fit statistics for confirmatory factor analyses: 29 items (n=96)

		Models	Satorra Bentler Scaled Chi-squared	df	p	CFI	NNFI	GFI	PNFI	RMSEA	SRMR
	M0	Independent model	2648.547	406							
Task - based models	M1	4 orthogonal factors	1026.739	377	0.000	0.710	0.688	0.812	0.569	0.132	0.191
	M2	4 oblique factors	609.099	371	0.000	0.894	0.884	0.876	0.704	0.081	0.061
	M3	5 orthogonal factors	1081.410	377	0.000	0.686	0.662	0.811	0.549	0.137	0.193
	M4	5 oblique factors	527.985	367	0.000	0.928	0.921	0.897	0.724	0.067	0.057
	M5	6 orthogonal factors	1221.625	377	0.000	0.623	0.594	0.788	0.500	0.150	0.199
	M6	6 oblique factors	483.671	362	0.000	0.946	0.939	0.905	0.729	0.058	0.051
Operation-based Model	M7	4 oblique factors	1082.621	371	0.000	0.683	0.653	0.748	0.540	0.139	0.084

df: degrees of freedom, CFI: Comparitive Fit Index, NNFI: Nonnormed Fit Index, GFI: Goodness-of-Fit Index, PNFI: Parsimony Normed Fit Index, RMSEA: Root Mean Square Error of Approximation, SRMR: Standardized Root Mean Square Residual

Table 7- Confirmatory factor analyses of *IADL Profile* 29 items: final 6 factor oblique completely standardized solution (n=100)

Item Number	Item Description	Regression coefficients*						Error variance
		F1	F2	F3	F4	F5	F6	
	F1: GOING TO GROCERY STORE / SHOPPING FOR GORCERIES							
201	Formulate goal	.601						.639
202	Plan	.672						.548
203	Carry out task	.589						.653
204	Verify attainment of goal	.669						.552
301	Formulate goal	.596						.645
302	Plan	.639						.592
303	Carry out task	.622						.613
304	Verify attainment of goal	.656						.570
	F2:HAVING A MEAL WITH GUESTS / CLEANING UP AFTER MEAL							
502	Plan		.415					.828
503	Carry out task		.593					.648
504	Verify attainment of goal		.443					.804
601	Formulate goal		.603					.636
602	Plan		.650					.578
603	Carry out task		.627					.607
604	Verify attainment of goal		.565					.680
	F3: PUTTING ON OUTDOOR CLOTHING							
101	Formulate goal			.739				.453
102	Plan			.717				.486
103	Carry out task			.588				.654
104	Verify attainment of goal			.685				.531
	F4: OBTAINING INFORMATION							
702	Plan				.590			.652
703	Carry out task				.698			.512
704	Verify attainment of goal				.654			.572
	F5: MAKING A BUDGET							
802	Plan					.694		.519
803	Carry out task					.633		.599
804	Verify attainment of goal					.712		.493
	F6: PREPARING A HOT MEAL FOR GUESTS							
401	Formulate goal						.408	.834
402	Plan						.554	.693
403	Carry out task						.613	.625
404	Verify attainment of goal						.558	.689

* All regression coefficients and error variances are significant at 0.05

Table 8- Confirmatory factor analyses: completely standardized correlations between factors (final 6 factor oblique solution)

Factors	F1	F2	F3	F4	F5	F6
F1: Going to grocery store / shopping for groceries	1.000					
F2: Having a meal with guests / cleaning up after meal	0.505	1.000				
F3: Putting on outdoor clothing	0.855	0.414	1.000			
F4: Obtaining information	0.457	0.585	0.454	1.000		
F5: Making a budget	0.485	0.545	0.328	0.524	1.000	
F6: Preparing a hot meal for guests	0.575	0.744	0.488	0.531	0.603	1.000

Appendix 1- Structure of *IADL Profile*; related tasks, operations and item numbers

TASKS (8)	Operations (4)				
	Formulate goal	**Plan**	**Carry out task**	**Verify attainment of goal**	
Putting on outdoor clothing	101	102	103	104	**Item numbers (30)**
Going to grocery store	201	202	203	204	
Shopping for groceries	301	302	303	304	
Preparing a hot meal for guests	401	402	403	404	
Having a meal with guests	501	502	503	504	
Cleaning up after meal	601	602	603	604	
Obtaining information		702	703	704	
Making a budget		802	803	804	

Appendix 2- Rating scale of the *IADL Profile*

	LEVELS	DEFINITION
4 :	**Independence without difficulty**	Capable of performing all components of the operation alone, without difficulty, in a reasonable amount of time, and in an acceptable manner. Can use technical aids or take advantage of an adapted environment.
3 :	**Independence with difficulty**	Capable of performing all components of the operation alone, but difficulties are observed with respect to the length of time required to carry out the operation or with how the operation is carried out. Can use technical aids or take advantage of an adapted environment.
2 :	**Requires verbal or physical assistance**	Capable of performing all components of the operation with verbal or physical assistance, in a reasonable amount of time, and in an acceptable manner. This therefore implies a level of difficulty sufficiently high to prevent execution of the operation without intervention by the evaluator.
1 :	**Requires both verbal and physical assistance**	Capable of performing all components of the operation with verbal and physical assistance, in a reasonable amount of time, and in an acceptable manner. This therefore implies a level of difficulty sufficiently high to prevent execution of the operation without intervention by the evaluator.
0 :	**Dependence**	Unable to perform the components of the operation in a reasonable amount of time or in an acceptable manner, despite verbal and physical assistance.
8 :	**Not observed (intrinsic cause)**	Operation not evaluated for reasons intrinsic to the person. (e.g., must stop the assessment as the subject must leave for another appointment).
9 :	**Not observed (extrinsic cause)**	Operation not evaluated for reasons extrinsic to the person. (e.g., unable to go to the grocery store as the road conditions are extremely icy and dangerous).

Appendix 3- Task specific instructions of the *IADL Profile*

ITEM NUMBER	TASKS	INSTRUCTIONS
101-104	Putting on outdoor clothing	*"Without knowing it, you invited my assistant and I to have lunch with you. Please get ready to receive us. We will assume any incurred expenses for a maximum of $20"* *"Now, please tell me what you are going to do"* Added information: If the person proposes a cold meal, the examiner adds the following information: *"We would prefer, if at all possible, that you prepare a hot meal."*
201-204	Going to the grocery store	
301-304	Shopping for groceries	
401-404	Preparing a hot meal for guests	
501-504	Having a meal with guests	
601-604	Cleaning up after the meal	
702-704	Obtaining information	*"I would like you to find information on the daily schedule of bus departures to Toronto" "Now, please tell me what you are going to do"*
802-804	Making a budget	*"Imagine that you have a net annual income of $20,000, that you live alone in an apartment and that you have all your furniture and appliances. You would like to put money aside to buy a car within the next year by paying a portion of it in cash. Can you write your annual budget and give the details?" "Now, please tell me what you are going to do."*

Appendix 4- Definition of operations of the *IADL Profile*

OPERATION	DEFINITION
FORMULATE A GOAL	Capacity: - to find a solution to satisfy a need or solve a problem situation.
PLAN	Capacity : - to think about the initial conditions before acting ; - to identify alternatives ; - to choose most adequate alternatives ; - to develop a general strategic and tactical plan of actions (sequence of actions or steps).
CARRY OUT THE TASK	Capacity : - to initiate his or her action plan ; - to carry out the plan of action while adapting to errors or novel situations (includes the surveillance / ongoing monitoring of task execution in relation to initial goal, endurance, manipulation and utilization of material); - to perceive errors in planning (time and space estimation errors) and execution (manipulation errors, tool selection errors) ; - to adjust actions in relation to perceived errors and new or unforeseen situations .
VERIFY ATTAINMENT OF THE INITIAL GOAL	Capacity : - to verify that the task initially planned was carried out ; compare the final result to the initial goal ; - To accept or reject the results ; - To end the task or to start the process again when the result is not attained.

Chapter 7

The criterion related validity of the *IADL Profile* with measures of executive functions, indices of trauma severity and sociodemographic characteristics

The criterion-related validity of the IADL Profile with measures of executive functions, indices of trauma severity and sociodemographic characteristics

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KEY WORDS: brain injuries, activities of daily living, psychometrics, home visits, executive processes

Abstract

Objective: To investigate the criterion related validity of the *IADL Profile* with indices of injury severity and measures of executive functions.

Design: Trained examiners administered three measures of executive functions (EF) to subjects: Tower of London (ToL), Stroop and the Working Memory Index (WMI) of the Weschler Memory Scale III. The *IADL Profile* was then administered by a trained occupational therapist in the subjects' home and community environment.

Setting: Patients were recruited from 12 rehabilitation hospitals in Quebec.

Patients: One hundred patients with a moderate or severe traumatic brain injury aged 16 to 65 years (convenience sample).

Intervention: Not applicable

Main outcome measures: Age, gender, education, Glasgow coma scale score at emergency, length of coma, duration of posttraumatic amnesia, time elapsed since the trauma, ToL, WMI, Stroop and *IADL Profile*.

Results: Level of education was significantly correlated to *IADL Profile* scores ($r=0.221$ to $r=.411$). Injury severity indicators were more strongly correlated to IADL scores than to measures of EF. Posttraumatic amnesia was the measure that was correlated with the largest number of factorial scores ($r= -0.303$ to $r= -0.532$). All *IADL Profile* scores showed weak to moderate correlations with measures of planning (ToL) and working memory (WMI).

Conclusions: This study provides evidence for the criterion related validity of the *IADL Profile* with relation to TBI injury severity, education and EF measures of planning and working memory.

Role of the candidate:

The candidate completed the literature review. In collaboration with her research directors, she submitted a grant proposal and obtained funding for this project. She prepared ethics applications and obtained ethics approval from the numerous centers involved in the project. She administered the *IADL Profile* to the majority of the 100 TBI subjects in their home and community environments, covering a distance of more than 10 000 km. In collaboration with her research directors, she prepared an intensive four-day training workshop for the two raters who collaborated on the project. She reviewed all qualitative observations documented with the *IADL Profile* by these two raters and ensured that the ratings attributed to related items were congruent with revised rating guidelines developed secondary to the reliability study. With the help of research assistants, she extracted information related to trauma severity from the subjects' medical charts and prepared the complete data set. In collaboration with her research directors, she analyzed the data, collated the results and interpreted the data. She wrote several drafts of the manuscript that were intensely scrutinized and commented on by her research directors. The manuscript will soon be submitted to the following journal:

Cortex

Moderate and severe traumatic brain injuries (TBI) are a major public health problem disproportionately affecting young adults (Gordon et al., 2006). The prevalence of disablement is estimated at 63/100 000 of the adult population living in the community (Dawson & Chipman, 1995). Large numbers report requiring prompting to initiate tasks and persistent problems with speed of processing, memory, and planning (Olver et al., 1996). Primary caregivers experience significant levels of stress, burden and depression (McCabe et al., 2007) and report having the most difficulty coping with the TBI individual's cognitive, behavioral and emotional changes (Ponsford et al., 2003). Though the fundamental goal of TBI rehabilitation is to help persons resume optimal levels of participation in real-world everyday activities (Brown et al., 2004), there is a notable lack of rigorously validated community-based observational measurement instruments of instrumental activities of daily living (IADL) upon which to base clinical decisions and evaluate the effectiveness of interventions (Ashley et al., 2001). A new performance-based test of instrumental activities of daily living (IADL), the *IADL Profile* (Bottari et al., 2004), was recently developed to measure independence in IADL for individuals with moderate or severe traumatic brain injury (TBI). To date, findings suggest that the *IADL Profile* is a promising means of documenting both IADL independence and the repercussions of executive deficits on everyday tasks in real-world environments.

Previously we reported the tool's intra and inter-rater reliability, internal consistency, and factorial validity (Bottari, Dassa, Dutil, & Rainville, in preparation-a; Bottari et al., in preparation-b). A high percentage of generalizability coefficients indicated satisfactory or perfect agreement and principal axis factoring and confirmatory factor analysis disclosed six correlated factors (F): (F1) going to grocery store / shopping for groceries, (F2) having a meal with guests / cleaning up, (F3) putting on outdoor clothing, (F4) obtaining information, (F5) making a budget, (F6) preparing a hot meal for guests. Internal consistency of the total scale was very high (0.95). Moreover, a heuristic approach based on a theoretical framework related to executive functions (EF), broadly defined as the capacity to plan and carry out complex goal-directed behaviour (Lezak, 1983; Stuss & Benson, 1986), led to the definition of three *ad hoc* composite scores labeled as follows: carry out tasks (Index 1), complex planning (Index 2) and action working memory (Index 3). These indexes, measured within everyday tasks carried out within the context of subjects' home and community environments, were defined as ecological indexes. The internal consistency of these indexes was high to very high with values ranging between 0.83 and 0.91. This study investigates the tool's criterion validity in relation to known predictors of IADL independence subsequent to TBI (e.g. executive functions, injury severity, and pre and post-injury level of education).

The task analysis that underlies the *IADL Profile* was structured so as to examine the repercussions of cognitive abilities, particularly EF, critical for IADL independence. These abilities and the extent to which they impede performance in the realization of complex IADL are frequently not tested (Fortin et al., 2003). Executive deficits have been argued to be the single most important component of deficits of independence in IADL in brain lesioned patients (Godbout & Doyon, 1995; Grafman et al., 1993; Lezak et al., 2004; Shallice & Burgess, 1991). Moreover, executive functioning has been identified as a key factor in relation to vocational outcome (Gordon et al., 2006; Ownsworth & McKenna, 2004).

EF are broadly defined as the capacity to plan and carry out complex goal-directed behaviour (Lezak, 1983; Stuss & Benson, 1986). Lezak (2004), based on the seminal work of Luria (1973), suggests that EF can be conceptualized as consisting of four main components: 1) volition; 2) planning; 3) purposive action and 4) effective performance. EF deficits are at times overtly apparent (e.g. defective self control or self-direction such as rigidity or difficulty in making shifts in ongoing behaviour) or more subtle (e.g. impaired capacity to initiate activity or to plan the activity sequences related to goal-directed behaviour) (Lezak et al., 2004b). In order to identify the stage or stages at which breakdown in executive behaviour occurs, a precursor to the identification of targeted treatment interventions, a systematic examination of the capacities that enter into the four components of executive activity is required (Crépeau, Scherzer, Belleville, & Desmarais, 1997; Lezak et al., 2004b). Data cumulated to date on EF have shown evidence that deficits are more severe in more complex and novel tasks (Burgess, 2000), in poorly structured tasks (Le Thiec et al., 1999) and in the presence of distracting stimuli in complex and dynamic environments (natural contexts) (Humphreys & Forde, 1998; Zalla et al., 2001).

The overall structure of the *IADL Profile* (e.g. tasks, instructions for examinees, evaluation environment) was operationalised in accordance with this theoretical understanding of EF. For instance, in order to maximize the possibility of observing EF deficits, particularly related to task initiation and planning, examinees receive minimally structured instructions. When compared to similar studies (Chevignard et al., 2000; Fortin et al., 2003; Rempfer et al., 2003; Semkovska et al., 2004), this less structured evaluation context should permit the observation of a broader range of behaviors related to EF. Observed behaviours and verbalisations are associated to four underlying operations related to EF so as to identify the stage at which breakdown in performance occurs: goal formulation, planning, carrying out the task, and verifying attainment of the initial goal. The *IADL Profile* includes eight tasks with elements of complexity and novelty, six of which are linked to the goal of preparing a hot meal (dressing to go outdoors, going to the grocery store, shopping for food, preparing a hot meal, having a meal with guests, cleaning up after the meal) and two of which are single tasks (obtaining information and making a budget). All tasks are administered in the person's home environment within a three hour period.

To determine whether the *IADL Profile* fulfills the major goal of documenting the cognitive abilities such as EF critical for IADL independence, scores were compared with three measures of EF carefully selected to better capture unique EF related to planning, inhibition and working memory, i.e. Tower of London (ToL)(Shallice, 1982), Stroop (Golden, 1978a; Stroop, 1935) and Working Memory Index (WMI) of the Weschler Memory Scale-III (WMS III) (Wechsler, 1997).

To date, investigations of the determinants of IADL independence in TBI have shown that reduced IADL independence, present in significant numbers of persons with TBI, is associated to more severe injury as measured by duration of post-traumatic amnesia (PTA) (de Guise et al., 2006; Doig et al., 2001; Gordon et al., 2006; Winkler et al., 2006), Glasgow Coma Scale (GCS) score and length of coma (Connelly et al., 2006; de Guise et al., 2006; Doig et al., 2001; Gordon et al., 2006; Hoofien et al., 2002); coma duration alone was shown to be a good predictor for more severe injuries only (Wilson et al., 1991). Injury severity in moderate and severe TBI has been argued by some to have an indirect rather than a direct relation to functional outcome with information processing speed shown to be a strong mediator between TBI injury severity and functional outcome (Rassovsky et al., 2006b). Sociodemographic variables such as number of years of education, age, and sex have also been found to be associated with outcomes related to IADL independence

(Dawson & Chipman, 1995; Gordon et al., 2006; Hoofien et al., 2001). Increasing age (Whiteneck et al., 2004) and the female gender (Gordon et al., 2006) have been associated by some to generally poorer outcomes (Connelly et al., 2006) though age has been shown to not be independently predictive (Teasdale & Jennett, 1974). Hence, to determine whether level of independence following TBI as documented with the *IADL Profile* is related to TBI injury severity, scores were compared with the GCS score (Chevignard et al., 2000), duration of PTA and duration of coma. Furthermore, scores were compared to age, gender, education and time post trauma.

Environmental factors, such as needing a special bus to take short trips or needing aids to enter or leave their residence, have also been associated with lower levels of participation in IADL (Fortin et al., 2003). Hence, in this study, scores obtained on the *IADL Profile*, administered in the person's home environment, were compared to rural versus urban living environment and distance to the grocery store; potentially important indicators of the influence of the environment on IADL independence, particularly in rural areas.

A few related studies have investigated the potential contribution of IADL task performance analysis as a means of better understanding the repercussions of EF deficits on everyday activities in TBI. For instance, results obtained by Chevignard et al., (2000) confirmed that script execution (or observation of task performance when shopping for groceries, cooking and answering a letter and finding the way to post the reply) in individuals with a dysexecutive syndrome (n=11) is a valid ecological approach to estimate the severity of deficits in daily life activities (Andresen, 2000). Similarly, Fortin et al. (2003) confirmed that individuals with mild to severe TBI (n=10) with frontal lobe lesions manifested marked anomalies during the performance of a meal preparation task; the latter were deemed indicative of an outstanding deficit in strategic planning and prospective memory, important underpinnings of reduced IADL performance (Fortin et al., 2003). However, as noted by the authors of this study, differences between TBI patients and control groups in IADL performance could be reduced to a mere artefact of the undetermined psychometric properties of the IADL task. To date, investigations in this area of study tend to be flawed by the absence of IADL task observations framed within measurement instruments with well established psychometric properties (e.g. inter-rater reliability). Conclusions pertaining to group differences between TBI and healthy controls could be debated on this basis as the potential for measurement error in IADL task performance analysis is considerable. IADL measurement instruments, like all other measures, must have evidence of satisfactory psychometric properties to ensure that tools give consistent answers (test-retest reliability, interrater reliability) and that they measure what they purport to measure (validity) (Le Thiec et al., 1999).

A number of studies have looked at the relation between observation based measures of everyday activities such as the Multiple Errands test (MET) (Knight, Alderman, & Burgess, 2002), an IADL type task used to measure EF deficits whose psychometric properties have recently begun to be established, and classical tests of EF such as the Stroop and the ToL (Alderman et al., 2003; Knight et al., 2002; Lezak, 1993). These studies were designed to examine whether classical tests of EF (e.g. Stroop, ToL) or a more ecological test such as the MET provide a more precise indication of executive deficits in everyday activities. Overall, these studies have shown a near absence of correlation between error scores obtained on the MET (inefficiencies, interpretation failures, rule breaks, task failures and total errors) and classical tests of EF. For instance, Knight et al. (2002) (n=20 subjects with acquired brain injury which included 12 TBI and five strokes) failed to find significant correlations between the ToL and a hospital version of the MET (Knight et al., 2002). Lethiec et al. (1999), based on 12 severe TBI, found six to be impaired on both neuropsychological measures of EF and the MET, five to be impaired on the MET but not on neuropsychological measures of EF and only one to be impaired on neuropsychological measures of EF and not on the MET. Overall, significantly more errors were evident in the MET than in the ToL. The lack of substantive relationships between observation-based measures of EF deficits in real-world activities and classical tests of EF has led some investigators to conclude that the latter are not adequate predictors of performance in everyday activities (Alderman et al., 2003; Knight et al., 2002; Lezak, 1993). However, these studies were based on small samples and included patients with diverse pathologies. The current study will examine similar relationships between the *IADL Profile* and classical measures of EF within a much larger (n=100) and more homogeneous sample (only moderate and severe TBI) of subjects.

If executive deficits are indeed apparent during the planning and realisation of complex everyday tasks, the *IADL Profile* should allow us to document IADL independence in its broadest sense that is in consideration of EF related deficits and their repercussions in real-world activities. Moreover, the lesser structure provided to examinees in the administration of this test, when compared to previously reported studies, may further our understanding of the repercussions of executive deficits while simultaneously reducing expected correlations between this measure and the much more structured approach used in classical tests of EF.

Certain aspects of neuropsychological functioning have also been shown to be significantly predicted by TBI injury severity (Cohadon, Castel, & Richer, 2002), as well as significantly predictive of functional outcome (Rassovsky et al., 2006a). For instance, TBI injury severity, as measured by the GCS, duration of PTA and neurological findings has been shown to be significantly related to working memory as measured by the WMI of the WMS-III, with lower scores in the more severely brain injured (Langeluddecke & Lucas, 2005). Certain studies have shown that inhibition, as measured by Stroop Interference errors, is related to TBI injury severity as measured by the presence of diffuse axonal injury, GCS scores and duration of impaired consciousness (Fork et al., 2005). Performance on the ToL has also been shown to be related to TBI injury severity (Levin et al., 1996). Based on these findings, we retained these three measures for the criterion-related validation of the *IADL Profile*.

As the *IADL Profile* was developed to document both IADL independence and the repercussions of executive deficits on everyday tasks in real-world environments, it is essential that we document the extent to which inferences about EF can be drawn from test scores obtained on the *IADL Profile*. Hence, the present study examined measures of relationship between the *IADL Profile* and tests of EF. More precisely, we looked at the correlations with a measure of planning ability, the ToL (Shallice, 1982), a measure of inhibition, the Stroop (Golden, 1978b; Stroop, 1935) and a measure of working memory, the WMI of the WMS-III (Wechsler, 1997). Moreover, as trauma severity, sociodemographic characteristics such as age, education, and gender and certain environmental characteristics have been shown to influence IADL independence secondary to a TBI, we will also look at correlations with these variables. Our goal in this study was to begin to establish the criterion-related validity of the *IADL Profile* in a sample of persons with moderate or severe TBI.

Methods

Participants:

Subjects were a convenience sample of moderate or severe TBI subjects recruited from 12 post-acute TBI programs in the province of Quebec. Potential subjects were identified by clinicans and referred to our research team who then verified that subjects met inclusion and exclusion criteria. Inclusion criteria were patient age between 16 and 65 years, French speaking, and a moderate or severe TBI. A moderate TBI was defined by a score ranging between nine and 12 on the GCS (Teasdale & Jennett, 1974), duration of loss of consciousness anywhere between 30 minutes and six hours, PTA varying between one and 14 days, and generally positive scan. GCS scores superior to 12 but accompanied by abnormalities on the CT scan were classified as moderate rather than complicated mild TBI (Levin et al., 1988; Williams, Levin, & Eisenberg, 1990). A severe TBI was defined by a score ranging between three and eight on the GCS, duration of loss of consciousness greater than six hours, PTA of several weeks, and positive scan. Exclusion criteria were disorientation (i.e., score of 65 or less on the Galveston Orientation and Amnesia Test (Levin et al., 1979)); severe mobility deficits (score < 3 on the bed, chair, wheelchair transfer item of the Functional Independence Measure, FIM (Uniform Data Set for Medical Rehabilitation, 1995)); severe language deficits (score < 4 on the communication item of the FIM) and history of hospitalisation for psychiatric disorders. Prior to the evaluation, subjects were given verbal and written information on the study and signed statements of informed consent. Subjects were informed that they were free to withdraw from the study at any time. The study was approved by the ethical review boards of participating centers.

Trauma severity:

Glasgow Coma Scale (Teasdale & Jennett, 1974) is an internationally recognized criterion measurement of TBI injury severity (Teasell et al., 2007). The GCS is a measure of level of consciousness. Three indicators of level of consciousness have been retained: eye opening, best motor response and verbal response. The total score varies from three to 15. A score ranging between three and eight is used to indicate a severe TBI, between nine and 12 a moderate TBI and between 13 and 15 a mild TBI. In our study, information regarding the GCS was extracted from the patients' medical files.

Coma length: According to Jennett & Teasdale (Jennett & Teasdale, 1981), altered consciousness is the most consistent indicator of brain damage. These authors define coma as "not obeying commands, not uttering words, and not opening eyes" (p.80). A patient who fails to meet anyone of these three components is regarded as not being in a coma. Coma has also been defined as a pathological state of profound and sustained unconsciousness (Vanier & Dutil, 1998). According to Levin et al. (1988) and cited in Lezak et al. (2004), coma has been defined as occurring when the GCS score is less than or equal to eight in patients without spontaneous eye opening, ability to obey commands or comprehensible speech (Levin et al., 1988). This information was extracted from health records at the time of injury.

Posttraumatic amnesia (PTA) is a criterion for severity of brain injury (Ahmed et al., 2000). It is defined by some as the time of injury to when the patient resumes "continuous memory" (Russell & Nathan, 1946) including the time in which the person is in a coma. Others suggest that the beginning of PTA should only be considered once the person is out of a coma (Levin et al., 1982). PTA varies from minutes to months, typically lasts about four times the length of coma (Brooks, 1989) and is considered one of the best predictors of outcome following TBI (Ahmed et al., 2000; Ropacki, 2000). PTA is frequently documented using prospective measures such as the Galveston Orientation and Amnesia Test (Levin et al., 1979). Based on this measure of orientation, a client who obtains three consecutive daily scores of 75 or greater is considered to be out of PTA. According to the guidelines used within the clinical settings at the time of our study, a PTA varying between one and 14 days was indicative of moderate TBI and a PTA of several weeks was indicative of severe TBI (Ministère de la santé et des services sociaux, 1999). This information was extracted from health records at the time of injury.

Procedures

Three measures of EF with well-established psychometric properties were administered to the subjects (n=100): the ToL, the WMI of the WMS-III and the Stroop. Trained research assistants administered these tests under the supervision of a qualified neuropsychologist. Neuropsychological testing lasted between 45 minutes and one hour and took place in subjects' homes. The order of testing was constant in all cases with neuropsychological tests administered first, immediately followed by the *IADL Profile*. All testing was completed on the same day.

Assessments with the *IADL Profile* were administered by one of three trained occupational therapists, blind to neuropsychological testing results, and lasted about three hours. The primary investigator validated all ratings according to revised rating guidelines developed secondary to results of the reliability and generalizability studies (Bottari et al., in preparation-b), prior to data analysis.

Though a wide variety of measures of EF are present in the literature, three measures were selected for use in this study: the Stroop, the ToL and the WMI of the WMS-III. These measures were carefully selected to better capture unique EF (planning, inhibition and working memory). All three measures are gold standards in the literature and have been extensively used to measure EF. Strong evidence of psychometric properties has been documented and validated French translations were available.

Measures of executive functions:

Stroop Color and Word Test

The Stroop (Golden, 1978b; Stroop, 1935), more specifically the Stroop interference measure, is used as a measure of inhibition, i.e. it documents the extent to which a person can inhibit the strongly ingrained habitual response of reading in order to name the color in which a word is written. This deliberate, controlled suppression of prepotent responses is commonly labelled as an EF linked to the frontal lobes (Miyake et al., 2000). In the present study, a French translation and adaptation of the Golden version of the test was used (Vanier, 1991) as it is one of the versions with the most thoroughly documented psychometric properties (Canning, 2002). This version of the Stroop consists of three subtasks; a word reading test, a color naming test and a color word naming test. The person is instructed to read as many words or to say as many colors as possible within a time limit of 45 seconds. The Golden version produces an interference score that measures the inhibition component. According to MacLeod (1991) the interference score is the most prevalent manner in which this test is scored (MacLeod, 1991). Test-retest reliability reported in the manual is acceptable (Golden, 1978b). Though the test manual presents normalized scores adjusted for age and level of education, raw scores were used in the present study as results obtained on the Stroop were compared to scores obtained on the *IADL Profile*. As the latter scores were not adjusted for age nor education, use of normalized Stroop scores would had introduced a component of error into the estimated correlations between these two measures. We thus used raw scores of each subtask to calculate the interference score.

Tower of London

The Tower of London (ToL) test (Shallice, 1982) was developed to identify deficits of planning in individuals with frontal lobe lesions. The test consists of 12 problems (reproduction of a model according to specific rules) of graded difficulty ranging from two to five moves. The task requires that the subject look ahead to determine the order of moves necessary to rearrange three coloured balls from their initial position on three pegs of different heights to a new set of predetermined positions on the three pegs. A problem is scored correct if the solution is achieved within the minimum number of moves necessary, rules are not broken and the solution is attained within 60 seconds. Results are summarised in terms of the number of problems correctly answered on the first trial. The ToL has been shown to be sensitive to frontal lobe dysfunction (Owen, Downes, Sahakian, Polkey, & Robbins, 1990; Shallice, 1982; Shallice & Burgess, 1991) and functional imaging studies have shown a major role for the prefrontal cortex during task performance (Baker et al., 1996). Though the ToL remains a gold standard for the measurement of planning ability, certain studies have failed to show its ability to discriminate between TBI with and without frontal lobe lesions (n=20) (Cockburn, 1995).

The Working Memory Index of the Weschler Memory Scale – III

The Weschler Memory Scale (WMS) is said to be the most widely used and most recognizable memory battery (Lezak et al., 2004b). The most recent version, the Weschler Memory Scale – III (WMS III) (Wechsler, 1997), consists of eight indexes, only one of which, the Working Memory Index (WMI), was used in the present study. The WMI is made up of two primary subtests, the Letter-Number Sequencing and the Spatial Span subtests. In the Letter-Number Sequencing subtest, subjects hear lists of randomized numbers and letters (in alternating order) of increasing lengths (from two to eight units). Subjects are then asked to separately repeat numbers and letters from the lowest to the highest in each series; numbers must always be given first. In the Spatial Span subtest, subjects must reproduce a sequence of blocks identified by the examiner, first in a direct order and then in a reverse order. Raw scores of the Letter-Number Sequencing subtest range between 0 and 21 and between 0 and 32 for the Spatial Span subtest. These scores are then transformed into scaled scores corrected for age which are then converted into a WMI score. These scores range from 49 to 155. Reported reliability coefficients for the WMS III are acceptable (Lezak et al., 2004b).

Data analysis

Criterion-related validation is defined as the study of the relationship between test scores and a practical performance criterion (Crocker & Algina, 1986). To address the objective of criterion-related validation, measures of relationships (Pearson's correlations) and comparison of means (t-tests) were examined between scores obtained on the *IADL Profile* (factor and total scores as well as index scores) and concomitant variables related to injury severity (GCS, PTA, and coma length), demographic characteristics (age, gender, level of education), and evaluation environment (distance to grocery store, urban / rural).

Concurrent validity, a type of criterion-related validation, refers to the relationship between test scores and a criterion measurement made at the time the test was given (Crocker & Algina, 1986). In this study, scores obtained on the *IADL Profile* were compared, using Pearson's correlation coefficient for continuous measures, with scores obtained on EF measures of inhibition (Stroop), planning (ToL) and working memory (WMI). Pearson's correlation coefficients are a measure of the degree of linear relationship between two sets of observations. The magnitude of the number represents the strength of the relationship between the two variables and the sign of the number indicates the positive or negative direction of the relationship (Crocker & Algina, 1986).

Next, for each of the variables of interest (e.g. age, gender, level of education, trauma severity, measures of EF) independent sample t-tests were conducted as a complement to the correlations. The mean *IADL Profile* scores (factor, total and index scores) of two subgroups, that is the 20 subjects with the highest independence scores and the 20 subjects with the lowest independence scores, were compared with the mean of these same subjects on all variables of interest. As these t-tests focused on contrasting the highest and lowest ends of independence with variables of interest, they provided information that was complementary to that obtained with correlations that are measures of relationship based on whole sample data.

Results

Participant characteristics

Sociodemographic and clinical characteristics are depicted in Table 1. As illustrated, the average age of the subjects was 37.0 years and the majority were male (78%). Sixty-nine percent had a severe TBI and the average time post-injury was 14.2 months. Though nearly 20% of subjects had GCS scores between 13 and 15, 96% of all subjects had a positive scan. Participant characteristic data were not normally distributed for coma length and PTA. Two outliers were removed to examine correlations with other variables. The mean number of years of education was 11.6 (± 3.4) years. At the time of the assessment, 41% were on a medical leave of absence from their work, 22% were undergoing a work assessment, 16% had been declared unemployable, and 12% were working (either full or part time).

Measures of injury severity and executive functions

Sample descriptors regarding measures of injury severity are reported in Table 1. The mean GCS score at emergency was 7.7 (range 3 to 15). The mean number of days of PTA was 34.0 ± 50.3 days. The mean duration of coma was 11.2 ± 17.6 days.

Working memory scaled scores on the WMI ranged from 66 to 151 with a mean score of 97.1 and a standard deviation of 14.8. ToL scores, in terms of the number of problems correctly answered on the first trial, ranged from 1 to 12 with a mean score of 8.1 and a standard deviation of 2.1. Stroop Interference scores based on raw rather than normalized scores ranged from -23.4 to 23.2 with a mean score of 3.2 and a standard deviation of 8.0. Stroop color word error scores ranged from .63 to 1.0 with a mean of .98 and a standard deviation of .06.

Correlations of indices of injury severity and sociodemographic variables with measures of executive functions and IADL Profile scores

To situate our sample on more widely documented correlations in the literature, Pearson's correlations were calculated between measures of injury severity, sociodemographic characteristics and measures of EF (Table 2). GCS, PTA and coma duration were all significantly correlated to each other ($r= -.327$ to $r= -.714$). GCS and coma length were also correlated to age with older subjects having higher GCS scores and shorter comas, therefore milder injuries. Only one measure of EF, the WMI, was correlated with a measure of injury severity, PTA ($r= -0.283$); the negative correlation indicates that the longer the duration of PTA the poorer the working memory score. All three measures of EF were correlated with education ($r=0.291$ to $r=0.484$). Planning, as measured by the ToL, was correlated with working memory ($r=0.352$), as measured by the WMI. The two measures of inhibition obtained from the Stroop were also correlated ($r=0.203$). All other correlations were not significant.

Pearson correlations were calculated between *IADL Profile* scores and measures of injury severity, sociodemographic characteristics and measures of EF. In addition, to further assess the criterion related validation of *IADL Profile* scores with concomitant variables, subjects were divided into quintiles and the group with the highest IADL scores (n=20) was compared to the group with the lowest IADL scores (n=20). As reported in

Tables 3 and 4, all three measures of injury severity (GCS, PTA and coma duration) were significantly correlated with the total score of the *IADL Profile* (r=0.248 to r=0.521). However, correlations between these three indices and *IADL Profile* factorial and index scores varied. PTA is the measure that was correlated with the largest number of factorial (r= -0.303 to r= -0.532) and index (r= -.344 to r= -.506) scores. The negative correlation indicates that, as expected, when duration of PTA increases, IADL independence scores decrease. Results obtained when comparing the means of individuals with the highest level of independence (n=20) with those of individuals with the lowest level of independence (n=20) on *IADL Profile* scores were comparable with these findings that is when the correlations showed a significant relationship, the contrast between the high and low independence groups was also significant. PTA of these two groups was significantly different for six out of ten *IADL Profile* scores: global score (t=2.447; df=17.999; p=.025), F1 (t= 2.4; df= 16.68; p=.028), F3 (t=2.45; df= 15.45; p=.027), F4 (t=2.157; df=12.177; p=.052), indexes 1 (t=2.582; df=14.261; p=.021) and 2 (t=2.34; df=14.80; p=.034). Coma length was also significantly different for six out of ten *IADL Profile* scores: global score (t=2.22; df=14.55; p=.043), F2 (t=2.88; df=21; p=.009), F3 (t=2.30; df=13.39; p=.038), F5 (t=2.64; df=22; p=.015), F6 (t=2.64; df=22; p=.015), and index 1 (t=2.24; df=13.13; p=.043). GCS was significantly different for five of ten *IADL Profile* scores: F2 (t=-4.74; df=29.06; p=.000), F3 (t=-3.64; df=36; p=.001), F5 (t=-4.26; df=36; p=.000), F6 (t=-4.26; df=36; p=.000) and index 1 (t=-2.53; df=35; p=.016). Hence, all ten *IADL Profile* scores (high-low) were significantly different on one or more measures of injury severity. Concerning the time of injury to test interval, a significant correlation was noted with factor score 6, preparing a hot meal, (r= -0.224) whereas the correlation with the total score (r= -0.200) was significant at a 0.051 level. No significant differences were found between high-low *IADL Profile* scores with regards to time post-trauma.

Socio-demographic variables

Education is the only socio-demographic variable correlated with the total score of the *IADL Profile* (r=.250), with factorial scores 2, 4, 5, 6 (r=.221 to r=.411) (Table 3) and with index scores 1 and 3 (r=.303 to r=.344) (Table 4). Results obtained when comparing the means of individuals with the highest level of independence (n=20) with those of individuals with the lowest level of independence (n=20) were comparable with these findings that is when the correlations showed a significant relationship, the contrast between the high and low independence groups was also significant. Education of these two groups was significantly different for factorial scores F4 (t= -3.62; df=36; p=.001), F5 (t= -2.47; df=37; p=.018), and F6 (t= -2.47; df=37; p=.018) and for index 1 (t= -3.01; df=37; p=.005). Age was correlated with two *IADL Profile* scores, that is F1 (going to the grocery store and shopping for groceries) (r= -0.234) and Index 2 (ecological Index of complex planning) (r=-.226). Thus, when age increases, IADL independence for these two scores decreases. This relation was confirmed by a significant difference between the high-low groups on *IADL Profile* scores according to age on F1 (t=2.13; df=38; p=.040) and additionally on Index 2 (t=2.63; df=38; p=.012). Regarding other variables such as gender (Table 5) and evaluation environment (rural / urban) (Table 6), no correlations were observed; neither with the total score nor with any of the 6 factor scores. Results obtained when comparing the means of individuals with the highest level of independence (n=20) with those of individuals with the lowest level of independence (n=20) on *IADL Profile* scores were comparable with these findings that is when the correlations showed a significant relationship, the contrast between the high and low independence groups was also significant. The correlation between factor 1 (going to the grocery store and shopping for groceries) and the distance to the grocery store (r= -0.213) was significant at a 0.055 level. The negative correlation indicates a pattern that suggests that when distance to the grocery store increases, IADL independence scores decrease.

Measures of executive functions

Two measures of EF were shown to be significantly correlated with the total score of the *IADL Profile*, that is the ToL (r=0.366) and the WMI (r=0.376) (Table 3). These two measures were also correlated with all factor scores of the *IADL Profile*, as well as with all three index scores. The greatest number of statistically significant correlations (p<0.001) were noted with factor 4 (obtaining information), the total score and index scores. Though the *IADL Profile* was administered within a real-world environment, no correlation was noted with a recognized measure of inhibition (Stroop). Results obtained when comparing the means of individuals with the highest level of independence (n=20) with those of individuals with the lowest level of independence (n=20) on *IADL Profile* scores were comparable with these findings that is when the correlations showed a significant relationship, the contrast between the high and low independence groups was also significant. ToL scores of these two groups were significantly different for three of ten *IADL Profile* scores: global score ($t = -2.07$; $df=38$; $p=.045$), F4 ($t = -2.83$; $df=27.2$; $p=.009$), and index 1 ($t = -2.13$; $df=38$; $p=.040$) (Table 7). WMI scores of these two groups were significantly different for eight of ten *IADL Profile* scores: global score ($t = -3.1$; $df=37$; $p=.004$), F1 ($t = -2.14$; $df=37$; $p=.039$), F2 ($t = -3.47$; $df=37$; $p=.001$), F3 ($t=-2.81$; $df=38$; $p=.008$), F4 ($t=-3.55$; $df=36$; $p=.001$), index 1 ($t=-3.91$; $df=37$; $p=.000$), index 2 ($t = -2.74$; $df=38$; $p=.009$), and index 3 ($t = -3.69$; $df=37$; $p=.001$). No significant differences were found between high-low *IADL Profile* scores and Stroop scores.

Discussion

Results of this study provide evidence for the criterion related validity of the *IADL Profile* with relation to injury severity (PTA, GCS and coma duration), level of education, and EF measures of planning (ToL) and working memory (WMI).

Measures of injury severity

Indicators of injury severity such as GCS scores, length of coma, and duration of PTA are known predictors of functional outcome (Gordon et al., 2006; Hoofien, Vakil, Gilboa, Donovick, & Barak, 2002; Whiteneck et al., 2004). Findings from this study are thus consistent with those of previous studies. Also, length of coma has been shown to be most predictive of functional outcome secondary to severe injuries (Wilson et al., 1991) and PTA has been shown to be the most predictive of functional outcome overall (Ahmed et al., 2000; Ropacki, 2000). Examination of factor and index scores of the *IADL Profile* suggests that coma length is significantly different between high and low functioning groups on simpler tasks whereas PTA is significantly different on more complex tasks but not on simpler tasks. For instance, coma duration of the high functioning *IADL Profile* group was shorter than the low functioning *IADL Profile* group on two simple tasks, F2 (having a meal /cleaning up) and F3 (putting on outdoor clothing). A central stage of EF that was particularly problematic for the low functioning group for F3 was goal formulating with more impaired individuals requiring the examiner's assistance to formulate the goal to go outdoors. Coma duration of the high functioning *IADL Profile* group who were independent on a more complex task (i.e. F5 making a budget), was shorter than the low functioning *IADL Profile* group who were dependent on this task. Almost all individuals with severe injuries were unable to even attempt this task due in part to accumulated fatigue rendering the degree of task complexity irrelevant to the outcome. Coma duration of the high functioning *IADL Profile* group who were independent on another apparently complex task (i.e. F6 preparing a hot meal), was also shorter than that of the low functioning *IADL Profile* group requiring assistance. Task complexity in this task varied from simple in the low functioning group (e.g. soup and sandwich) to complex in the high functioning group (e.g. stir-fry) as subjects were left to select their own menus.

PTA of the high functioning group was shorter than that of the low functioning *IADL Profile* group on more complex tasks such as F1 (going to grocery store / shopping for groceries), F4 (obtaining information), Index 2 (ecological index of complex planning) and Index 3 (ecological index of action working memory). The low functioning group tended to be dependent on F1 and F4 and the high functioning group tended to be independent. Alternately, on both indexes, the low functioning group required assistance and the high functioning group was independent suggesting that overall, less impaired individuals were, as expected, more independent on the *IADL Profile*. Finally, GCS score differences between the high and low functioning *IADL Profile* groups were similar to results obtained with coma duration as these two indices of injury severity were highly correlated.

These results are congruent with the definition of complexity proposed by Rainville et al (2005). According to these investigators, complex tasks differ from simpler tasks on a number of parameters (Rainville & Passini, 2005). First, complex tasks imply a larger number of decisions. In simple tasks one can make a decision and directly act on it (e.g. having a meal). In more complex tasks (e.g. shopping for groceries), intermediate decisions are frequently required prior to acting on the decision (e.g. getting dressed to go outdoors, going to the grocery store). Alternately, complexity involves the need to breakdown an initial goal into a series of subgoals (e.g. deciding to get dressed to go shopping to eventually be able to prepare a meal for guests).

As the general recovery curve suggests improvement over time subsequent to a TBI, we expected a stronger relationship between *IADL Profile* scores and time of injury to test interval. However, our results can be explained by the cross-sectional rather than longitudinal design of our study. Indeed, subjects recruited via rehabilitation centers at a greater distance from their injury were those with persistent and severe disabilities still requiring services years after their injury.

Despite documented correlations between measures of injury severity and *IADL Profile* scores, only PTA was correlated with one of the measures of EF that is the WMI. Some concerns have been raised regarding the low internal consistency (alpha = 0.25) of the ToL (Schnirman, Welsh, & Retzlaff, 1998). In fact, Schnirman et al. (1998) remarked that this alone could account for low correlations between this test and all other measures. Hence, the greater correlation of *IADL Profile* scores to injury severity may be partly explained both by the better ecological validity of the *IADL Profile* and at least in comparison to the ToL, by the better psychometric properties (alpha = 0.95) of the former tool. These results are also congruent with the general understanding that independence in IADL involves not only EF but also a number of other factors (e.g. environment, other abilities) documented with the *IADL Profile* but not with measures of EF. Hence, the *IADL Profile* provides additional information pertaining to the consequences of the TBI, as compared to measures of EF.

Socio-demographic characteristics

Age was significantly correlated with two *IADL Profile* scores, that is F1 (going to the grocery store and shopping for groceries) and Index 2 (ecological index of complex planning). Independence tended to decrease with increasing age on both of these scores. These results could suggest that in these two situations (i.e. F1 and Index 2), increased age amplifies the consequences of the TBI on IADL independence. For instance, going to the grocery store and shopping for groceries without assistance is, particularly in rural areas, largely dependent on individuals having resumed driving subsequent to the TBI. Here, grocery stores are frequently not within walking distance and public transportation is frequently non-existent or extremely scarce. One recent study based on 51 moderate to severe TBI subjects interviewed at an average of 4.3 years post-injury, found that 39 % had resumed independent driving. The average age of the participants who had resumed independent driving was 39.1 (± 15.1) years and the average age of the nondrivers was 40.1

(± 11.9) years (Rappaport, 2006). Average age was therefore found not to differ between drivers and nondrivers. For individuals of all ages, planning how to get to places more or less out of walking distance such as the grocery store may be more complex if they were able to drive prior to their TBI but are no longer able to do so. Though more studies with individuals of a broad spectrum of ages living at varied distances from the grocery store would likely be required to further examine the correlation between age and F1 (going to the grocery store and shopping for groceries) found in this study, one hypothesis that would merit further investigation is that permanent or temporary loss of driving ability subsequent to a TBI affects older people more so than younger people. Said differently, it is possible that younger subjects have a greater facility adapting to this new non-driver situation and more easily find alternate means of getting to the grocery store (e.g. walk the longer distance, call a friend for a lift). As older subjects in this study had milder injuries overall, these results cannot be explained by the greater severity of the injury in older subjects.

As the *IADL Profile* largely revolves around a meal preparation task, we could have expected to see gender differences favouring women. However, the sheer absence of significant relations between gender and any of the ten *IADL Profile* scores suggests that the test is pertinent for both men and women and moreover, that neither gender is either advantaged nor disadvantaged by this type of test. This may be partly explained by the fact that the *IADL Profile* allows all subjects to prepare a meal of their choice. The element of familiarity in their selected menus may have removed gender effects on this task. Alternately, lack of difference between genders in the present study could also be a bias of the sample as a large number of men participants were very comfortable preparing meals.

Level of education was significantly correlated with seven out of ten *IADL Profile* scores, the largest number of significant correlations among the sociodemographic variables. In contrast, Smith-Knapp et al. (1996) showed that the Functional Independence Measure cognitive score, administered to 164 TBI subjects, was not correlated to education (Smith-Knapp, Corrigan, & Arnett, 1996). The higher degree of complexity of IADL tasks measured with the *IADL Profile* made it more difficult for subjects to perform thus adding to the clinical pertinence of a measurement instrument designed to document the repercussions of EF on IADL independence. The highest correlations were observed with two factors: F4 (obtaining information) and F5 (making a budget). These are possibly the two most systematically complex tasks of the test. The significant correlation between education and F6 (preparing a hot meal) could possibly be related to the greater inherent difficulty involved in menu selection and overall planning of the meal. Regarding the significant correlation between education and F2 (having a meal and cleaning up), it is possible that the task "cleaning up after the meal" (and not having a meal per se) weighed more heavily in this factor and that the items of this task are related to education.

Significant correlations with the Ecological Index of Action Working Memory of the *IADL Profile* are consistent with previous studies of neuropsychological performance on the WMI following TBI (Dori & Chelune, 2004). The degree of task complexity upon which the *IADL Profile* was based, may explain these results; tasks were designed to be complex as deficits in EF are known to be more apparent in complex tasks (Burgess, 2000; Rainville & Passini, 2005). Overall, these results are noteworthy as relations with education highlight, to a certain extent, the complexity of IADL tasks as measured by the *IADL Profile*. Moreover, this association with complexity further suggests that results obtained on the *IADL Profile* may permit the observation of repercussions of EF deficits on IADL independence. Finally, these results confirm the criterion-related validity of the *IADL Profile* with education.

Environmental factors

No differences were found in IADL independence between subjects living in rural and those living in urban environments when the confounding variable of driving ability was not considered. However, distance to the grocery store, neared statistical significance ($p=.055$) with F1 (going to grocery store / shopping). Hence, there is an unconfirmed tendency for individuals living a greater distance from a grocery store to be less independent on this task. In contrast to Fortin et al. (2003), subjects in our study were required to plan for themselves the means of getting to the grocery store of their choosing; the examiner did not select the grocery store beforehand, nor drive the person there directly as this would have removed the possibility of documenting individuals' ability to plan this task. Greater distances generally led to greater task complexity, particularly pertaining to planning requirements. Moreover, planning complexity was at its peak when long distances to the grocery store were accompanied by loss of driving ability. Driving in rural areas is frequently the only means available for going to the grocery store. As a side note, it is important to state that subjects who were unable to drive, that is who had not successfully completed their driving assessments, had the alternative of asking the examiner to drive them to the grocery store. However, this option was not proposed to the subject as subjects were informed at the onset of the test that they were to behave as though they were alone and only request the examiner's assistance when truly necessary. Thus, subjects had to explore all possible alternatives, identify the examiner as a viable alternative in the absence of other possibilities, and verify whether the examiner would agree to drive them. Overall, these results are consistent with previous studies that have highlighted that independence decreases with increased environmental demands (Vallée et al., 2006). Notably, the findings argue in favour of observation based IADL tests administered in subjects' home environments as in more construed evaluation settings, subjects' level of independence may arguably be overestimated.

Measures of executive functions

Overall, results indicated that the ToL and the WMI were significantly correlated to all ten *IADL Profile* scores. Moreover, results indicate that subjects with the highest level of independence on eight of ten *IADL Profile* scores had better working memory, as measured by the WMI of the WMS-III. Subjects with the highest level of independence on three of ten *IADL Profile* scores had better planning as measured by the ToL. Compared to previous investigations using the Multiple Errands Test or other unstandardized IADL tests, and based on small sample sizes of patients with diverse pathologies, our results show relations between IADL and EF that were not previously shown. This suggests first and foremost that inferences about the repercussions of EF on everyday tasks in real-world environments can be drawn from scores of the *IADL Profile*. Of equal interest is the demonstrated ecological validity of both the ToL and the WMI in a large homogeneous sample.

However, the strength of the correlations between both these measures of EF and scores obtained on the *IADL Profile* did not differ widely between factors related to more or less complex tasks. According to the literature, planning is required in more complex tasks and less so in simpler tasks (Rainville & Passini, 2005). Correlations with tasks generally considered as having a lower level of complexity (i.e. having a meal / cleaning up; putting on outdoor clothing) may result from the manner in which the *IADL Profile* is administered. More precisely, subjects are evaluated on these tasks not as single tasks but as part of a sequence of tasks where the subject formulates goals and plans the sequence. This may account for the greater than expected correlations between theses tasks and concomitant variables related to planning and working memory. Also, of particular interest are documented correlations between the ToL and WMI with ecological indexes of complex planning and action working memory derived from the *IADL Profile*. These correlations further support the notion that more complex IADL tasks require planning and working memory.

Failure to find significant correlations between the selected inhibition task used in this study (Stroop) and the *IADL Profile* administered in a real-world environment with large numbers of distractors is particularly difficult to explain. Bush et al. (2005) showed inhibition, an important component of EF, to be impaired subsequent to a TBI. However, Stroop Interference scores have previously been shown to not differentiate between individuals with TBI who required assistance with ADL and those who did not (Leahy & Lam, 1998). The hypothesis put forth by Leahy & Lam is that overall impaired performance on all subtests can lead to Interference scores in the normal range. With these results, one may either question the ecological validity of scores obtained on the Stroop, the sensitivity of the *IADL Profile* to inhibition errors or the likelihood that inhibition errors, though present, do not widely alter a person's level of independence in IADL tasks. These and other hypotheses require further investigation.

A number of limitations of the present study need to be acknowledged. First, as already reported, a fair proportion of data was missing on coma length and PTA. These data, extracted from existing medical files, were checked for quality and any unclear or incomplete information was deleted and considered missing. Second, TBI subjects' problems with fatigue imposed time limits on overall neuropsychological testing and did not allow us to extend the number of tests beyond the three that were used. Testing had to be completed within a one-day session due in part to the vast territory covered to attain sample size, the same day as testing with the *IADL Profile*. As a more comprehensive neuropsychological assessment might have yielded a different pattern of findings, it would be important to replicate these findings with additional neuropsychological measures.

Conclusions

This study provides evidence for the criterion related validity of the *IADL Profile* with relation to TBI injury severity, education and EF measures of planning and working memory. Results of this study add credibility to the *IADL Profile's* ability to attain its goal that is to measure IADL independence subsequent to a moderate or severe TBI. Moreover, relations between *IADL Profile* scores and measures of EF suggest that inferences can be drawn regarding the repercussions of cognitive deficits related to EF on IADL. Overall, these results suggest that use of the *IADL Profile* with individuals having sustained a moderate or severe TBI provides a wealth of information on individuals' independence in complex and novel IADL carried out in their own home and community environments and of the underlying causes of persistent difficulties.

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Table 1- Description of sample (n=100)

Variable	Values
Age (years)	37.0 ± 13.7
Gender, % male	78%
Education (years)	11.6 ± 3.4
TBI severity, %	
Severe	69%
Moderate	31%
Glasgow Coma Score at emergency (n=96)	
3 - 8	63.5%
9 - 12	16.7%
13 -15	19.8%
Positive scan	96.0%
Post-traumatic amnesia (days) (n=73)	34.0 ± 50.3
Less than 1 day	6.8%
Between 1 and 14 days	27.4%
Greater than 14 days	63.0%
Coma duration % (n = 61)	
No coma	41.0% (25)
2- 7 days	14.8% (9)
8-14 days	16.4% (10)
> 14 days	27.9% (17)
Cause of TBI	
Motor vehicle accident	61%
Pedestrian accident	16%
Falls	6%
Work accident	5%
Sports injury	5%
Other	7%
Time post-injury (months)	14.2 ± 13.6
Mobility outdoors, %	
Walked with / without orthosis	78%
Walked with a cane or walker	14%
Used a wheelchair	8%

Note: Values are mean ± standard deviation (SD) unless otherwise indicated.

Table 2- Pearson correlations between concomitant variables (n varies between 44 and 97)

Variables	Post traumatic amnesia	Coma duration	Age	Level of education	Tower of London	Weschler Memory Scale III-working memory index	Stroop Interference score	Stroop color word error score
Glasgow coma score at emergency	-.327**	-.714***	0.404***	-0.032	0.065	0.059	-0.109	-.123
Post traumatic amnesia		.578***	-0.005	-0.017	-0.183	-0.283*	-0.031	0.119
Coma duration			-0.290*	0.090	0.044	-0.012	0.163	0.160
Age				0.047	-0.156	-0.075	-0.133	-0.232*
Level of education					0.291**	0.484***	0.326***	0.337**
Tower of London						0.352***	-.061	-.234*
Weschler Memory Scale III-working memory index							.156	.095
Stroop Interference score								0.203*

* p <0.05; **p < 0.01; *** p < 0.001

Table 3- Pearson correlations between *IADL Profile* scores and concomitant variables

	Variables	n	Factor 1 Going to store/ shopping	Factor 2 Having meal/ cleaning up	Factor 3 Putting on outdoor clothing	Factor 4 Obtaining information	Factor 5 Making budget	Factor 6 a Preparing a hot meal	Total score
Indices of injury severity	Glasgow Coma score at emergency	96	0.155	0.310**	0.168	0.091	0.145	0.293**	0.248*
	Post traumatic amnesia	70	-0.432***	-0.303**	-0.532***	-0.308**	-0.222	-0.224	-0.361**
	Coma duration	56	-0.270*	-0.257 (p=.052)	-0.203	-0.100	-0.176	-0.309	-0.521***
	Time of injury to test interval	100	0.002	-0.087	0.037	0.045	-0.112	-0.224*	-0.200 (p=.051)
Socio-demographic characteristics	Age	98	-0.234*	0.016	-0.080	-0.022	-0.177	0.114	-0.154
	Level of education	98	0.040	0.221*	0.011	0.411***	0.342***	0.251*	0.250*
	Distance to grocery store	83	-0.213 (p=.055)	0.038	-1.220	0.088	-0.032	-0.027	-0.136
Tests of executive functions	Tower of London	98	0.223*	0.274**	0.219*	0.327***	0.215 (p=0.052)	0.291**	0.366***
	Weschler Memory Scale III-working memory index	96	0.209*	0.300**	0.223*	0.425***	0.359***	0.197 (p=0.052)	0.376***
	Stroop Interference score	95	0.056	0.017	-.031	-.035	-.019	0.038	0.049
	Stroop color word error score	96	0.003	0.028	-.012	0.129	0.206*	0.096	0.073

* $p < 0.05$; **$p < 0.01$; *** $p < 0.001$

Table 4- Pearson correlations between *IADL Profile* index scores and concomitant variables

	Variables	n	Index 1 Carry out task	Index 2 Ecological index of complex planning	Index 3 Ecological Index of action working memory
Indices of injury severity	Glasgow Coma score at emergency	92	.268**	.189	.201 (p=.054)
	Post traumatic amnesia	70	-.506***	-.414***	-.413***
	Coma duration	55	-.329*	-.296*	-.290*
	Time of injury to test interval	95	-.033	-.028	-.071
Socio-demographic characteristics	Age	96	-.119	-.226*	-.162
	Level of education	94	.303**	.161	.338***
	Distance to grocery store	83	-.127	-.155	-.103
Tests of executive functions	Tower of London	96	.398***	.233*	.357***
	Weschler Memory Scale III-working memory index	94	.420***	.299**	.408***
	Stroop Interference score	93	.021	.076	.046
	Stroop color word error score	94	.089	.047	.121

* $p < 0.05$, ** $p < 0.01$; *** $p < 0.001$

Table 5- Scores of *IADL Profile* compared to gender

Variables	Gender	N	Mean	Std. Deviation	Std. Error Mean	Are variances considered equal?	T statistic	df	Sig
Factor1 Going to grocery store	Male	77	2 807	1 299	148	yes	047	96	963
	Female	21	2 792	1 388	302				
Factor 2 Having meal / cleaning up	Male	78	3 465	648	073	yes	- 561	98	576
	Female	22	3 558	821	175				
Factor 3 Putting on outdoor clothing	Male	78	3 615	980	111	no	831	27 16	413
	Female	22	3 352	1 390	296				
Factor 4 Obtaining information	Male	78	2 295	1 260	142	yes	-1 197	97	234
	Female	21	2 667	1 278	279				
Factor 5 Making a budget	Male	77	1 307	1 220	139	yes	283	96	778
	Female	21	1 222	1 235	270				
Factor 6 Preparing a hot meal	Male	78	3 180	839	095	yes	-1 317	98	191
	Female	22	3 432	599	127				
Total score	Male	76	88 618	20 870	2 394	yes	021	94	983
	Female	20	88 500	27 600	6 171				
Index 1 Carry out all tasks	Male	76	2 600	823	094	yes	- 111	94	912
	Female	20	2 625	1 105	247				
Index 2 Ecological Index of Complex Planning	Male	76	2 615	985	113	yes	- 111	94	912
	Female	20	2 643	1 089	244				
Index 3 Ecological Index of Action Working Memory	Male	76	2 389	863	099	yes	- 360	94	719
	Female	20	2 469	985	220				

Table 6- Scores of *IADL Profile* compared to evaluation environment: urban / rural

Variables	Environment	N	Mean	Std. Deviation	Std. Error Mean	Are variances considered equal?	T statistic	df	Sig
Factor 1 : Going to grocery store	Urban	65	2.789	1.367	.170	yes	-.159	96	.874
	Rural	33	2.833	1.215	.212				
Factor 2 : Having meal cleaning up	Urban	65	3.488	.668	.083	yes	.043	98	.965
	Rural	35	3.482	.729	.123				
Factor 3 : Putting on outdoor clothing	Urban	65	3.542	1.068	.132	yes	-.191	98	.849
	Rural	35	3.586	1.121	.190				
Factor 4 : Obtaining information	Urban	65	2.467	1.247	.155	yes	1.010	97	.315
	Rural	34	2.196	1.303	.223				
Factor 5 : Making a budget	Urban	65	1.313	1.250	.155	yes	.269	96	.788
	Rural	33	1.242	1.167	.203				
Factor 6 : Preparing a hot meal	Urban	65	3.235	.775	.096	yes	-.007	98	.995
	Rural	35	3.236	.847	.143				
Total score	Urban	65	89.154	21.874	2.713	yes	.355	94	.723
	Rural	31	87.419	23.419	4.206				
Index 1: Carry out all tasks	Urban	65	2.629	.854	.106	yes	.374	94	.709
	Rural	31	2.557	.953	.171				
Index 2: Ecological Index of Complex Planning	Urban	65	2.629	1.005	.125	yes	.113	94	.910
	Rural	31	2.604	1.010	.181				
Index 3: Ecological Index of Action Working Memory	Urban	65	2.454	.894	.111	yes	.350	94	.727
	Rural	31	2.385	.927	.166				

Table 7- Comparison of TBI groups with highest and lowest *IADL Profile* total scores with t-tests on measures of injury severity, sociodemographic variables and measures of executive functions

Concomitant variables	Highest *IADL Profile* global score (n=20)		Lowest *IADL Profile* global score (n=20)		
	M	SD	M	SD	t
Glasgow Coma Scale	8.632	3.760	6.556	3.502	-1.736
Post-traumatic amnesia	21.250	14.085	53.750	50.583	2.447*
Coma duration	6.000	9.487	25.462	30.021	2.220*
Time of injury to test interval	12.713	10.967	25.663	53.480	1.061
Age	36.150	13.978	41.700	14.797	1.219
Level of education	13.350	3.870	11.211	4.417	-1.611
Tower of London	8.650	1.755	7.100	2.845	-2.073*
WMI of WMSIII	104.600	16.600	89.263	14.521	-3.065**
Stroop Interference score	3.905	8.400	1.520	8.523	-.869

M= Mean, SD= Standard deviation

* p <0.05; **p < 0.01; *** p < 0.001

Chapter 8

Discussion and conclusions

This thesis aimed to develop and validate a new performance-based measure of IADL, the *IADL Profile.* Based on earlier work on the ADL Profile, this new measure was developed to better estimate independence in IADL and the repercussions of executive deficits on IADL for individuals with a TBI. Psychometric studies regarding this new measurement instrument's content validity, intra and interrater reliability, internal consistency, factorial validity and criterion-related validity were completed.

Development of the *IADL Profile* was based on current knowledge on TBI, IADL and EF. The instrument consists of eight tasks known to reflect everyday activities in which large percentages of individuals with a TBI require assistance. This includes meal preparation, housekeeping, shopping and personal finances. When compared to previous performance based instruments (see Fisher, 2003) and studies (see Chevignard et al., 2000; Fortin et al., 2003) a larger number of tasks known to be relevant and problematic for individuals with a TBI (see Whiteneck et al., 2004; Kozlowski et al., 2002; Mazaux et al., 1997; Dawson et al., 1995) were included in the *IADL Profile*. As environmental barriers have been shown to limit IADL independence of individuals with a TBI living in the community (Ashley et al., 2001; Dawson & Chipman, 1995), the administration context of the tool was selected to be the individual's home and community environment.

When developing the test, particular attention was given to including task complexity and novelty, elements known to be of fundamental importance to tests of IADL independence in consideration of executive functioning (Burgess, 2000; Crépeau et al., 1997; Goel et al., 1997; Rabbitt, 1997). A non-structured approach (Lezak, 1989; Lezak et al., 2004b) and real-world environments (Burgess et al., 2006; Burgess & Robertson, 2002) were also judged important. One particularly new contribution of the *IADL Profile* in relation to previous studies is the integration of all three elements into one complex and long lasting multitask IADL. For instance, based on a minimally structured approach, subjects were left to formulate task goals and subgoals and act on their own initiative related to going to the grocery store, shopping for groceries, preparing a hot meal for guests, having a meal and cleaning up after the meal after having been told that they were to "get ready for guests to arrive" and that "20$ would be provided to cover incurred costs". To document relevant goal formulating and planning behaviours, subjects were simply asked to verbalize what they were going to do. Elements of complexity were inter-related to this minimally structured approach as subjects were expected to complete all aspects of planning of combined tasks and sub-tasks (i.e. consider different menu options and choose meal, verify presence of necessary ingredients, decide on what to purchase, decide on where to purchase ingredients and on how to get to the grocery store). Finally, the third element, "real world environment", was combined with the two previous elements as the test was administered in subjects' home and community environments. This further contributed to the complexity of the multitask IADL as subjects had to consider, for example, the distance from their home to the nearest grocery store and the transportation available to reach their destination. When compared to previous studies (see Fortin et al., 2003), greater planning (identification of alternative forms of transportation for individuals living far from the grocery store without a valid driver's license) was required for the task "going to the grocery store" when measured with the *IADL Profile.* This approach is more ecological, and we expect, a closer approximation of the individual's IADL independence. It is also more sensitive to the repercussions of executive functioning on the ability to accomplish this task. Alternately, two other tasks "obtaining information" and "making a budget" were designed to tap into elements of complexity and novelty though here more limited interactions were required with the real-world environment and the test approach was more structured as goals were explicitly formulated by the examiner.

The framework for error analysis proposed in the *IADL Profile* extends beyond the action coding system proposed by Schwartz (1991) as, in the *IADL Profile*, all four components of executive functioning are documented (goal formulation, planning, carrying out the task, verifying attainment of the initial goal). This should provide a more complete analysis of potential repercussions of executive function deficits on IADL independence. Moreover, since the *IADL Profile* is a measure of IADL independence, error analysis also considers the extent to which errors have repercussions on IADL independence, an aspect not documented with the action coding system. In addition, another new contribution of the *IADL Profile* in relation to the action coding system is the consideration of the impact of errors on task safety. As a score of independence in the *IADL Profile* implies that the person is able to carry out all aspects of the task safely, safety is also measured with this instrument. Finally, as the *IADL Profile* is based on earlier work on the ADL Profile, it is based on an error analysis system that has been previously tested in more complex community based tasks than the error coding system proposed by Schwartz (1991).

In developing the *IADL Profile*, we hypothesized that a measure of IADL independence structured to consider the pivotal role of EF would better reflect individuals' level of IADL functioning in the community than currently used measures of IADL. The results of the validation process presented in Chapter 5 showed that the content of the *IADL Profile* was judged by an international multidisciplinary group of experts (neurologists, neuropsychologists, physiatrists and occupational therapists) to be pertinent to its goal that is to the measurement of IADL independence based on EF. Results of the intra and interrater reliability study showed that a high percentage of generalizability coefficients indicated satisfactory or perfect agreement. As expected in a performance-based test, results of the generalizability study identified raters as the greatest source of measurement error. Results presented in Chapter 6 showed that the total IADL score of the *IADL Profile* has an excellent internal consistency of 0.95. This finding indicates that all items included in the global score are strongly related with each other. Findings from the analyses of the factorial validity study indicated that the tool consists of six factors: (F1) going to the grocery store and shopping for groceries, (F2) having a meal with guests and cleaning up afterwards, (F3) putting on outdoor clothing, (F4) obtaining information, (F5) making a budget, and (F6) preparing a hot meal for guests. Findings from the criterion-related validity study presented in Chapter 7 showed that IADL scores are highly correlated with TBI injury severity, particularly with post-traumatic amnesia. A number of scores are also correlated with education and with measures of EF. No relations were shown between *IADL Profile* scores and gender. Correlations between F1 (going to the grocery store and shopping for groceries) and distance to the grocery store was shown to be significant suggesting that individuals who live at a greater distance from the grocery store are less independent in this task than individuals living closer to the grocery store. Also, analyses of the criterion validity study showed that individuals with higher IADL independence (see Table 7), as documented by higher global *IADL Profile* scores, had less severe TBIs (shorter PTA and shorter comas), better planning abilities (higher scores on Tower of London) and better working memory (better scores on Working Memory Index of WMS III). No relations were observed between individuals with higher IADL independence and gender. Similarly, no relations were observed between individuals with higher IADL independence and the evaluation environment that is whether the test was administered within a rural or urban setting.

Results discussed in preceding chapters will not be discussed again. The goal of the present chapter is to expand upon previous reflections discussed in the articles by adding a more global appreciation of the overall results of the validation process. More specifically, we will examine the extent to which the real-world context of this performance-based test influenced our overall findings. We will also examine how our results corroborate, refute or add to previous definitions of IADL independence. Based on the overall findings of the study we will also re-examine the purpose of the *IADL Profile* more specifically in comparison to ecological measures of EF. We will also examine the unique and specific contributions of this thesis to furthering our understanding about IADL independence in consideration of EF. Here we will particularly discuss the potential contributions of the *IADL Profile* to treatment planning and its potential use in TBI programs. Finally, we will propose future studies to pursue the development of the *IADL Profile* initiated in this study.

Performance based measures of IADL independence in a real-world environment

In Chapter 4 we reported that a very limited number of studies had examined the influence of context (e.g. home, clinic) on performance-based IADL tests in persons with cerebral damage. Thus, no clear evidence was found regarding the superiority of either environment for the administration of a performance-based IADL test. The complexity of data collection in real-world environments was deemed a potential explanation for this limited number of studies. However, numerous conceptual frameworks, some of which have gained international recognition in the field of rehabilitation (e.g. International Classification of Functioning, Disability and Health; Disability Creation Process), state that rehabilitation efforts must consider the influence of a person's environment on participation (Stucki & Melvin, 2007). In the field of occupational therapy, most conceptual frameworks consider interactions between the person and his or her environment (Dunn et al., 1994; Kielhofner, 1995; Law et al., 1996; Polatajko, Craik, Davis, & Townsend, 2007; Rousseau et al., 2002; Townsend & Polatajko, 2007). The environment has thus gained recognition as a key determinant of participation. However, attempts at applying the principles of this conceptual framework to performance-based IADL tests have thus far been limited. Indeed, few indicators were found regarding the key environmental aspects that should be documented within this type of measurement instrument. To our knowledge, our study is one of the first serious attempts at developing a psychometrically sound performance-based test of IADL independence based on EF administered within the person's home and community environment.

Real-world assessments are increasingly considered as the optimal manner in which to document the interplay between individuals' neuropsychological deficits and the requirements of their daily lives for a better appreciation of everyday functioning (Burgess et al., 2006; Burgess & Robertson, 2002; Ponsford et al., 1995). However, we are among the first researchers to have addressed the methodological challenges involved in developing and validating performance-based IADL tests for individuals with a TBI to be administered in such complex, highly individualized, unpredictable, and multidimensional environments as subjects' home and community environments. We thus expect that use of this measurement instrument in clinical and research settings may contribute new knowledge regarding the influences of real-world environments on IADL performance in TBI.

In our content validity study reported in Chapter 5, we showed that international experts in the field of TBI, EF and IADL unanimously agreed that tests of independence in IADL based on EF should be based in real-world environments as was operationalized in the *IADL Profile*. In Chapter 6, we discussed the challenges brought upon interrater reliability by the presence of the vast number of uncontrolled elements influencing performance in such complex and dynamic environments. The large variability in the spectrum of behaviours to be analysed led us to establish more refined guidelines to reduce measurement error. Based on the overall findings of this study, we concluded that the basic premise of pursuing real-world performance-based assessments should be maintained. The methodological challenges that are implicit to the development and validation of such tests should be viewed not as reasons to abandon this line of research but rather as a challenge to delve more deeply into better understanding the numerous factors that influence IADL performance in real-world environments. This type of research is essential not only to guide future developments of such tests but also to ensure that these measurement instruments provide all of the information required to guide treatment interventions aimed at maximizing participation after a TBI.

In Chapter 7, our factorial validity study showed that context influenced IADL performance as items of the measurement instrument were grouped not only according to an inherent task complexity but also as a function of the environmental demands associated with the tasks. For instance, tasks requiring subjects to go outdoors grouped under a single factor that is F1 (going to the grocery store \ shopping for groceries). Also, F2 (dressing to go outdoors) a generally simple and familiar task was shown to have a much greater than expected level of complexity due to the manner in which task performance was documented in the test protocol. Dressing to go outdoors was actually a subtask associated to a larger routine of tasks required to attain the larger goal of going to the grocery store to buy food to prepare a meal. Also, in Chapter 8 the environment was examined as an independent variable, particularly distance to the grocery store. Here, our data showed that performance of the task going to the grocery store was related to the distance between the subject's home and the grocery store. Overall, these results were shown to be consistent with previous studies that have highlighted that independence decreases with increased environmental demands (Iwarsson & Isacsson, 1997; Vallée et al., 2006).

Other than distance to the grocery store, a number of other environmental factors may have influenced independence in IADL, as measured using the *IADL Profile* in subjects' homes and community environments. In Chapter 4, we argued that IADL tests that attempt to overly asepticise the evaluation environment by systematically removing environmental distractors (e.g. presence of children during meal preparation) reduce the ecological validity of the test. Therefore, as reported in Chapter 5, the *IADL Profile*, administered in subjects' homes, attempted to avoid this downfall by allowing families and \ or friends to be present throughout the administration of the test. Those present during the test were however asked to refrain from interacting with examinees throughout the duration of the test to allow for the observation of all aspects of EF (e.g. goal formulation and planning). However, the very nature of the test does not preclude a certain number of interactions. With the *IADL Profile*, all interactions between the subject, the examiner and any other individual encountered during the administration of the test (e.g. relative, friend), must be analyzed to determine whether the information exchanged was trivial or essential to adequate task performance and goal attainment. These interactions are intrinsically taken into account in the measurement of IADL independence with the *IADL Profile*. They are key components that must be considered in the measurement of IADL independence as they constitute the human or social aspect of the home environment surrounding task performance. Hence, based on a qualitative analysis of behaviours and interactions, tasks and related operations are scored on a scale ranging from independence to dependence requiring that interactions be examined to determine whether or not they constitute a form of assistance. It must be noted that assistance for deficits in EF can at times be extremely subtle. For example, simply proposing a menu for the meal preparation task could be the only assistance required when someone is unable to make a decision. The subtlety of the assistance adds to the challenge of analysing these interactions. Delineating moments where another person is indeed compensating for lost skills clearly requires a close examination of these interactions. It is important to note that results obtained from the inter-rater reliability study permitted the inclusion of required guidelines for the analysis of these interactions in the *IADL Profile* administration manual.

Though we found minimal literature pertaining to the intricacies involved in analysing social interactions in the context of performance-based IADL tests administered in the home, Rogers (1982) and later Tamaru et al (2007) argue that everyone needs help sometimes and that independence entails a comfortable balance of what they term "dependent" and independent behaviours. We would argue however that in the context of applying a test such as the *IADL Profile*, the examiner must remained focused on the goal of the test. The examiner must determine, for each task and operation, where the person's performance is located on a continuum ranging from dependent to independent. Subsequent interpretations can be made regarding the extent to which the balance between independent and dependent behaviours exists within the family context. Alternately, a much simpler manner of approaching these interactions is proposed in a test such as the Multiple Errands Test (Shallice & Burgess, 1991). Here, interactions with the examiner are simply considered as rule breaks and no further analysis regarding the scoring of the task is required. Requests for assistance from people other than the examiner are considered as appropriate strategies towards attainment of the goal (Alderman et al., 2003; Knight et al., 2002). We would argue, however, that the *IADL Profile* approach specifically aimed at a more indepth analysis of the significance and importance of these interactions may provide more precise indicators of treatment needs despite evidently challenging interrater reliability.

These environmental elements are but a very small sampling of the numerous elements that may influence IADL task performance in real-world environments. Due to the limited number of studies to have previously examined this, much work remains to be done in identifying critical environmental elements and in including these in measurement instruments such as the *IADL Profile*. We suggest that elements that would benefit from closer examination include, but are certainly not limited to, the following: influence of weather (winter, summer, storm, rain or sunny day), familiarity with the environment (e.g. how long the person has been living in the home where the assessment is taking place), road and sidewalk conditions, etc.

Definition of IADL independence

The purpose of the *IADL Profile* is to measure IADL independence based on EF. As reported in Chapter 4, independence in IADL results from the competence of individuals to do things for themselves in interaction with the environment in which they live. Furthermore, competence implies the ability to decide what we want to do, to choose from available options and plan a course of action, to implement the plan in day to day activities and to assess the outcomes (Rogers, 1982). As discussed previously, our data provides some evidence for the importance of considering interactions between the person and his / her real-world environment when documenting IADL independence. As presented in Chapter 6, our data also provides strong support for a definition of IADL independence that considers all four components of EF (goal formulation, planning, carrying out, and verifying attainment of the initial goal). Consistent with the results of previous studies (Lezak, 1989; Luria, 1966; Miyake et al., 2000), we showed that these four components are intertwined in task related performance and that all four operations are required for the successful performance of goal-directed activities. However, though correlations between different tests of EF are known to at times be low, correlations between different components of EF during task performance on the *IADL Profile* were quite high.

Indeed, having based the *IADL Profile* on this definition of IADL independence proved to be one of its unique contributions and one of its greatest challenges, particularly with regards to scoring. *IADL Profile* scores provide a measure of IADL independence. To attribute scores, examiners must first qualitatively document behaviours that provide information on the person's ability in each of the four components of EF (formulate a goal, plan, carry out task, verify attainment of initial goal) underlying each task and then to attribute an independence score. This analytic process is highly complex as examiners must not merely list undifferentiated task related observations but instead analyse and interpret each IADL observation according to any one of four operations based on EF. In comparison, the Multiple Errands Test reduces rating requirements to indicating which of a list of potential errors were made by the subject. Limited training is required for this type of scoring and interrater reliability is generally adequate to high (e.g. Knight et al., 2002). Though the *IADL Profile* presents a much higher degree of difficulty of scoring, we propose that this level of analysis is core to the unique contribution of the *IADL Profile* as it forces examiners to move beyond simple observations to actual analysis and interpretation of observed difficulties. Moreover, though rarely required in IADL measurement instruments, this level of analysis facilitates a better understanding of the stage at which IADL tasks breakdown and thus provides information that is invaluable for targeted treatment interventions. Admittedly, this complex analytic process challenges interrater reliability and requires more extensive examiner training.

Potential users of this test will be trained occupational therapists whose clinical experience will range from beginner to highly experienced therapists. As such, raters selected for the generalizability study were chosen to represent this universe of raters. According to the results of the interrater reliability study presented in Chapter 5, all therapists will require specialized training for use of this test and this regardless of the therapist's years of experience with TBI. Highly experienced therapists have been noted to superimpose their clinical reasoning onto existing rating guidelines and can therefore not be expected to reliably score the test without mandatory participation in a three or four day training workshop on the *IADL Profile*.

Returning to the definition of IADL independence, we suggest that the definition should consider the expected intra-individual variability of performance in relation to specific task requirements for individuals with frontal lobe lesions (Stuss, Murphy, Binns, & Alexander, 2003). According to Stuss et al (2003), damage to the frontal lobes impairs stability of cognitive performance. Excessive variability or inconsistency may be a significant factor for real-life activities. Hence, independence should not be perceived as a static state of being, neither over time nor over different tasks. Independence fluctuates not only in relation to task complexity and to environmental demands but also in relation to the person's cognitive ability to stay on task when confronted with a particular situation. Stuss et al (2003) have provided evidence that a person's mean performance at one time may not reflect wide irregularities over time. Thus, evaluations of IADL independence in individuals with frontal lobe lesions should not be limited to a single activity observation as this may not capture inconsistencies in the person's ability. Hence, we propose the following addendum to the definition proposed by Rogers (1982): *Independence should not be perceived as a static state of being but rather as a dynamic state that fluctuates according to the person's cognitive and physical abilities in relation to the demands of the task or situation to which he or she is confronted at any give time.* Hence, as seen in the *IADL Profile*, tests of IADL independence administered secondary to a TBI should include the measurement of performance in familiar as well as in novel and complex tasks and this in a number of different environments. The latter should be selected so as to reflect the places where different types of IADLs are carried out (Rogers, 1982) and represent the many different environmental demands to which the person will most likely be confronted in day-to-day life. Information obtained on this type of test should encompass the totality of IADL independence in multiple settings and provide an accurate and meaningful indicator of functioning. Finally, though this was not done in the present study, measurement could also be repeated over time to document this potential variability in performance (test-retest).

Defining the purpose of the *IADL Profile*

The *IADL Profile* was developed to measure independence in IADL based on EF. Subsequent to the validation studies that have so far been completed on the tool, it is important to verify whether results of these studies support the proposed goal of this test. The first step in this process was the content validity study. Here international experts in the field of EF and IADL were consulted to determine the clarity and pertinence of the tool in relation to its intended goal. Experts unanimously agreed with the clarity and pertinence of the tool's underlying task analysis based on EF. Moreover, experts agreed that the tasks selected for the measurement instrument were sufficiently complex and novel to permit the observation of EF deficits.

Second, results obtained from the criterion-related validity study reported in Chapter 7 provide added evidence that the *IADL Profile* documents what it intends to document. Our data suggested that correlations between the *IADL Profile* and measures of EF were significant but not high. This suggests that a certain portion of both sets of measures is documenting similar aspects of functioning. Previous studies looking at correlations between traditional and ecological measures of EF have largely failed to show relations between these two types of measures (Chevignard et al., 2000). Here, authors critiqued the ecological validity of traditional measures of EF but not the sensitivity of ecological measures to EF deficits. Other studies have shown limited relations between traditional measures of EF themselves (Miyake et al., 2000). Here varied task demands (e.g. language or visuospatial) was hypothesized as a possible explanation for the limited relations. The lack of purity of measures of EF has previously been deemed as problematic because cognitive abilities other than EF are required to complete tests of EF (Rabbitt, 1997). Others have suggested that the limited correlations between measures of EF may reflect the separability of EF (Gehring & Knight, 2000) into sub-components. A more recent study has shown evidence that EF may consist of a number of distinct processes (Bush et al., 2005). Due to these vastly unresolved issues surrounding EF, we were not expecting the *IADL Profile* to be highly related to measures of EF even if its content was pertinent to its intended goal. Indeed, as our study was among the first reported studies to show correlations between a performance-based IADL test and measures of EF, we would argue that these results provide some evidence that inferences about the repercussions of executive functioning deficits on IADL independence can be drawn from the *IADL Profile*.

However, one important question still remains. Can the *IADL Profile* be used to document EF deficits in a manner similar to the Multiple Errands Test? Despite several inherent similarities between these two tests, the Multiple Errands Test was developed as a measure of EF and the *IADL Profile* as a measure of independence in consideration of EF. Is the distinction mere semantics or are the differences conceptually meaningful? Evidently, measures of EF such as the Multiple Errands Test are interested in better understanding the repercussions of EF deficits on everyday functioning just as the *IADL Profile*. However, does this imply that the two measures are documenting the same thing? Are these two measures both measuring the same construct or should both tests be considered complementary? It was our decision to define the main purpose of the *IADL Profile* as a measure of independence based on EF and not as an ecological measure of EF. Results of our factorial validity study support this decision as our data were not compatible with a four-factor solution based on the four components of EF that underlie task analysis. Indeed, though three ecological indexes of EF were defined (i.e. carry out tasks, complex planning and action working memory), the factor solution was closely tied to IADL task performance. Both of these findings (i.e. IADL task based factors and three ecological indexes of EF) directly support the targeted goal of the *IADL Profile*.

We propose that the value of the *IADL Profile* would be augmented if it was used in conjunction with a measure such as the Multiple Errands Test due to the recurrent methodological challenges involved in developing both ecological measures of EF and measures of IADL independence based on EF and of interpreting the results of these tests. In principle, the Multiple Errands Test permits the diagnosis of EF deficits. However, we propose that it does not provide targeted treatment interventions as clearly as the *IADL Profile*.

One of the unique contributions of the *IADL Profile* is its ability to measure IADL independence from a more global perspective that is in consideration of the four basic components of EF. This feature is insufficiently documented in other performance-based IADL tests. Also, the *IADL Profile* is one of the very few instruments that evaluates individuals within their home and community environment and thus considers the influence of a real-world environment on IADL independence. Though the *IADL Profile* is not a measure of EF, it provides valuable information pertaining to EF deficits and their repercussions on IADL independence. Crucial information is also obtained on the stage at which breakdown occurs and the tasks in which breakdown occur. In summary, though the *IADL Profile* was first and foremost developed as a measure of IADL independence, its greatest strength and unique contribution is its consideration of EF when determining IADL independence in a real-world environment.

Contributions of the thesis to furthering our understanding about the problem studied

The interest of using an analytic measurement instrument such as the *IADL Profile* is its potential contribution to targeting treatment interventions. Numerous aspects of the *IADL Profile* were specifically designed to assist with treatment planning in home and community-based activities in consideration of EF. For instance, the *IADL Profile* focuses on observing behaviour in real-world environments. This should allow both the client and the therapist to work together to find adaptive skills that meet and overcome problems in IADLs from a practical perspective. Moreover, the wealth of concrete examples of observable everyday behaviours documented with the *IADL Profile* illustrate at times complex EF deficits in relation to specific activities and environmental factors and have been shown through our earlier clinical work with the ADL Profile to be easily understood by patients, families, treatment teams and funding sources. Direct observations in real-world environments also have the advantage of removing sizeable portions of predictions and hypotheses regarding performance in the individual's home and community environment that generally accompany recommendations derived from lab-based or simulated tests. Also, test results obtained in individuals' home and community environments are more likely to be based on tasks that are meaningful to the individual and thus may further facilitate communication between team members, the patient and the family. Another characteristic of the *IADL Profile* is the task and environment specific recommendations that will result from the test. This should further facilitate the team's ability to put into place meaningful and targeted treatment goals. For instance, a number of subjects evaluated in this study required cueing to consider initial conditions before acting in a task such as "grocery shopping". More specifically, they may have too rapidly left their house to go shopping without having taken the time to think of what they needed to buy, where they would go buy it and how much time would be required to carry out their plan. Having identified these difficulties, the examiner could readily propose that appropriate strategies be put into place to specifically assist the person the next time he or she chooses to go grocery shopping (e.g. teach the person to use a prepared list of things to consider before leaving the house when going grocery shopping). The basic premise underlying measures such as the *IADL Profile* is that assessments undertaken in real-world environments are likely to facilitate links between assessment and rehabilitation (Knight et al., 2002). Hence, we expect this test to contribute to the development of more targeted community-based treatment interventions. This is congruent with best-practice guidelines post acquired brain injury as it has been shown that providing social and behavioural rehabilitation in clients' communities results in greater independence, higher social activity levels, and less need for care support (Cullen, Chundamala, Bayley, & Jutai, 2007).

As previously mentioned, families may be present while the *IADL Profile* is administered as it is administered in the person's home. This has the advantage of allowing the family to observe the client's strengths and difficulties during the assessment and to better understand necessary interventions to facilitate the client's task performance. This has the added advantage of increased family collaboration with the identification of therapeutic goals. For example, in the context of this study we evaluated a 21 year old gentleman at six months post severe TBI. He had just recently been discharged from a residential rehabilitation program at a distance from his home and had not prepared a meal since his accident. As his mother observed the evaluation in her home, she quickly realized that her son required the examiner's assistance to carry out the task of preparing a meal safely (e.g. cueing required to not place metal container into the microwave) and appropriately (e.g. cueing required to remove pasta from boiling water before leaving the house to go buy sauce). Following observation of her son's test performance, the mother was able to identify, in collaboration with the examiner, ways in which she could contribute to her son's rehabilitation by addressing each of these specific behaviours. Collaboration with the family thus helps shape the intervention process so that it will work for the person in real-world contexts (Sohlberg & Mateer, 2001). Working with families to help them put into place required structures and strategies to compensate for specific deficits has been shown to facilitate better outcome (Sohlberg & Mateer, 2001).

As previously discussed, the *IADL Profile* assists in identifying the stage where breakdown in task performance occurs and this in multiple tasks and in multiple contexts. The unique contribution of each task to the overall assessment allows the examiner to identify both patterns and differences in EF stage breakdown. For instance, many clients have difficulties either in formulating goals or in planning. A pattern of such difficulties can be observed in more complex tasks with fewer difficulties observed in more familiar and simple tasks. Finally, the interest of having both complex and simpler tasks permits the identification not only of the client's weaknesses but also of the client's strengths in relation to IADL performance and EF. In summary the *IADL Profile* has the potential to yield a highly individualized treatment plan.

Use of the *IADL Profile* in TBI programs

The *IADL Profile* was developed as a community-based measure of independence. Use of the tool within a clinical context requires that the client meet certain pre-requisites. As previously mentioned in the subject selection criteria of this study, subjects were required to meet certain standards of orientation (scores greater than 65 on the Glasgow Orientation and Amnesia Test), mobility (scores greater than or equal to three on the bed, chair, wheelchair transfer item of the Functional Independence Measure, FIM) and comprehension (scores greater than or equal to four on the communication item of the FIM). Administration of the *IADL Profile* to individuals whose functioning does not meet these minimum standards may have more limited usefulness as subjects would likely be rated as dependent on most tasks. The evaluation may provide limited additional information. Hence, we do not expect the *IADL Profile* to be appropriate for use by trauma teams working with moderate and severe TBI in acute care. At the earliest, we suggest that the *IADL Profile* be used in inpatient rehabilitation settings when subjects meet previously stated minimum standards and where a home assessment is deemed pertinent. In abiding by these minimum standards, we showed that completion rates were good enough to assume acceptable respondent burden and relative ease of comprehension of test instructions.

As previously mentioned, the ideal setting for the assessment is the person's home and community environment. As not all TBI subjects can return to their own homes subsequent to their accidents, alternate environments are acceptable for administration of the test. For instance, subjects discharged either to their parents' or to their siblings' homes can clearly be assessed in these respective environments. In these instances, the environment may be less familiar to the subject than their own homes and this will have to be considered when interpreting the results (greater novelty of the environment effectively contributes to increased task complexity and may thus lead to more impaired performance).

It is as of yet unclear how long after an injury the *IADL Profile* can be administered and still provide valuable results. In this study, the average time post-injury of subjects was 14.2 ± 13.6 months (with one outlier of 240 months removed). The full range went from two to 240 months post-trauma. Results of the test for the subject who was 20 years post-injury were deemed useful for treatment planning by the referring clinican. Generally, we suggest that the presence of queries regarding the individual's functioning in IADL or a need for further information is a sufficient indicator for the appropriateness of using the test. As a number of subjects who participated in this study had returned to work, pertinence of the test may also be indicated for individuals at this stage of their rehabilitation.

Study limitations

Recruiting subjects with a moderate or severe TBI through numerous clinical settings in which researchers in this study were not directly involved was very difficult and the situation had certain unavoidable repercussions on the study. First, the initial prototype of the tool was only tested on 8 moderate or severe TBI subjects. Though this would have initially appeared to be a sufficient sample size, it later became evident that a larger sample size would have addressed certain issues raised during the inter-rater reliability study. More precisely, the limited number of subjects tested during the pilot testing of the tool limited the number of rating guidelines that could be provided in the initial training of the raters. This was particularly true for tasks less familiar to raters such as "going to the grocery store". Rating of this task was challenged by the multiple ways used by subjects to attain the goal in relation to personal factors (ability to walk or drive to the store) combined with environmental factors (distance to the grocery store, resources of the person such as presence of a family member willing to drive). Second, again due to recruitment difficulties, the 30 subjects of the reliability study were the first 30 subjects evaluated (after initial pilot testing of the tool) and not 30 subjects randomly selected from the overall sample of 100 subjects. Had all subjects been evaluated prior to instigating the reliability study, rating guidelines presented to raters would have been more exhaustive and have addressed the numerous situations encountered when evaluating subjects in their own home and community environment. However, time constraints clearly did not permit that the reliability study be initiated only at the end of two years of recruiting and evaluating subjects.

The test was pilot tested only with TBI subjects and not with healthy control subjects. Though this was not identified as an essential step in the planning phases of the study, in retrospect we realized that verifying healthy control subjects' understanding of test instructions may have provided valuable information when attempting to better understand the needs and difficulties of TBI subjects.

Though the sample size was appropriate for establishing the psychometric properties of the tool, the sample was at the lower limit of acceptability for a confirmatory factor analysis. Moreover, the exploratory and confirmatory factor analyses should have ideally been based on two separate samples of at least 100 TBI subjects each. As two years of intense recruiting were required to obtain a first sample of 100 moderate and severe TBI subjects and this through the collaboration of numerous clinical settings, it was not feasible to recruit a second sample of this size for CFA. CFA was therefore only provided for completion of the EFA.

The challenge involved in validating ecological observation-based measures of independence in IADL is to obtain samples that reflect the many different facets of complex home and community environments and their respective influences on IADL independence. Future studies may need to be designed so as to better differentiate the influence of the environment on IADL independence for different subgroups of individuals (e.g. rural versus urban dwellers).

Interpretation of findings of the criterion validity study with measures of injury severity related to coma duration and PTA must be interpreted with caution as a fair proportion of data were missing from existing medical files. All data were checked for quality and any unclear or incomplete information was deleted and considered missing. Finally, TBI subjects' problems with fatigue imposed time limits on overall neuropsychological testing and did not allow us to extend the number of tests beyond the three that were used. Testing had to be completed within a one-day session due in part to the vast territory covered to attain sample size, the same day as testing with the *IADL Profile*. As a more comprehensive neuropsychological assessment might have yielded a different pattern of findings, it would be important to replicate these findings with additional neuropsychological measures.

Future steps in the development of the *IADL Profile*

Tool development is an ongoing process and thus a number of future studies are suggested to further develop this test. First, as was initially recommended by the measurement expert during the content validity study, the subsequent version of the user's guide, *IADL Profile* (version 3.0), would benefit from incorporating a number of examples of clinical profiles of patients performing at all levels of independence on the different tasks of the test. Also included would be new rating criteria identified subsequent to the reliability study. To complement the criterion validity study, it would be pertinent to analyse data obtained in this study using multiple regression analyses.

Future studies could also examine the extent to which subjects' and significant others' perceptions of performance in IADL are related to actual performance documented by an occupational therapist secondary to administration of the *IADL Profile*. Moreover, we could also examine the extent to which subjects prior experience with the many different tasks assessed with the *IADL Profile* determine actual performance. A potential gold standard to which results may be compared is the individual's self-reported current level of responsibility with regards to the different tasks. If, as expected, individuals who currently assume the responsibility of the different tasks are more independent than individuals who do not assume responsibility, this will add to the validity of the test. Though TBI subjects have frequently been reported to have reduced insight into their level of functioning, it is expected that they can clearly report whether different tasks are under their responsibility; the latter may be more clear-cut than reporting on one's level of independence.

As this test is administered within individuals' home and community environments, it would be interesting to further analyze how the individuals' living environment influences independence in everyday activities. We suggest that elements that would benefit from closer examination in future studies include, but are not limited to, the following: influence of weather conditions (winter, summer, storm, icy or snowy conditions, rain or sunny day), familiarity with the environment (e.g. how long the person has been residing in the home where the assessment is taking place), road and sidewalk conditions, etc.

Sensitivity to change and responsiveness could be examined as it is likely that the tool will be administered on more than one occasion throughout a client's treatment program. To examine whether clinically meaningful change can be documented with the *IADL Profile*, repeat measures will need to be obtained at fixed intervals such as an initial assessment and then again prior to discharge. Test-retest reliability could also be estimated to document whether individuals' performances are stable over time.

Future studies could examine underlying mechanisms that explain loss of IADL independence secondary to a moderate or severe TBI. As mentioned previously, the environment's role in this may benefit from a thorough examination particularly considering that the environment is an area that can be addressed and acted upon in rehabilitation settings (Dawson, Schwartz, Winocur, & Stuss, 2007). An in-depth error analysis of performance on the *IADL Profile* to identify the stages of EF where the greatest proportion of task breakdown in real-world functioning occurs could assess the tool's contribution to targeted treatment intervention and to potentially elaborate novel treatment interventions for this patient population.

Moreover, use of the *IADL Profile* in studies comparing performance of TBI subjects with the performance of healthy controls on tasks such as making a budget and obtaining information would be an important step towards improving the interpretation of errors committed in these more complex tasks. Studies that compare the performance of TBI subjects with that of healthy controls are crucial to improving our ability to discriminate pathological errors with important consequences on everyday activities from errors of healthy controls with limited or no repercussions on everyday activities. Also, though the task "modifying a budget" had to be removed from the test, continued development of the task via an in-depth examination of task performance of healthy controls compared to TBI subjects would be essential as this task is potentially highly relevant and pertinent to the IADL assessment of TBI subjects.

Validation of the test with other populations with a dysexecutive syndrome (e.g. Alzheimer type dementia, schizophrenia, Parkinson's, multiple sclerosis, stroke, etc.) could also be completed. For each population, certain minor adaptations may be deemed necessary to accommodate for the diverse pathologies and associated needs to be considered within an IADL test. For instance, validation studies are recommended for use of the test with mild TBI. Mild TBI is a major public health problem (503/100,000) disproportionately affecting young adults and representing 80% of the overall TBI population; common causes of injury include falls and motor vehicle accidents (Cassidy et al., 2004). Abnormal neuropsychological profiles frequently associated with post-concussive symptoms include deficits in working memory, attention, information processing speed, and integrative tasks that contribute to EF. Outcome studies suggest that the most serious repercussion, occurring in 15-20% of individuals, is prolonged time off work linked to persistent post-concussive symptoms and possibly to cognitive deficits (Ruff, 2005). The *IADL Profile* could thus be reviewed to identify tasks that are sensitive to the needs of mild TBI. We expect that tasks which showed minimal variance in moderate and severe TBI due to overall independence in performance (e.g. having a meal with guests, putting on outdoor clothing and cleaning up after meal) will need to be removed from the test. Tasks most likely to be retained include more complex tasks such as going to the grocery store and shopping for groceries, preparing a hot meal for guests, obtaining information and making a budget. The task modifying a budget, a complex task removed from the current version due to a difficulty in identifying appropriate rating criteria, should be re-examined with this clientele based on a new set of rating criteria. It would be pertinent that these validation studies include an examination of correlations between the IADL Profile and measures of EF. This could be accompanied by functional magnetic resonance imaging due to the diagnostic difficulties frequently associated to mild TBI.

As previously mentioned, a new specialized training workshop will need to be developed as this training will be obligatory for all therapists wishing to administer, score and interpret the *IADL Profile*. Essential topics to be covered in this workshop will include a review of underlying conceptual frameworks, comparable profiles of patient functioning at all levels of IADL independence, viewing of videos of individuals with EF deficits and related analysis of behaviours, etc. Finally, the test could be translated into a number of other languages to increase its availability for occupational therapists and TBI individuals everywhere.

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Appendix I

Documents for experts: Content validity study

Montréal, le 27 octobre 2004

Objet : Votre collaboration au projet de recherche intitulé : «Validation d'un nouvel instrument de mesure de l'indépendance dans les activités de la vie quotidienne basé sur les fonctions exécutives pour les personnes ayant subi un traumatisme cranio-cérébral : études de fidélité et de validité».

Madame, Messieur,

Nous désirons dans un premier temps vous remercier d'avoir accepté de collaborer au projet ci- haut mentionné. Cette étude se fait dans le cadre de mon doctorat (Ph.D.) et regroupe des chercheurs de différentes disciplines (ergothérapie, neuropsychologie, mesure et évaluation). Dans le cadre de cette étude, nous avons développé un instrument de mesure qui s'intitule le « *Profil des activités instrumentales* ». Cet instrument a pour but de mesurer l'indépendance de la personne ayant subi un traumatisme cranio-cérébral (TCC) dans les activités de la vie quotidienne (AVQ) en considérant particulièrement la question des fonctions exécutives, nécessaires à la réalisation de ces activités. L'évaluation à l'aide du « *Profil des activités instrumentales* » consiste en une observation directe de la personne dans ses AVQ, une approche qui se distingue des questionnaires traditionnels.

L'bjectif de cette étude est d'établir les qualités psychométriques du *Profil des activités instrumentales*. Les objectifs spécifiques sont les suivants :

- Vérifier la validité de contenu, c'est-à-dire la pertinence et la clarté des différents éléments composant ce nouvel instrument des AVQ;
- Déterminer trois types de fidélité (homogénéité interne, et intra- et inter-juges);
- Déterminer la validité de construit (validité factorielle);
- Déterminer la validité de critère de ce nouvel instrument de mesure en lien avec la sévérité du traumatisme et les résultats obtenus sur les mesures des fonctions exécutives.

Pour réaliser le premier objectif ayant trait à la validité de contenu, nous devons faire une consultation auprès d'experts dans le domaine et c'est à ce titre que nous sollicitons votre collaboration. Nous cherchons à connaître dans cette étude, selon le jugement professionnel des experts, la pertinence et la clarté des tâches et des consignes du Profil des activités instrumentales ainsi que l'adéquation du système de cotation en lien avec les objectifs visés par l'outil.

Dans le présent envoi vous trouverez deux documents : 1) le Guide d'administration du *Profil des activités instrumentales*) une grille d'analyse à compléter par l'expert. Tel que demandé, vous retrouverez en fichier attaché une version électronique des documents. Il est important de considérer que la « grille d'analyse à compléter par l'expert » est un fichier EXCEL. Ainsi, pour bien prendre connaissance de l'ensemble du document, veuillez vous assurer d'ouvrir toutes les feuilles de travail. De même, pour imprimer le document, vous devez sélectionner dans la boîte d'impression, l'item « classeur entier ».

Vous trouverez, à la première page de la grille d'analyse, une brève explication des critères retenus pour vous aider à vous prononcer sur la pertinence et la clarté du Profil des activités instrumentales. Nous vous recommandons de prendre connaissance de l'ensemble du document avant de débuter les exercices. N'hésitez pas à communiquer avec moi si vous avez des questions ou commentaires à formuler. Les questionnaires complétés devront nous être retournés par la poste ou par courriel d'ici le 15 novembre 2004. Pour vous remercier de votre collaboration, il nous fera plaisir de vous faire parvenir une copie de la nouvelle version de l'outil une fois l'étude terminée.

Soyez assuré que les renseignements recueillis dans les questionnaires seront traités avec toute la confidentialité et les règles d'éthique d'usage.

En vous remerciant à l'avance de votre précieuse collaboration, je vous prie de recevoir, Madame/ Messieur, l'expression de mes meilleurs sentiments.

Carolina Bottari, M.Sc. erg.

Doctorante en réadaptation (sciences biomédicales)

Laboratoire d'évaluation activités – habitudes de vie

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p.j. Grille d'analyse à compléter par l'expert

Guide d'administration du *Profil des activités instrumentales* (version 1.0)

Centre de recherche interdisciplinaire en réadaptation du Montréal Métropolitain

Université de Montréal

GRILLE D'ANAYSE À COMPLÉTER PAR L'EXPERT

PROFIL DES AVQ - RÉVISÉ

Dans le cadre du projet de recherche intitulé :

"Validation d'un nouvel instrument de mesure de l'indépendance dans les activités de la vie quotidienne basé sur les processus exécutifs pour les personnes ayant subi un traumatisme cranio-cérébral : études de fidélité et de validité"

Préparé par :

Carolina Bottari, M. Sc., erg.
Doctorante en réadaptation (sciences biomédicales)

Sous la responsabilité de :

Élisabeth Dutil, M. Sc.
Clément Dassa, Ph. D.
Constant Rainville, Ph. D.
Marie Vanier, Ph. D.

Université de Montréal
Centre de recherche interdisciplinaire en réadaptation
du Montréal métropolitain (CRIR)

TABLE DES MATIÈRES

IDENTIFICATION DU RÉPONDANT

1. Indiquez votre nom (facultatif)

2. Indiquez votre discipline (cochez la ou les cases appropriées)

- ☐ Ergothérapie
- ☐ Neurologie
- ☐ Neuropsychologie
- ☐ Statistiques et mesure
- ☐ Médecine de rééducation
- ☐ Autre (précisez)

3. Où effectuez-vous vos travaux de recherche ?

- ☐ Dans un centre de recherche (précisez)
- ☐ À l'Université (précisez)

4. Indiquez le nombre d'années d'expérience que vous avez avec les personnes ayant subi un traumatisme crânien ou autres clientèles avec troubles possibles des processus exécutifs âgées entre 16 et 65 ans (ex.: tumeur frontale)

À titre de clinicien :
Nombre d'années

Clientèles

À titre de chercheur :
Nombre d'années

Clientèles

GUIDE POUR L'EXPERT

Dans le cadre de ma thèse de doctorat, nous poursuivons le développement du Profil des AVQ (version 4.0). La nouvelle version s'intitule le « *Profil des AVQ - révisé* ». Cet instrument a pour but de mesurer l'indépendance de la personne ayant subi un traumatisme cranio-cérébral (TCC) dans les activités de la vie quotidienne (AVQ) en considérant particulièrement la question des processus exécutifs, nécessaires à la réalisation de ces activités. Le *Profil des AVQ - révisé,* basé sur une observation directe de la personne, permet à l'examinateur de prendre position à la fois sur le niveau d'indépendance de la personne dans la tâche et sur la quantité et le type d'assistance requise (verbale ou physique) pour compléter toutes les étapes (ou opérations) de la tâche soit FORMULER UN BUT, PLANIFIER, EXÉCUTER, S'ASSURER DE L'ATTEINTE DU BUT INITIAL. De plus, l'outil facilite une analyse détaillée des comportements observés et des éléments contextuels reliés à la tâche, l'analyse des erreurs encourues et l'élaboration d'hypothèses explicatives.

Nous vous demandons, à titre d'expert, de vous prononcer, selon votre jugement professionnel, sur la **pertinence** et la **clarté** des aspects suivants reliés au *Profil des AVQ - révisé:*
- *la définition de chacune des tâches de l'outil;*
- *le contexte d'administration;*
- *les consignes données à la personne par l'examinateur;*
- *le système de cotation.*

La **pertinence** se définie comme le potentiel des différentes tâches identifiées dans l'instrument (incluant la définition, le contexte d'administration, les consignes données à la personne par l'examinateur et le système de cotation) à fournir de l'information sur l'indépendance de la personne ayant subi un TCC dans ses AVQ en considérant particulièrement les processus exécutifs.

La **clarté** est définie comme l'intelligibilité ou la compréhensibilité de la définition des tâches, des consignes que l'examinateur donne à la personne, du contexte d'administration et de l'adéquation du système de cotation en lien avec les objectifs de l'outil.

RAPPEL DES GRANDS CONCEPTS CLÉS DU *PROFIL DES AVQ - RÉVISÉ*

Un bref rappel de certains grands concepts clés retrouvés dans le *Guide d'administration du Profil des AVQ - révisé* vous est ici présenté. Ce rappel, nous l'espérons, vous permettra dans un premier temps d'avoir un coup d'œil rapide sur l'outil dans sa globalité et dans un deuxième temps, vous aidera à effectuer les exercices demandés.

L'indépendance, selon Rogers (1982), se définie comme la compétence des individus à s'occuper d'eux-mêmes en interaction avec les exigences de l'environnement dans lequel ils vivent. Ceci implique la capacité à décider ce que l'on veut faire, à élaborer un plan d'action, à faire la tâche et à évaluer les résultats.

Selon Hamonet et Bégué-Simon (1988), la réalisation d'**activités de la vie quotidienne** assure la survie personnelle des individus ainsi que leur maintien dans la communauté. Ceci implique la réalisation de tâches uniques (simples et complexes) et de tâches multiples (tâches effectuées ensemble ou de manière successive l'une après l'autre) qui répondent aux exigences de tâches et d'obligations quotidiennes (Organsiation mondiale de la santé, 2001).

Selon plusieurs auteurs, les **processus exécutifs**, traditionnellement associés au lobe frontal, sont requis pour l'adaptation à des situations nouvelles (Burgess, 1997; Rainville, Amieva, Lafont, Dartigues, Orgogozo & Fabrigoule, 2001; Rabbitt, 1997). Les **processus exécutifs**, selon le Modèle du fonctionnement cérébral de Luria (1973), se définissent sommairement comme la capacité à analyser les données préliminaires (états internes, environnement extérieur), à formuler un but, à planifier (développer une stratégie pour résoudre le problème), à exécuter le plan d'action, à s'auto-corriger et à vérifier si le but initial est atteint (Luria, 1966). Les définitions de ces sous-composantes des processus exécutifs sont présentées dans le tableau 1 du *Guide d'administration du Profil des AVQ - révisé*. Les processus exécutifs observés lors de la réalisation des différentes tâches aident l'examinateur à mieux cerner l'indépendance de la personne.

Dans le *Profil des AVQ - révisé,* la personne est observée pendant l'exécution de neuf tâches réalisées selon différents scénarios. Chaque tâche est **définie** de façon à standardiser l'observation de la tâche. À l'intérieur même de ces définitions sont inclus des éléments qui représentent l'ensemble des opérations (FORMULER UN BUT, PLANIFIER, EXÉCUTER, S'ASSURER DE L'ATTEINTE DU BUT INITIAL) nécessaires à la réalisation de la tâche. Par exemple, la définition de la tâche "téléphoner pour obtenir une information" inclut "considérer les alternatives possibles pour obtenir l'information désirée et réfléchir à la façon de joindre le service d'assistance annuaire". Ceci reflète les actions nécessaires pour "PLANIFIER" la tâche.

Afin de recueillir le maximum d'informations sur l'ensemble des opérations nécessaires à la réalisation des tâches (incluant la capacité de la personne à reconnaître ses besoins et à formuler un but), les **consignes données à la personne** par l'ergothérapeute sont intentionnellement peu structurantes, c'est-à-dire que l'objet de la mise en situation (ce que la personne doit faire) n'est pas énoncé explicitement.

Toutefois, les consignes données à l'examinateur (désignées par l'expression « **contexte d'administration** ») sont plus structurées car il est crucial qu'il comprenne la façon de recueillir certaines observations bien précises et ce, sans dire directement à la personne ce qu'elle doit faire. Certaines tâches de l'outil sont administrées selon un enchaînement de tâches (mettre ses vêtements, se déplacer à l'extérieur, faire des courses, préparer un repas chaud et prendre un repas) et d'autres sont administrées une seule tâche à la fois (téléphoner pour obtenir une information, gérer ses finances et utiliser les transports en commun). Ainsi, la consigne dite par l'examinateur à la personne pour les tâches administrées selon un enchaînement de tâche est la même, soit: "Vous nous avez invités, mon assistant et moi, pour souper. Préparez-vous à nous recevoir. S'il y a lieu, nous assumerons les frais encourus, pour un maximum de 20,00$."

Pour que cette consigne nous permette d'observer l'ensemble des tâches mentionnées ci-haut, l'examinateur doit au préalable s'assurer (ex.: avec la famille de la personne) que l'achat des ingrédients nécessaires pour la préparation d'un repas n'ait pas été effectué. L'utilisation d'un enchaînement de tâches vise à mieux recueillir de l'information sur la capacité de la personne à FORMULER UN BUT et à PLANIFIER un ensemble de tâches.

Pour les tâches administrées une seule tâche à la fois (téléphoner pour obtenir une information, gérer ses finances et utiliser les transports en commun), des consignes spécifiques à chaque tâche ont été formulées. Par exemple, pour la tâche "utiliser les transports en commun", la consigne suivante est énoncée à la personne: "Vous avez fixé un rendez-vous à un ami au... Vous devez vous rencontrer à un endroit précis. J'aimerais que vous vous rendiez à ce rendez-vous."

Cette façon d'évaluer les tâches a été choisie car elle augmenterait le potentiel d'observation de comportements reliés aux processus exécutifs (ex : formulation d'un but de la tâche, planification, initiation de la tâche, etc.).

DIRECTIVES AUX EXPERTS POUR REMPLIR LE QUESTIONNAIRE

Pour vous prononcer sur la pertinence et la clarté de l'outil, vous trouverez ci-joint une description de chaque tâche du *Profil des AVQ- révisé*. Pour chaque tâche, vous trouverez la définition de la tâche, le contexte d'administration, les consignes à donner à la personne et l'échelle de cotation. L'échelle de cotation et la procédure de cotation sont détaillées dans le *Guide d'administration du Profil des AVQ - révisé*.

Dans votre appréciation du questionnaire, nous vous demandons de coter pour chaque tâche, sur une échelle de 1 à 3, la **pertinence** de la définition, du contexte d'administration, des consignes à la personne et du système de cotation (1= non pertinent, 2= plus ou moins pertinent et 3= pertinent); nous vous demandons de coter la **clarté** de ces mêmes aspects de chaque tâche sur une échelle de 1 à 3 (1= pas clair, 2= plus ou moins clair et 3=clair). Ensuite, vous pouvez inscrire vos commentaires directement sur la version électronique si vous le désirez dans l'espace réservé à cet effet à la suite des sections portant respectivement sur la description de chaque tâche et du système de cotation.

En vous remerciant de votre précieuse collaboration,

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EXERCICES RELIÉS À LA PERTINENCE ET LA CLARTÉ

Définition de la tâche

Contexte d'administration

Consignes données à la personne par l'examinateur

Système de cotation relié à chaque tâche

Pages 7- 15 à remplir par l'expert

Faire le ménage

Jugement de l'expert

Définition de la tâche

	Pertinence			Clarté		
	Non (1)	Plus ou moins (2)	Oui (3)	Non (1)	Plus ou moins (2)	Oui (3)
Cochez >>>						
	Commentaires					

Faire le ménage en nettoyant la cuisine après la préparation d'un repas chaud ou en faisant l'entretien des vêtements ou en nettoyant diverses parties de la maison (ex.: nettoyer la salle de bain, passer l'aspirateur). Ceci inclut verbaliser l'intention de faire le ménage et identifier les aspects de la tâche à accomplir. Pour faire le ménage de la cuisine, la personne devrait nettoyer les comptoirs de la cuisine, laver et ranger la vaisselle, faire les ajustements nécessaires en cours de route et vérifier que la cuisine soit propre et ordonnée. L'entretien des vêtements inclut les éléments suivants: rassembler et trier le linge à laver, vérifier si le matériel nécessaire est disponible, choisir les bons détergents et le bon cycle de lavage, faire sécher, repasser (si nécessaire) et plier le linge, faire les ajustements nécessaires en cours de route, vérifier que les vêtements soient propres, etc.

Contexte d'administration

	1	2	3	1	2	3
Cochez >>>						
	Commentaires					

L'ergothérapeute doit s'assurer de respecter les conditions suivantes:

1. Cette tâche peut être administrée tant à domicile qu'en milieu institutionnel.
2. L'évaluation en milieu institutionnel devrait être faite dans un lieu où le matériel nécessaire (ex cuisinière, lessiveuse) est disponible. Pour faciliter l'observation de la formulation du but, placez des vêtements par terre devant la lessiveuse.
3. Une évaluation au domicile de la personne doit être préparée à l'avance avec la famille de la personne (demander par exemple d'attendre après l'évaluation pour faire la lessive).
4. Cette tâche peut aussi être évaluée en même temps que la tâche "préparer un repas chaud".

Consignes à la personne

	1	2	3	1	2	3
Cochez >>>						
	Commentaires					

L'ergothérapeute donne la consigne suivante à la personne:

"Qu'est-ce que vous avez pensé faire lorsque je vous ai dit que je viendrais passer une journée chez vous?" Au besoin ajouter : *"Tel que je vous l'ai mentionné au téléphone, le but de notre rencontre est d'observer comment vous vous débrouillez dans votre quotidien "* (Pause pour permettre à la personne de répondre). *"Dites-moi ce que vous allez faire."*

Système de cotation

	1	2	3	1	2	3
Cochez >>>						
	Commentaires					

1. Durant l'observation de la tâche, l'ergothérapeute inscrit les comportements observés ainsi que les verbalisations de la personne.
2. À la suite de l'observation de la tâche, l'ergothérapeute analyse les comportements observés et les verbalisations de la personne selon les quatre opérations du *Profil des AVQ-révisé*, c'est-à-dire FORMULER UN BUT, PLANIFIER, EXÉCUTER, S'ASSURER DE L'ATTEINTE DU BUT INITIAL. Un score est donné à chaque opération (scores opérations) et à la tâche (score tâche) selon l'échelle suivante:

0	1	2	3	4
Dépendance	Assistance verbale et physique et physique	Assistance verbale ou physique	Indépendance avec difficulté	Indépendance

METTRE SES VÊTEMENTS ET CHAUSSURES

Jugement de l'expert

Définition de la tâche

	Pertinence			Clarté		
	Non (1)	Plus ou moins (2)	Oui (3)	Non (1)	Plus ou moins (2)	Oui (3)
Cochez >>>						
Commentaires						

S'habiller complètement. Ceci inclut verbaliser l'intention de s'habiller, choisir les vêtements appropriés à la température et au contexte, coordonner les gestes nécessaires pour mettre des vêtements sur diverses parties du corps, faire les ajustements nécessaires en cours de route, vérifier que son habillement est conforme à cette occasion, etc.

Contexte d'administration

	1	2	3	1	2	3
Cochez >>>						
Commentaires						

L'ergothérapeute doit s'assurer de respecter les conditions suivantes:

1. De préférence l'évaluation se fait au domicile de la personne. Au besoin, elle peut se faire dans l'établissement où est hébergée la personne.
2. Cette tâche peut être évaluée dans une routine de sortie à l'extérieur avec les tâches "se déplacer à l'extérieur", "faire des courses", "préparer un repas chaud" et "prendre un repas".
3. L'examinateur devrait se présenter chez la personne au moment de la journée le plus propice (ex: en après-midi pour que la personne ait le temps de sortir pour faire les achats en prévision de la préparation du souper).
4. L'examinateur ne doit pas sortir les vêtements pour la personne.

Consignes à la personne

	1	2	3	1	2	3
Cochez >>>						
Commentaires						

L'ergothérapeute donne la consigne suivante à la personne:

"Vous nous avez invités, mon assistant et moi, pour souper. Préparez-vous à nous recevoir. S'il y a lieu, nous assumerons les frais encourus, pour un maximum de 20,00$." (Pause)

"Pouvez-vous me répéter ce que je viens de vous expliquer?" (Pause)

"Dites-moi ce que vous allez faire."

Système de cotation

	1	2	3	1	2	3
Cochez >>>						
Commentaires						

1. Durant l'observation de la tâche, l'ergothérapeute inscrit les comportements observés ainsi que les verbalisations de la personne.
2. À la suite de l'observation de la tâche, l'ergothérapeute analyse les comportements observés et les verbalisations de la personne selon les quatre opérations du *Profil des AVQ-révisé*, c'est-à-dire FORMULER UN BUT, PLANIFIER, EXÉCUTER, S'ASSURER DE L'ATTEINTE DU BUT INITIAL. Un score est donné à chaque opération (scores opérations) et à la tâche (score tâche) selon l'échelle suivante:

0	1	2	3	4
Dépendance	Assistance verbale et physique et physique	Assistance verbale ou physique	Indépendance avec difficulté	Indépendance

SE DÉPLACER À L'EXTÉRIEUR

Jugement de l'expert

Définition de la tâche

	Pertinence			Clarté		
	Non (1)	Plus ou moins (2)	Oui (3)	Non (1)	Plus ou moins (2)	Oui (3)
Cochez >>>						
Commentaires						

Se déplacer à l'extérieur à pied ou en fauteuil roulant et se rendre à une destination prédéterminée (ex.: épicerie). Ceci inclut verbaliser l'intention de se déplacer à l'extérieur, réfléchir aux alternatives possibles de parcours, choisir un parcours, marcher ou se propulser en fauteuil roulant, traverser une rue de façon sécuritaire, faire les ajustements nécessaires en cours de route, s'assurer que la destination prévue a été atteinte, etc.

Contexte d'administration

	1	2	3	1	2	3
Cochez >>>						
Commentaires						

L'ergothérapeute doit s'assurer de respecter les conditions suivantes:

1. De préférence l'évaluation se fait à proximité du domicile de la personne. Au besoin, elle peut se faire à proximité de l'établissement où est hébergée la personne.
2. Cette tâche est généralement évaluée avec les tâches "mettre ses vêtements", "faire des courses", "préparer un repas chaud", et "prendre un repas". Elle peut, au besoin, aussi être évaluée avec la tâche "utiliser les transports en commun".
3. Le besoin de se déplacer à l'extérieur est créé en s'assurant que dans la cuisine il n'y a pas tous les ingrédients pour la préparation d'un repas chaud.

Consignes à la personne

	1	2	3	1	2	3
Cochez >>>						
Commentaires						

L'ergothérapeute donne la consigne suivante à la personne:

"Vous nous avez invités, mon assistant et moi, pour souper. Préparez-vous à nous recevoir. S'il y a lieu, nous assumerons les frais encourus, pour un maximum de 20,00$." (Pause)
"Pouvez-vous me répéter ce que je viens de vous expliquer?" (Pause)
"Dites-moi ce que vous allez faire."

Système de cotation

	1	2	3	1	2	3
Cochez >>>						
Commentaires						

1. Durant l'observation de la tâche, l'ergothérapeute inscrit les comportements observés ainsi que les verbalisations de la personne.

2. À la suite de l'observation de la tâche, l'ergothérapeute analyse les comportements observés et les verbalisations de la personne selon les quatre opérations du *Profil des AVQ-révisé*, c'est-à-dire FORMULER UN BUT, PLANIFIER, EXÉCUTER, S'ASSURER DE L'ATTEINTE DU BUT INITIAL. Un score est donné à chaque opération (scores opérations) et à la tâche (score tâche) selon l'échelle suivante:

0	1	2	3	4
Dépendance	Assistance verbale et physique et physique	Assistance verbale ou physique	Indépendance avec difficulté	Indépendance

FAIRE DES COURSES

Jugement de l'expert

Définition de la tâche

Pertinence			Clarté		
Non (1)	Plus ou moins (2)	Oui (3)	Non (1)	Plus ou moins (2)	Oui (3)

Cochez >>>

Commentaires

Se procurer à l'épicerie la nourriture et les boissons nécessaires pour la préparation d'un repas chaud. Ceci inclut verbaliser l'intention de faire des courses, vérifier les ingrédients qui doivent être achetés pour le repas, décider du lieu où faire les achats, considérer les alternatives possibles pour se rendre à l'épicerie, considérer le temps requis, vérifier d'avoir l'argent nécessaire, trouver l'épicerie, sélectionner les aliments en fonction d'un plan, payer, emballer les achats, faire les ajustements nécessaires en cours de route, s'assurer d'avoir bien acheté les ingrédients requis pour la préparation d'un repas, etc.

Contexte d'administration

Cochez >>>

1	2	3	1	2	3

Commentaires

L'ergothérapeute doit s'assurer de respecter les conditions suivantes:

1. De préférence l'évaluation se fait à une épicerie située à proximité du domicile de la personne. Au besoin, elle peut se faire à proximité de l'établissement où est hébergée la personne.
2. L'examinateur doit préparer l'évaluation selon le lieu où elle sera effectuée. Pour une évaluation administrée au domicile de la personne, l'examinateur doit au préalable s'assurer (avec la famille de la personne) que l'achat des ingrédients nécessaires pour la préparation d'un repas chaud n'aura pas été effectué. Pour une évaluation dans l'établissement où est hébergé la personne, l'examinateur doit s'assurer que tous les ingrédients pour la préparation d'un repas chaud ne sont pas disponibles dans le réfrigérateur et le garde manger.

Consignes à la personne

Cochez >>>

1	2	3	1	2	3

Commentaires

L'ergothérapeute donne la consigne suivante à la personne:

"Vous nous avez invités, mon assistant et moi, pour souper. Préparez-vous à nous recevoir. S'il y a lieu, nous assumerons les frais encourus, pour un maximum de 20,00$." (Pause)
"Pouvez-vous me répéter ce que je viens de vous expliquer?" (Pause)
"Dites-moi ce que vous allez faire."

Système de cotation

Cochez >>>

1	2	3	1	2	3

Commentaires

1. Durant l'observation de la tâche, l'ergothérapeute inscrit les comportements observés ainsi que les verbalisations de la personne.
2. À la suite de l'observation de la tâche, l'ergothérapeute analyse les comportements observés et les verbalisations de la personne selon les quatre opérations du *Profil des AVQ-révisé*, c'est-à-dire FORMULER UN BUT, PLANIFIER, EXÉCUTER, S'ASSURER DE L'ATTEINTE DU BUT INITIAL. Un score est donné à chaque opération (scores opérations) et à la tâche (score tâche) selon l'échelle suivante:

0	1	2	3	4
Dépendance	Assistance verbale et physique et physique	Assistance verbale ou physique	Indépendance avec difficulté	Indépendance

PRÉPARER UN REPAS CHAUD

Définition de la tâche

	Jugement de l'expert					
	Pertinence			Clarté		
	Non (1)	Plus ou moins (2)	Oui (3)	Non (1)	Plus ou moins (2)	Oui (3)
Cochez >>>						
Commentaires						

Préparer un repas chaud, incluant un grand nombre d'ingrédients, pour trois personnes. Ceci inclut verbaliser l'intention de préparer un repas, réfléchir aux alternatives possibles de menu, considérer le temps requis, vérifier les ingrédients et s'ils sont disponibles, faire le choix d'un menu, transformer les ingrédients en les pelant, tranchant, mélangeant en fonction de son plan initial, faire cuire les ingrédients de façon sécuritaire, servir le repas, faire les ajustements nécessaires en cours de route, vérifier qu'il a préparé son repas conforme à cette occasion, etc.

Contexte d'administration

	1	2	3	1	2	3
Cochez >>>						
Commentaires						

L'ergothérapeute doit s'assurer de respecter les conditions suivantes:

1. De préférence l'évaluation se fait au domicile de la personne. Au besoin, elle peut se faire dans l'établissement où est hébergée la personne.
2. L'examinateur devrait se présenter chez la personne une ou deux heures avant son heure habituelle de prise de repas.
3. L'examinateur ne doit pas proposer de menu. Il doit plutôt encourager la personne à faire son propre choix de menu.
4. Cette tâche peut être évaluée avec les tâches "mettre ses vêtements et chaussures", " se déplacer à l'extérieur", "faire des courses", et " prendre un repas".

Consignes à la personne

	1	2	3	1	2	3
Cochez >>>						
Commentaires						

L'ergothérapeute donne la consigne suivante à la personne:

"Vous nous avez invités, mon assistant et moi, pour souper. Préparez-vous à nous recevoir. S'il y a lieu, nous assumerons les frais encourus, pour un maximum de 20,00$." (Pause)
"Pouvez-vous me répéter ce que je viens de vous expliquer?" (Pause)
"Dites-moi ce que vous allez faire."

Système de cotation

	1	2	3	1	2	3
Cochez >>>						
Commentaires						

1. Durant l'observation de la tâche, l'ergothérapeute inscrit les comportements observés ainsi que les verbalisations de la personne.
2. À la suite de l'observation de la tâche, l'ergothérapeute analyse les comportements observés et les verbalisations de la personne selon les quatre opérations du *Profil des AVQ-révisé*, c'est-à-dire FORMULER UN BUT, PLANIFIER, EXÉCUTER, S'ASSURER DE L'ATTEINTE DU BUT INITIAL. Un score est donné à chaque opération (scores opérations) et à la tâche (score tâche) selon l'échelle suivante:

0	1	2	3	4
Dépendance	Assistance verbale et physique et physique	Assistance verbale ou physique	Indépendance avec difficulté	Indépendance

PRENDRE UN REPAS

Jugement de l'expert

	Pertinence			Clarté		
	Non (1)	Plus ou moins (2)	Oui (3)	Non (1)	Plus ou moins (2)	Oui (3)
Cochez >>>						
Commentaires						

Définition de la tâche

Manger des aliments et prendre une boisson. Ceci inclut reconnaître le besoin de manger et de boire, décider ce qu'il veut manger, demander qu'on lui apporte son repas ou aller le chercher par lui même, couper les aliments, ouvrir les contenants, verser des liquides à boire, boire et manger de façon acceptable, faire les ajustements nécessaires en cours de route, s'assurer d'avoir comblé sa faim et sa soif, etc.

Contexte d'administration

	1	2	3	1	2	3
Cochez >>>						
Commentaires						

L'ergothérapeute doit s'assurer de respecter les conditions suivantes:

1. Cette tâche peut être évaluée avec les tâches "mettre ses vêtements", "se déplacer à l'extérieur", "faire des courses", et "préparer un repas chaud".
2. L'examinateur devrait se présenter chez la personne une ou deux heures avant son heure habituelle de prise de repas si cette tâche est évaluée avec les tâches énumérées ci haut.

Consignes à la personne

	1	2	3	1	2	3
Cochez >>>						
Commentaires						

L'ergothérapeute donne la consigne suivante à la personne:

"Vous nous avez invités, mon assistant et moi, pour souper. Préparez-vous à nous recevoir. S'il y a lieu, nous assumerons les frais encourus, pour un maximum de 20,00$." (Pause)
"Pouvez-vous me répéter ce que je viens de vous expliquer?" (Pause)
"Dites-moi ce que vous allez faire."

Système de cotation

	1	2	3	1	2	3
Cochez >>>						
Commentaires						

1. Durant l'observation de la tâche, l'ergothérapeute inscrit les comportements observés ainsi que les verbalisations de la personne.

2. À la suite de l'observation de la tâche, l'ergothérapeute analyse les comportements observés et les verbalisations de la personne selon les quatre opérations du *Profil des AVQ-révisé*, c'est-à-dire FORMULER UN BUT, PLANIFIER, EXÉCUTER, S'ASSURER DE L'ATTEINTE DU BUT INITIAL. Un score est donné à chaque opération (scores opérations) et à la tâche (score tâche) selon l'échelle suivante:

0	1	2	3	4
Dépendance	Assistance verbale et physique et physique	Assistance verbale ou physique	Indépendance avec difficulté	Indépendance

TÉLÉPHONER POUR OBTENIR UNE INFORMATION

Jugement de l'expert

Définition de la tâche

	Pertinence			Clarté		
	Non (1)	Plus ou moins (2)	Oui (3)	Non (1)	Plus ou moins (2)	Oui (3)
Cochez >>>						
	Commentaires					

Obtenir une information par téléphone. Ceci inclut les aspects suivants: considérer les alternatives possibles pour obtenir l'information désirée, localiser l'annuaire téléphonique ou réfléchir à la façon de joindre le service d'assistance annuaire, trouver le numéro de téléphone requis, composer le numéro de téléphone, demander, obtenir et transmettre l'information à l'examinateur, faire les ajustements nécessaires en cours de route, s'assurer de l'obtention des informations en fonction du problème à résoudre pour effectuer cette tâche, etc.

Contexte d'administration

	1	2	3	1	2	3
Cochez >>>						
	Commentaires					

L'ergothérapeute doit s'assurer de respecter les conditions suivantes:

1. Cette tâche peut être administrée tant au domicile de la personne que dans l'établissement où est hébergée la personne.
2. L'examinateur doit s'assurer qu'il y a un annuaire et un téléphone de disponible sans toutefois les placer devant la personne.
3. L'examinateur doit compléter par le nom d'une ville, la consigne indiquée ci-dessous. Le choix de la ville doit impliquer un trajet d'autobus de 3 heures ou plus du domicile de la personne (ou de l'établissement où elle est hébergée).

Consignes à la personne

	1	2	3	1	2	3
Cochez >>>						
	Commentaires					

L'ergothérapeute donne la consigne suivante à la personne:

"J'aimerais que vous vous informiez de l'horaire des départs d'autobus pour ….(nom de la ville)." (Pause)
"Pouvez-vous me répéter ce que je viens de vous demander?" (Pause)
"Dites-moi ce que vous aller faire."

Système de cotation

	1	2	3	1	2	3
Cochez >>>						
	Commentaires					

1. Durant l'observation de la tâche, l'ergothérapeute inscrit les comportements observés ainsi que les verbalisations de la personne.
2. À la suite de l'observation de la tâche, l'ergothérapeute analyse les comportements observés et les verbalisations de la personne selon les quatre opérations du *Profil des AVQ-révisé*, c'est-à-dire FORMULER UN BUT, PLANIFIER, EXÉCUTER, S'ASSURER DE L'ATTEINTE DU BUT INITIAL. Un score est donné à chaque opération (scores opérations) et à la tâche (score tâche) selon l'échelle suivante:

N.B. Puisque le but de la tâche est formulé dans la consigne, cette opération est cotée non évaluée pour cause extrinsèque (9).

0	1	2	3	4
Dépendance	Assistance verbale et physique et physique	Assistance verbale ou physique	Indépendance avec difficulté	Indépendance

GÉRER SES FINANCES

Définition de la tâche

	Jugement de l'expert					
	Pertinence			Clarté		
	Non (1)	Plus ou moins (2)	Oui (3)	Non (1)	Plus ou moins (2)	Oui (3)
Cochez >>>						
Commentaires						

Faire un budget et gérer ses dépenses en fonction d'un revenu. Ceci inclut réfléchir aux dépenses obligatoires tels que les frais liés à l'habitation (loyer, hypothèque, taxes, réparation), au transport (autobus, essence), aux services (électricité, téléphone), à la nourriture (approvisionnements alimentaire, restaurants) et autres (vêtements, assurances), considérer les ajustements possibles aux dépenses en fonction d'une modification du revenu s'il y a lieu (ex: changement d'emploi), corriger les erreurs qui ont pu se glisser au cours de la réalisation de la tâche, s'assurer que le budget réalisé est plausible en fonction des données initiales, etc.

Contexte d'administration

	1	2	3	1	2	3
Cochez >>>						
Commentaires						

L'ergothérapeute doit s'assurer de respecter les conditions suivantes:

1. Cette tâche peut être administrée tant au domicile de la personne que dans l'établissement où elle est hebergée.
2. Les questions sont données par écrit à la personne et les réponses doivent aussi être écrites.

Consignes à la personne

	1	2	3	1	2	3
Cochez >>>						
Commentaires						

L'ergothérapeute demande à la personne de lire les problèmes suivants inscrits sur des feuilles séparées.

Question 1: *"Vous avez une proposition pour un nouvel emploi qui vous intéresse beaucoup, mais qui représente une diminution de salaire. Comment ajusteriez-vous vos dépenses? Donnez les détails. Pouvez vous me dire ce que vous avez compris?"*

Question 2: *"Imaginez que votre revenu annuel net est de 20,000$, que vous vivez seul en logement et que vous possédez déjà les meubles et les électroménagers. Pouvez-vous effectuer votre budget pour l'année et donnez les détails? Pouvez-vous me dire ce que vous avez compris?"*

Système de cotation

	1	2	3	1	2	3
Cochez >>>						
Commentaires						

1. Durant l'observation de la tâche, l'ergothérapeute inscrit les comportements observés ainsi que les verbalisations de la personne.
2. À la suite de l'observation de la tâche, l'ergothérapeute analyse les comportements observés et les verbalisations de la personne selon les quatre opérations du *Profil des AVQ-révisé*, c'est-à-dire FORMULER UN BUT, PLANIFIER, EXÉCUTER, S'ASSURER DE L'ATTEINTE DU BUT INITIAL. Un score est donné à chaque opération (scores opérations) et à la tâche (score tâche) selon l'échelle suivante:

N.B. Puisque le but de la tâche est formulé dans la consigne, cette opération est cotée non évaluée pour cause extrinsèque (9).

0	1	2	3	4
Dépendance	Assistance verbale et physique et physique	Assistance verbale ou physique	Indépendance avec difficulté	Indépendance

UTILISER LES TRANSPORTS EN COMMUN

Jugement de l'expert

Définition de la tâche

Pertinence			Clarté		
Non (1)	Plus ou moins (2)	Oui (3)	Non (1)	Plus ou moins (2)	Oui (3)
Commentaires					

Cochez >>>

Utiliser les transports en commun, c'est-à-dire prendre l'autobus sur un trajet de plus ou moins six kilomètres en impliquant une correspondance (si possible). Ceci inclut verbaliser l'intention d'utiliser le transport en commun, réfléchir aux alternatives possibles de parcours et de transports en commun, considérer le temps requis, faire le choix d'un parcours, prendre l'autobus, payer son passage, faire les ajustements nécessaires en cours de route, s'assurer que la destination prévue a été atteinte, etc.

Contexte d'administration

Cochez >>>

1	2	3	1	2	3
Commentaires					

L'ergothérapeute doit s'assurer de respecter les conditions suivantes:

1. La destination choisie par la personne doit être suffisamment éloignée de son domicile pour nécessiter un déplacement en transport en commun.

Consignes à la personne

Cochez >>>

1	2	3	1	2	3
Commentaires					

L'ergothérapeute donne la consigne suivante à la personne:

"Vous avez fixé un rendez-vous à un ami au ... Vous devez vous rencontrer à un endroit précis. J'aimerais que vous vous rendiez à ce rendez-vous." (Pause)
"Pouvez-vous me répéter ce que je viens de vous demander?" (Pause)
"Dites-moi ce que vous aller faire."

Système de cotation

Cochez >>>

1	2	3	1	2	3
Commentaires					

1. Durant l'observation de la tâche, l'ergothérapeute inscrit les comportements observés ainsi que les verbalisations de la personne.
2. À la suite de l'observation de la tâche, l'ergothérapeute analyse les comportements observés et les verbalisations de la personne selon les quatre opérations du *Profil des AVQ-révisé*, c'est-à-dire FORMULER UN BUT, PLANIFIER, EXÉCUTER, S'ASSURER DE L'ATTEINTE DU BUT INITIAL. Un score est donné à chaque opération (scores opérations) et à la tâche (score tâche) selon l'échelle suivante:

0	1	2	3	4
Dépendance	Assistance verbale et physique et physique	Assistance verbale ou physique	Indépendance avec difficulté	Indépendance

EXERCICES RELIÉS À L'ADÉQUATION DU SYSTÈME DE COTATION

Jugement d'expert sur l'adéquation du système de cotation

Pages 17-20 à remplir par l'expert

JUGEMENT D'EXPERT SUR L'ADÉQUATION DU SYSTÈME DE COTATION

	Oui	Non
1. Ce système de cotation est-il adéquat pour ce type d'observation? (décrit dans le *Guide d'administration du Profil des AVQ - révisé à la* page 8)		
Si non, spécifiez pourquoi.		
Avez-vous des suggestions? Vous pouvez ajouter une feuille supplémentaire au besoin.		

	Oui	Non
2. Cette échelle présuppose qu'une personne ayant subi un TCC et qui a besoin d'assistance physique et verbale présente plus de dépendance qu'une personne nécessitant de l'aide verbale seulement. Elle présuppose aussi qu'une personne nécessitant de l'aide verbale seulement présente plus de dépendance qu'une personne nécessitant de l'aide physique seulement. Est-ce que vous endossez cette hiérarchie des difficultés?		
Si non, spécifiez pourquoi ?		
Avez-vous des suggestions?		

	Oui	Non
3. Est-ce que selon vous, cette échelle de cotation du *Profil des AVQ-révisé* exprime bien un continuum de dépendance à indépendance?		
Si non, spécifiez pourquoi ?		
Avez-vous des suggestions?		

4. Est-ce que selon vous la définition des niveaux des échelles de cotation (tâches, opérations), tel que présenté dans les tableaux 5 à 9 du *Guide d'administration du Profil des AVQ - révisé* est claire et pertinente? SVP répondre ci-bas.

Jugement de l'expert

4. A. Échelle de cotation: tâches (Tableau 5)

Pertinence			Clarté		
Non (1)	Plus ou moins (2)	Oui (3)	Non (1)	Plus ou moins (2)	Oui (3)
Commentaires					

4. B. Échelle de cotation:
opération "FORMULER UN BUT" (Tableau 6)

1	2	3	1	2	3
Commentaires					

4. B. Échelle de cotation:
opération "PLANIFIER" (Tableau 7)

1	2	3	1	2	3
Commentaires					

	Jugement de l'expert					
	Pertinence			Clarté		
	Non (1)	Plus ou moins (2)	Oui (3)	Non (1)	Plus ou moins (2)	Oui (3)
4. C. Échelle de cotation: opération "EXÉCUTER" (Tableau 8)						
	Commentaires					

	1	2	3	1	2	3
4. D. Échelle de cotation opération "S'ASSURER DE L'ATTEINTE DU BUT INITIAL" (Tableau 9)						
	Commentaires					

5. Si vous avez d'autres commentaires sur l'outil en général, veuillez les inscrire.

Commentaires

Appendix II

*IADL Profile a*dministration guide (version 2.0)

CRIR Centre de recherche interdisciplinaire en réadaptation du Montréal Métropolitain

Université de Montréal

LE PROFIL DES ACTIVITÉS INSTRUMENTALES (version 2.0)

GUIDE D'ADMINISTRATION

Dans le cadre du projet de recherche intitulé :

Validation d'un nouvel instrument de mesure de l'indépendance dans les activités de la vie quotidienne basé sur les fonctions exécutives pour les personnes ayant subi un traumatisme cranio-cérébral : études de fidélité et de validité

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Doctorante en réadaptation (sciences biomédicales)

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Université de Montréal, Centre de recherche interdisciplinaire en réadaptation du Montréal métropolitain (CRIR)

Projet subventionné par le Fonds de la recherche en santé du Québec, la Société de l'assurance automobile du Québec, l'Association des hôpitaux du Québec, l'Association des établissements de réadaptation en déficience physique du Québec et le Réseau provincial de recherche en adaptation-réadaptation

Mars 2005

TABLE DES MATIÈRES

Feuilles d'analyse des comportements observés

INTRODUCTION

Le présent document constitue le *Guide d'administration du Profil des activités instrumentales* (version 2.0). Cette révision s'est avérée nécessaire car les études de validation sur le *Profil des AVQ* (1992-2003) ont démontré le besoin de mieux définir certains concepts sous-jacents à l'outil, tel que les fonctions exécutives, de façon à mieux refléter l'état des connaissances actuelles. Elles nous ont aussi indiqué le besoin de revoir le choix de l'ensemble des tâches (21) de l'outil original, le *Profil des AVQ*, de formuler des consignes spécifiques qui s'adressent non seulement à l'examinateur mais aussi à la personne évaluée et d'élaborer un guide pour coter les opérations.

Le présent document constitue la version 2.0 du *Profil des activités instrumentales*, un instrument développé dans le cadre des travaux de doctorat de Carolina Bottari, ergothérapeute. Le guide d'administration comprend la description de l'outil soit le but, l'approche, la procédure d'administration, les consignes que l'examinateur doit donner à la personne, le système de cotation et les scénarios des différentes tâches du *Profil des activités instrumentales*.

DESCRIPTION DE L'OUTIL

- **But**

Le *Profil des activités instrumentales* (version 2.0) vise à recueillir des données sur l'indépendance de la personne ayant subi un traumatisme cranio-cérébral (TCC) dans les activités de la vie quotidienne (AVQ) en considérant particulièrement les fonctions exécutives nécessaires à la réalisation de ces activités. L'indépendance de la personne est évaluée par **mise en situation**, c'est-à-dire en l'observant directement pendant la réalisation de ses AVQ en situation de vie réelle. Suite aux mises en situation, **un questionnaire administré sous forme d'entrevue** évalue par deux questions la situation pré-traumatique liée aux AVQ (fréquence de pratique et responsabilités) et par deux questions, la situation post-traumatique liée aux AVQ (fréquence de pratique et responsabilité). Le questionnaire est administré à la personne et lorsque possible à une personne significative i.e. au conjoint, à la mère / père, à un enfant. Ces deux modes d'évaluation permettent de documenter les expériences antérieures des personnes ayant subi un TCC et d'évaluer les changements occasionnés par le traumatisme. En effet, le degré de familiarité de la personne avec la tâche influence la réussite ou l'échec de celle-ci, et sert à pondérer les difficultés observées lors de la réalisation de celles-ci.

L'indépendance, selon Rogers (1982), se définie comme la compétence des individus à s'occuper d'eux-mêmes en interaction avec les exigences de l'environnement dans lequel ils vivent. Ceci implique la capacité à décider ce que l'on veut faire, à élaborer un plan d'action, à faire la tâche et à évaluer les résultats.

Dans le *Profil des activités instrumentales* une personne est dite indépendante lorsqu'elle :

- est en mesure d'effectuer toutes les composantes de la tâche (FORMULER UN BUT, PLANIFIER, EXÉCUTER, S'ASSURER DE L'ATTEINTE DU BUT INITIAL) seule, dans un délai raisonnable* et de façon acceptable**. La personne peut être indépendante même si elle utilise des aides techniques ou si elle bénéficie d'un environnement adapté.

- *délai raisonnable : Une tâche est dite réalisée dans un délai raisonnable si elle n'excède pas exagérément le temps pris habituellement par une personne fonctionnant normalement.

- **façon acceptable : Une tâche est réalisée de façon acceptable si ses résultats sont conformes aux critères de qualité adoptés socialement ou encore, si elle est faite de manière sécuritaire et si elle est assez bien exécutée pour que la personne évaluée ou une autre personne n'ait pas à la recommencer. Une tâche est réalisée de façon sécuritaire lorsque le potentiel ou le risque de la personne de se blesser ou de causer un dommage à son environnement durant sa performance dans la tâche est jugé comme étant minimal. Une tâche est réalisée de façon socialement acceptable, si l'entourage immédiat de la personne encourage ou accepte le comportement ou la façon de réaliser la tâche.

L'indépendance est hiérarchisée par rapport à l'accomplissement de la tâche sans aide (sans ou avec difficulté) ou avec aide (verbale ou physique) et à la quantité d'aide requise.

Selon Hamonet & Bégué-Simon (1988), les **AVQ** sont des activités propres à donner à la personne une autonomie individuelle assurant sa survie personnelle et son maintien dans la communauté. Le *Profil des activités instrumentales* propose ainsi une vision élargie des AVQ. Il inclut à l'intérieur de la définition des activités liées aux soins personnels, aux activités domestiques et à diverses activités réalisées dans la communauté. Le *Profil des activités instrumentales* n'évalue pas les activités sociales tel que « aller manger au restaurant avec ses amis », les activités de loisirs, la conduite automobile ou les activités de travail. Toutefois, certaines tâches (ex. : faire des courses) permettront d'évaluer les interactions avec des personnes autres que l'examinateur et la tâche « prendre un repas avec des invités » permettra d'évaluer les interactions sociales avec l'examinateur et une autre personne (ex : capacité d'initier et de maintenir une conversation). Les tâches évaluées avec le *Profil des activités instrumentales* sont les suivantes : mettre ses vêtements d'extérieur, se rendre à l'épicerie, faire des courses, préparer un repas chaud, prendre un repas avec des invités, ranger après le repas, obtenir une information, faire un budget et modifier un budget.

Selon plusieurs auteurs, les **fonctions exécutives,** traditionnellement associés au lobe frontal, sont requis pour l'adaptation à des situations nouvelles (Burgess, 1997; Rainville, Amieva, Lafont, Dartigues, Orgogozo & Fabrigoule, 2001; Rabbitt, 1997). Les fonctions exécutives, selon le Modèle du fonctionnement cérébral de Luria (1973), se définissent sommairement comme la capacité à analyser les données préliminaires (états internes, environnement extérieur), à formuler un but, à planifier (développer une stratégie pour résoudre le problème), à exécuter le plan d'action, à s'auto-corriger et à vérifier si le but initial est atteint (Luria, 1966). Les définitions de ces sous-composantes des fonctions exécutives [désignée par l'expression « opérations » dans le *Profil des activités instrumentales* sont présentées dans le tableau 1. La sous-composante liée à la capacité à analyser les données préliminaires n'a pas été retenue dans cet outil car il serait difficile pour l'examinateur d'obtenir suffisamment d'information pour se prononcer sur cette opération.

Tableau 1 : Définitions des opérations du *Profil des activités instrumentales*

FORMULER UN BUT	Capacité :	
	-	à exprimer une solution pour satisfaire un besoin ou résoudre une situation problématique.
PLANIFIER	Capacité :	
	-	à réfléchir avant d'agir aux conditions de départ ;
	-	à identifier des alternatives ;
	-	à choisir l'alternative la plus adéquate ;
	-	à élaborer un plan général stratégique / tactique d'action (séquence d'actions ou d'étapes).
EXÉCUTER	Capacité :	
	-	à initier son plan d'action ;
	-	à poursuivre la réalisation du plan d'action (inclut la surveillance / vérification continue de l'exécution en fonction du but initial, l'endurance, la manipulation et l'utilisation du matériel, etc) tout en s'ajustant en fonction des erreurs constatées et des situations nouvelles ou imprévue ;
	-	à percevoir les erreurs de planification (erreur d'estimation de temps, de l'espace) et d'exécution (erreurs de manipulation, erreurs dans la sélection d'outil) ;
	-	à modifier l'exécution en fonction des erreurs perçues et des situations imprévues.
S'ASSURER DE L'ATTEINTE DU BUT INITIAL	Capacité :	
	-	à identifier l'atteinte du but initial: confronter les résultats obtenus au but initial ;
	-	à accepter ou à rejeter les résultats ;
	-	à terminer la tâche ou à recommencer le processus lorsqu'il y a rejet du résultat.

Le *Profil des activités instrumentales,* basé sur une observation directe de la personne, permet à l'examinateur de se positionner à la fois sur le niveau d'indépendance de la personne dans la tâche et sur la quantité et le type d'assistance requise (verbale ou physique) pour compléter toutes les étapes (ou opérations) de la tâche soit FORMULER UN BUT, PLANIFIER, EXÉCUTER, et S'ASSURER DE L'ATTEINTE DU BUT INITIAL. De plus, l'outil facilite une analyse détaillée des comportements observés et des éléments contextuels reliés à la tâche, l'analyse des erreurs encourues et l'élaboration d'hypothèses explicatives.

Il est important de préciser que les opérations du *Profil des activités instrumentales*, quoique basées sur les fonctions exécutives, ne s'y limitent pas. Par exemple, pour l'opération « EXÉCUTER », des difficultés d'ordre physique (ex. : perte d'équilibre) peuvent empêcher la personne de poursuivre seule la réalisation du plan d'action. Ainsi, de telles difficultés seront considérées lors de la cotation de l'opération « EXÉCUTER ». L'étendue des répercussions de ces difficultés sur la réalisation des différentes tâches est considérée dans la grille de cotation de chaque tâche. Ainsi, une difficulté peu induire un ralentissement au niveau de l'exécution de la tâche (indépendance avec difficulté) ou faire en sorte que la personne nécessite une assistance verbale (assistance verbale requise) ou physique (assistance physique requise) pour réussir la tâche. Parfois, la personne ne peut réaliser la tâche (dépendance) malgré l'assistance fournit par l'examinateur. Les difficultés de la personne sont ainsi évaluées en fonction de leurs natures, de leurs importances, et de leurs conséquences sur les AVQ.

La personne est observée directement pendant l'exécution de neuf tâches réalisées selon différents scénarios. Chaque tâche du *Profil des activités instrumentales* est **définie** de façon à standardiser l'observation de la tâche. À l'intérieur même de ces définitions, sont inclus des éléments qui représentent l'ensemble des opérations (FORMULER UN BUT, PLANIFIER, EXÉCUTER, et S'ASSURER DE L'ATTEINTE DU BUT INITIAL) nécessaires à la réalisation de la tâche. Par exemple, la définition de la tâche « obtenir une information » inclut «considérer les alternatives possibles pour obtenir l'information désirée ex : annuaire téléphonique, service d'assistance annuaire, Internet». Ceci reflète les actions nécessaires pour « PLANIFIER » la tâche.

- **Approche**

Afin de recueillir le maximum d'informations sur l'ensemble des opérations nécessaires à la réalisation des tâches (incluant la capacité de la personne à formuler un but) et donc à l'indépendance de la personne, les **consignes données à la personne** par l'examinateur sont intentionnellement peu structurantes, c'est-à-dire que l'objet de la mise en situation (ce que la personne doit faire) n'est pas énoncé explicitement par l'examinateur. Par exemple, l'observation de la tâche « préparer un repas chaud » ne se fera pas en disant à la personne « J'aimerais que vous prépariez une assiette de spaghetti avec un dessert et un breuvage ». Plutôt, l'approche préconisée dans le *Profil des activités instrumentales* est de se présenter chez la personne un certain temps avant l'heure habituelle de prise de repas et en lui disant *« Vous nous avez invités, mon assistant et moi, pour dîner. Préparez-vous à nous recevoir. Nous assumerons les frais encourus pour l'achat des articles requis pour un maximum de 20,00$».*

Ainsi, l'examinateur pourra mieux déterminer l'indépendance de la personne à prendre son repas lorsqu'elle est seule à domicile et qu'elle doit aller faire les courses requises et se préparer le repas. En effet, cet exemple illustre bien que certaines tâches du *Profil des activités instrumentales* sont incluses dans une routine ou une séquence de tâches réalisées en série.

Cette façon d'évaluer les tâches a été choisie car elle augmenterait le potentiel d'observation de comportements reliés aux fonctions exécutives (ex : formulation d'un but de la tâche, planification, initiation de la tâche, etc.).

Toutefois, les consignes données à l'examinateur (désignées par l'expression « **contexte d'administration** ») sont plus structurées car il est crucial que l'examinateur comprenne la façon de recueillir certaines observations bien précises et ce, sans dire directement à la personne ce qu'elle doit faire.

- **Procédure d'administration**

ENVIRONNEMENT

L'environnement dans lequel l'évaluation est administrée est le domicile de la personne. Au-delà du domicile, une épicerie et une rue sont divers environnements qui serviront à évaluer les activités telles faire des courses et se déplacer à l'extérieur.

ÉQUIPEMENT

Le *Profil des activités instrumentales* ne nécessite pas d'équipement spécial pour être administré. L'équipement requis est celui normalement utilisé par la personne pour les AVQ. Cet équipement se retrouve dans l'environnement domiciliaire et communautaire de la personne.

DURÉE

La durée et l'étendue de la période d'évaluation sont variables selon divers facteurs, tels que l'état de la personne, son endurance, la phase de récupération, où elle se situe et sa collaboration. Une durée d'environ 3 heures est à prévoir. L'évaluation se fait idéalement sur une seule séance mais peut au besoin être entrecoupée de périodes de repos pour la personne qui en exprime un besoin (ex : lié à une fatigue importante).

DÉMARCHE D'ÉVALUATION

Certaines tâches de l'outil sont administrées selon un enchaînement de tâches (mettre ses vêtements d'extérieur, se rendre à l'épicerie, faire des courses, préparer un repas chaud, prendre un repas avec des invités et ranger après le repas) et d'autres sont administrées une seule tâche à la fois (obtenir une information, faire un budget et modifier un budget). Ainsi, la consigne dite par l'examinateur à la personne pour les tâches administrées selon un enchaînement de tâches est la même soit: *« Vous nous avez invités, mon assistant et moi, pour dîner. Préparez-vous à nous recevoir. Nous assumerons les frais encourus pour l'achat des articles requis pour un maximum de 20,00$».*

L'utilisation d'un enchaînement de tâches vise à mieux recueillir de l'information sur la capacité de la personne à FORMULER UN BUT et à PLANIFIER un ensemble de tâches.

Pour les tâches administrées une seule tâche à la fois (obtenir une information, faire un budget et modifier un budget), des consignes spécifiques à chaque tâche ont été formulées. Par exemple, pour la tâche « obtenir une information », la consigne suivante est dite à la personne: « *J'aimerais que vous vous informiez de l'horaire des départs d'autobus pour ... (nom de la ville.* ». Lorsque l'évaluation se fait aux alentours de Montréal, le nom de la ville qui est dite est Toronto.

Les consignes précédentes (pour les tâches administrées selon un enchaînement de tâches et une seule tâche à la fois) sont suivies de deux questions. Une première vise à s'assurer que la personne comprend bien la consigne et est formulée ainsi: "*Pouvez-vous me dire dans vos propres mots ce que je viens de vous expliquer ?*" Des explications supplémentaires sont données lorsqu'il est apparent que la personne n'a pas compris la consigne. Il est à noter que des informations données par l'examinateur dans le but de s'assurer de la compréhension de la consigne ne sont pas considérées dans la cotation des tâches, c'est à dire la personne ne reçoit pas une cote « ASSISTANCE VERBALE REQUISE» lorsque ces informations lui sont transmises. La deuxième vise à obtenir de l'information sur l'opération « PLANIFIER ». Elle est formulée ainsi: «*Dites-moi ce que vous allez faire*". Lorsque la personne s'en tient à dire ce qu'elle ferait dans un contexte hypothétique, l'examinateur fournit les informations nécessaires pour que la personne comprenne que les tâches d'AVQ doivent être réalisées de façon concrète. Par exemple, la personne pourrait dire ceci « Si j'avais invité des amis à souper je commencerais certainement à me préparer maintenant. J'ai du gigot d'agneau dans le frigidaire que je pourrais apprêter. Je garderais cela simple mais j'essayerais de préparer quelque chose de bien ». L'examinateur dirait donc « Est-ce que vous pourriez réaliser concrètement ces activités afin de vous préparer à nous recevoir maintenant? ». Encore une fois, ceci n'est pas considéré dans la cotation des tâches.

L'administration du *Profil des activités instrumentales* implique que l'examinateur s'assure en premier lieu que l'évaluation sera effectuée en toute sécurité (e.g. lecture du dossier médical pour connaître les contre-indications médicales, consultation des autres professionnels). La sécurité est basée sur le potentiel ou le risque de la personne à se blesser ou de causer du dommage à son environnement durant sa performance dans la tâche. En effet, le concept de sécurité doit être omniprésent pour l'examinateur lors de l'administration de cet outil, considérant particulièrement que les personnes ayant un subi un TCC sont à haut risque de compromettre leur propre sécurité ou celle d'autrui suites aux multiples atteintes cognitives qui peuvent découler de ce traumatisme.

En premier lieu, l'examinateur doit identifier les tâches pour lesquelles une mise en situation ne pourra être administrée dû la présence d'un risque trop élevé de compromettre la sécurité de la personne. Par exemple, la tâche « se rendre à l'épicerie » ne sera pas évaluée si la personne a une fracture non consolidée du fémur. Une tâche non évaluée sera soit cotée « NON-ÉVALUÉE POUR DES CAUSES INTRINSÈQUES» (ex : contre-indication médicale) ou « DÉPENDANCE » (ex : aphasie mixte sévère).

En deuxième lieu, l'examinateur doit s'assurer d'intervenir en offrant soit de l'assistance verbale ou physique ou en interrompant l'activité au moment où le bien-être ou la sécurité de la personne sont compromis. Ces interventions se feront de façons progressives. Ainsi, lorsque l'examinateur juge qu'un comportement de la personne est non sécuritaire, il donne en premier lieu l'opportunité à la personne de modifier la situation et d'ainsi réduire l'élément de dangerosité. Le laps de temps alloué peut parfois être très court puisque certaines situations exigent une intervention rapide (ex : lorsque la personne traverse une rue) et d'autres moins rapides (ex : la personne ne ferme pas le rond de poêle). Dès que l'examinateur convient que la personne est incapable d'assumer sa propre sécurité, il intervient en offrant une assistance soit physique ou verbale ou les deux selon les besoins de la personne. Cette assistance est considérée lors de la cotation de la tâche puisque l'aide requise est directement reliée à l'indépendance de la personne dans ses AVQ. Autrement, il n'intervient pas lors de la réalisation de la tâche (voir la section PROCÉDER À LA MISE EN SITUATION).

Lorsque la sécurité de la personne est précaire sans toutefois nécessiter une intervention directe de la part de l'examinateur, l'examinateur juge de la sécurité de la personne non seulement pendant la réalisation de la tâche mais en fonction des risques réels qui pourraient survenir dans le futur. Par exemple, une personne avec une démarche chancelante lors de la tâche « se rendre à l'épicerie » qui nécessite une supervision très proche de l'examinateur sans toutefois nécessiter une assistance physique sera cotée « ASSISTANCE PHYSIQUE REQUISE » lors de la cotation de la tâche.

L'examinateur doit ensuite choisir le moment de la journée le plus opportun pour administrer l'outil (e.g. quelques heures avant le dîner ou le souper pour évaluer l'enchaînement des tâches liées à la préparation d'un repas chaud) et il doit expliquer le rôle de l'ergothérapeute ainsi que le but de l'évaluation à la personne afin de favoriser sa coopération à l'évaluation.

CONSIGNES DONNÉES A LA PERSONNE PAR L'EXAMINATEUR

Avant de débuter la mise en situation, les consignes suivantes sont données à la personne par l'examinateur:

INTRODUCTION DE LA MISE EN SITUATION
"Nous aimerions connaître votre fonctionnement dans vos activités de la vie de tous les jours, c'est-à-dire les activités que vous faites généralement à l'intérieur et à l'extérieur de votre domicile. Plus précisément, nous voulons savoir, suite à votre accident, les changements qui sont survenus dans la réalisation de vos activités." *"Je vous demanderai donc de réaliser, au cours des prochaines heures que nous passerons ensemble, certaines de ces activités que vous feriez normalement lorsque vous êtes chez vous et je vous observerai. "* *"Toutefois, l'évaluation que nous allons faire aujourd'hui est un peu particulière dans le sens où je ne vous dirai pas quoi faire, dans la mesure du possible. J'aimerais vous laisser entreprendre, par vous même, les activités de votre choix. Si jamais vous décidiez de faire des activités qui ne sont pas nécessaires à cette évaluation, je vous en informerai. »* *"Pendant l'évaluation, je me placerai un peu à l'écart pour voir comment vous vous débrouillez. Vous pouvez me poser des questions au besoin, mais autant que possible, vous devez essayer de fonctionner tout seul."* *"Pendant l'activité, je prendrai des notes. Nous discuterons de vos résultats à la fin de l'évaluation si vous le désirez."* *"Pouvez-vous me résumer ce que je viens de vous expliquer ?"* *"Avez-vous des questions ?"*

En plus des consignes générales d'introduction à la mise en situation, des consignes spécifiques aux différentes tâches du *Profil des activités instrumentales* sont décrites à l'intérieur des différents scénarios reliés à ces tâches. Ces consignes spécifiques aux différentes tâches sont énoncées à la personne au moment de la mise en situation de la tâche et sont résumées au tableau 2. La première consigne spécifique donnée par l'examinateur à la personne sera la consigne pour l'enchaînement de tâches lié à la préparation d'un repas chaud, c'est-à-dire *"Vous nous avez invités, mon assistant et moi, pour souper. Préparez-vous à nous recevoir. S'il y a lieu, nous assumerons les frais encourus pour l'achat des articles requis, pour un maximum de 20,00$."*

Tableau 2 : Consignes spécifiques aux tâches

TÂCHES	CONSIGNES À LA PERSONNE
Section 1 : Enchaînement de tâches : Mettre ses vêtements d'extérieur; Se déplacer à l'extérieur; Faire des courses; Préparer un repas chaud; Prendre un repas avec des invités; Ranger après le repas.	Pour observer l'ensemble de ces tâches une seule consigne est donnée par l'examinateur à la personne soit : *"Vous nous avez invités, mon assistant et moi, pour souper. Préparez-vous à nous recevoir. S'il y a lieu, nous assumerons les frais encourus pour l'achat des articles requis, pour un maximum de 20,00$."* *« Pouvez-vous me dire dans vos propres mots ce que je viens de vous expliquer ? (Attendre la réponse et offrir des clarifications pour vous assurer que la personne comprend bien ce qui lui ai demandé) »…« Maintenant, dites-moi ce que vous allez faire ».* **Informations supplémentaires** à ajouter si la personne propose de préparer un repas froid : « *Nous aimerions, de préférence, vous observer préparer un repas chaud si possible* ». N.B. L'ajout de cette dernière information n'est pas considérée dans la cotation des tâches.

TÂCHES	CONSIGNES À LA PERSONNE
Section 2 : Tâches uniques	
Obtenir une information	*"J'aimerais que vous vous informiez de l'horaire des départs d'autobus pour...(nom de la ville)."* *« Pouvez-vous me dire dans vos propres mots ce que je viens de vous expliquer ? (Attendre la réponse et offrir des clarifications pour vous assurer que la personne comprend bien ce qui lui est demandée) »...« Maintenant, dites-moi ce que vous allez faire ».*
Faire un budget	*«Imaginez que votre revenu annuel net est de 20,000$, que vous vivez seul en logement et que vous possédez déjà les meubles, les électroménagers et les installations requises. Vous envisagez mettre de l'argent de côté car vous aimeriez vous acheter une auto d'ici un an en payant une partie comptant. Pouvez-vous effectuer votre budget pour l'année et donnez les détails ? »* *« Pouvez-vous me dire dans vos propres mots ce qui vous est demandé dans ce problème ? (Attendre la réponse et offrir des clarifications pour vous assurer que la personne comprend bien ce qui lui est demandée) »...« Maintenant, dites-moi ce que vous allez faire ».*
Modifier un budget	*« Vous avez une proposition pour un nouvel emploi qui vous intéresse beaucoup, mais qui représente une diminution de salaire. Comment ajusteriez-vous vos dépenses? Donnez différents scénarios possibles ».* *« Pouvez-vous me dire dans vos propres mots ce qui vous est demandé dans ce problème ? (Attendre la réponse et offrir des clarifications pour vous assurer que la personne comprend bien ce qui lui est demandée) »...« Maintenant, dites-moi ce que vous allez faire».*

ADMINISTRATION DE LA MISE EN SITUATION

Lors de la mise en situation, l'examinateur se place à l'écart et observe le comportement de la personne. Il n'intervient qu'au besoin lors de la réalisation de la tâche. Si la personne pose des questions, l'examinateur l'encourage à trouver elle-même les solutions et s'abstient de résoudre le problème pour elle. Afin de recueillir le plus d'informations possibles sur le processus de réalisation de la tâche (ex.: capacité à formuler des buts et à établir un plan d'action), l'examinateur évite de formuler le but, de décrire les étapes de la tâche, de fournir des aides techniques, de donner des stratégies pour résoudre des situations problématiques qui surgissent en cours de tâche ainsi que de mentionner les erreurs observées.

L'examinateur n'assiste la personne que lorsque nécessaire. Il doit donc la laisser fonctionner seule tant et aussi longtemps qu'il juge que la sécurité et le bien-être de la personne (physique et psychologique) ne sont pas compromis. Lorsque la sécurité ou le bien-être de la personne sont compromis (ex. : une personne qui oublie d'appliquer les freins de son fauteuil roulant avant d'effectuer un transfert), l'examinateur offre de l'assistance verbale ou physique selon les besoins, et ce, de façon progressive. Par exemple, pour l'assistance verbale, l'examinateur donne premièrement des indices non-spécifiques tel que « Avez-vous oublier quelque chose ? ». Si la personne ne reconnaît pas ainsi qu'elle a omis d'appliquer les freins de son fauteuil roulant avant d'effectuer un transfert, l'examinateur donne un indice spécifique tel que « Vous devez appliquer votre frein avant de vous lever de votre fauteuil roulant ». Si la personne demeure passive devant cette consigne, l'examinateur lui montre les freins et lui démontre comment les appliquer. Si la personne réussit à appliquer les freins de son fauteuil roulant avec cette consigne, une cotation d'ASSISTANCE VERBALE sera attribuée à la tâche en cours. Si malgré l'assistance de l'examinateur la personne demeure incapable de réaliser la tâche, une cotation de « DÉPENDANCE » est attribuée à la tâche en cours.

Concernant la douleur et la fatigue, l'examinateur doit être alerte à leurs manifestations tout au cours des mises en situation. L'examinateur peut vérifier si la personne se sent en mesure de poursuivre l'évaluation lorsqu'il observe des manifestations de l'une ou de l'autre de ces difficultés. Ces interrogations de la part de l'examinateur ne sont pas considérées dans la cotation. Toutefois, dans le cas où l'examinateur doit proposer de modifier la tâche en cours pour aider la personne à s'adapter à sa fatigue ou à sa douleur, ceci sera considéré dans la cotation, i.e. ASSISTANCE VERBALE OU PHYSIQUE. Dans le cas où une douleur non habituelle influencerait trop le déroulement de la tâche, l'examinateur peut reporter la séance d'évaluation. La personne est ici considérée soit « NON ÉVALUÉE POUR CAUSES INTRINSÈQUES » OU « DÉPENDANCE » puisque la mise en situation n'a pu être complétée.

Lorsqu'une personne demeure inactive ou encore si elle persévère, l'examinateur offrira de l'assistance lorsqu'il jugera que la personne ne modifiera pas la situation d'elle-même. Il est primordial d'éviter d'intervenir trop rapidement car ceci influence largement la cotation. Une personne qui réussit mais avec un certain délai sera cotée « INDEPENDANCE AVEC DIFFICULTÉ ». Toutefois, dès que l'examinateur juge qu'il doit intervenir, la cotation sera « ASSISTANCE VERBALE ».

L'examinateur peut également intervenir dans le cas d'un comportement inadéquat en cours de réalisation d'une tâche (ex.: crier des bêtises à la caissière lorsque la personne fait des courses).

Toute assistance, verbale ou physique, requise pour la réussite de la tâche dans un délai raisonnable et de façon acceptable sera considérée lors de la cotation de la tâche. Lorsqu'une personne est incapable de réussir la tâche malgré l'assistance verbale et physique de l'examinateur, elle sera cotée « DÉPENDANCE ».

Il est important que l'examinateur note le temps de réalisation de chaque tâche pour statuer sur le niveau d'indépendance de la personne. En effet, une cotation « INDÉPENDANCE SANS DIFFICULTÉ » implique que la tâche est réalisée dans un délai raisonnable. Une tâche qui, malgré l'assistance de l'examinateur, ne peut être réalisée dans un délai raisonnable sera cotée « DÉPENDANCE ».

• **SYSTÈME DE COTATION**

PROCÉDURE À SUIVRE POUR LA COTATION DU *PROFIL DES ACTIVITÉS INSTRUMENTALES*

1. Observations notées lors de la tâche

Lors du déroulement de la tâche, l'examinateur inscrit les comportements observés ainsi que les verbalisations de la personne qui permettent de justifier la cote accordée. Les inscriptions sont faites en utilisant des mots clé ou des phrases simples.

Exemples de comportements observés:
Thérapeute lui dit de mettre les freins, mais elle ne s'exécute pas, elle ne fait rien et attend.
Essaie de se lever à deux reprises et le thérapeute doit lui répéter de mettre ses freins.
N'est pas capable d'enlever les couvercles des contenants.
Incline les pots pour les ouvrir mais ça coule dans son plateau.
"Mange" son jus avec sa cuillère.

Exemple de verbalisations spontanées:
"Je vais prendre ma douche après le petit déjeuner."
"J'ai une sortie ce soir, je vais donc me laver les cheveux. J'ai du shampooing mais pas de revitalisant. Je vais prendre une serviette."

Lorsque l'examinateur ne peut inscrire les comportements durant l'observation (ex : lorsque la personne nécessite de l'assistance), il est fortement recommandé de les inscrire immédiatement après l'évaluation car les détails sont extrêmement importants et peuvent être oubliés facilement.

2. Analyse des comportements observés

Une fois l'observation terminée, l'examinateur analyse les comportements observés selon les quatre opérations du *Profil des activités instrumentales.* Le cadre de cette analyse est inspirée du modèle de fonctionnement cérébral de A.R. Luria (1978).

Tableau 3 : Exemples d'analyse des comportements observés

ERREURS OBSERVÉES	LIEN AVEC LES OPÉRATIONS DU PROFIL DES ACTIVITÉS INSTRUMENTALES	DÉFINITION DES OPÉRATIONS
Ne reconnaît pas qu'une situation est problématique ou qu'une chose doit être faite (ex : ne reconnaît pas le besoin de faire le ménage) conduisant à une absence d'intention de résoudre le problème.	**FORMULER UN BUT**	Capacité : - à exprimer une solution pour satisfaire un besoin ou résoudre une situation problématique.
Ne verbalise aucune intention (ex : son discours ne comporte pas des expressions tel que « il faut que…je ferai…. je pourrais…. je prévois…. j'irai… »).		
Ne formule le but de faire le ménage qu'avec l'encouragement de l'examinateur.		
Malgré l'insistance de l'examinateur, refuse de changer ses vêtements bien qu'ils soient très sales et qu'une sortie soit prévue.		
Incapable d'élaborer une séquence d'étapes malgré l'aide de l'examinateur.	**PLANIFIER**	Capacité : - à réfléchir avant d'agir aux conditions de départ; - à identifier des alternatives; - à choisir l'alternative la plus adéquate; - à élaborer un plan général stratégique / tactique d'action (séquence d'actions ou d'étapes).
Effectue des observations fragmentaires de façon impulsive et sans plan.		
Incapable de faire le choix d'une épicerie pour faire ses courses après avoir tout considéré, c'est-à-dire la distance à parcourir, les aubaines, l'achalandage, etc.		

Dévie continuellement de son but. Très distrait par les éléments dans l'environnement. Recherche aléatoire du matériel et des informations dans l'annuaire téléphonique. Lors de la prise de repas, se salit et il ne pense pas de s'essuyer avec une serviette de table... Même avec les indices donnés par l'examinateur, il ne se corrige pas... Il ne s'en préoccupe pas.	**EXÉCUTER**	Capacité : - à initier son plan d'action; - à poursuivre la réalisation du plan d'action (inclut la surveillance / vérification continue de l'exécution en fonction du but initial, l'endurance, la manipulation et l'utilisation du matériel, etc) tout en s'ajustant en fonction des erreurs constatées et des situations nouvelles ou imprévues; - à percevoir les erreurs de planification (erreur d'estimation de temps, de l'espace) et d'exécution (erreurs de manipulation, erreurs dans la sélection d'outil); - à modifier l'exécution en fonction des erreurs perçues et des situations imprévues.
Termine la tâche sans toutefois avoir atteint le but initial. Ne compare pas les résultats obtenus au but initial.	**S'ASSURER DE L'ATTEINTE DU BUT INITIAL**	Capacité : - à identifier l'atteinte du but initial; confronter les résultats obtenus au but initial; - à accepter ou à rejeter les résultats;à terminer la tâche ou à recommencer le processus lorsqu'il y a rejet du résultat.

3. Cotation de chaque tâche (Score tâche)

Dans la prochaine étape, l'examinateur attribue un score à la tâche selon l'échelle de cotation décrite ci-dessous. De plus, après avoir fait la cotation des opérations (étape 4), l'examinateur doit s'assurer que le score attribué pour la tâche correspond au plus bas des scores attribués aux opérations. Par exemple, si une personne reçoit une cotation de 4 pour l'opération "FORMULER UN BUT", 4 pour l'opération "PLANIFIER", 2 pour l'opération "EXÉCUTER" et 4 pour l'opération "S'ASSURER DE L'ATTEINTE DU BUT INITIAL", le score attribué à la tâche est 2. En d'autres termes, une personne qui nécessite de l'assistance verbale ou physique de l'examinateur pour réussir l'opération « EXÉCUTER », même si elle est indépendante pour les trois autres opérations, nécessite de l'assistance verbale ou physique pour réussir la tâche.

EXEMPLE :

Cotation globale des opérations et des tâches			
	Opérations	Tâches	Commentaires
Obtenir une information	4 4 2 4	2	
Préparer un repas chaud	2 1 0 0	0	

DESCRIPTION DE L'ÉCHELLE DE COTATION DU *PROFIL DES ACTIVITÉS INSTRUMENTALES*

Une échelle de cotation de type ordinal (5 niveaux) est utilisée. Cette échelle est appliquée pour chacune des tâches du *Profil des activités instrumentales*.

Tableau 4: Échelle de cotation: tâches

Niveau		Définition
4 :	Indépendance sans difficulté	Capable d'effectuer toutes les opérations de la tâche seule, sans difficulté, dans un délai raisonnable* et de façon acceptable **. Peut utiliser des aides techniques ou bénéficier d'un environnement adapté.
3 :	Indépendance avec difficulté	Capable d'effectuer toutes les opérations de la tâche seule, mais des difficultés sont observées en ce qui concerne le temps d'exécution ou la façon de réaliser la tâche. Peut utiliser des aides techniques ou bénéficier d'un environnement adapté.
2 :	Assistance verbale ou physique requise	Capable d'effectuer une ou plusieurs opérations de la tâche avec assistance verbale ou physique, dans un délai raisonnable et de façon acceptable: ceci implique donc que la personne ne peut réaliser la tâche sans l'assistance verbale ou physique de l'examinateur. L'aide verbale peut être fournie sous forme d'aide incitative (prompt), aide continue (pour le shift) ou simple supervision (overview). Par exemple, l'examinateur donnera des suggestions, des consignes, des indices pour aider la personne à se recentrer sur l'objectif ou à se rappeler des consignes. D'autres exemples incluent un soutien pour l'identification d'un problème survenu en cours de tâche, rester près pour prévenir les chutes associées à des action impulsives ou un reflet d'une erreur survenu en cours de tâche. Ce type d'assistance est apporté pour pallier à des problèmes d'ordre cognitif ou exécutif. L'aide physique peut être apportée de différentes façons: soulever la personne lors d'un transfert, installer une aide technique, pousser un fauteuil roulant, actionner les boutons de contrôle du four, donner un appui lors de la marche, rester près pour prévenir les chutes associés à un trouble d'équilibre, etc. Ce type d'assistance est apporté pour pallier à des problèmes d'ordre physique.
1 :	Assistance verbale et physique requises	Capable d'effectuer une ou plusieurs opérations de la tâche avec assistance verbale et physique, dans un délai raisonnable et de façon acceptable. Ceci implique donc que la personne ne peut réaliser la tâche sans l'assistance physique et verbale de l'examinateur.

0 :	Dépendance	Incapable d'effectuer une ou plusieurs opérations de la tâche dans un délai raisonnable ou de façon acceptable malgré l'assistance verbale ou physique répétée de l'examinateur. Par exemple. malgré le fait que l'examinateur répète à cinq reprises que la personne doit signaler le « 411 » pour obtenir les informations recherchées. la personne ne réussit pas à rejoindre l'assistance annuaire.
8 :	Non évaluée (cause intrinsèque)	Tâche non évaluée pour des raisons intrinsèques à la personne. Ces raisons peuvent être: refus de se prêter à la mise en situation ou de collaborer. contre-indication médicale. etc.
9 :	Non évaluée (cause extrinsèque)	Tâche non évaluée pour des raisons extrinsèques à la personne. Ces raisons peuvent être: oubli du clinicien, manque de temps. manque d'équipement. manque de ressources humaines. environnement inadapté ou empêchant la mise en situation, etc.

***Délai raisonnable:** Le temps d'exécution d'une opération ou d'une tâche est raisonnable s'il n'excède pas exagérément le temps pris habituellement par une personne fonctionnant normalement. Le jugement de l'examinateur est fondé sur sa connaissance d'une routine normale d'AVQ et du temps requis pour réaliser cette routine.

****Façon acceptable:** Une opération ou une tâche est réalisée de façon acceptable si ses résultats sont conformes aux critères de qualité adoptés socialement ou encore, si elle est faite de manière sécuritaire et si elle est assez bien exécutée pour que la personne évaluée ou une autre personne n'ait pas à la recommencer. Une opération ou une tâche est réalisée de façon sécuritaire lorsque le potentiel ou le risque de la personne de se blesser ou de causer du dommage à son environnement durant sa performance dans la tâche est jugé conforme à un risque normal. Une opération ou une tâche est réalisée de façon socialement acceptable. si l'entourage immédiat de la personne encourage ou accepte le comportement ou la façon de réaliser la tâche ou l'opération.

***** Assistance physique:** La cotation « assistance physique » ne s'applique que pour une seule opération. soit l'opération "EXÉCUTER".

4. Cotation de chaque opération (Score opération)

Les opérations sont cotées séparément en utilisant l'échelle de cotation ordinale à 5 niveaux du *Profil des activités instrumentalesé*. Il est suggéré de n'attribuer les scores aux opérations qu'une fois la tâche complétée et de ne coter que les opérations ayant été observées. Afin de faciliter la cotation des opérations par l'examinateur, les tableaux 6 à 9 reprennent chacune des opérations et illustrent, pour chaque niveau de l'échelle de cotation (tel que défini au tableau 4) des exemples de comportements bien précis qui s'y rattachent. Ces tableaux devraient faciliter l'analyse des comportements observés et des éléments contextuels à la tâche, l'analyse des erreurs encourues et l'élaboration d'hypothèses explicatives.

Il est à noter que l'assistance physique ne s'applique que pour une seule opération, soit l'opération "EXÉCUTER", puisque ce type d'assistance est apporté pour pallier à des problèmes d'ordre physique.

Opération: FORMULER UN BUT

Tableau 5: Échelle de cotation: opération "FORMULER UN BUT"

Niveau		Définition
4:	Indépendance sans difficulté	Capable d'exprimer une solution pour satisfaire un besoin ou résoudre une situation problématique seule, sans difficulté, dans un délai raisonnable* et de façon acceptable **. Elle connaît ses besoins et formule des intentions réalistes. *Par exemple, après avoir constaté qu'elle n'a pas les articles requis pour la préparation d'un repas, elle verbalise, sans hésitation, qu'elle devra aller faire les courses nécessaires pour l'achat des articles requis.*
3:	Indépendance avec difficulté	Capable d'exprimer une solution pour satisfaire un besoin ou résoudre une situation problématique sans aide de l'examinateur. Toutefois, des difficultés sont observées en ce qui concerne le temps requis ou la façon de faire cette opération. *Par exemple, après avoir constaté qu'elle n'a pas les articles requis pour la préparation d'un repas, elle hésite un long moment avant de proposer d'aller faire les courses nécessaires pour l'achat des articles requis. Ainsi elle connaît bien ses besoins et formule des intentions réalistes mais les délais sont long.*
2:	Assistance verbale requise	Capable d'exprimer une solution pour satisfaire un besoin ou résoudre une situation problématique avec assistance verbale, dans un délai raisonnable et de façon acceptable; ceci implique donc que la personne ne peut réaliser cette opération sans l'assistance verbale de l'examinateur. *Par exemple, elle a des besoins, mais elle ne paraît pas bien les connaître; elle prend difficilement des décisions; elle formule peu d'intentions (ex: il faut que, je pourrais, etc.) ou les solutions exprimées sont parfois irréalistes. L'examinateur doit parfois l'assister par ses questions, ses encouragements, ses indices, ses commentaires, ses consignes, sans lesquels la personne ne peut réaliser l'opération.*
0:	Dépendance	Incapable d'exprimer une solution pour satisfaire un besoin ou résoudre une situation problématique dans un délai raisonnable ou de façon acceptable malgré l'assistance verbale.

	Par exemple, elle ne connaît pas ses besoins ou ne définit pas de buts; trop souvent, elle formule des désirs inappropriés et formule des intentions irréalistes. Malgré l'assistance de l'examinateur elle ne réussit pas à formuler une intention réaliste.
8: Non évaluée (cause intrinsèque)	Opération non évaluée pour des raisons intrinsèques à la personne *Ces raisons peuvent être: refus de se prêter à la mise en situation ou de collaborer, contre-indication médicale, etc.*
9: Non évaluée (cause extrinsèque)	Opération non évaluée pour des raisons extrinsèques à la personne. *Ces raisons peuvent être: procédure d'administration qui ne permet pas l'observation de cette opération pour la tâche (i.e. le but est formulé par l'examinateur), oubli du clinicien, manque de temps, manque d'équipement, manque de ressources humaines, environnement inadapté ou empêchant la mise en situation, etc.*

N.B. La cotation assistance physique ne s'applique que pour une seule opération, soit l'opération "EXÉCUTER".

*** Délai raisonnable:** Le temps d'exécution d'une opération est raisonnable s'il n'excède pas exagérément le temps pris habituellement par une personne fonctionnant normalement. Le jugement de l'examinateur est fondé sur sa connaissance d'une routine normale d'AVQ et du temps requis pour réaliser cette routine.

**** Façon acceptable:** Une opération est réalisée de façon acceptable si ses résultats sont conformes aux critères de qualité adoptés socialement ou encore, si elle est faite de manière sécuritaire et si elle est assez bien exécutée pour que la personne évaluée ou une autre personne n'ait pas à la recommencer. Une opération est réalisée de façon sécuritaire lorsque le potentiel ou le risque de la personne de se blesser ou de causer du dommage à son environnement durant sa performance dans la tâche est jugé conforme à un risque normal. Une opération est réalisée de façon socialement acceptable, si l'entourage immédiat de la personne encourage ou accepte le comportement ou la façon de réaliser la tâche ou l'opération.

4. Cotation de chaque opération (suite)

Opération: PLANIFIER

Tableau 6: Échelle de cotation: opération "PLANIFIER"

Niveau	Définition
4: Indépendance sans difficulté	Capable d'effectuer toutes les composantes de l'opération seule, sans difficulté, dans un délai raisonnable* et de façon acceptable **. *Ceci implique plusieurs aspects: elle réfléchit avant d'agir aux conditions de départ (ex. : temps de préparation disponible); elle identifie les alternatives possibles pour atteindre le but visé (ex. : diverses façons de se rendre à sa destination) en lien avec les conditions de départ; elle choisit l'alternative la plus adéquate (ex. : fait un choix en fonction d'un degré de difficulté approprié à ses capacités); elle élabore un plan général d'action (ex. : identifie les éléments de la tâche).*
3: Indépendance avec difficulté	Capable d'effectuer toutes les composantes de l'opération seule, mais des difficultés sont observées en ce qui concerne le temps requis ou la qualité de la planification. *Ceci implique plusieurs aspects: elle réfléchit avant d'agir aux conditions de départ; elle identifie les alternatives possibles pour atteindre son but en fonction des conditions de départ; elle choisit l'alternative la plus adéquate en fonction des conditions de départ (ex. : choisit de se rendre à l'épicerie en fauteuil roulant pour compenser ses difficultés à la marche); elle identifie les éléments de la tâche seule (tout en sachant ce que la tâche implique en terme de durée et de difficulté). Toutefois, elle aurait intérêt à prendre un peu plus ou moins de temps à établir son plan d'action (ex. : prend trop ou trop peu de temps à considérer les alternatives).*
2: Assistance verbale requise	Capable d'effectuer toutes les composantes de l'opération avec assistance verbale, dans un délai raisonnable et de façon acceptable: ceci implique donc que la personne ne peut réaliser l'opération sans l'assistance verbale de l'examinateur. *Par exemple, sans l'assistance de l'examinateur elle a tendance à agir avant d'avoir fini de réfléchir aux conditions de départ (ex. : ce que la tâche implique en terme de temps, de durée, de difficulté; ses propres capacités); elle ne considère qu'un nombre restreint d'alternatives (ex. : ne réfléchit pas aux façons pour optimiser ses capacités); elle ne choisit pas l'alternative la plus adéquate en fonction du but initial et des conditions de*

	départ; elle n'identifie que certains éléments de la tâche et élabore difficilement les stratégies (ou grandes lignes) nécessaires pour atteindre le but initial. L'examinateur doit parfois l'assister par ses questions, ses encouragements, ses indices, ses commentaires, ses consignes, etc.
0: Dépendance	Incapable d'effectuer les composantes de l'opération dans un délai raisonnable ou de façon acceptable malgré l'assistance verbale. *Par exemple, malgré l'assistance verbale, elle ne réussit pas à réfléchir avant d'agir aux conditions de départ; elle est incapable d'élaborer les stratégies (ou grandes lignes) nécessaires pour atteindre le but initial; elle ne réussit qu'à identifier un nombre très restreint des éléments de la tâche.*
8: Non évaluée (cause intrinsèque)	Opération non évaluée pour des raisons intrinsèques à la personne. *Ces raisons peuvent être: refus de se prêter à la mise en situation ou de collaborer, contre-indication médicale, etc.*
9: Non évaluée (cause extrinsèque)	Opération non évaluée pour des raisons extrinsèques à la personne. *Ces raisons peuvent être: oubli du clinicien, manque de temps, manque d'équipement, manque de ressources humaines, environnement inadapté ou empêchant la mise en situation, etc.*

N.B. La cotation assistance physique ne s'applique que pour une seule opération, soit l'opération "EXÉCUTER".

*** Délai raisonnable:** Le temps d'exécution d'une opération est raisonnable s'il n'excède pas exagérément le temps pris habituellement par une personne fonctionnant normalement. Le jugement de l'examinateur est fondé sur sa connaissance d'une routine normale d'AVQ et du temps requis pour réaliser cette routine.

**** Façon acceptable:** Une opération est réalisée de façon acceptable si ses résultats sont conformes aux critères de qualité adoptés socialement ou encore, si elle est faite de manière sécuritaire et si elle est assez bien exécutée pour que la personne évaluée ou une autre personne n'ait pas à la recommencer. Une opération est réalisée de façon sécuritaire lorsque le potentiel ou le risque de la personne de se blesser ou de causer du dommage à son environnement durant sa performance dans la tâche est jugé conforme à un risque normal. Une opération est réalisée de façon socialement acceptable, si l'entourage immédiat de la personne encourage ou accepte le comportement ou la façon de réaliser la tâche ou l'opération.

4. Cotation de chaque opération (suite)

Opération: EXÉCUTER

Tableau 7: Échelle de cotation: opération "EXÉCUTER"

Niveau	Définition
4: Indépendance sans difficulté	Capable d'effectuer toutes les composantes de l'opération seule, sans difficulté, dans un délai raisonnable* et de façon acceptable **. *Ceci implique plusieurs aspects: elle initie son plan d'action; elle n'a pas de problème d'accès au lieu et à l'équipement; elle manipule et utilise adéquatement le matériel et l'équipement; elle ne semble pas présenter de trouble lié à l'endurance, à l'équilibre, à la préhension, à la reconnaissance d'objets, à la rétention d'information, à la distractibilité, etc. ayant des répercussions sur la tâche; elle poursuit la réalisation du plan d'action (inclut la surveillance / vérification continue de l'exécution en fonction du but initial) tout en s'ajustant en fonction des erreurs constatées et des situations nouvelles ou imprévues (ex: elle ne perd pas son objectif de vue) qui surviennent lors de la réalisation de la tâche; elle tient compte de la notion de temps; elle coordonne et optimise ses actions; elle vérifie sa performance, se critique, perçoit les problèmes et les erreurs et est intéressée à corriger lorsque nécessaire; elle accorde l'attention requise aux détails, prend la tâche au sérieux, travaille de façon sécuritaire et se comporte adéquatement; elle peut utiliser des aides techniques ou bénéficier d'un environnement adapté.*
3: Indépendance avec difficulté	Capable d'effectuer toutes les composantes de l'opération seule, mais des difficultés sont observées en ce qui concerne le temps requis ou la qualité de l'exécution. *Par exemple: elle initie la tâche et réalise son plan d'action mais elle présente certaines difficultés telles que l'accès au lieu et à l'équipement, l'utilisation du matériel et de l'équipement, la distractibilité, le manque de rétention de l'information, etc. sans toutefois nécessiter l'aide de l'examinateur pour exécuter la tâche; elle s'éloigne parfois du plan et du but fixés, mais elle y revient d'elle-même; elle perçoit globalement les problèmes et les erreurs, mais l'attention aux détails laisse parfois à désirer; elle trouve des solutions correctes aux problèmes qui se présentent, mais le processus de résolution de problèmes est ardu; elle se critique, prend la tâche au sérieux, travaille de façon sécuritaire et se comporte adéquatement.*

2:	Assistance verbale ou physique requise	Capable d'effectuer toutes les composantes de l'opération ou de la tâche avec assistance verbale ou physique, dans un délai raisonnable et de façon acceptable: ceci implique donc que la personne ne peut "EXÉCUTER" la tâche sans assistance verbale ou physique de l'examinateur. *Par exemple, pour l'aide verbale: elle nécessite parfois de l'aide pour initier son plan d'action ou pour poursuivre la réalisation du plan d'action; elle peut présenter certaines difficultés telles que la distractibilité, le manque de rétention de l'information, etc. dont l'ampleur peut être diminuée avec les conseils de l'examinateur; elle s'éloigne parfois du plan et du but fixés, et nécessite l'aide de l'examinateur pour y revenir; elle ne s'adapte pas toujours aux situations nouvelles ou aux imprévus qui peuvent survenir lors de la réalisation de la tâche et l'examinateur doit lui en faire part; elle ne tient pas compte de la notion de temps et coordonne difficilement ses actions; l'examinateur doit parfois lui suggérer de vérifier sa performance et l'aider à modifier l'exécution en fonction des erreurs perçues et des situations imprévues.* *L'aide physique peut être apportée de différentes façons: soulever la personne lors d'un transfert, installer une aide technique, pousser un fauteuil roulant, actionner les boutons de contrôle du four, donner un appui lors de la marche, se tenir près de la personne à cause d'un risque de chute lié à un problème d'équilibre, etc. Ce type d'assistance est apportée pour pallier à des problèmes d'ordre physique.*
1:	Assistance verbale et physique requises	Capable d'effectuer toutes les composantes de l'opération avec assistance verbale et physique. Ceci implique donc un niveau de difficulté suffisamment important pour empêcher l'exécution de la tâche sans intervention de l'examinateur.
0:	Dépendance	Incapable d'effectuer les composantes de l'opération dans un délai raisonnable ou de façon acceptable malgré l'assistance reçue. *Par exemple: elle ne peut EXÉCUTER la tâche même avec l'utilisation d'aides techniques (ex: fauteuil roulant) dans un délai raisonnable et de façon acceptable; elle ne peut parfois pas accéder au lieu et à l'équipement ou elle est très limitée sur le plan de l'endurance, de l'équilibre, de la fatigue, de la préhension, de la reconnaissance d'objets, de la rétention d'information, de la distractibilité, etc. ayant des répercussions importantes sur la tâche.; elle ne répond pas adéquatement à l'assistance apportée par l'examinateur ou elle la refuse; elle perd de vue le but et le plan fixés sans pouvoir les retrouver malgré l'aide de l'examinateur; la tâche est excessivement ardue pour elle;*

	l'examinateur doit EXÉCUTER certaines parties de la tâche pour elle car même avec assistance, elle ne peut corriger efficacement sa performance.
8: Non évaluée (cause intrinsèque)	Opération non évaluée pour des raisons intrinsèques à la personne. *Ces raisons peuvent être: refus de se prêter à la mise en situation ou de collaborer, contre-indication médicale, etc.*
9: Non évaluée (cause extrinsèque)	Opération non évaluée pour des raisons extrinsèques à la personne. *Ces raisons peuvent être: oubli du clinicien, manque de temps, manque d'équipement, manque de ressources humaines, environnement inadapté ou empêchant la mise en situation, etc.*

4. Cotation de chaque opération (suite)

Opération: S'ASSURER DE L'ATTEINTE DU BUT INITIAL

Tableau 8: Échelle de cotation: opération "S'ASSURER DE L'ATTEINTE DU BUT INITIAL"

Niveau	Définition
4: Indépendance sans difficulté	Capable d'effectuer toutes les composantes de cette opération seule dans un délai raisonnable et de façon acceptable. *Ceci implique plusieurs aspects: elle vérifie que la tâche initialement prévue a été réussie (ex : achète les articles requis pour la préparation d'un repas chaud, obtient les renseignements recherchés); elle confronte le résultat final au but initial; elle accepte ou rejette les résultats; elle termine la tâche lorsque le but initial est atteint ou recommence le processus lorsqu'il y a rejet du résultat.*
3: Indépendance avec difficulté	Capable d'effectuer toutes les composantes de l'opération seule, mais des difficultés sont observées en ce qui concerne le temps requis pour réaliser cette opération et la laxité des critères d'évaluation des résultats. *Par exemple, prend un temps plus long pour relire la réponse donnée au problème proposé dans la tâche « faire un budget » pour s'assurer d'avoir bien considéré l'ensemble des données initiales.*
2: Assistance verbale requise	La personne est capable d'effectuer toutes les composantes de cette opération avec assistance verbale, dans un délai raisonnable et de façon acceptable; ceci implique donc que la personne ne peut réaliser l'opération sans l'assistance verbale de l'examinateur. L'aide verbale peut être fournie sous forme de suggestion, d'encouragements, de questions, de consignes, d'indices, d'avertissements, etc. *Par exemple: elle est capable avec les indices donnés par l'examinateur de confronter le résultat final au but initial (ex : aide pour vérifier si elle a obtenu l'ensemble des heures de départs d'autobus de la journée tel que demandé dans la consigne initiale); elle est capable, avec suggestion, d'accepter ou de rejeter les résultats; elle réussit avec encouragements et suggestions à recommencer la tâche lorsqu'il y a rejet du résultat (ex : l'examinateur suggère de téléphoner à nouveau pour obtenir les renseignements manquants).*

0: Dépendance	Incapable d'effectuer les composantes de l'opération dans un délai raisonnable ou de façon acceptable malgré l'assistance verbale. *Par exemple: elle est incapable, même avec assistance, de confronter le résultat final au but initial; elle est incapable, même avec assistance, d'accepter ou de rejeter les résultats; elle ne termine pas la tâche malgré l'atteinte du but initial et les encouragements de l'examinateur; elle ne recommence pas la tâche lorsqu'il y a rejet du résultat.*
8: Non évaluée (cause intrinsèque)	Opération non évaluée pour des raisons intrinsèques à la personne. *Ces raisons peuvent être: refus de se prêter à la mise en situation ou de collaborer, contre-indication médicale, etc.*
9: Non évaluée (cause extrinsèque)	Opération non évaluée pour des raisons extrinsèques à la personne. *Ces raisons peuvent être: oubli du clinicien, manque de temps, manque d'équipement, manque de ressources humaines, environnement inadapté ou empêchant la mise en situation, etc.*

N.B. La cotation assistance physique ne s'applique que pour une seule opération, soit l'opération "EXÉCUTER".

*** Délai raisonnable:** Le temps d'exécution d'une opération est raisonnable s'il n'excède pas exagérément le temps pris habituellement par une personne fonctionnant normalement. Le jugement de l'examinateur est fondé sur sa connaissance d'une routine normale d'AVQ et du temps requis pour réaliser cette routine.

**** Façon acceptable:** Une opération est réalisée de façon acceptable si ses résultats sont conformes aux critères de qualité adoptés socialement ou encore, si elle est faite de manière sécuritaire et si elle est assez bien exécutée pour que la personne évaluée ou une autre personne n'ait pas à la recommencer. Une opération est réalisée de façon sécuritaire lorsque le potentiel ou le risque de la personne de se blesser ou de causer du dommage à son environnement durant sa performance dans la tâche est jugé conforme à un risque normal. Une opération est réalisée de façon socialement acceptable, si l'entourage immédiat de la personne encourage ou accepte le comportement ou la façon de réaliser la tâche ou l'opération.

SCÉNARIOS DES TÂCHES DE LA MISE EN SITUATION

PROFIL DES ACTIVITÉS INSTRUMENTALES

Section 1: Enchaînement de tâches

Tel que décrit précédemment, certaines tâches de l'outil sont administrées selon un enchaînement de tâches afin de recueillir le maximum d'informations sur l'ensemble des opérations nécessaires à la réalisation des tâches (incluant la capacité de la personne à reconnaître ses besoins et à formuler un but).

Les tâches qui seront observées au cours de cet enchaînement de tâches sont les six tâches suivantes :

- **mettre ses vêtements d'extérieur;**
- **se rendre à l'épicerie;**
- **faire des courses;**
- **préparer un repas chaud;**
- **prendre un repas avec des invités;**
- **ranger après le repas.**

Définition des tâches :

METTRE SES VÊTEMENTS D'EXTÉRIEUR

S'habiller pour sortir à l'extérieur. Ceci inclut verbaliser l'intention de s'habiller, choisir les vêtements appropriés à la température et au contexte, coordonner les gestes nécessaires pour habiller diverses parties du corps (ex : manteau, chapeau, bottes), faire les ajustements nécessaires en cours de route et vérifier que son habillement est conforme à cette occasion. Autres comportements (spécifiez) :

SE RENDRE À L'ÉPICERIE

Se déplacer à l'extérieur à pied ou en fauteuil roulant pour se rendre à l'épicerie. Ceci inclut verbaliser l'intention de se déplacer à l'extérieur, réfléchir aux alternatives possibles pour se rendre à l'épicerie, considérer aussi la distance et le temps requise pour s'y rendre, choisir un parcours, marcher ou se propulser en fauteuil roulant avec et sans sacs d'épicerie, traverser une rue de façon sécuritaire, faire les ajustements nécessaires en cours de route et s'assurer que la destination prévue a été atteinte. Autres comportements (spécifiez) :

FAIRE DES COURSES

Se procurer à l'épicerie la nourriture et les boissons nécessaires pour la préparation d'un repas chaud. Ceci inclut verbaliser l'intention de faire des courses, vérifier les ingrédients qui doivent être achetés pour le repas, décider du lieu où faire les achats, considérer le temps requis, vérifier d'avoir l'argent nécessaire, sélectionner les aliments en fonction d'un plan, payer, emballer les achats, faire les ajustements nécessaires en cours de route et s'assurer d'avoir bien acheté les ingrédients requis pour la préparation d'un repas. Autres comportements (spécifiez) :

PRÉPARER UN REPAS CHAUD

Préparer un repas chaud pour trois personnes. Ceci inclut verbaliser l'intention de préparer un repas, réfléchir aux alternatives possibles de menu, considérer le temps requis, vérifier les ingrédients et s'ils sont disponibles, faire le choix d'un menu, transformer les ingrédients en les pelant, tranchant, mélangeant en fonction de son plan initial, faire cuire les ingrédients de façon sécuritaire, servir le repas, faire les ajustements nécessaires en cours de route et vérifier qu'elle a préparé son repas conforme à cette occasion. Autres comportements (spécifiez) :

PRENDRE UN REPAS AVEC DES INVITÉS

Manger des aliments et prendre une boisson. Ceci inclut reconnaître le besoin de manger et de boire, décider ce qu'il veut manger, aller le chercher par lui même, couper les aliments, ouvrir les contenants, verser des liquides à boire, boire et manger de façon acceptable, initier et maintenir une conversation avec ses invités, faire les ajustements nécessaires en cours de route et s'assurer d'avoir comblé sa faim et sa soif. Autres comportements (spécifiez) :

RANGER APRÈS LE REPAS

Faire le ménage en nettoyant la cuisine après la préparation d'un repas chaud Ceci inclut verbaliser l'intention de ranger après le repas, identifier les aspects de la tâche à accomplir, desservir la table, nettoyer les comptoirs de la cuisine, laver et ranger la vaisselle, faire les ajustements nécessaires en cours de route et vérifier que la cuisine soit propre et ordonnée. Autres comportements (spécifiez) :

Consignes à la personne

Ainsi, pour observer l'ensemble de ces tâches une seule consigne est donnée par l'examinateur à la personne soit :

> *« Vous nous avez invités, mon assistant et moi, pour dîner. Préparez-vous à nous recevoir. S'il y a lieu, nous assumerons les frais encourus pour l'achat des articles requis pour un maximum de $20.00 »*

De plus, afin de s'assurer que la personne a bien compris la consigne, l'examinateur ajoute :

> *« Pouvez-vous me dire dans vos propres mots ce que je viens de vous expliquer ? »*

(L'examinateur attend la réponse et offre des clarifications afin de s'assurer que la personne comprend bien ce qui lui est demandée).

Des clarifications sont données sur la consigne de départ si nécessaire sans que cela ne soit considéré dans la cotation

Finalement, pour s'assurer d'obtenir certaines informations liées à la formulation de but et à la planification avant que la personne ne débute l'exécution des tâches, l'examinateur ajoute :

« Maintenant, dites-moi ce que vous allez faire ».

Informations supplémentaires à ajouter si la personne propose de préparer un repas froid : '

« Nous aimerions, de préférence, vous observer préparer un repas chaud si possible ».

N.B. L'ajout de cette dernière information n'est pas considéré dans la cotation des tâches.

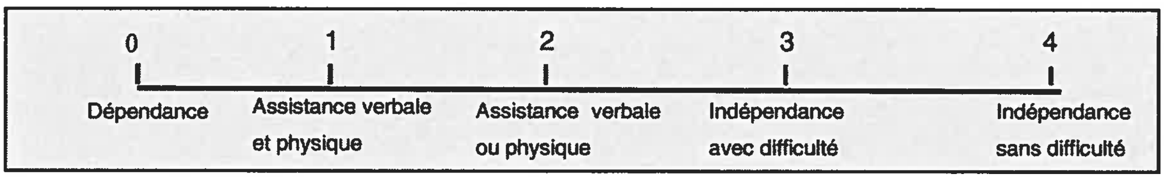
Contexte d'administration

L'ergothérapeute doit s'assurer de respecter les conditions suivantes :

1. L'évaluation se fait au domicile de la personne. Le domicile peut être tout autant le domicile parental lorsque la personne n'a plus d'appartement suite à l'accident.
2. La nécessité de se déplacer à l'extérieur est introduite par une tâche impliquant des déplacements extérieurs c'est à dire « faire des courses ». Ainsi, il peut s'avérer nécessaire de s'assurer au préalable (avec la famille de la personne) que la personne ait besoin de se procurer certains ingrédients pour la préparation d'un repas chaud.
2. L'évaluation des tâches impliquant des déplacements à l'extérieur se fait à proximité du domicile de la personne.
3. L'examinateur devrait se présenter chez la personne au moment de la journée le plus propice (ex: deux heures avant l'heure habituelle de prise de repas pour que la personne ait le temps de sortir pour faire les achats en prévision de la préparation soit du dîner ou du souper).
4. L'examinateur ne doit pas proposer de menu ni d'endroit propice pour faire les courses. Il doit plutôt encourager la personne à faire ses propres choix. Aussi, il ne doit ni sortir les vêtements ni les autres articles requis pour la personne. .

Consignes de cotation

1. Durant l'observation de la tâche, l'ergothérapeute inscrit les comportements observés ainsi que les verbalisations de la personne (c.f. feuille d'analyse des comportements observés).
2. À la suite de l'observation de la tâche, l'ergothérapeute analyse les comportements observés et les verbalisations de la personne qui permettent de justifier la cote accordée selon les quatre opérations du *Profil des activités instrumentales*, c'est-à-dire FORMULER UN BUT, PLANIFIER, EXÉCUTER, S'ASSURER DE L'ATTEINTE DU BUT INITIAL. Un score est donné à chaque opération (scores opérations) et à la tâche (score tâche) selon l'échelle suivante (c.f. feuille d'analyse des comportements observés):



Section 2: Tâches administrées une seule tâche à la fois

Tel que décrit précédemment, certaines tâches de l'outil sont administrées une seule tâche à la fois.

Les tâches qui sont incluses dans cette deuxième section de la mise en situation sont les suivantes :

- **obtenir une information**
- **faire un budget**
- **modifier un budget**

Pour chaque tâche, vous retrouverez dans le présent guide d'administration :

1) La définition de la tâche;
2) Le contexte d'administration;
3) Les consignes à la personne;
4) Le système de cotation;

OBTENIR UNE INFORMATION

Définition de la tâche

Obtenir une information tel un horaire d'autobus. Ceci inclut les aspects suivants: considérer les alternatives possibles pour obtenir l'information désirée (annuaire téléphonique, service d'assistance annuaire, Internet) et faire le choix d'une de ces alternatives. Si la personne choisit d'utiliser l'annuaire téléphonique ou le service d'assistance annuaire, elle doit localiser l'annuaire téléphonique ou réfléchir à la façon de joindre le service d'assistance annuaire, trouver le numéro de téléphone requis, composer le numéro de téléphone, et demander l'information. Si la personne choisit d'utiliser l'Internet, elle doit réfléchir à comment obtenir l'information requise, trouver le site Internet approprié et l'information recherchée. Dans tous les cas, elle doit obtenir et transmettre l'information à l'examinateur, faire les ajustements nécessaires en cours de route et s'assurer de l'obtention des informations en fonction du problème à résoudre pour effectuer cette tâche. Autres comportements (spécifiez) :

Contexte d'administration

L'ergothérapeute doit s'assurer de respecter les conditions suivantes:

1 Cette tâche peut être administrée tant au domicile de la personne que dans l'établissement où est hébergée la personne.

2 L'examinateur doit s'assurer qu'il y a un annuaire et un téléphone de disponible sans toutefois les placer devant la personne.

3 L'examinateur doit compléter par le nom d'une ville, la consigne indiquée ci-dessous. Le choix de la ville doit impliquer un trajet d'autobus de trois heures ou plus du domicile de la personne (ou de l'établissement où elle est hébergée). Par exemple, lors d'une évaluation à Montréal, on complète la consigne avec « Toronto ».

Consignes à la personne

L'ergothérapeute donne la consigne suivante à la personne:

"J'aimerais que vous vous informiez de l'horaire des départs d'autobus pour ....(nom de la ville)." (Pause)

De plus, afin de s'assurer que la personne a bien compris la consigne, l'examinateur ajoute :

« Pouvez-vous me dire dans vos propres mots ce que je viens de vous expliquer ? »

(L'examinateur attend la réponse et offre des clarifications afin de s'assurer que la personne comprend bien ce qui lui est demandée. Des clarifications sont données sur la consigne de départ si nécessaire sans que cela ne soit considéré dans la cotation).

Finalement, pour s'assurer d'obtenir certaines informations liées à la planification avant que la personne ne débute l'exécution de la tâche, l'examinateur ajoute : « *Maintenant, dites-moi ce que vous allez faire* ».

Consignes de cotation

1 Durant l'observation de la tâche, l'ergothérapeute inscrit les comportements observés ainsi que les verbalisations de la personne (c.f. feuille d'analyse des comportements observés).

2 À la suite de l'observation de la tâche, l'ergothérapeute analyse les comportements observés et les verbalisations de la personne selon les quatre opérations du *Profil des activités instrumentales*, c'est-à-dire FORMULER UN BUT, PLANIFIER, EXÉCUTER, S'ASSURER DE L'ATTEINTE DU BUT INITIAL. Un score est donné à chaque opération (scores opérations) et à la tâche (score tâche) selon l'échelle suivante (c.f. feuille d'analyse des comportements observés) :

N.B. Puisque le but de la tâche est formulé dans la consigne, cette opération est cotée non évaluée pour cause extrinsèque (9).

0	1	2	3	4
Dépendance	Assistance verbale et physique	Assistance verbale ou physique	Indépendance avec difficulté	Indépendance sans difficulté

FAIRE UN BUDGET

Définition de la tâche

Faire un budget, c'est à dire gérer ses dépenses en fonction d'un revenu. Ceci inclut réfléchir aux dépenses obligatoires tels que les frais liés à l'habitation (loyer, hypothèque, taxes, réparation), au transport (autobus, essence), aux services (électricité, téléphone), à la nourriture (approvisionnements alimentaire, restaurants) et autres (vêtements, assurances), faire le calcul des montants reliés, corriger les erreurs qui ont pu se glisser au cours de la réalisation de la tâche et s'assurer que le budget réalisé est plausible en fonction des données initiales. Autres comportements (spécifiez) :

Contexte d'administration

L'ergothérapeute doit s'assurer de respecter les conditions suivantes:

1 Cette tâche peut être administrée tant au domicile de la personne que dans l'établissement où elle est hébergée.

2 La question est donnée par écrit à la personne et la réponse doit aussi être écrite.

Consignes à la personne

L'ergothérapeute demande à la personne de lire le scénario suivant.

"Imaginez que votre revenu annuel net est de 20,000$, que vous vivez seul en logement et que vous possédez déjà les meubles et les électroménagers et les installations requises. Vous envisagez mettre de l'argent de côté car vous aimeriez vous acheter une auto d'ici un an en payant une partie comptant. Pouvez-vous effectuer votre budget pour l'année et donnez les détails? ».

« Pouvez-vous me dire dans vos propres mots ce qui vous est demandé dans ce scénario ? »

(L'examinateur attend la réponse et offre des clarifications afin de s'assurer que la personne comprend bien ce qui lui est demandée. Des clarifications sont données sur la consigne de départ si nécessaire sans que cela ne soit considéré dans la cotation).

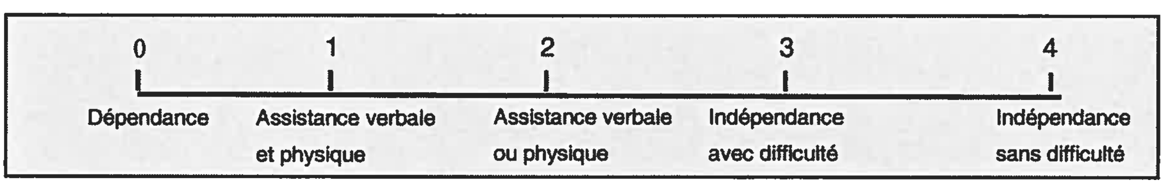
Finalement, pour s'assurer d'obtenir certaines informations liées à la planification avant que la personne ne débute l'exécution de la tâche, l'examinateur ajoute : *« Maintenant, dites-moi ce que vous allez faire. »*.

Consignes de cotation

1 Durant l'observation de la tâche, l'ergothérapeute inscrit les comportements observés ainsi que les verbalisations de la personne (c.f. feuille d'analyse des comportements observés).

2 À la suite de l'observation de la tâche, l'ergothérapeute analyse les comportements observés et les verbalisations de la personne selon les quatre opérations du *Profil des activités instrumentales*, c'est-à-dire FORMULER UN BUT, PLANIFIER, EXÉCUTER, S'ASSURER DE L'ATTEINTE DU BUT INITIAL. Un score est donné à chaque opération (scores opérations) et à la tâche (score tâche) selon l'échelle suivante (c.f. feuille d'analyse des comportements observés) :

N.B. Puisque le but de la tâche est formulé dans la consigne, cette opération est cotée non évaluée pour cause extrinsèque (9).



MODIFIER UN BUDGET

Définition de la tâche

Modifier un budget en fonction d'une éventuelle perte de revenu liée à un changement d'emploi. Ceci inclut considérer différents ajustements possibles quant aux dépenses (ex : transport, loisirs, vêtements, hébergement) et vérifier la plausibilité de ces ajustements en fonction du nouveau revenu. Autres comportements (spécifiez) :

Contexte d'administration

1. Cette tâche peut être administrée tant au domicile de la personne que dans l'établissement où elle est hébergée.
2. La question est donnée par écrit à la personne et la réponse doit aussi être écrite.

Consignes à la personne

L'ergothérapeute demande à la personne de lire le problème suivant :

« Vous avez une proposition pour un nouvel emploi qui vous intéresse beaucoup, mais qui représente une diminution de salaire. Comment ajusteriez-vous vos dépenses? Donnez différents scénarios possibles. »

« Pouvez-vous me dire dans vos propres mots ce qui vous est demandé dans ce problème ? »
(L'examinateur attend la réponse et offre des clarifications afin de s'assurer que la personne comprend bien ce qui lui est demandée. Des clarifications sont données sur la consigne de départ si nécessaire sans que cela ne soit considéré dans la cotation).

Finalement, pour s'assurer d'obtenir certaines informations liées à la planification avant que la personne ne débute l'exécution de la tâche, l'examinateur ajoute : *« Maintenant, dites-moi ce que vous allez faire. ».*

Consignes de cotation

1. Durant l'observation de la tâche, l'ergothérapeute inscrit les comportements observés ainsi que les verbalisations de la personne (c.f. feuille d'analyse des comportements observés).
2. À la suite de l'observation de la tâche, l'ergothérapeute analyse les comportements observés et les verbalisations de la personne selon les quatre opérations du *Profil des activités instrumentales*, c'est-à-dire FORMULER UN BUT, PLANIFIER, EXÉCUTER, S'ASSURER DE L'ATTEINTE DU BUT INITIAL. Un score est donné à chaque opération (scores opérations) et à la tâche (score tâche) selon l'échelle suivante (c.f. feuille d'analyse des comportements observés) :

0	1	2	3	4
Dépendance	Assistance verbale et physique	Assistance verbale ou physique	Indépendance avec difficulté	Indépendance sans difficulté

CONCLUSION

Le *Profil des activités instrumentales* évalue l'indépendance dans les AVQ des personnes ayant subi un TCC. L'outil consiste en neuf tâches évaluées lors d'une observation directe de la personne dans ses activités. Les consignes spécifiques à donner à la personne pour chaque tâche tendent à donner le minimum d'informations à la personne dans le but d'observer ses capacités non seulement à exécuter la tâche, mais aussi à la planifier et à formuler le but. Des grilles de cotation spécifiques aux opérations sous-jacentes aux tâches (FORMULER UN BUT, PLANIFIER, EXÉCUTER, S'ASSURER DE L'ATTEINTE DU BUT INITIAL) précisent les types d'erreurs et l'aide requise pour réussir les différentes opérations.

L'étude en cours visera à établir les qualités psychométriques du *Profil des activités instrumentales*. Nous examinerons ainsi la validité de contenu, la fidélité intra- et inter-juges, la consistance interne, la validité factorielle et la validité de critère.

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FEUILLES D'ANALYSE DES COMPORTEMENTS OBSERVÉS

PROFIL DES ACTIVITÉS INSTRUMENTALES

INFORMATION GÉNÉRALE

Initiales du sujet :	
Numéro du dossier de recherche :	
Date de l'évaluation :	
Nom de l'examinateur	

ÉLÉMENTS CONTEXTUELS À LA MISE EN SITUATION

Lieu où s'effectue l'évaluation : 1. Maison 2. Appartement 3. Domicile parental 4. Famille d'accueil 5. Appartement supervisé 6. Maison de chambre 7. Autre, spécifiez : **Familiarité de la personne avec le lieu où s'effectue l'évaluation** (spécifiez depuis quand la personne habite dans ce lieu) :__________ 1. Pas du tout 2. Un peu 3. Beaucoup 9. Ne sait pas **Mode de déplacement à l'intérieur :** 1. Marche avec ou sans prothèse ou orthèse 2. Marche avec canne ou marchette 3. Se déplace en fauteuil roulant **Mode de déplacement à l'extérieur** : 1. Marche avec ou sans prothèse ou orthèse 2. Marche avec canne ou marchette 3. Se déplace en fauteuil roulant	**Saison** (spécifiez température extérieure): 1. Hiver 2. Été 3. Automne 4. Printemps **Milieu :** 1. Urbain 2. Rural **Distance jusqu'à l'épicerie :** __________ **Personnes présentes lors de l'évaluation (autre que l'examinateur) :** 1. Conjoint 2. Enfant(s) 3. Parent (s) 4. Autre, spécifiez : **Autres informations pertinentes :**

METTRE SES VÊTEMENTS D'EXTÉRIEUR

S'habiller pour sortir à l'extérieur. Ceci inclut verbaliser l'intention de s'habiller, choisir les vêtements appropriés à la température et au contexte, coordonner les gestes nécessaires pour habiller diverses parties du corps (ex : manteau, chapeau, bottes), faire les ajustements nécessaires en cours de route et vérifier que son habillement est conforme à cette occasion. Autres comportements (spécifiez):

T O Tâche – Opérations (T: score Tâche O: score

☐ **Mettre ses vêtements d'extérieur**

☐ - Formuler un but

☐ - Planifier

☐ - Exécuter

☐ - S'assurer de l'atteinte du but initial

Cette tâche se déroule entre _____ et ____. La durée est donc de_________ minutes.

0	1	2	3	4
Dépendance	Assistance verbale et physique	Assistance verbale ou physique	Indépendance avec difficulté	Indépendance sans difficulté

SE RENDRE À L'EPICERIE

Se déplacer à l'extérieur à pied ou en fauteuil roulant pour se rendre à l'épicerie. Ceci inclut verbaliser l'intention de se déplacer à l'extérieur, réfléchir aux alternatives possibles pour se rendre à l'épicerie, considérer aussi la distance et le temps requise pour s'y rendre, choisir un parcours, marcher ou se propulser en fauteuil roulant avec et sans sacs d'épicerie, traverser une rue de façon sécuritaire, faire les ajustements nécessaires en cours de route et s'assurer que la destination prévue a été atteinte. Autres comportements (spécifiez) :

T O Tâche – Opérations (T: score Tâche O: score

☐ **Se rendre à l'épicerie**

☐ - Formuler un but

☐ - Planifier

☐ - Exécuter

☐ - S'assurer de l'atteinte du but initial

Cette tâche se déroule entre _____ et ____. La durée est donc de_________ minutes.

0	1	2	3	4
Dépendance	Assistance verbale et physique	Assistance verbale ou physique	Indépendance avec difficulté	Indépendance sans difficulté

FAIRE DES COURSES

Se procurer à l'épicerie la nourriture et les boissons nécessaires pour la préparation d'un repas chaud. Ceci inclut verbaliser l'intention de faire des courses, vérifier les ingrédients qui doivent être achetés pour le repas, décider du lieu où faire les achats, considérer le temps requis, vérifier d'avoir l'argent nécessaire, sélectionner les aliments en fonction d'un plan, payer, emballer les achats, faire les ajustements nécessaires en cours de route, s'assurer d'avoir bien acheté les ingrédients requis pour la préparation d'un repas, autre, spécifiez :

T O Tâche – Opérations (T: score Tâche O: score

☐ **Faire des courses**

☐ - Formuler un but

☐ - Planifier

☐ - Exécuter

☐ - S'assurer de l'atteinte du but initial

Cette tâche se déroule entre _____ et ____. La durée est donc de_________ minutes.

0	1	2	3	4
Dépendance	Assistance verbale et physique	Assistance verbale ou physique	Indépendance avec difficulté	Indépendance sans difficulté

PRÉPARER UN REPAS CHAUD

Préparer un repas chaud pour trois personnes. Ceci inclut verbaliser l'intention de préparer un repas, réfléchir aux alternatives possibles de menu, considérer le temps requis, vérifier les ingrédients et s'ils sont disponibles, faire le choix d'un menu, transformer les ingrédients en les pelant, tranchant, mélangeant en fonction de son plan initial, faire cuire les ingrédients de façon sécuritaire, servir le repas, faire les ajustements nécessaires en cours de route, vérifier qu'il a préparé son repas conforme à cette occasion, autre, spécifiez :

T O Tâche – Opérations (T: score Tâche O: score

☐ **Préparer un repas chaud**

☐ - Formuler un but

☐ - Planifier

☐ - Exécuter

☐ - S'assurer de l'atteinte du but initial

Cette tâche se déroule entre _____ et ____. La durée est donc de_________ minutes.

0	1	2	3	4
Dépendance	Assistance verbale et physique	Assistance verbale ou physique	Indépendance avec difficulté	Indépendance sans difficulté

PRENDRE UN REPAS AVEC DES INVITÉS

Manger des aliments et prendre une boisson. Ceci inclut reconnaître le besoin de manger et de boire, décider ce qu'il veut manger, aller le chercher par lui même, couper les aliments, ouvrir les contenants, verser des liquides à boire, boire et manger de façon acceptable, initier et maintenir une conversation avec ses invités, faire les ajustements nécessaires en cours de route et s'assurer d'avoir comblé sa faim et sa soif. Autres comportements (spécifiez) :

T O Tâche – Opérations **(T: score Tâche O: score**

☐ **Prendre un repas avec des invités**

☐ - Formuler un but

☐ - Planifier

☐ - Exécuter

☐ - S'assurer de l'atteinte du but initial

Cette tâche se déroule entre _____ et ____. La durée est donc de_________ minutes.

0	1	2	3	4
Dépendance	Assistance verbale et physique	Assistance verbale ou physique	Indépendance avec difficulté	Indépendance sans difficulté

RANGER APRÈS LE REPAS

Faire le ménage en nettoyant la cuisine après la préparation d'un repas chaud. Ceci inclut verbaliser l'intention de ranger après le repas, identifier les aspects de la tâche à accomplir, desservir la table, nettoyer les comptoirs de la cuisine, laver et ranger la vaisselle, faire les ajustements nécessaires en cours de route et vérifier que la cuisine soit propre et ordonnée, autre, spécifiez :

T O Tâche – Opérations (T: score Tâche O: score

☐ **Ranger après le repas**

☐ - Formuler un but

☐ - Planifier

☐ - Exécuter

☐ - S'assurer de l'atteinte du but initial

Cette tâche se déroule entre _____ et ____. La durée est donc de_________ minutes.

0	1	2	3	4
Dépendance	Assistance verbale et physique	Assistance verbale ou physique	Indépendance avec difficulté	Indépendance sans difficulté

OBTENIR UNE INFORMATION

Obtenir une information tel un horaire d'autobus. Ceci inclut les aspects suivants: considérer les alternatives possibles pour obtenir l'information désirée (annuaire téléphonique, service d'assistance annuaire, Internet) et faire le choix d'une de ces alternatives. Si la personne choisit d'utiliser l'annuaire téléphonique ou le service d'assistance annuaire, elle doit localiser l'annuaire téléphonique ou réfléchir à la façon de joindre le service d'assistance annuaire, trouver le numéro de téléphone requis, composer le numéro de téléphone, et demander l'information. Si la personne choisit d'utiliser l'Internet, elle doit réfléchir à comment obtenir l'information requise, trouver le site Internet approprié et l'information recherchée. Dans tous les cas, elle doit obtenir et transmettre l'information à l'examinateur, faire les ajustements nécessaires en cours de route et s'assurer de l'obtention des informations en fonction du problème à résoudre pour effectuer cette tâche. Autres comportements (spécifiez) :

T O Tâche – Opérations (T: score Tâche O: score

☐ **Obtenir une information**

☐ - Formuler un but

☐ - Planifier

☐ - Exécuter

☐ - S'assurer de l'atteinte du but initial

Cette tâche se déroule entre _____ et ____. La durée est donc de_________ minutes.

0	1	2	3	4
Dépendance	Assistance verbale et physique	Assistance verbale ou physique	Indépendance avec difficulté	Indépendance sans difficulté

FAIRE UN BUDGET

Faire un budget, c'est-à-dire gérer ses dépenses en fonction d'un revenu. Ceci inclut réfléchir aux dépenses obligatoires tels que les frais liés à l'habitation (loyer, hypothèque, taxes, réparation), au transport (autobus, essence), aux services (électricité, téléphone), à la nourriture (approvisionnements alimentaire, restaurants) et autres (vêtements, assurances), faire le calcul des montants reliés, corriger les erreurs qui ont pu se glisser au cours de la réalisation de la tâche, s'assurer que le budget réalisé est plausible en fonction des données initiales, autre, spécifiez :

T O Tâche – Opérations **(T: score Tâche O: score**

☐ **Faire un budget**

☐ - Formuler un but

☐ - Planifier

☐ - Exécuter

☐ - S'assurer de l'atteinte du but initial

Cette tâche se déroule entre _____ et ____. La durée est donc de_________ minutes.

0	1	2	3	4
Dépendance	Assistance verbale et physique	Assistance verbale ou physique	Indépendance avec difficulté	Indépendance sans difficulté

MODIFIER UN BUDGET

Modifier un budget en fonction d'une éventuelle perte de revenu liée à un changement d'emploi. Ceci inclut considérer différents ajustements possibles quant aux dépenses (ex : transport, loisirs, vêtements, hébergement) et vérifier la plausibilité de ces ajustements en fonction du nouveau revenu. Autres comportements (spécifiez) :

T O Tâche – Opérations (T: score Tâche O: score

☐ **Modifier un budget**

☐ - Formuler un but

☐ - Planifier

☐ - Exécuter

☐ - S'assurer de l'atteinte du but initial

Cette tâche se déroule entre ____ et ___. La durée est donc de_____ minutes.

0	1	2	3	4
Dépendance	Assistance verbale et physique	Assistance verbale ou physique	Indépendance avec difficulté	Indépendance sans difficulté

Appendix III

Ethics certificate

Appendix IV

Consent form

Formulaire d'information et de consentement:

Étude de validité

TITRE DU PROJET :

Validation d'un nouvel instrument de mesure de l'indépendance dans les activités de la vie quotidienne pour les personnes ayant subi un traumatisme crânien : études de fidélité et de validité.

RESPONSABLES :

Carolina Bottari, M.Sc., étudiante au doctorat, École de réadaptation Université de Montréal, Centre de recherche interdisciplinaire en réadaptation (CRIR), Institut de réadaptation de Montréal (IRM). (514-340-2111 poste 2001)

Élisabeth Dutil, M.Sc., École de réadaptation Université de Montréal, CRIR, IRM; Constant Rainville, Ph.D., Département de psychologie, Université de Montréal, CRIR, Hôpital juif de réadaptation, Centre de recherche de l'Institut universitaire de gériatrie de Montréal; Clément Dassa, Ph.D., Médecine sociale et préventive, Université de Montréal.

PERSONNE RESSOURCE DU CENTRE :

À déterminer

OBJECTIF DU PROJET :

Une équipe de recherche a récemment développé un nouvel instrument de mesure de l'indépendance dans les activités de la vie quotidienne. Cet instrument s'avère important pour les intervenants afin d'évaluer vos besoins réels de façon à vous offrir des services appropriés à ceux-ci.

Les objectifs de cette étude sont de valider l'instrument de façon à s'assurer qu'il évalue réellement l'indépendance dans les activités de la vie quotidienne (validité). Aussi, nous voulons vérifier si les problèmes observés lors de la réalisation des activités sont reliés à des problèmes spécifiques tels que notés dans des tests d'attention et de planification.

Ce projet aura une durée d'environ 2 ans.

NATURE ET DURÉE DE VOTRE PARTICIPATION :

Votre participation dans ce projet de recherche consistera à prendre part à une évaluation portant sur différentes activités de la vie de tous les jours et sur certains tests d'attention et de planification. Cette évaluation aura lieu dans l'établissement où vous recevez vos soins ou, à votre lieu de résidence. Elle sera d'une durée d'environ cinq heures. Lors de l'évaluation vous aurez à faire votre routine quotidienne telle que vous la faites habituellement (ex : se coiffer, se brosser les dents, préparer un repas, faire la lessive, prendre l'autobus, faire des courses). Au besoin, l'ergothérapeute pourra vous proposer certaines activités (ex : téléphoner pour une information, s'acquitter d'une facture) pour compléter l'évaluation. Pendant l'évaluation, l'ergothérapeute se placera un peu à l'écart pour observer comment vous vous y prenez. Vous pouvez poser des questions au besoin, mais autant que possible vous devez essayer de fonctionner tout seul. **Selon votre décision, l'évaluation peut être enregistrées avec une caméra vidéo pour permettre une analyse plus approfondie des comportements observés et par exemple identifier plus facilement le type d'aide approprié à vos besoins**. Le fait d'avoir l'évaluation sur vidéo peut également faciliter la communication avec le milieu clinique et/ou servir de matériel pédagogique pour l'enseignement. Vous devrez aussi compléter certaines évaluations d'attention et de planification.

AVANTAGES PERSONNELS POUVANT DÉCOULER DE VOTRE PARTICIPATION :

Les résultats de cette étude devraient permettre de doter les cliniciens d'un nouvel instrument de mesure valide pour mieux évaluer l'indépendance des personnes ayant subi un traumatisme crânien. Les recommandations qui en découlent devraient être plus justes quant à votre compétence à reprendre vos responsabilités (ex : pour préparer vos repas et payer vos factures) et à demeurer seule à domicile.

RISQUE POUVANT DÉCOULER DE VOTRE PARTICIPATION :

Votre participation à cette étude ne vous expose à aucun risque majeur car l'ergothérapeute s'assurera que la mise en situation sera fait en toute sécurité. Cependant, vous pourriez ressentir un stress émotionnel ou une perte de confiance en vous-même si vous vivez certains échecs. Le cas échéant, une requête pourrait être adressée (avec votre permission), au psychologue du centre référant.

INCONVÉNIENTS PERSONNELS POUVANT DÉCOULER DE VOTRE PARTICIPATION :

Il est possible de vivre un stress lequel peut être occasionné par le fait même de vous faire évaluer et de ressentir de la fatigue occasionnée par la durée de l'évaluation. Vous pourrez alors prendre des pauses si vous le désirez. Vous pourrez aussi éprouver certaines frustrations si certaines activités de la vie de tous les jours sont plus difficiles à réaliser qu'avant votre traumatisme. Vous ne subirez aucun autre inconvénient à part le temps que vous investirez pour participer à l'évaluation.

ACCÈS À DES INFORMATIONS DANS VOTRE DOSSIER MÉDICAL :

Vous acceptez que les assistants de recherche du projet consultent votre dossier médical afin de compléter les informations requises. Ils consulteront les résultats des tests en neuroradiologie (e.g. scan cérébral) et des tests complétés pour déterminer la sévérité de votre traumatisme crânien (ex : Échelle de coma de Glasgow). Ils devront aussi consulter les évaluations des professionnels suivants : physiatre, neuropsychologue, et orthophoniste. Le rapport du physiatre nous permettra, entre autres, de vérifier le diagnostique et s'il y a certaines restrictions médicales qui devront être prisent en compte lors de l'évaluation des activités de la vie quotidienne. Le rapport du neuropsychologue nous permettra de vérifier si certaines évaluations (ex : Stroop) vous ont été administrées en clinique et ce afin d'éviter un dédoublement des évaluations lorsque possible. Les rapports du neuropsychologue et de l'orthophoniste nous permettront également de valider certaines hypothèses concernant les causes sous-jacentes aux difficultés qui pourraient survenir lors de l'évaluation (ex : problème de mémoire ou problème de compréhension du langage écrit). Finalement, certaines données socio-économiques seront requises (ex : âge, niveau de scolarité).

CONFIDENTIALITÉ :

Tous les renseignements personnels recueillis à votre sujet au cours de l'étude seront codifiés afin d'assurer leur confidentialité. Ces données seront conservées sous clé au centre de recherche de l'Institut de réadaptation de Montréal par le responsable de l'étude pour la période nécessaire pour analyser et publier les résultats, c'est à dire 5 ans. Seuls les membres de l'équipe de recherche y auront accès. Une exception sera faite dans le cas où votre dossier devrait être révisé par un comité de déontologie, le comité d'éthique de la recherche ou par les organismes qui subventionnent cette recherche. Les membres de ces comités sont des professionnels tenus de respecter les exigences de confidentialité.

Aucune publication ou communication scientifique résultant de cette étude ne renfermera quoi que ce soit qui puisse permettre de vous identifier. En acceptant de participer à cette étude, vous acceptez que les informations recueillies soient utilisées pour fins de communication clinique, scientifique, professionnelle ou d'enseignement.

QUESTIONS CONCERNANT CETTE ÉTUDE

Pour toutes questions concernant ce projet de recherche, le chercheur s'assurera que vous recevez des réponses satisfaisantes.

RETRAIT DE VOTRE PARTICIPATION :

Votre participation à cette étude est volontaire. Vous êtes donc libre de refuser d'y participer. Vous pouvez également vous retirer de l'étude à n'importe quel moment, sans avoir à donner de raisons, en faisant connaître votre décision au chercheur ou à l'une de ses assistantes.

Votre décision de ne pas participer à l'étude ou de vous en retirer n'aura aucune conséquence sur les soins qui vous seront fournis par la suite ou sur vos relations avec votre médecin et les autres intervenants.

En cas de retrait de votre part, les documents audiovisuels et écrits qui vous concernent seront détruits.

CLAUSE DE RESPONSABILITÉ

En acceptant de participer à cette étude, vous ne renoncez à aucun de vos droits ni ne libérez les chercheurs ou les institutions impliquées de leurs obligations légales et professionnelles.

INDEMNITÉ COMPENSATOIRE :

Aucune indemnité ne sera versée.

PERSONNES-RESSOURCES :

Si vous avez des questions à poser au sujet de cette étude ou s'il survient un incident défavorable quelconque ou si vous désirez vous retirer de l'étude, vous pouvez contacter en tout temps Madame Carolina Bottari, étudiante au doctorat, au (514) 340-2085 poste 2001.

Si vous avez des questions sur vos droits et recours ou sur votre participation à ce projet de recherche, vous pouvez communiquer avec Me Anik Nolet, coordonnatrice à l'éthique de la recherche des établissements du CRIR au (514) 527-4527 poste 2643 ou par courriel à l'adresse : [redacted]

CONSENTEMENT

- ☐ J'autorise à être filmé ___
- ☐ Je n'autorise pas à être filmé ___

J'autorise que le film soit utilisé aux fins suivantes

- ☐ Recherche___
- ☐ Enseignement et / ou communication scientifique___
- ☐ Communication avec l'équipe clinique___

Je déclare avoir lu et compris le présent projet, la nature et l'ampleur de ma participation, ainsi que les risques auxquels je m'expose tels que présentés dans le présent formulaire. J'ai eu l'occasion de poser toutes les questions concernant les différents aspects de l'étude et de recevoir des réponses à ma satisfaction.

Je, soussigné(e), accepte volontairement de participer à cette étude. Je peux me retirer en tout temps sans préjudice d'aucune sorte. Je certifie qu'on m'a laissé le temps voulu pour prendre ma décision et je sais qu'une copie de ce formulaire figurera dans mon dossier médical.

Une copie signée de ce formulaire d'information et de consentement doit m'être remise.

______________________	______________________
Nom du participant(e)	Signature
______________________	______________________
Nom du représentant(e) légal(e) du sujet inapte	Signature obligatoire du représentant légal du sujet inapte (si applicable)

Fait à ____________________, le __________________ 200__

______________________ ______________________

Nom du participant(e) | ASSENTIMENT DU PARTICIPANT
Signature

______________________ ______________________

Nom du participant(e) | ASSENTIMENT DE L'ENFANT
Signature

Fait à ____________________, le __________________ 200__

ENGAGEMENT DU CHERCHEUR

Je soussigné(é), ______________________________, certifie

(a) avoir expliqué au signataire intéressé les termes du présent formulaire ;

(b) avoir répondu aux questions qu'il m'a posées à cet égard ;

(c) lui avoir clairement indiqué qu'il reste, à tout moment, libre de mettre un terme à sa participation au projet de recherche ci-dessus ; et

(d) que je lui remettrai une copie signée et datée du présent formulaire.

Dans le cas d'un sujet inapte :

(e) m'être assuré(e) que le sujet a compris au maximum de ses capacités tous les aspects de sa participation à l'étude décrite dans le présent formulaire.

_______________________ _______________________

Nom du responsable du projet ou de son représentant — Signature

Fait à ____________________, le ____________________ 200__