Cognitive Strategy Application during Everyday Task Performance in Men with HIV-1 Dementia

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(HlthScD)

Discipline of Occupational Therapy
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By

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ABSTRACT

A common and clinically important complication of late stage human immunodeficiency virus Type 1 (HIV-1) infection is HIV-associated neurocognitive disorder (HAND). HAND encompasses three syndromes, HIV-associated asymptomatic neurocognitive impairment (ANI), HIV-1-associated mild neurocognitive disorder (MND), and HIV-1-associated dementia (HAD). It is estimated that 30-60% of all HIV-1 infected individuals will have at least mild neurocognitive impairment (MND), and 10-15% of those will develop HAD. Research conducted outside medicine has focused on identifying the type and pattern of neuropsychological impairments present in people with HAND, and to correlate impairments identified from neuropsychological testing with scores on laboratory-based tests of everyday task performance.

Typically, the performance of tasks and routines in daily life occurs in naturalistic contexts, and is orchestrated around the achievement of personally meaningful, needed and/or desired performance goals. It requires that one uses cognitive strategies to attend, perceive, remember, decide, plan and act on intentions within real-world contexts. Little is known about the impact of cognitive information processing strategy application impairments on the performance of meaningful tasks and routines carried out by people with HAND in contexts where performance would naturally occur.
This research addressed this gap by investigating the real-world impact of information strategy application disorder in a sample of 30 men diagnosed with HAD, the most severe form of HAND. The home contexts of those in the sample consisted of home, supported living and residential care. The criterion-referenced Perceive, Recall, Plan and Perform (PRPP) System of Task Analysis was used to identify the level of task performance mastery demonstrated by men in the sample (Stage One), and the information processing strategy application errors that impacted on their performances (Stage Two). The Clinical Staging of AIDS Dementia Complex (CSADC) scale was used to identify the level of severity of HAD. A total of seventy one task performances were assessed across the sample in a variety of naturalistic contexts.

None of the men in the sample demonstrated mastery of task performance. The mean Mastery score was 30.07%. The predominant type of error made by men as they performed daily life tasks was Timing; they spent too much time completing tasks. This was followed by errors of Accuracy; they made mistakes in what they did. Descriptive analysis of the PRPP Stage Two scores revealed that these men had difficulties across all domains of information processing strategy application but most notably with Plan Quadrant (Mean 30.75%) and Perceive Quadrant (Mean 53.49%) strategy application behaviours.

Rasch calibration of the ordinal PRPP Stage Two strategy application scores produced an interval-level linear hierarchy of information processing strategy application difficulties experienced by the group. Men in the sample
demonstrated problems sequencing complex tasks, choosing plans and actions, analysing problems encountered, and monitoring sensory changes during performances. Problems were also identified in their abilities to contextualise their performances to fit within time constraints (Contextualises to Duration), and enact plans in a fluid manner (Flows).

Differences in performances between men with mild dementia versus those with moderate/severe dementia identified using a 2 x 4 repeated measures ANOVA carried out on the Rasch-calibrated PRPP Stage Two scores revealed similarities in performance across Perceive, Recall, Plan and Perform Quadrants but those with mild dementia performed better overall. Further analyses revealed specific differences in performance between those with mild versus those with moderate/severe dementia. Most striking about the findings was that men at both ends of the dementia spectrum had relatively good Recall Quadrant strategy application capacities (Mean 75.30%). Even those with the lowest total PRPP Stage Two scores, could recognize and use objects, and recall the procedures of known tasks. A statistically significant predictive correlation was found between Plan Quadrant disorders and severity of dementia.

This pilot study demonstrated the utility of the PRPP System, a criterion-referenced, occupation-embedded, ecological method of identifying task performance skill and information processing strategy application disorders impacting on performance, for use with people living with HIV/AIDS who have HAD. Identifying the specific impact of information processing strategy
application disorders on real-world task performance provides occupational therapists with information necessary to more specifically tailor therapy to the individual performance and participation needs of people with HIV-1-associated dementia.
DECLARATION

I, Judy Lynn Ranka, hereby declare that the work contained within this thesis is my own, and has not been submitted to any other university or institution as a part or a whole requirement for any other higher degree.

I, Judy Lynn Ranka, hereby declare that I was the principal researcher of all work included in this thesis, including work published with multiple authors.

Name:  Judy Lynn Ranka

Signed:  

Date:   31 March, 2010
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Several people assisted with this research, and their contributions are acknowledged here.

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CHAPTER ONE

Introduction

1.1 Overview

This research was carried out to gain an understanding of how cognitive impairments impact on the occupational performance of men whose impairments are the result of infection with the human immunodeficiency virus (HIV). It emerged from activities associated with the researcher’s involvement with occupational therapists in Sydney, Australia. In particular, a need was identified for research that would determine whether the cognitive impairments associated with HIV and AIDS (acquired immunodeficiency syndrome) could be identified and described in a systematic manner through observations of everyday task performance in real-world contexts where performance typically occurs. Unique to this research was the use of an occupational therapy ecological measurement model in the methodology. In this chapter, relevant background to the research, the need for the study, and the significance of the problem are presented. This is followed by the aims of the research, the research questions, and the definitions of key terms used throughout the thesis. The chapter ends with an overview of the scope and design of the study, and the structure of the thesis.
1.2 BACKGROUND:

HIV infection has caused the worst pandemic in recent medical history (De Cook & De Lay, 2008; Tammina, 2006). In 2005 the World Health Organization estimated that 40.3 million people were infected with HIV (World Health Organisation, 2005). In 2007, the number of people living with HIV in Australia was estimated to be 19,000 (Australian Bureau of Statistics, 2008; UNAIDS/WHO, 2008). The introduction of the highly active antiretroviral therapies (HAART) a decade ago has changed the course of HIV disease (Woods, Moore, Weber, & Grant, 2009). Most notably, longevity is reported to have increased (Brew, Crowe, Landay, Cysique, & Guillemin, 2009; Maschke et al., 2000), and the incidence of malignancies and other opportunistic infections that are specific to the central nervous system is significantly reduced (Cystique, Maruff, & Brew, 2004; Dore, McDonald, Li, Kaldor, & Brew, 2003; Maschke et al., 2000; Sacktor et al., 2001). Although people living with HIV/AIDS (PLWHA) who are receiving HAART are living well for longer, on a global scale antiretroviral therapies are only provided to 31% of infected people (De Cook & De Lay, 2008).

One consequence of HIV infection first reported in the literature over 20 years ago (Brew, Rosenblum, & Price, 1988; Navia, Cho, Petito, & Price, 1986; Navia & Price, 1987; Price, 1987; Price & Brew, 1988) is a neurocognitive impairment recently labelled, HIV-associated neurocognitive disorder (HAND) (Antinori et al., 2007). HAND encompasses three syndromes: HIV-associated asymptomatic neurocognitive impairment (ANI), HIV-1-associated mild neurocognitive disorder
(MND) and HIV-1-associated dementia (HAD) (Antinori et al., 2007; Grant, 2008). HAND is distinct from other forms of neurological disorders typically seen in HIV-1 infection and AIDS in that it is caused by the human immunodeficiency virus itself (McArthur, Brew, & Nath, 2005; Price, 1996).

While common perception is that HAART has all but eliminated neurocognitive impairment in PLWHA (The Body: Project Inform, 2002), the impact of HAART on preventing HAND is lower than expected (Antinori et al., 2007; Cystique et al., 2004; Sperber & Shao, 2003). It is now estimated that 30-60% of all HIV-1 infected individuals will have at least mild neurocognitive disorder (MND) (Grant, 2008), and 10-15% of those will develop dementia (HAD) (Brew & Gonzalez-Scarano, 2007; Gonzales-Scarano & Martin-Garcia, 2005). In developing countries, the prevalence of HAND is unclear but existing evidence suggests the rates are comparable to, or higher than, in the developed world (Brew & Gonzalez-Scarano, 2007; Wong, Robertson, Nakasujja, et al., 2007; Wright, Brew, Kongsaengdao, et al., 2006).

Of particular note is that the incidence of HAD, the most severe form of HAND, is reported to be increasing among older people with HIV-1 infection who are receiving HAART (Brew & Gonzalez-Scarano, 2007; Cherner et al., 2004; Valcour et al., 2004). One explanation supported by a growing body of evidence is that the presence of HIV facilitates the expression and progression of neurodegenerative diseases already present in an aging population (Brew et al., 2009). Others at risk of developing HAND are women. In the United States,
women represent the fastest growing sub-group of PLWHA (Cystique et al., 2004; Ojikutu & Stone, 2005). Further, Poundstone, et al. (2001) and others (Wojna et al., 2006) report that once AIDS-defining illnesses such as HAND are established, the progression of the disease is more pronounced in women than in men. Children infected with HIV-1 also exhibit a variety of neurological, neurodevelopmental and neuropsychological abnormalities (Llorente, Turcich, & Lawrence, 2004). Some estimate that more than one half of children with HIV-1 infection will develop a dementing illness (Koutsilieri, ter Meulen, & Riederer, 2001). Clearly, HAND remains of concern to PLWHA and health professionals despite the success of HAART programs.

The typical profile of cognitive impairment in adult forms of HAND is identified by neuropsychological testing. It includes problems in attention, a disturbance in memory and executive functions and psychomotor slowing (Castellon, Hinkin, & Myers, 2000; Grant, 2008; Welsh, Razani, Martin, & Boone, 2002). In ANI syndrome, these impairments do not impact on daily life. In MND and HAD, the impact becomes progressively more profound, and eventually threatens one's capacity to live independently (Boccellari & Dilley, 1992), remain employed (Antinori et al., 2007), and retain a belief that life is worth living (Carter, Rourke, Murjji, Shore, & Rourke, 2003; Friedland, Renwick, & McColl, 1996; Honn & Bornstein, 2002). Although the course of HAND is not necessarily progressive nor predictable (McArthur, 2004; Zeifert, Leary, & Boccellari, 1996), the real and potential impact it has on daily life makes it one of the most feared and
devastating neurological complications of HIV and AIDS (Avison, Nath, & Berger, 2002; Cinque et al., 2004; Nath et al., 2008).

Occupational therapy (OT) is a profession whose primary purpose is to address the daily life impact of diseases and disorders, and the impairments they create (Christiansen & Baum, 2005; Crepeau, Cohen, & Boyt-Schell, 2009). Occupational therapy assessments are used to identify how skilled or independent people are in performing everyday occupations, and how impairments and contextual barriers impact on skilled performance (Law & Baum, 2005). Interventions designed by occupational therapists aim to achieve real-world occupational performance and participation outcomes (Law & Baum, 2005). In Australia, occupational therapists provide services to PLWHA at all stages of the disease, and in a variety of contexts, including: outpatient clinics with those recently diagnosed, acute infectious diseases units with clients who have medical complications that require intervention, at home through home visit support, in group home contexts and in residential care units (Jackson, 1995). The diversity of settings in which occupational therapists see PLWHA places them in a prime position to address the daily life consequences of HAND.

1.3 NEED:

A small group of occupational therapists working with PLWHA in the Sydney metropolitan area sought advice from the researcher about the following practice dilemmas. They reported that frequently findings from neuropsychological assessment of cognitive impairment did not reflect the skills and abilities they
observed when evaluating clients carrying out typical, rather than laboratory-based, daily life tasks. They expressed frustration at the lack of suitable measures for use with clients in this area of practice, and found that the literature in occupational therapy offered little guidance. Further, these therapists felt the quality of information they could provide to the team about the real-world impact of impairment was inadequate. Consequently, explaining the findings from occupational therapy assessment to their clients, and those intimately involved with them, was problematic. Despite a desire to produce outcome data, these therapists reported difficulty in conceptualizing how evidence of occupational therapy effectiveness could be generated. Finally, they described variations in the scope of practice across different contexts, and found it difficult to articulate a cohesive and consistent role and purpose statement that could then be used to guide instrument selection and program design.

1.4 SIGNIFICANCE:

It was assumed that the needs expressed above are not unique to this group of occupational therapists. As described earlier, HIV infection continues to produce cognitive impairment; it has been identified as a common cause of dementia in the world (McArthur, 2004; Schifitto et al., 2001). Further, a new demographic of people with impairment is emerging; older people, women and children. Clearly, unless advances in medicine result in improved control of HIV infection or a cure, the number of people who experience the disabling consequences of cognitive impairment will increase. Concomitantly, the need for services that focus on the real-world consequences of HAND is also likely to increase (O'Dell, 1996;
Occupational Therapy plays a key role in addressing the real-world consequences of HAND (Arnold, & Stone, 2009; Gregory, & Gibbs, 2002; Jackson, 1995; Paul, & Orchanian, 2003; Pizzi, 2006). If therapists are able to identify the specific impact of HAND on everyday task performance as it is carried out in real-world contexts, occupational therapy programs designed can better target the problematic behaviours, and therefore improve the performance and participation outcomes for the men, women and children with HAND they serve.

One measure used to identify the real-world impact of cognitive impairment on task performance in other samples, such as those with schizophrenia (Aubin, Chapparo, Gélinas, Stip, & Rainville, 2009), children with learning disorders (Lohri, 2005), and adults with traumatic brain injury (Munkehetvit, 2005; Nott & Chapparo, 2007), is the Perceive, Recall, Plan & Perform System of Assessment (Chapparo & Ranka, 1997c, 2008). The research reported here represents the first step in a line of research aimed at identifying the impact of cognitive impairment from HIV/AIDS on everyday task performance using this ecological assessment.

1.5 RESEARCH AIM

The aim of this research was to investigate how the cognitive impairments that result from HIV-associated neurocognitive disorder (HAND) impact on the
performance of everyday tasks in men when performance is carried out in typical, real-world contexts.

1.6 RESEARCH QUESTIONS

The following questions guided the study:

1.6.1 Research Question 1
What levels of mastery do men with HAD demonstrate in performing everyday tasks in naturalistic contexts as measured by the PRPP System Stage One?

1.6.2 Research Question 2
What information processing strategy application errors are identified by the PRPP Stage Two in men with HAD as they perform everyday tasks in naturalistic contexts?

1.6.3 Research Question 3
What impact does the severity of HAD have on information processing strategy application errors identified by the PRPP Stage Two during the performance of everyday tasks?

1.7 DEFINITION OF TERMS

The terms below represent concepts that were central to this study. For the purposes of this research, they are defined as follows:
1.7.1 Occupational performance

Occupational performance (OP) encompasses the interaction between people, the occupations they carry out and the contexts in which performance occurs (American Occupational Therapy Association, 2008; Chapparo & Ranka, 1997b). For the purposes of this research, occupational performance is defined as the ability to perceive, recall, plan and perform roles, routines and tasks for the purpose of self-maintenance, rest, play or leisure, or being productive in response to internal (self-determined) or external (context-determined) reasons or demands, and to the satisfaction of self and/or significant role partners (Chapparo & Ranka, 1997a).

1.7.2 Human immunodeficiency virus (HIV)

HIV is the retrovirus that causes AIDS (Gallo & Montagnier, 1988). HIV is a generic term for the two strains of HIV virus: HIV-1 and HIV-2. HIV-1 is the most prevalent form, and that which most research is about. The geographic spread of HIV-2 is mostly isolated to West Africa (Center for Disease Control and Prevention, 1992). For purposes of this research, HIV is used unless the cited author/s specifically referred to HIV-1.

1.7.3 Acquired immune deficiency syndrome (AIDS)

AIDS is the consequence of advanced HIV infection (Gallo & Montagnier, 1988).
1.7.4 Highly active antiretroviral therapies (HAART)

HAART therapies are the highly active antiretroviral medication combinations prescribed to sustain low levels of HIV viral load and high levels of helper T cell lymphocytes (Dore, et al., 2003). When effective, they enable the body to combat opportunistic infections, and prevent seroconversion to AIDS (Maschke, et al., 2000). HAART is also referred to as the combination antiretroviral therapies (cART) (Woods, Moore, Weber, & Grant, 2009).

1.7.5 HIV-associated neurocognitive disorder (HAND)

HAND is a documented neurocognitive disorder usually associated with late stage HIV infection or AIDS (Antinori et al., 2007). HAND encompasses three syndromes (Antinori et al., 2007): 1) HIV-associated asymptomatic neurocognitive impairment (ANI), 2) HIV-1-associated mild neurocognitive disorder (MND), and 3) HIV-1-associated dementia (HAD). HAND replaces the terms previously used, AIDS dementia complex (ADC) and HIV-1 encephalopathy (Antinori et al., 2007).

1.7.6 Cognition

Cognition is the outcome of an ongoing dynamic interaction between the person, an activity, and the environment (Toglia, 2005). It is comprised of attention, perception, memory, and higher-level cognitive skills such as planning, decision-making and judgment (Katz & Hartman-Maeir, 2005). Cognition enables one to acquire and use information in order to adapt to environmental demands and carry out desired actions (Lidz & Elliott, 2000). It is one of the occupational therapy
profession’s domains of concern (American Occupational Therapy Association, 2008), and is an important component of occupational therapy practice that focuses on performance and participation (Baum, Foster, & Wolf, 2009).

1.7.7 Information processing

An information processing model of cognition adopts a view of the mind as a complex mental organism involved in receiving, storing, retrieving and using information to formulate responses (Gale Group, 2001). The process of receiving and transforming information for use encompasses dimensions of attention, perception, memory, thinking reasoning, deciding and response activation (Neisser, 1967; Newell, 1990; Reed, 2000). Information processing is a conceptual view of cognition gaining prominence in occupational therapy literature (Levy, 2005).

1.7.8 Information processing strategy application

Strategies are the salient thinking and acting behaviours one uses to plan, execute and evaluate performance on a particular task and its outcomes (Lenz, Ellis, & Scanlon, 1996). This plan-full approach to tasks varies according to the complexity of the task and the person’s familiarity with it. Strategy application may involve the implementation of both cognitive and metacognitive strategies (Missiuna, Mandich, Polatajko, & Malloy-Miller, 2001). Information processing strategy application extends this view to include the salient and particular modification of general information processing operations referred to previously;
e.g. attending, perceiving, remembering and planning behaviours, during task
performance.

1.7.9 Information processing strategy application errors

Information processing strategy application errors are mistakes made during the
selection or execution of responses (Gale Group, 2001). In this research it refers
to mistakes made in the application of attending, perceiving, remembering,
thinking, reasoning, deciding and enacting behaviours used to plan, execute and
evaluate performance of a task and its outcomes.

1.7.10 Ecological validity

Ecological validity commonly refers to the degree of representativeness of a task
and the generalisability of test results (Kvavilashvili & Ellis, 2004, p.62). Clinical
tests which have ecological validity correspond in form and context to a situation
encountered outside the laboratory (representativeness), and are predictive of
problems one will experience outside the laboratory (generalisability).

1.7.11 The Perceive, Recall, Plan & Perform (PRPP) System of Task

Analysis

The Perceive, Recall, Plan & Perform (PRPP) System of Task Analysis is an
occupational therapy assessment (Chapparo & Ranka, 1997c, 2005), and
intervention model (Chapparo & Ranka, 2003, 2009) that evolved out of the
Occupational Performance Model (Australia) (Chapparo & Ranka, 1997c).
1.7.12 The Perceive, Recall, Plan & Perform (PRPP) System Assessment

The PRPP System Assessment (abbreviated PRPP Assessment or PRPP) is a two-stage ecological assessment that provides occupational therapists with a means of identifying errors in client mastery of everyday tasks and routines (Stage One), and errors in information processing strategy application that impact on task performance mastery (Stage Two) (Chapparo & Ranka, 1997c, 2005).

1.7.13 Mastery

Mastery is the ability of a person to perform a given task to the skill level determined by that person and/or the requirements of the performance context. It is a fluid concept, with the criterion for successful mastery determined by each individual situation. The PRPP System is used to assess task performance mastery, and to design intervention to improve performance mastery.

1.8 SCOPE OF THE RESEARCH

This research was a descriptive study that focused on identifying and describing the strategy application difficulties that impacted on everyday task performance in a sample of thirty men with HIV-1-associated dementia (HAD), the most severe form of HAND. Participants were all living in the Sydney metropolitan area in one of three types of residences: at home with family or significant others, in supported living, or in residential care. The conclusions drawn from this research relate to this sample only.
1.9 DESIGN AND OVERVIEW OF THE RESEARCH

To answer the research questions posed, a descriptive project was designed and carried out. Figure 1.1 illustrates the overall design of the research.

A summary description of the two research phases illustrated in the design is presented below.

1.9.1 Phase One: Pilot study - Stage 1

A pilot study was carried out in two stages. In Stage 1, the feasibility of using the PRPP Stage One Assessment with PLWHA was explored over a six month period.
with seven occupational therapists currently working in HIV/AIDS, or with past experience in the area, using an action research process. It yielded a case study where the PRPP Assessment Stage One was used as a pre-test, post-test measure across two tasks.

1.9.2 Phase One: Pilot study - Stage 2

In Stage 2 of the pilot study, five therapists from the original group of seven explored the feasibility of using the PRPP Stage Two Assessment with people who have HAND. In-depth critical case methods to investigate the use of the PRPP Assessment as a whole with one man diagnosed with HIV-1-associated dementia (HAD). His performance mastery was assessed on the task of shopping in a local grocery store, and information processing strategy application errors impacting on his performance were identified. The assessment findings were used to set occupational performance goals, and to plan intervention.

1.9.3 Phase Two: Descriptive study

Thirty men diagnosed with HAD were assessed with the PRPP Assessment as they performed self-selected tasks in real-world home and community contexts. Data obtained from the PRPP Assessment were analysed to identify levels of performance mastery, mastery errors, information processing strategy application errors impacting on mastery, patterns of strategy application errors, and differences in patterns based on severity of HAD using traditional statistics and Rasch analysis methods.
1.10 THEESIS OUTLINE AND STRUCTURE

The remainder of the thesis is comprised of traditional chapters with publications embedded within one of them.

1.10.1 Chapter Two: Literature Review

Chapter Two contains a review of research relevant to the areas of HIV/AIDS, cognitive impairment resulting from HIV infection, the impact of cognitive impairment on everyday life, information processing perspectives of cognition and occupational performance, and occupational therapy assessment of the occupational performances of people with cognitive impairment from HIV/AIDS. The review is first framed within the International Classification of Functioning, Disability and Health, and then within the occupational therapy specific Occupational Performance Model (Australia).

1.10.2 Chapter Three: Phase One: Pilot Study

Chapter Three contains a description of the two stages of pilot study. Published results from the pilot study are contained within this chapter.

1.10.3 Chapter Four: Phase Two: Descriptive Study - Methods

Chapter Four provides an in-depth description of the methods used to carry out Phase Two: the descriptive study that sought to investigate the impact of HAD on everyday task performance.
1.10.4 Chapter Five: Phase Two: Descriptive Study - Results

Chapter Five presents the results for the descriptive study of the impact of HAD on everyday task performance in a sample of 30 men.

1.10.5 Chapter Six: Discussion & Conclusions

Chapter Six contains a discussion of the results. The similarities and differences between the results obtained in this research and previous research are described, and hypotheses are generated. The limitations of the study are stated, the significance of the study is highlighted, conclusions from the findings are drawn, and recommendations for further research are made.
CHAPTER TWO

Literature Review

2.1 OVERVIEW

The purpose of this chapter is to review literature relevant to the primary variables under study:  HIV and AIDS, neurocognitive impairment in HIV, the effects of these impairments on everyday task performance, and assessment of neurocognitive impairment within the context of real-world task performance. This review contributes to fulfilling the first research aim which was to gain an understanding of what is known about cognitive impairments caused by the human immunodeficiency virus, and how they impact on the occupational performance of HIV+ men.

Chapter Two is organised into six major sections. To begin, the conceptual framework of the research is presented (Section 2.2). This includes a world health view of the consequences of diseases and disorders, and an occupational therapy view that is consistent with world health perspectives. The core variable of occupational performance is defined and described. In Section 2.3 background information about the underlying disease process of HIV and AIDS, and its impact on the brain are presented in order to better understand the aetiology of
cognitive impairment in the people studied in this research. Information about the specific cognitive impairments that result from HIV infection is presented in Section 2.4 with an emphasis on HIV-associated neurocognitive disorder (HAND), another core variable studied in this research. Published research about the impact of HAND on daily life is the focus of Section 2.5. Gaps in knowledge and about these variables are discussed, and the need for more research that focuses on the real-world impact of HAND is highlighted. In the next section (Section 2.6), an information processing view of cognition is presented. Propositions are made about its use as an explanatory model of the cognitive processes that enable real-world performance, and as a model for assessing real-world cognition. The final section (2.7) focuses on occupational therapy assessment of clients with HAND. Measures available and suitable for use by occupational therapists in this area of practice are critically reviewed for conceptual congruence with the tenets of ecological assessment of real-world cognition, and against psychometric and practical criteria. The choice of instrument used in this research, the PRPP Assessment, is supported by the findings reported in this section.

2.2 CONCEPTUAL FOUNDATION

2.2.1 International Classification of Functioning, Disability and Health

The World Health Organization has proposed that health conditions impact on people in different ways as illustrated in the International Classification of Functioning, Disability and Health (ICF) (World Health Organization (WHO), 2001) (Figure 2.1). Most apparent are changes that may occur in the structure of
the body or the function of these structures. The resulting impact is labelled, impairment. These impairments may be temporary or permanent, and may or may not limit one’s capacity and performance of everyday activities. Any limitations that exist may or may not restrict one’s capacity and performance of activities to the extent that participation in the wider community is restricted. The WHO acknowledges that any limitations and restrictions that result from impairments of the body structure or function are likely to be influenced by environmental barriers and facilitators. Conversely, primary causes of impairments, limitations or restrictions, and resultant health conditions may arise from an environmental stressor.

![Figure 2.1: The International Classification of Functioning, Disability and Health (ICF) Framework (WHO, 2001)](image)

The ICF has been used as a conceptual framework in studies that sought to explore and discuss the consequences of HIV on people (Hwang & Nochajski,
2003; van As, Myezwa, Stewart, Maleka, & Musenge, 2009; Worthington, Myers, O'Brien, Nixon, & Cockerill, 2005). While useful in understanding the scope of difficulties experienced by HIV+ individuals and PLWHA, its primary purpose is to establish a common nomenclature for identifying, classifying and researching the impact of health conditions on a global scale in order to understand and address the similarities and differences that may exist in various parts of the world (World Health Organization, 2001, 2002).

Conceptual congruence between the constructs of the ICF and occupational therapy has been described (Haugboelle, 2002; Stewart, 2002), however the need to retain profession-specific practice models in framing research and organizing practice has also been emphasized (Bruyere, van Looy, & Peterson, 2005; Law & Baum, 2005; Ranka, 2003). The research presented in this thesis is a clinically based investigation carried out to inform occupational therapy practice, a profession that addresses the occupational performance and participation needs of people. For this reason, the conceptual foundation of this research is drawn from occupational therapy literature.

2.2.2 Occupational Performance

Occupational performance is a major theme in this research. Occupational performance is an organizing construct that encompasses the multitude of factors contributing to one’s success in performing everyday tasks and routines in naturalistic and virtual contexts. It is also a term used to convey the core concepts and domain of concern of occupational therapy (American Occupational Therapy
Association, 2008; Chapparo & Ranka, 1997). One conceptualization of occupational performance is the Occupational Performance Model (Australia) (OPM(A) (Chapparo & Ranka, 1997). Figure 2.2 is the schematic illustration of the fourth order constructs, the final elaboration, of the OPM(A).

Central to the concept of occupational performance (OP) is the relationship between people, their contexts and the activation of this relationship through the performance of occupations (Canadian Association of Occupational Therapists, 1997; Chapparo & Ranka, 1997; Christiansen & Baum, 1997; Law et al., 1996; Trombly, 1993; Yerxa, 1994). People, including their occupations, personal capacities and central human cores are defined as the internal context in the OPM(A). This is represented by the four central blue boxes interconnected by

**Figure 2.2:** The Occupational Performance Model (Australia): Fourth order constructs and structure (Chapparo & Ranka, 2006)
arrows in Figure 2.2. Occupations are conceptualised as a hierarchy of routines, tasks and sub-tasks that are carried out for the self-defined purpose of self-maintenance, rest, leisure/play, or productivity/schooling. The performance of these occupations contributes to success and perceived satisfaction in fulfilling the requirements of one’s needed or desired occupational roles (Chapparo & Ranka, 1997).

Successful performance of occupations is predicated on the use of human capacities that enable performance. In this model (Figure 2.2), these are illustrated as biomechanical, sensory-motor, cognitive, intrapersonal and interpersonal capacities. The foundation to these capacities is the structure and function of the central human core, referred to in the OPM(A) (Figure 2.2) as the body, mind and spirit.

The external context is comprised of physical, sensory, social and cultural dimensions. These are illustrated in the outer ring of Figure 2.2. Political and economic contexts are not illustrated in this model but are positioned between the internal and external context. Laws and economies are created by people, and influenced by physical, sensory and sociocultural dimensions of the contexts in which people live (Chapparo & Ranka, 1997). They, in turn, influence the interactions between the internal (person, people) and external contexts, and are critical in determining the possibilities in occupational therapy. The external context, including its political and economic dimensions, shapes performance: it creates barriers and affords opportunities.
Time and space, the final two constructs illustrated in Figure 2.2 represent the orchestration of interactions between all constructs in time and in place (external dimension), and one’s internal representations and interpretations of the experience of events in time and place (internal dimension). Past life history and present performance, as well as, future desires for occupational performance across the life span are addressed by these two constructs.

### 2.2.3 Occupational Therapy

Occupational therapy (OT) focuses on the occupational performance needs of people, that is, the capacity of people to carry out (perform) needed or desired roles, routines and tasks (occupations) (Chapparo & Ranka, 1997), to participate in life to the fullest as individuals and in concert with role partners, to find meaning and satisfaction with performance, and to achieve a sense of well-being (American Occupational Therapy Association, 2008; Christiansen & Baum, 1997; Gutman, Mortera, Hinojosa, & Kramer, 2007; Ranka & Chapparo, 1997; Yerxa, 1994). Occupational therapists acknowledge that performance may be compromised by physical, sensory, cognitive, intrapersonal or interpersonal impairments, or by barriers that exist in the contexts where performance occurs. Enhanced performance is achieved in occupational therapy by combinations of 1) using techniques and methods that build client capacities, 2) grading or modifying the occupations to be performed, teaching alternative methods of performance and practicing performance in context to develop skill, and 3) removing barriers to performance and enhancing contextual supports that exist (American Occupational Therapy Association, 2008; Ranka, 2001; Ranka &
Chapparo, 1997). Occupational therapy practice for PLWHA may address any or all of these dimensions of occupational performance to achieve optimum performance and participation outcomes.

The review of literature about the primary variables investigated in this study will now be presented with reference to the central concepts of occupational performance described above.

2.3 HIV: THE DISEASE

The people studied in this research were all HIV+ individuals. HIV infects the central core of a person. This is represented in the OPM(A) (Figure 2.3) as a disease of the body, and in many, impacts on the structure and function of the brain [mind]. Further explication of the impact on the spirit is beyond the scope of this research.

![Figure 2.3 Representation of HIV/AIDS in the OPM(A) as a disease of the core elements of body and mind.](image-url)
2.3.1  HIV & the body

The human immunodeficiency virus (HIV) is a retrovirus (Gallo & Montagnier, 1988). Retroviruses are comprised of ribonucleic acid (RNA) and contain a special viral enzyme (reverse transcriptase) that allows the virus to convert its RNA to DNA (deoxyribonucleic acid), and then integrate itself into the genome of the host cell. Figure 2.4 is an illustration of the human immunodeficiency virus. On the left is a schematic representation of the core particles of the virus. The image on the right is a cryo-electron tomography image of the internal structure of an actual HIV particle, the RNA-producing core is coloured red.

![Anatomy of the AIDS Virus](image1.png)

**Figure 2.4** Schematic illustration (left) of an HIV virion (HowStuffWorks, 2001), and a cryo-electron tomography image (right) of the internal structure of an actual HIV particle (Wellcome Images).

The main targets of HIV are two white blood cells (leukocytes): the lymphocyte and the macrophage. Replication of HIV in the body occurs when the retrovirus binds to a type of lymphocyte known as memory T cells. These T cells have a
molecule on the cell wall known as cluster of differentiation 4 (CD4) which is the receptor for HIV infiltration (McArthur, Brew, & Nath, 2005; Weber & Weiss, 1988). CD4 T cells coordinate the activities of other cells involved in resisting or controlling infection, therefore, are central to the body’s defence against illness (Redfield & Burke, 1988; Stop AIDS Project, 2009). After HIV has been integrated into the host-cell genome, it can remain latent for years. With cell activation, the infected cell produces new HIV particles that bind to the CD4 of other T cells (McArthur et al., 2005). Figure 2.5 illustrates this process.

![Figure 2.5: Replication process of HIV in a CD4 T cell (University of Washington, 2004)](image)

A small host T cell in the upper left corner (coloured blue) has released a newly created HIV retrovirus (coloured green). The process of attachment of this retrovirus to the CD4 receptor on the membrane of another host T cell (in
magnified form) is illustrated the centre of Figure 2.5. The flow of yellow arrows from the upper centre of Figure 2.5 to the lower right corner illustrates the process of replication of HIV within the nucleus of the host T cell. The DNA of the replicating HIV virion integrates with the DNA of the host cell. New viral proteins and viral RNA are then released from the nucleus of the host cell. The flow of yellow arrows across the lower part of Figure 2.5 depicts the new viral proteins integrating with new viral RNA, and the assembly of a new virus. The assembling virus buds from the cell wall, and is released as a mature HIV retrovirus (coloured green with the internal structure visible).

A hallmark of HIV infection is progressive immunodeficiency created by the profound depletion of CD4 T cells (McArthur et al., 2005). Conversion from HIV to AIDS generally occurs when the CD4 T cell count falls below 200/ml, the viral load increases, and opportunistic infections appear (Stop AIDS Project, 2009). Successful HAART regimes control the viral replication process thereby keeping the CD4 count high enough to enable effective immune responses to infection.

2.3.2 HIV infiltration of the brain

The brain is the second most frequently infected organ after the lungs (Masliah, DeTeresa, Mallory, & Hansen, 2000). Although HIV enters the central nervous system early after infection (Clifford, 2000; Davis, 1992), the effects are rarely observed until after systemic immunosuppression occurs (McArthur et al., 2005). The primary mechanisms of CNS infiltration involve macrophages, the second type of leukocyte targeted by HIV. Unlike T cells, entry of HIV into
macrophages occurs via chemokine receptors (Hult, Chana, Masliah, & Everall, 2008). Once entered, the host macrophages act as reservoirs for the virus (Gallo & Montagnier, 1988; McArthur et al., 2005).

Two types of macrophage cells are implicated in CNS infection: microglia which are endogenous to the brain and monocytes present in the body. HIV targets microglia cells directly and soon after infection (Conzenza, Zhao, Si, & Lee, 2002; Dickson et al., 1994). Monocytes however, are infected elsewhere in the body and transport the virus into the brain via a ‘Trojan Horse’ mechanism (Ghafouri, Amini, Khalili, & Sawaya, 2006; Hult et al., 2008; Nath, 1999). Both microglia and monocytes monitor the health of neurons in the brain and respond quickly to disease or injury by crossing the blood brain barrier (BBB) (Resnick, Berger, Shapshak, & Tourtellotte, 1988; Weber & Weiss, 1988). Once infected macrophages cross the BBB into neurons, they produce synaptodendritic injury and neuronal damage (Avison, Nath, & Berger, 2002; Cinque et al., 2004; Hult et al., 2008; Peruzzi et al., 2005). Figure 2.6 illustrates microglia (coloured red) and their close proximity to a neuronal body and its dendrites (coloured yellow).

Figure 2.6: Microglia and their relationship to neurons (Streit & Kincaid-Colton, 1995, p.39).
Chronic immune responses associated with advanced HIV infection cause further CNS damage through a dysregulation of macrophages and the overproduction of various inflammatory cytokines and chemokines which are toxic to neurons (McArthur et al., 2005; Streit & Kincaid-Colton, 1995). This toxicity produces focal or diffuse inflammatory changes in the white matter, and these give rise to the development of sensory neuropathies and HAND (Gartner, 2000). Recently, it was postulated that the effectiveness of HAART on systemic infection may in fact, set up a chronic mild inflammatory state in the CNS that results in mild neurological consequences like those seen in ANI and MND (Brew, Crowe, Landay, Cysique, & Guillemin, 2009; Foley, Ettenhofer, Wright, & Hinkin, 2008; Woods, Moore, Weber, & Grant, 2009). This may explain the increasing incidence of these two syndromes, as discussed in Section 1.2.

2.3.3 Brain sites affected by HIV

The multiple mechanisms of CNS infiltration by HIV have made it difficult for researchers to identify the specific neural sites impacted by infection. In people with HAD, both cortical and sub cortical areas are involved leading to its classification as a sub cortical dementia (Antinori et al., 2007; Grant, 2008; McArthur et al., 2005; Moore et al., 2006; Woods, Dawson et al., 2009). At a sub cortical level, the neurotoxic effects of HIV are most prominent in the basal ganglia, specifically the putamen (Fujimura et al., 1997; Jernigan et al., 1993; Kieburtz et al., 1996; Masliah, Ge, & Mucke, 1996; Paul et al., 2007; Ragin et al., 2005). Further, there is considerable neuropathological evidence that hippocampal neurons are affected in advanced HIV disease (Kruman, Nath,
At a cortical level, the most persistent finding among neuroimaging and neuropathological studies of HIV+ persons is the involvement of cerebral white matter (Ernst & Chang, 2004; Paul et al., 2008). On autopsy, the brains of people with HAD typically are atrophied, the ventricles are larger than normal and specific focal lesions of the white matter are present (Navia, Cho, Petito, & Price, 1986; Wilson, 2002). There is however, no clear regional specificity associated with HIV infiltration. It is thought that the expression of HAND results from a disruption in the functional connectivity of the basal ganglia and neocortex, and a dysregulation of broader neural networks that depend on the integrity of these frontostriatal loops, rather than by isolated frontal system pathologies (Castello, Sherman, Courtney, Melrose, & Stern, 2006).

The destructive processes associated with HIV in the body, and then in the brain, may impair the cognitive capacities of those infected. The cognitive impairments created by HIV are the focus of the next section of this review.

### 2.4 COGNITIVE IMPAIRMENT IN HIV

Cognitive impairment, especially in the pre-HAART era, results from a variety of opportunistic parasitic, bacterial and viral HIV-related diseases (e.g., toxoplasmosis cryptococcal meningitis, progressive multifocal leucoencephalopathy, cytomegalovirus encephalitis), and from primary brain
lymphoma and metastatic dissemination to the brain (Price, 1996; Ungvarski & Trzcianowska, 2000; World Health Organisation Regional Office for South-East Asia, 2008). The cognitive impairment investigated in this research was HIV-associated neurocognitive disorder (HAND), a consequence of primary HIV infiltration into the brain through mechanisms described in Section 2.3.

Conceptually, the link between HIV and cognitive impairment is illustrated in the OPM(A) by the arrows connecting the core elements of body/mind to the construct, cognition (Figure 2.7).

**Figure 2.7** HIV/AIDS and its relationship to the cognitive capacities of a person as illustrated in the OPM(A)

### 2.4.1 HIV-Associated Neurocognitive Disorder (HAND)

HAND is a documented neurocognitive disorder typically associated with later stages of HIV infection or AIDS (Antinori et al., 2007). As reported in Chapter 1, HAND encompasses three syndromes: HIV-associated asymptomatic...
neurocognitive impairment (ANI), HIV-1-associated mild neurocognitive disorder (MND), and HIV-1-associated dementia (HAD). Methods used to diagnosis HAND include laboratory measures of viral load and CD4 T cell numbers, and appraisals of behavioural change. Magnetic resonance imaging (MRI) and computerized tomography (CT) scans may be used to rule out other causes of symptoms (Uthman & Abdulmalik, 2008).

In developed countries, behavioural change is typically measured by neuropsychologists using a battery of neuropsychological (NP) tests (Cysique, Maruff, Darby, & Brew, 2006; Grant, 2008; Sacktor et al., 2005). The domains most frequently affected in people with HAND include attention and speed of processing, learning and memory, verbal language skills, psychomotor abilities, executive functions and other neurocognitive functions (e.g. sensory-perceptual skills) (Antinori et al., 2007; Grant, 2008; Reger, Welsh, Razani, Martin, & Boone, 2002). The associated impairments identified by neuropsychological (NP) testing have been described in detail by Grant, et al. (2008) and Woods, et al. (2009). Table 2.1 lists the neurocognitive domains assessed through NP testing and the associated behavioural impairments.

Individual patterns of impairment vary depending on the neurological structures affected, and the severity of the impact (Dawes et al., 2008; Grant, 2008). A diagnosis of HAND is based partly on the presence of impairment in at least two of these HIV-related cognitive ability domains, provided other co-morbidities
have been ruled out (Antinori et al., 2007). Appendix 1 contains a complete description of the criteria used to diagnose HAND.

### TABLE 2.1. Neurocognitive domains affected in people with HAND and the associated behavioural impairments

<table>
<thead>
<tr>
<th>Neurocognitive Domain</th>
<th>Associated impairments in people with HAND</th>
</tr>
</thead>
</table>
| Attention & Speed of Processing | • Complex information manipulation, especially under time pressure  
|                        | • Visual search and discrimination  
|                        | • Divided or selective attention  
|                        | • Covert orienting  
| Learning and Memory | • Episodic memory; e.g., difficulty recollecting recently acquired information;  
|                        | • Learning stories and lists  
|                        | • Non-verbal learning; complex designs  
|                        | • Prospective memory; esp. time-based remembering intentions  
| Verbal language skills | • Verbal fluency; e.g., spontaneous generation of words or other language, particularly under pressure of time.  
|                        | • Verb production  
| Executive function | • Abstraction  
|                        | • Set-shifting  
|                        | • Response inhibition  
|                        | • Decision making  
| Psychomotor abilities | • Psychomotor slowing: bradykinesia, bradyphrenia  
|                        | • Reduced coordination  
|                        | (However, these may be a related to peripheral neuropathy rather than HAND)  
| Other neurocognitive function | • Perceptual motor integration (in some)  
|                        | • Integration and processing of complex tactile information  
|                        | (However, these may be a related to peripheral neuropathy rather than HAND)  

Research that led to the identification of the domains listed in Table 2.1 has enabled neuropsychologists to identify those NP tests of most use in documenting the neurocognitive disorders of HAND, and measuring change. Table 2.2 lists tests that comprise a typical NP test battery (Heaton et al., 2004).
TABLE 2.2. Neurocognitive test battery to assess the neurocognitive domains affected in people with HAND

<table>
<thead>
<tr>
<th>Verbal</th>
<th>Abstraction / Executive Functioning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boston Naming Test</td>
<td>Category Test</td>
</tr>
<tr>
<td>Thurstone Word Fluency</td>
<td>Trail Making Test</td>
</tr>
<tr>
<td>Category Fluency</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Information Processing Speed</th>
<th>Attention / Working Memory</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAIS-R Digit Symbol</td>
<td>WAIS-R Digit Span</td>
</tr>
<tr>
<td>Trail Making Test</td>
<td>WAIS-R Arithmetic</td>
</tr>
<tr>
<td>WAIS-R Block Design</td>
<td>PASAT Total Correct</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Motor</th>
<th>Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grooved Pegboard Time (dom. hand)</td>
<td>Story Learning</td>
</tr>
<tr>
<td>Grooved Pegboard Time (non-dom. hand)</td>
<td>Figure Learning</td>
</tr>
<tr>
<td>Finger Tapping (dom. hand)</td>
<td>Delayed Recall</td>
</tr>
<tr>
<td>Finger Tapping (non-dom. hand)</td>
<td>Stored Memory</td>
</tr>
<tr>
<td></td>
<td>Figure Memory</td>
</tr>
</tbody>
</table>

Neuropsychological assessment of cognitive impairment makes an important contribution to the diagnostic process, and to illuminating the cognitive architecture of HAND. Specifically, Grant (2008, p.43) asserts that NP tests such as those listed above assess, “the actual relevant product of the brain: the abilities to perceive, evaluate, decide, act, and remember”.

Limitations associated with the use of NP tests have also been reported (Grant, 2008). For example, the time required to assess one person using one of these NP test batteries is approximately four hours. In an attempt to simplify the process of assessment and overcome some of the other limitations associated with NP testing (e.g. cross-cultural bias, the impact of educational level on performance, and time required for testing), screening tests of neurocognitive performance have also been developed (Cysique et al., 2006; Morgan et al., 2007; Power, Selnes, Grim,
& McArthur, 1995; Sacktor et al., 2005). Further, NP test batteries are not only used to diagnose HAND but also in efficacy studies of HAART. Repeated measurement introduces problems associated with the effects of test familiarity and practice on performance. The risk of scores regressing to the mean on repeated testing is a concern. For these reasons, detection of ‘true’ NP change remains a challenge (Grant, 2008). Questions remain also about the degree to which the cognitive impairments identified through NP testing impact on daily life task performance (Antinori et al., 2007; Burgess et al., 2006; Gorman, Foley, Ettenhofer, Hinkin, & van Gorp, 2009; Grant, 2008; Heaton et al., 2004; Ingraham, Bridge, Janssen, Stover, & Mirsky, 1990; Morgan & Heaton, 2009; Reger et al., 2002; Schifitto et al., 2001; Woods, Moore et al., 2009). This concern was expressed by the occupational therapists who contacted the researcher at the outset of this study (Section 1.3). Research about this variable will be reviewed next.

2.5 THE IMPACT OF HAND ON EVERYDAY FUNCTION

The importance of identifying the impact of cognitive impairments on daily life performance was first documented by Price and Brew (1988) and Price, Sidtis, Brew and Cleary (1988) soon after the AIDS dementia complex (ADC) (now referred to as HAD) was described (Navia, Cho et al., 1986; Navia, Jordan, & Price, 1986; Snider, Simpson, Nielson, et al., 1983). Price and Brew (1988) and colleagues (Price et al., 1988) proposed that daily life impact is central to diagnosing ADC, and developed an observational scale to be used for this purpose (Price et al., 1988) (Appendix II). Since these seminal publications, several
researchers have added to the body of knowledge about the impact of cognitive impairment, and daily life impact is now central to diagnosing HAND as described in Section 2.4.1.

Conceptually, the link between cognitive impairment and everyday functioning is illustrated in the OPM(A) (Figure 2.8) by the arrows connecting the construct of cognition to those associated with one’s occupations; e.g. the tasks and routines of self-maintenance, rest, leisure and productivity, and by the arrows that connect these constructs with the central organiser of occupations, one’s occupational roles. Since everyday functioning occurs in the real world, the constructs of the external context are illuminated (Figure 2.8). The orchestration of real-world performance within time and space, and one’s desires for a future place in space and time is represented by the illumination of these latter two constructs (Figure 2.8).

**Figure 2.8** HAND and its relationship to the everyday, real-world occupations of a person as illustrated in the OPM(A)
2.5.1 Sources of evidence about the impact of HAND on everyday function

Investigations of the relationships between the HAND and everyday function have typically been carried out by neuropsychologists who sought to establish the predictive power of NP testing in determining the impact of impairment on daily life, important in efficacy studies of HAART (Grant, 2008; Heaton et al., 2004; Schifitto et al., 2001; Woods, Moore et al., 2009). Neuropsychologists in day to day practice are reported to have been asked to identify and delineate not only the cognitive consequences of the cerebral pathology present in clients with HAND but also the behavioural impact of these consequences (Morgan & Heaton, 2009). Increasingly, neuropsychologists are required to make predictive statements about a person’s ability to carry out everyday tasks in the real world (Chelune & Moehle, 1986; Heaton & Pendleton, 1981; Marder et al., 2003), for example, can people tested live independently, what are the prospects for employment and rehabilitation, and what environmental supports are needed? Although occupational therapists clearly have a role to play in answering these questions, only one report of occupational therapy research about the impact of HAND on daily life was located (Gregory & Gibbs, 2002). The focus of that report was the perceptions of loss reported by four men with HAD. While relevant to occupational therapists and others who address the spiritual and psychosocial dimensions of HAND, that research was not relevant to the primary variables investigated in this review.
2.5.2 Approaches to investigation: Ecological validity

The requirement to make predictions about everyday task performance has prompted neuropsychologists to seek to establish ecological validity of their measures; that is, to what degree do scores on NP tests correlate with measures of everyday function. Two approaches to ecological validity have been described: veridicality and verisimilitude (Morgan & Heaton, 2009, p.640). Veridicality refers to being in agreement with an object's real properties, to be truthful or veracious (Dictionary.com, n.d.). In research reported here, it involves examining the statistical relationships between NP measures of HAND and specific measures of instrumental activities of daily living (IADL) (Gorman et al., 2009; Woods, Moore et al., 2009). Verisimilitude refers to the quality of appearing to be real (Dictionary.com, n.d.). In research, it refers to the use of measures of everyday task performance that are similar in construction to the demands of tasks required of the person in the natural environment (Chaynor & Schmitter-Edgecombe, 2003; Morgan & Heaton, 2009). When a verisimilitude approach to ecological validity is applied, the ability of the client to perform everyday tasks is directly and objectively assessed. Scores obtained may then be associated with other NP or laboratory-based measures, if desired.

The majority of studies reviewed in this chapter adopted a veridicality approach to establishing ecological validity. IADL measures used include self-report, collateral/proxy reports (Antinori et al., 2007), or measures based on self-report, such as the Lawton and Brody IADL Scale (Lawton & Brody, 1969) which was originally developed for use with an aging population but validated for use with
an HIV/AIDS population (Heaton et al., 2004; Sadek, Vigil, Grant, & Heaton, 2007). The Patient’s Assessment of Own Functioning Inventory (PAOFI) (Chelune, Heaton, & Lehmann, 1986) was used by some (Heaton et al., 2004) to identify the frequency with which a person reports difficulties with neurocognitive behaviours, work and recreation. Specific rating and performance scales of IADL have also been used in studies that sought to validate clinical staging scales of HAND, or identify that an association exists between NP measures and daily functioning. These include the Role Functioning items of the Medical Outcome Study Approach (Stewart & Ware, 1993), the Katz Instrumental Activities of Daily Living Scale (Katz, Ford, Moskowitz, & et al., 1963) and Lawton, et al.’s Physical Self-Maintenance Scale (PSMS) (Lawton & Brody, 1969) reported by Marder (Marder et al., 2003). The Karnofsky Performance Scale Index (Karnofsky, Abelman, Craver, & et al., 1948) has also been used by some (Schifitto et al., 2001) to rate both health status and functional impairment on a 10 point scale.

Some of the research reviewed included a verisimilitude approach together with the more traditional veridicality approach to establishing ecological validity. In these studies, tests of everyday task performance were added to the data collection process, and then scores obtained were correlated with other functional and NP scores. The task-based measures used in these studies are of most relevance to the research reported in this thesis, and will be described in more detail. Gorman, et al. (2009) and Woods, et al. (2009) provide recent and comprehensive reviews of the various lines of research about the impact of HAND on everyday function. A
synopsis of the methods, findings and remaining gaps in knowledge are presented below.

2.5.3 Synopsis of findings from research

2.5.3.1 Employment

Returning to gainful employment and remaining employed required a shift in thinking in PLWHA and health professionals when HIV ceased to be a death sentence (Gorman et al., 2009). Not surprising, the IADL focus of most research about the impact of HAND on everyday function has been on employment. Using self-report and work history records of PLWHA, one consistent finding is that a diagnosis of MND or HAD is associated with unemployment.

Heaton and colleagues (1996) report that in a sample of 289 HIV+ men, those with symptomatic HAND were three times as likely to be unemployed than those without HAND. In recent research, Twamley (2006) investigated the rate of unemployment among HIV+ men with HAND (n=27), HIV+ men without HAND (n=27), and men with schizophrenia (n=27). The rate of unemployment among those with HAND was higher than HIV+ men without HAND, and approached levels of those with schizophrenia, which is known to be high (Bowie, Reichenberg, Patterson, Heaton, & Harvey, 2006; McGurk & Mueser, 2004).

The neurocognitive domains that were associated with a greater likelihood of unemployment were identified in a meta-analytic review inclusive of a variety of clinical populations (epilepsy, TBI, HIV and other various disorders).
(Kalechstein, Newton, & van Gorp, 2003). Diminished performance across all neurocognitive domains, especially in executive functioning and memory, was associated with unemployment. Others have found that impairment on NP tests of these domains predicts unemployment over and above medical symptoms among men with HAND (Albert et al., 1995).

Although considerable evidence exists to demonstrate that neurocognitive impairments of HAND impact negatively on employment, in the majority of cases methods used to measure employment have not been embedded in the tasks or skills required of a working person. One exception was research carried out by Heaton, et.al. (2004) that included the standardized work samples contained in the Microcomputer Evaluation and Screening Assessment (MESA) Short Form 2 (Valpar International Corporation, 1986) and the Computerized Assessment (COMPASS) (Valpar International Corporation, 1992). Regardless, no measures used yield information about the impact of impairment on specific work behaviours in naturalistic contexts.

2.5.3.2 Medication adherence

Predictions about medication adherence are important because of the demonstrated success of HAART in maintain the health status of many HIV+ individuals (Uthman & Abdulmalik, 2008). HAART regimens, however, require that a person ingests as many as 104 tablets and injects two 90mg vials of drugs subcutaneously in multiple combinations and at varying intervals (Boehringer-Ingelheim, 2006, October). Several authors report that 40-50% of HIV-infected
individuals receiving HAART fail to maintain the consistently high levels of adherence that are needed to successfully sustain or reconstitute desirable levels of immune functioning (Gifford et al., 2000; Hinkin et al., 2002; Hinkin et al., 2004; Paterson et al., 2000).

While a number of factors have been shown to affect medication adherence, including age, substance/alcohol abuse, mood and anxiety disorders, negative health beliefs, poor social support and dysfunctional coping strategies, powerful associations with neurocognitive impairment in the domains of executive functioning, attention/working memory, verbal memory, and motor functioning have been demonstrated (Castellon, Hinkin, Wright, & Barclay, 2009; Gorman et al., 2009; Hinkin et al., 2002; Hinkin et al., 2004; Waldrop-Valverde et al., 2006). Methods used to measure medication adherence included self-report, pill counts, number of pharmacy prescription refills, and through the use of the Medication Event Monitoring System (MEMS) (Aprex Corp., n.d.). The latter is a microprocessor that is located in a pill bottle cap and automatically records the date, time and duration of each bottle opening.

Task-embedded methods to measure medication management in laboratory settings have also been used in early research. The Medication Management Test (MMT) (Albert et al., 1999) developed specifically for use with PLWHA entails sorting, organizing, and making inferences about fictitious medications (e.g. when a prescription would need to be refilled). Research using the MMT found that low
MMT scores correlated with low scores on NP tests of the domains of memory, executive and motor functioning (Albert et al., 1999; Albert et al., 2003).

Heaton et al. (2004) developed the Medication Management Ability Assessment (MMAA) based on the structure and items of the MMT. The adapted version includes a mock medication dispenser insert task, as well as a hierarchical re-ordering of tasks according to difficulty. Scores on the MMAA correlated with NP measures of executive function and memory (Heaton et al., 2004). Methodological issues associated with all of these measures have been highlighted (Gorman et al., 2009).

2.5.3.3 Financial Management

Although less extensively studied than medication management and adherence, the real-world tasks of organizing household finances and managing daily monetary transactions have also been examined in the HIV/AIDS population. Assessment of money management has historically been measured via self-report. Recently, laboratory procedures have been developed and/or adapted to directly assess financial management skills in PLWHA.

In landmark research (to be described more detail in Section 3.5), Heaton and colleagues (2004) assessed money management in a sample of 267 HIV-infected adults, 99 of whom demonstrated impairment on NP testing (NP-impaired). The functional outcome measures used included the financial skills item on the Direct Assessment of Functional Status (DAFS) (Lowenstein & Bates, 1992), a criterion-
referenced assessment of the degree to which a person completes the pre-
determined steps of tasks such as calculating currency and balancing a check
book.

Household money management was assessed through another task-analytic
criterion-referenced test developed by Heaton, et al. called *Advanced Finances*
(Heaton et al., 2004). Participants were provided with blank checks, a check book
register, one check to deposit, deposit slips, three bills to pay (including a credit
card bill), and a calculator. They were required to pay each bill, determine the
resulting check book balance, and pay as much of their credit card bill as possible
while leaving a minimum of $100 in their checking account. Points were awarded
for successful completion of steps. Higher rates of failure on this test were
associated with greater NP impairment, particularly in the domains of executive
functioning. Despite the reported ecological validity of these measures,
performance of personal financial transactions in naturalistic banking contexts
was not assessed.

2.5.3.4 Driving

Research that focuses on predicting driving performance among PLWHA
commenced approximately ten years ago when evidence collected from self-report
suggested that as many as 29% of people with MND (mild neurocognitive
disorder) reported a decline in driving performance (Marcotte et al., 1999). In
addition to self-report, assessment of driving performance typically is carried out
with the use of driving simulators, on-road driving evaluations on pre-determined,
closed-course routes, and driving history as determined by the number of driving citations and on-road accidents recorded during the previous year (Marcotte & Scott, 2009). Using these methods, Marcotte and colleagues (2004) identified that low scores on measures of executive functioning, attention/working memory, and motor abilities were most predictive of driving dysfunction. Poor visual attention, assessed by the Useful Field of View (UFOV) (Visual Awareness Research Group Inc, n.d.) was associated with an increased history of road accidents, particularly when present along with other NP impairment (Marcotte et al., 2006).

Subsequently, deficits in visual attention, visuospatial ability, memory, fine motor control, and executive function have been identified as those NP domains most likely to contribute to reduced driving performance among PLWHA, with visuospatial and attention abilities playing a key role among older HIV-infected adults (Gorman et al., 2009). Problems associated with the ecological validity of the outcome measures used have been described but the potential for catastrophic consequences, and the time required to use real-world assessments of driving are reported to inhibit further development of on-road NP assessments (Marcotte & Scott, 2009).

2.5.3.5 Shopping and Cooking

Shopping and cooking were assessed as part of a functional battery used by Heaton et al. (2004) to measure IADL as a construct. In research referred to in Section 2.5.1.3 Heaton and colleagues (2004) used the shopping item on the
criterion-referenced Direct Assessment of Functional Status (DAFS) test (Lowenstein & Bates, 1992). This item requires that subjects select items from a previously presented grocery list. A cooking test developed for the same research required that individuals follow recipes and coordinate a meal. Participants were provided with two recipe cards, one for cooking pasta and the second for heating bread. Cooking pasta was broken down into three steps. Heating bread consisted of one step. Participants were asked to determine the order and timing with which to cook the items so that both items are completed at approximately the same time. Points were awarded for following instructions, as well as completing the items at the same time. Isolated correlations with NP impairment were not reported as the purpose of the research was to demonstrate the predictive validity of the NP battery on the construct of IADL.

2.5.3.6 Summary

The research conducted to investigate the impact of HAND on everyday life has aimed to demonstrate that an impact exists, and then to establish the ecological validity of NP measures in predicting the impact. Most of this research adopted a veridicality approach by using self-report, rating scales or documented histories of functional outcomes, and then correlated the scores obtained with scores from NP testing. Some researchers adopted a verisimilitude approach by incorporating tests of everyday function as measures of functional outcome. Table 2.3 lists the assessments referred to in this section, and categorises them according to the type of ecological validity they align with.
TABLE 2.3. Ecological assessments used in research to investigate the impact of HAND on everyday task performance

<table>
<thead>
<tr>
<th>Veridicality approach</th>
<th>Verisimilitude approach</th>
</tr>
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<tbody>
<tr>
<td>to establishing ecological validity of NP measures</td>
<td>to establishing ecological validity of NP measures</td>
</tr>
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</table>

Assessments / methods reported
- Self-report &/or Collateral/Proxy-report
- Employment history
- Driving infringement & accident history
- Driving simulators
- Pill counts & pharmacy refills
- Medication Event Monitoring System (MEMS)
- Microcomputer Evaluation and Screening Assessment of work skills (MESA)
- Computerised assessment of work samples (COMPASS)
- Useful Field of View
- Lawton and Brody IADL Scale validated for use with PLWHA
- Physical Self Maintenance Scale (PSMS)
- Patient’s Assessment of Own Functioning Inventory (PAOFI)
- Role functioning items of the Medical Outcomes Study Approach
- Katz Instrumental Activities of Daily Living Scale
- Karnofsky Performance Scale

Assessments / methods reported
- Medication Management Test (MMT)
- Medication Management Ability Assessment (MMAA)
- Direct Assessment of Functional Status – Financial Skills & Shopping
- Advanced Finances
- Cooking test
- Closed-course driving assessment

The neurocognitive impairments that exist in people with HAND have been demonstrated to impact on the IADLs of employment, medication adherence, financial management, driving, shopping and cooking. Further, all neurocognitive domains listed and described in Section 2.4.1 have been shown to be associated with the laboratory-based measures of IADL described above. Those NP domains that were reported most frequently to associate with everyday function were executive function, learning / memory and attention. Visual attention and visuospatial ability correlated specifically with poor driving performance.
2.5.4 Limitations of ecological approaches used

While assessments such as those described above may have utility in some research, a major concern is that laboratory-based measures are not true indicators of real-world performance, especially when performance is of tasks that hold meaning for the person performing them, and when those tasks are carried out in situations where task performance typically occurs (Burgess et al., 2006; Dunn, 2005; Kingstone, Smilek, & Eastwood, 2008). All assessments of functional impact used in research reviewed, including those aligned with a verisimilitude approach to ecological validity, were carried out under artificial conditions. As a result, the unexpected perturbations that impact on cognitive processes used during everyday task performances were controlled for, thus making the research inconsistent with ecological goals (Kingstone et al., 2008).

The limitations in this body of knowledge are illustrated in the OPM(A) (Figure 2.9) by the absence of colour in those constructs that relate specifically to the real-world elements of occupational performance: occupational role, the external context and time and space. Further, the occupations assessed in previous research were only those classified in the OPM(A) as productivity (employment) and some IADL (self-maintenance) tasks. The complete scope of daily life tasks, including those associated with rest and leisure, have not been investigated. Limitations remain for occupational therapists whose interests are the real-world consequences of HAND on the totality of occupational performance.
2.5.5 New directions in ecological research

In recent years, new paradigms for studying and measuring real-world cognition have been proposed. One of these is *macrocognition* (Crandall, Klein, & Hoffman, 2006, p. 131). *Macrocognition* extends beyond person-cognition to include contextual factors in the broadest sense. Crandall, et al. (2006, p. 132) maintain that the cognitive processes one uses in everyday life are influenced by the purpose for thinking, one’s prior experience, the situation itself, the tools that are available, the challenges one is faced with, and the partners involved in performance.

Congruent with the tenets of *macrocognition*, Kingstone and colleagues (2008) argue that a new paradigm for studying real-world cognition is needed, and have named this *cognitive ethology*. They propose that human cognition operates in

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**Figure 2.9** Scope of existing research about the impact of HAND on everyday occupations of a person as illustrated in the OPM(A)
service of individuals as they interact with an ever-changing, naturalistic environment. While ecological approaches have prompted researchers to consider the role of the environment in determining behaviour, the focus of cognitive ethology is broader. This paradigm involves studying, “the behaviour of an embodied individual interacting with his or her environment” (Kingstone et al., 2008, p.324). Here the focus is both on what the active, engaged person is doing in the environment, and what information is available to that person to support purposeful behaviour. Cognitive ethology, they maintain, does not seek to negate laboratory-based methods. Rather, Kingstone and colleagues (2008) assert that accurate understandings of human cognition will not be obtained unless they are first grounded in systematic observations of how cognition operates in naturalistic settings. The goal of cognitive ethology is, “to provide the much needed body of observations on the basis of which existing laboratory findings can be validated, and future laboratory experiments can be grounded” (Kingstone et al., 2008, p.336). Only then will a clear, accurate understanding of human cognition in the real world be obtained.

Others support these new paradigms by encouraging those whose interest is in real-world cognition to, “create bespoke tests specifically intended for clinical application rather than adapting procedures emerging from purely experimental investigations” (Burgess et al., 2006, p.2). Assessment approaches that emerge from this alternative perspective will not only enable a more accurate identification of dysfunction in the real world but may also guide the development of novel, targeted, cognitive and behavioural strategies to lessen the impact of
HAND on the day-to-day lives of PLWHA, and their care providers (Woods, Moore et al., 2009). Embedding these methods within everyday occupations in occupational therapy may achieve the desired outcome of enhanced occupational performance and participation in everyday life.

The development of bespoke assessment methods with the capabilities described above requires that an explanatory model of real-world cognition be identified. In particular, a view of cognition that explains how the multiple elements of cognition interact to give one the capacity to carry out needed and/or desired everyday tasks in the naturalistic contexts where performance occurs. One view of cognition that considers the interactive and interdependent relationship that exists between the person and their cognitive capacities, the demands and challenges of everyday tasks to be performed, and the influence of context on performance is information processing.

Seminal articles about HAND (Grant, 2008; Morgan & Heaton, 2009) and ecological assessment (Burgess et al., 2006) allude to information processing theories of cognition as holding promise in guiding the development of new assessments that arise from the paradigms of cognitive ethology and macrocognition. Because of the congruence that exists among the core tenets of occupational therapy described in Section 2.2.2 and information processing theory, this view of cognition is also gaining prominence in occupational therapy and rehabilitation literature (Abreau & Peloquin, 2005; Glogoski, Milligan, & Wheatley, 2006; N. Katz & Hartman-Maeir, 2005; Levy, 2005; Polatajko &
Mandich, 2005; Shumway-Cook & Woollacott, 2007; Toglia, Golisz, & Goverover, 2009). The next section of this review focuses on information processing, its use as an explanatory model of occupational performance, and as a guide for assessment of real-world performance of everyday tasks.

2.6 INFORMATION PROCESSING

2.6.1 Origins

Information processing theories of cognition and cognitive science emerged in the 1950’s from the field of computer science and artificial intelligence (Newell, Shaw, & Simon, 1958), theories of language (Chomsky, 1957), studies of short-term memory and the concept of chunking (Miller, 1956), and research that aligned concept formation with cognitive processes (Bruner, Goodnow, & Austin, 1956). Broadbent consolidated ideas about human information processing and proposed that much of cognition involves a sequential series of processing operations (Broadbent, 1958). He maintained that once a stimulus is presented, basic perceptual processing occurs. This is followed by attention mechanisms that transfer some of the initial perceptual processing to a short-term memory store, and some to a long-term memory store.

Broadbent’s ideas were elaborated on by Neisser (1967) who characterised people as dynamic information processing systems whose mental operations could be described in the computational terms of input, computation and output. While some early models of information processing presented the information flow as
linear or unidirectional, Neisser (1976) maintained that nearly all cognitive activity consists of interactive bottom-up and top-down processes occurring together. Bottom-up processing is stimulus-driven and directly affected by a sensory input. Top-down processing is conceptually driven and affected by the individual’s memory of past experience and expectations in the present (Engel, Fries, & Singer, 2001; Eysenck & Keane, 2000). The flow of information is bidirectional. Figure 2.10 is a simplistic model of information processing derived from the early work of these theorists and researchers.

![Figure 2.10 Conceptualization of an early model of information processing](image)

Atkinson and Shiffrin (1968) developed further the theoretical model of processing in a short-term memory store and a long-term one. Later, Newell and colleagues (1972) conceptualised human problem solving from information processing perspective, and added this to developing models. By the end of the 1970’s, most cognitive psychologists agreed that the information processing paradigm was a valid way to study human cognition (Lachman, Lachman, & Butterfield, 1979). This view continues to dominate thinking (Eysenck & Keane, 2000; Simon & Kaplan, 1989).
2.6.2 Contemporary perspective

Contemporary models of information processing are all based on ideas proposed by Broadbent, and build on the early work described above (Eysenck & Keane, 2000). As research continued, more complex models evolved with components added to represent and account for new discoveries. These include the parallel and distributed processing capabilities used during automatic and controlled actions (Rumelhart, Hinton, & McClelland, 1986), executive control processes (Baddeley, 2003; Baddeley, 2004; Burgess et al., 2006; Shallice & Burgess, 1996), and various feedback/feedforward loops enabling multi-directional information flow (Schmidt & Wrisberg, 2004; Shumway-Cook & Woollacott, 2007). Higher levels of cognition such as the ability to think about one’s own mental processes and state of knowledge are represented in contemporary models of information processing by the construct of metacognition (Risberg & Grafman, 2006, p.143). Metacognition involves a number of higher cognitive elements associated with planning, organizing, problem-solving and decision-making, as well as knowledge of one’s own abilities, state of knowledge, and personal resources (Eysenck & Keane, 2000; Mazzoni & Nelson, 1998). Executive operations, such as the ongoing monitoring of cognitive processes as they are used and the online determination of whether material or instructions are adequate, or whether one is making progress in performing a task, are also critical dimensions of metacognition (Eysenck & Keane, 2000).
2.6.3 Current conceptualisations of information processing

Current conceptualizations of information processing are necessarily more complex. The mind is viewed as an organism involved in receiving, storing, retrieving and using information to formulate responses (Gale Group, 2001). These cognitive operations involve the brain mechanisms of attention, perception, memory, thinking reasoning, deciding and response activation (Newell, 1990; Reed, 2000). The flow of information is multidirectional and multiple feedback loops ensure performance is optimum (Schmidt & Wrisberg, 2004; Shumway-Cook & Woollacott, 2007). Most apparent in modern conceptualizations are the multiple avenues of information flow to and from short-term and long-term memory. In contrast to the early work of Atkinson and Schiffrin (1968), the access to long-term memory is not necessarily through short-term memory (Craik, 2002; Craik & Lockhart, 1972). Sensory perceptions can prompt recall of information already stored in long-term memory. Figure 2.11 depicts an information processing model conceptualised from elements derived from the literature.
2.6.3.1 Input processing

As illustrated in Figure 2.11 the input or prompt for processing information may arise from within the person (internal), or from some salient feature in the context (external). 'Bottom-up' processing begins when this sensory input received from visual, somatic, auditory, olfactory, kinaesthetic and proprioceptive receptors is registered as sensory memories within the various sensory processing regions of the brain (Baddeley, 2004; Schmidt & Wrisberg, 2004). That which captures the attention of the system is processed more deeply which, in turn, gives rise to the

Figure 2.11 Contemporary conceptualisation of information processing
formation of sensory perceptions. Irrelevant sensory input is processed no further and fades away (Eysenck & Keane, 2000; Gibson, 1988).

2.6.3.2 Throughput processing
The perceptions formed are then processed within the mechanisms of short-term memory. Information from the past that is stored in long-term memory as facts, procedures and consolidated episodes is retrieved, and comparisons are made in working memory between what is retrieved and the newly formed sensory/perceptual images (Baddeley, 2004). This constant comparative process enables interpretations of the input to be made. Perceptual information is also purported to have direct access to long-term memory when the experiences being processed are familiar (Craik, 2002). This direct line of processing reduces the energy required for information processing (Carter, 2009). Processing loops that exist between sensory processing, short-term memory and long-term memory enable a confirmation or rejection of interpretations being made (Baddeley, 2004).

Information retrieved from memories of past experience has the capacity to direct an output response (Andres, 2003). If these memories are incomplete or unstable and incapable of directing a response, metacognitive operations are used. Metacognitive and executive processes function as 'top-down' generators and controllers of information processing (Borkowski & Burke, 1996; Burgess et al., 2006; Carter, 2009; Eysenck & Keane, 2000). Through the interaction between these higher cognitive elements and the throughput processing described above, needed or desired action plans that differ the past are formulated, evaluated and
judged against personal desires, external demands and the likelihood of success (Risberg & Grafman, 2006). Executive processes, in particular, exert control over processing operations to ensure the output remains focused on the central goal or reason for processing (Borkowski & Burke, 1996; Carter, 2009; Fernandez-Duque, Baird, & Posner, 2000).

2.6.3.3 Output processing

Decisions made as a result of the information processing operations described to this point are processed further through feedforward mechanisms to an output processor. In this phase, output responses are refined. Outputs may be motor (actions), verbal (words, song) or cognitive (thoughts and ideas) (Risberg & Grafman, 2006). Responses that take the form of actions, words or songs can be observed by the person and others. Personally derived goals and ideas that arise from memory and metacognitive operations output as thoughts. Thoughts cycle through the processing system as person-derived inputs, another form of top-down processing (Borkowski & Burke, 1996; Risberg & Grafman, 2006).

2.6.3.4 Feedback processing

Output responses provide the processing system with feedback (Schmidt & Wrisberg, 2004) that can be observed through changes in the context (external) or derived from within the person (internal). Other internal feedforward and feedback loops exist. These are represented by the arrows from short-term and long-term memory to the output response, and from the output response back to these two memory constructs. This processing flow keeps the system informed.
about the output responses as they are happening. Through this, decisions can be made about whether what is going to happen and what is happening is consistent with the intent and plan. Through these multiple feedback and input loops the system is able to evaluate performance and store information for future reference (Marteniuk, 1976; Schmidt & Wrisberg, 2004; Shumway-Cook & Woollacott, 2007).

2.6.3.5 Information processing and cognitive impairments in people with HAND

As reported earlier (Section 2.4.1), Grant (2008) asserted that NP tests assess the brain processes of perceiving, evaluating, deciding, acting and remembering. Clients with HAND demonstrate difficulties with these processes as described in Sections 2.4 and 2.5. Information processing theory can be used to explain how the neurocognitive processes of perceiving, evaluating, deciding, acting and remembering interact during task performance. It may also be used to better understand the neurocognitive impairments that most limit task performance in the real world.

2.6.4 Information processing and occupational performance

Occupational therapists define information processing relative to occupational performance. It is, “the ability to take in, organise, manipulate and integrate new information with previous experiences in order to plan, structure and perform goal directed behaviour” (Chapparo, 2006b, p.45). The outcome of information processing is the ability to perform daily life tasks, and participate in needed and desired contexts.
2.6.4.1 Information processing strategies during occupational performance

During occupational performance, information processing operations drive the enactment of behaviour as one approaches and carries out a task. Specific behavioural strategies are used to gather information about the task and performance context, to interpret the meaning of information and to plan, execute and evaluate performance and its outcomes (Johnson, 2004; Lenz, Ellis, & Scanlon, 1996; Toglia et al., 2009). Consistent with the tenets of cognitive ethology proposed by Kingstone et al. (2008) and described in Section 2.5.5, this perspective explains how cognition operates in real world settings. The planned approach to strategy use varies according to the complexity of the task and the performer’s familiarity with it. Specific information processing strategies one uses during occupational performance have been described (Chapparo, 2006a; Missiuna, Mandich, Polatajko, & Malloy-Miller, 2001; Toglia et al., 2009). Figure 2.12 is based on ideas expressed by Chapparo (2006) and Toglia (2009). It depicts the information processing model illustrated in Figure 2.11, and gives examples of the type of strategies one uses to process information about the task at each major stage of processing.
Figure 2.12 Information processing and strategies used during occupational performance
2.6.4.2 Information processing strategy application errors

Information processing strategy application errors are mistakes one makes during the selection or execution of responses (Gale Group, 2001). People with HAND can be assumed to make the same type of mistakes during real-world performance. To address the needs expressed by the occupational therapists reported in Section 1.3, an assessment that is capable of measuring what the active, engaged person is doing is required. In particular, a method is needed that can reveal the information processing strategy application errors people with HAND demonstrate as they carry out needed or desired occupations under naturalistic contexts at times which are congruent with everyday life.

The final section of this review focuses on assessments that are recommended for use by occupational therapists who work with people who have HAND. The aim of Section 2.7 is to determine which assessments, if any, will enable an investigation of the variables of concern in this research: occupational performance, information processing, ecological assessment, and HAND.

2.7 O.T. ASSESSEMENT OF PLWHA WHO HAVE HAND

Assessments listed in occupational therapy textbooks that were recommended for use with PLWHA who have HAND were identified (Arnold & Stone, 2009; Paul & Orchanian, 2003). Arnold and Stone (2009, p.1030) categorized these tests as, “OT Evaluations of Basic and Instrumental Activity Daily Living Skills” (B/IADL), and “OT Evaluations of Cognitive/Perceptual Skills”, whereas, Paul
and Orchanian (2003, p.99) categorised the dimensions to be assessed under, “Assessment of Performance Skills” and “Assessment of Performance Components”. They (Paul & Orchanian, 2003, p.100) went on to list specific tests but only categorized these as, “Standardised Assessment Tools”. Few were relevant to the variables investigated in this review. Table 2.4 contains a list of the combined recommendations from these authors with the standardized assessment tools recommended by Paul and Orchanian (2003) re-categorised to fit within the domains they assess.

### TABLE 2.4 Assessments recommended for use by occupational therapists working with PLWHA who have HAND

<table>
<thead>
<tr>
<th>OT EVALUATIONS (Arnold &amp; Stone, 2009)</th>
<th>ASSESSMENTS (Paul &amp; Orchanian, 2003)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>B/IADL</strong></td>
<td><strong>Performance Areas</strong></td>
</tr>
<tr>
<td>Functional Independence Measure (FIM)</td>
<td>BADL &amp; IADL</td>
</tr>
<tr>
<td>Assessment of Motor and Process Skills (AMPS)</td>
<td>Home management</td>
</tr>
<tr>
<td>Klein-Bell Activities of Daily Living Skills (Klein-Bell)</td>
<td>Work/productivity skills</td>
</tr>
<tr>
<td>Kohlman Evaluation of Living Skills (KELS)</td>
<td>Play and leisure skills</td>
</tr>
<tr>
<td>Satisfaction with Performance Scaled Questionnaire (SPSQ)</td>
<td>School/educational setting if applicable</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Cognitive/Perceptual Skills</strong></th>
<th><strong>Performance Components – Cognitive Integration</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lowenstein Occupational Therapy Cognitive Assessment (LOTCA)</td>
<td>Level of Arousal</td>
</tr>
<tr>
<td>Mini-Mental State Exam (MMSE)</td>
<td>Orientation</td>
</tr>
<tr>
<td>Test of Everyday Attention (TEA)</td>
<td>Recognition</td>
</tr>
<tr>
<td></td>
<td>Attention span</td>
</tr>
<tr>
<td></td>
<td>Memory</td>
</tr>
<tr>
<td></td>
<td>Sequencing</td>
</tr>
<tr>
<td></td>
<td>Spatial operations</td>
</tr>
<tr>
<td></td>
<td>Problem solving</td>
</tr>
<tr>
<td></td>
<td>Learning</td>
</tr>
<tr>
<td></td>
<td>Generalisation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Standardised Tests</strong></th>
<th><strong>Standardised Tests</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>No tests listed</td>
<td>No tests listed</td>
</tr>
</tbody>
</table>

* Listed as the Modified Interest Checklist with no source reported Interest Checklist*
Using the structure and constructs of the OPM(A) as a guide, the assessments and domains listed above fall into two clusters: an occupation-focused cluster and a component-focused cluster.

2.7.1 Occupation-focused methods

Occupation-focused methods assess a person’s ability to carry out occupations of importance to them or those they associate with in naturalistic contexts, and at critical points in a person’s life with reference to future goals. These dimensions are coloured orange in Figure 2.13.

Eight occupation-focused assessments were listed as having clinical utility in the area of HIV/AIDS. Three of these were eliminated from further consideration. The SPSQ (Yerxa, Burnett-Beaulieu, Stocking, & Azen, 1988), and the OPHI
(American Occupational Therapy Association, n.d.) that was revised as the OPHI-II (Kielhofner et al., n.d.) were eliminated because they are administered by interview or questionnaire. The third assessment, the Interest Checklist (Matsutsuyu, 1969) that was revised as the NPI Interest Checklist (Rogers, Weinstein, & Figone, 1978), was eliminated for similar reasons as those listed above, and because Paul and Orchanian (2003) recommended a modified version of this instrument but provided no source information. The remaining five are briefly described below.

2.7.1.1 Functional Independence Measure (FIM)

The FIM (Center for Functional Assessment Research at SUNY Buffalo, n.d.) is designed for use with adults with various physical impairments. It measures 18 activities that represent functional status: 13 with a motor emphasis related to self-care, and 5 with a cognitive emphasis involving communication. Scores reflect the impact of disability on the individual, and on human and economic resources in the community (Boop, 2009, p.1112).

2.7.1.2 Barthel Index (Barthel)

The Barthel (Mahoney & Barthel, 1965) is designed for use with adults. It measures the basic activities of daily living (BADL) status of hospital patients, and is used to assess change (Boop, 2009, p.1097).
2.7.1.3 Klein-Bell Activities of Daily Living Scale (Klein-Bell)

The Klein-Bell (Klein & Bell, n.d.) is designed for use with children and adults. It measures BADL independence in dressing, mobility, elimination, bathing and hygiene, eating and emergency communication to determine current status, change in status, and sub-activities to focus on in rehabilitation (Boop, 2009, p.1117).

2.7.1.4 Kohlman Evaluation of Living Skills (KELS)

The KELS (McGourty, 1979, 1999) is designed for use with adults with cognitive impairment. It evaluates the ability for a person to live independently and safely in the community by assessing self-care, safety and health, money management, transportation and telephone, work and leisure. It is reported that the KELS test items tend to emphasise the knowledge component of activities (Boop, 2009, p.1118).

2.7.1.5 Assessment of Motor and Process Skills (AMPS)

The AMPS (Fisher, 2006) is designed for use with people 3 years and up. It is an ecological assessment of the motor and process units of performance a person carries out in the context of performing several familiar functional [everyday] tasks of the subject’s choice (Boop, 2009, p.1095). The test items on the AMPS are IADLs that have been analysed, and the motor and process units of performance delineated. Only tasks that have been subjected to this standardization process are listed as test items, and the person being assessed chooses those of relevance (Fisher, 2006). The test environment is specified for
each task to ensure test administration complies with the standardized protocol. The motor units and process units are actions expressed as verbs that are carried out to complete the task. Motor units include, for example, the verbs: bends, maintains, coordinates. Process units include heeds, searches, questions, for example. Critical to the variables investigated in this review, the motor and process units of behaviour are not considered to reflect the motor and cognitive capacities one uses to complete the task. The AMPS assesses task performance competence only. AMPS Motor Scores, AMPS Process Scores and AMPS Total Scores can be calculated and used to predict independent living success (Fisher, 2006).

2.7.2 Component-focused methods
Component-focused methods assess a person’s cognitive capacity typically through tests that are similar in structure to NP assessments. Subjects are asked to complete pencil-paper tasks, copy block designs, arrange picture cards, demonstrate actions, etc. Ecological assessments of cognitive component function use plausible real-world tasks as the test items but still aim to assess elements of cognition. Component-focused methods are represented in the OPM(A) (Figure 2.14) by the cognitive component coloured orange. The dotted orange arrows emanating from the construct cognition represents emerging ecological approaches to assessing this construct.
Three component-focused assessments were listed in occupational therapy textbooks as suitable for use with PLWHA who have HAD.

2.7.2.1 Lowenstein Occupational Therapy Cognitive Assessment (LOTCA)

The LOTCA (Itzkovich, Elazar, Averbuch & Katz, n.d.) is designed for use with people 6 years and up. A second version, LOTCA-G (Elazar, Itzkovich, & Katz, n.d.), is available for use with older adults. The LOTCA identifies abilities and limitations in areas of cognitive processing. Areas assessed include orientation, perception, visuomotor organization, and thinking operations (Boop, 2009, p.1120).
2.7.2.2 MiniMental State Exam (MMSE)

The MMSE (Folstein, Folstein, & McHugh, 1975) is designed for use with adolescents and adults. It quantitatively measures cognitive performance through a series of questions that investigate orientation to person, place and time, memory, calculation, recall, and language (Boop, 2009, p. 1124).

2.7.2.3 Test of Everyday Attention (TEA)

The TEA (Robertson, Ward, Ridgeway, & Nimmo-Smith, 1996) is designed for use with adults. It is an ecological assessment of attention. The dimensions of attention assessed include selective attention, sustained attention, and attentional switching (Robertson et al., 1996, p.526). The task items include: Map searching, Elevator counting, Elevator counting with distraction, Visual elevator, Auditory elevator with reversal, Telephone search, Telephone search dual task, and Lottery. All items are administered in an office. Some items (e.g. Elevator counting) require participants to pretend they are riding in an elevator, and others involve listening to tape recordings of ring tones (e.g. Telephone search dual task), or lottery numbers (Lottery).

2.7.3 Alternative: Occupation-embedded methods of assessing real-world cognition

The primary variables investigated in this research focus on the real-world impact of HAND on occupational performance. As described previously (Section 2.5.5), methods to assess the cognitive operations used during everyday task performance
are required. Conceptually, assessments with this capacity are illustrated in the OPM(A) by the elements coloured orange (Figure 2.15).

Tests that fit the criteria for this type of assessment were identified and included in this review.

2.7.3.1 A-ONE

The A-ONE (Árnadóttir & Fisher, 2008) (previously called the Árnadóttir Occupational Therapy Neurobehavioral Evaluation (A-ONE) (Árnadóttir, 1990)) is a standardized, criterion-referenced test designed for use with adults who have central nervous system dysfunction. It comprises two scales: the Functional Independence Scale (commonly referred to as the ADL scale) (Árnadóttir & Fisher, 2008, p.51), and the Neurobehavioral Scale. The ADL scale rates...
independence in performance of the BADL tasks of dressing, grooming and
hygiene, transfers and mobility, feeding, and communication (Árnadóttir &
Fisher, 2008, p.53) under standardized conditions created in a hospital room or
OT department. The Neurobehavioral Scale is a four-point scale used to rate the
neurobehavioral problems that interfere with BADL. The cognitive domains rated
are motor apraxia, ideational apraxia, unilateral body neglect, somatoagnosia,
spatial relations, unilateral spatial neglect, and organization / sequencing. Other
domains include abnormal tone–right, abnormal tone–left, and perseveration.
The original purpose of the A-ONE was to assist intervention planning
(Árnadóttir, 1990). It is being developed further for use as an outcome measure
(Árnadóttir & Fisher, 2008).

2.7.3.2 Perceive, Recall, Plan & Perform Assessment (PRPP)
The PRPP assessment (Chapparo & Ranka, 2005) is a standardized, criterion-
referenced test designed for use with anyone, of any age, gender or sociocultural
background whose occupational performance is compromised by cognitive
impairments regardless of aetiology. It is used to assess the effectiveness of
information processing strategy application within the context of everyday task
performance. The PRPP is administered in two stages. Stage One is used to
assess task performance mastery on any task of relevance to a person or that
person's significant role partners, and in contexts where performance typically
occurs. Performance is scored by denoting errors in performance using a set error
typology. Errors include: omission (the step is omitted), accuracy (the step is
performed inaccurately), repetition (performance of the step is repeated
unnecessarily) and timing (the time taken to perform the step is excessive or insufficient). Stage One yields data from which a global estimate of error free performance is calculated and expressed as a percentage score (Chapparo & Ranka, 2005). Scores from Stage One are used to establish a baseline score of mastery useful in subsequent outcome measurement. Scores are also used to guide the focus of intervention relative to error typologies impacting on mastery. Figure 2.16 depicts the structure of the PRPP Stage One.

![Figure 2.16 Structure of the PRPP Assessment - Stage One (Task performance mastery)](image)

The PRPP Stage Two assessment is based on an early information processing model of human behaviour developed by Romiszowski (1984). It is consistent with propositions about information processing and occupational performance described in Section 2.6.4.1 and illustrated in Figure 2.12. The PRPP Assessment Stage Two information processing model is depicted in Figure 2.17.
Information processing strategies used during task performance are conceptually divided into four quadrants (Figure 2.17): *Perceive* (behavioural strategies used to attend and gathering sensory information and to form highly discriminative sensory pictures of oneself and the task environment), *Recall* (behavioural strategies reflecting the processes associated with information storage, recognition and retrieval), *Plan* (behavioural strategies associated with making plans,
decisions and judgments about the nature and quality of performance) and

*Perform* (behavioural strategies for carrying out and adjusting performance).

Each Quadrant is further broken down into more specific ‘Sub-Quadrants’ of
cognitive processing that represent information processing operations such as:
*sensing, recalling procedures, programming, initiating*. These are depicted in the
inner ring in Figure 2.17.

‘Descriptors’ are the test items on Stage Two of the PRPP Assessment.
Descriptors are verbs that specify particular information processing strategies
applied by people across all tasks. These are illustrated in the outer ring in Figure
2.17. Descriptor behaviours are rated by an observer on a 3-2-1 scale relative to
the extent to which they are judged to contribute to effective performance
(*mastery*) on Stage One of the assessment. Raw scores can be converted to
percentage scores that reflect Sub-Quadrant or Quadrant strategy application
during task performance.

### 2.7.4 Utility of assessments reviewed

None of the occupation-focused or component-focused methods reviewed were
deemed suitable to answer the questions posed in this research. First, the division
of measures into the two domains parallels assessment approaches used in NP
research described earlier (Section 2.5). The *veridicality* approach to establishing
ecological validity where scores obtained on measures from each domain are
statistically analysed to identify the associations between them has already been
criticized heavily. This was discussed in detail in Section 2.5.4. The need for bespoke assessments that move beyond this paradigm has also been identified and discussed (Section 2.5.5).

Component-focused methods were rejected also because they are assessed out of the context of everyday life. Second, the cognitive processes measured on these assessments are not necessarily those which are impaired in clients with HAD, as discussed in Sections 2.4 and 2.5. Third, occupational therapists have been criticized for arbitrarily designing and using tests which are essentially truncated versions of NP assessments, and which usually have limited construct validity or inter-rater reliability (Mortera, 2006). No further search for this type of assessment was conducted.

The TEA is an ecological assessment of cognitive processes but its structure and administration protocol parallel other ecological assessments used in NP research that adopted a verisimilitude approach to ecological validity (Section 2.5.4). Like those assessments, the test is administered in an office setting where the unexpected perturbations that may impact on cognitive processes and task performance are controlled for. The findings, therefore, may or may not be relevant to the real-world needs of the person being assessed. Criticisms of this approach to identifying the real-world impact of HAND on daily life occupational performance have been discussed previously (Section 2.5.5). Further, the elements assessed on the TEA align with traditional models of cognition where domains are compartmentalized into discrete entities, in this case, attention. Even
a cursory examination of the test items and instructions reveals that multiple information processing strategies are used to derive the correct answers, not just attention. For these reasons, this test was given no further consideration.

Limitations also exist in using the A-ONE to answer the questions posed in this research. First, many clients with HAND have no difficulty with BADL, even those with HAD. Second, although clients with HAND have a central nervous system disorder, the characteristics of their impairments differ from those for whom this test was designed (See Section 2.4). For these reasons, it was deemed unsuitable for this research.

The PRPP Assessment appears to be most suitable to study the variables in this research. It is a bespoke, flexible, ecological assessment of occupational performance that is congruent with the constructs and structure of the OPM(A), and the tenets of cognitive ethology and macrocognition described in Section 2.5. It assesses task performance mastery, and embeds the assessment of information processing strategy application within the everyday occupations being performed in real-world situations where natural perturbations exist.

Research reported in which the PRPP Assessment was used include some conducted with people who have traumatic brain injury (Fry & O'Brien, 2002; Nott & Chapparo, 2006, 2007) and schizophrenia (Aubin, Chapparo, Gélinas, Stip, & Rainville, 2009; Aubin, Gélinas, Stip, Rainville, & Chapparo, 2007; Still, Beltran, Catts, & Chapparo, 2002), and on tasks such as return to driving.
following cerebrovascular accident (Turnbull, 2007). Research is currently being carried out using this test with children who have learning difficulties, typical preschool children and adults post stroke. The effectiveness of the PRPP Intervention has recently been demonstrated in adults who are in the agitated phase of recovery from traumatic brain injury (Nott, Chapparo, & Heard, 2008a).

Although the use of the PRPP Assessment is expanding in clinical practice (Douglas, Liu, Warren, & Hopper, 2007) and research, the measurement properties of the instrument have not been widely published. Early research conducted by Chapparo and Ranka (1992) demonstrated high agreement among six testers in identifying the breakdown of steps in Stage One for dressing, hygiene, and meal preparation tasks in normal adults. Acceptable to high inter-rater and intra-tater agreement was obtained in the identification of Stage One errors in a sample of clients with acquired brain injury, along with high evidence of face and content validity using a panel of experts (Chapparo & Ranka, 1992). Internal consistency of items in each quadrant has been reported as high (Fordam, 2001), and inter-rater and test-retest reliability across a number of studies ranges from 0.64 to 0.99 (Lohri, 2005; Munkehvit, 2005; Nott, Chapparo, & Heard, 2008b; Pulis, 2002). Studies using the PRPP Assessment have demonstrated agreement between PRPP Quadrant and Subquadrant scores and neuropsychological assessments of cognition in adolescents with early psychosis (Still et al., 2002), and between PRPP Quadrant and Subquadrant scores and tests of cognitive play in normal and learning disabled children when raters were blind to the purpose of the study (Boland, 2004).
The conceptual foundation of the PRPP Assessment, the structure of the instrument, the administration protocol and the standardization rigor all support the use of the PRPP Assessment as a suitable instrument for this research.

2.8 SUMMARY OF KEY FINDINGS

In summary, the review of pertinent literature relating to the major variables investigated in this research revealed the following findings.

2.8.1 HIV-Associated Neurocognitive Disorder

- HIV replication in the body and infiltration of the brain through multiple mechanisms produces a feared neurocognitive disorder labelled HAND.
- HAART therapies control the body and brain processes that lead to HAND thereby delaying its onset but concerns are raised about the long-term effects of HAART, and the direct role these therapies may play in producing HAND.
- Both sub cortical and cortical brain regions are affected in people with HAND—most notably in the basal ganglia, frontal regions and the striatal loops between them.
- The neurocognitive impairments most characteristic of HAND have been identified.

2.8.2 Impact of HAND on everyday function

- Research has demonstrated that the NP impairments typical of HAND are associated with IADL limitations.
• The NP domains that associate most strongly with limitations in IADLs investigated are visual attention and executive function.

• Methodological problems associated with research design and instrument selection in studies of these variables have been identified.

• A need for alternative approaches to studying these variables has been expressed.

2.8.3 Information processing

• The information processing model of cognition provides a framework to analyse the cognitive demands of daily life tasks.

• Input, throughput, output and feedback are consistent stages of information processing that have been described.

• Multiple processing circuits within and between these stages have been described.

2.8.4 Information processing and occupational performance

• Occupational performance is the domain of concern of occupational therapy

• Occupational performance is described as an output of the transactions between the person, the task (occupation) and the performance context.

• Cognition is an important element of occupational performance.

• Information processing provides an accepted theoretical explanation of the cognitive processes that contribute to successful occupational performance.
The constellation of cognitive impairments and task limitations identified in people with HAND can be explained by information processing theory. The real-world impact of these impairments can be explained by the conceptual congruence that exists with occupational performance and information processing.

2.8.5 Assessing information processing and occupational performance

- Occupational therapy assessments recommended for use with PLWHA who have HAD are either discrete occupation-focused assessments or discrete component-focused assessments of cognitive processes.
- Occupation-embedded methods of assessing cognitive processes have been developed in occupational therapy but only one of these assesses information processing strategy application behaviours applied during the performance of everyday tasks carried out in real-world contexts, the PRPP Assessment.
CHAPTER THREE

Phase One: Pilot Study

3.1 OVERVIEW

Chapter Three contains a description of Phase One of the research. Phase One was an exploratory pilot phase. Exploratory research is typically carried out to 1) test the feasibility of undertaking a more extensive study, and 2) to develop the methods to be employed in any subsequent studies (Babbie, 2004). In this research, the pilot study was designed to investigate the feasibility of using the PRPP Assessment to identify the impact of HIV-associated neurocognitive disorder (HAND) on occupational performance. It was carried out in two stages. The research questions posed, and the methods employed for each stage of the pilot phase are presented below. Some of the outcomes were presented at scientific conferences or published in a peer-reviewed journal. The abstract, poster presentation and the accepted journal manuscript are contained within this chapter.

3.2 PHASE ONE: PILOT STUDY - STAGE 1

3.2.1 Research Question

How can task performance mastery be measured in PLWHA who HAND?
3.2.2 Design

To answer the exploratory question posed in this phase of the research, a participatory action research process was carried out. Participatory action research involves people in a process of collective, self-reflective inquiry (Kemmis, 1998). Ideally, this type of research is initiated by the people with concerns requiring resolution (Grbich, 2004). As reported in Chapter 1, occupational therapists working with PLWHA approached the researcher and articulated their practice concerns. One key concern of theirs described in Section 1.3 was the lack of suitable assessments for use with clients with HAND seen in practice.

3.2.3 Sample

Seven occupational therapists working in HIV/AIDS, or with past experience in the area formed the initial action cycle group. The characteristics of those who formed this first group are presented in Table 3.1.
TABLE 3.1. Characteristics of the occupational therapists involved in the first cycle of Stage 1 of the Pilot Study

<table>
<thead>
<tr>
<th>Age in Years</th>
<th>Years working in OT</th>
<th>Years working in HIV OT</th>
<th>OT practice context</th>
<th>Country of OT education</th>
<th>Gender</th>
</tr>
</thead>
<tbody>
<tr>
<td>22 years</td>
<td>0.7 years</td>
<td>0.4 years</td>
<td>Community</td>
<td>Australia</td>
<td>Female</td>
</tr>
<tr>
<td>24 years</td>
<td>3 years</td>
<td>1 year</td>
<td>Acute, Community, Residential</td>
<td>Australia</td>
<td>Female</td>
</tr>
<tr>
<td>25 years</td>
<td>4 years</td>
<td>2 years</td>
<td>Acute, Community</td>
<td>Australia</td>
<td>Female</td>
</tr>
<tr>
<td>25 years</td>
<td>4 years</td>
<td>0.8 years</td>
<td>Acute Community</td>
<td>USA</td>
<td>Female</td>
</tr>
<tr>
<td>26 years</td>
<td>5 years</td>
<td>0.8 years</td>
<td>Community Residential</td>
<td>Australia</td>
<td>Female</td>
</tr>
<tr>
<td>38 years</td>
<td>11 years</td>
<td>6 years</td>
<td>Community Residential Palliative</td>
<td>Australia</td>
<td>Female</td>
</tr>
<tr>
<td>43 years</td>
<td>15 years</td>
<td>10 years</td>
<td>Community Palliative</td>
<td>Australia</td>
<td>Female</td>
</tr>
</tbody>
</table>

Mean age = 29 years
Mean years experience as an OT = 6.1 years
Mean years experience as an OT in HIV = 4.3 years

3.2.4 Methods: Action Cycle 1

The first action cycle occurred over a three month period during which time an assessment list was created from the literature. Each test was described and critically appraised by the group using criteria reported by Law, et al. 2005, as well as with reference to each member's personal beliefs about occupational therapy and the demands of their workplaces. The group agreed that the Perceive, Recall, Plan and Perform System Assessment (PRPP) (Chapparo & Ranka, 2006) appeared to be a suitable tool to identify task performance mastery across the type
of tasks that were relevant to the clients they saw in practice, however, none had more than undergraduate experience with the PRPP. The PRPP Assessment had also never been formally used with people who have HAND. To further this research and meet the practice needs of the group, a second action cycle was planned.

3.2.5 Methods: Action Cycle 2

The second action cycle was carried out over a three month period with a self-nominated sample (N=5) from the original group of seven. Two removed themselves from the original group because they planned to relocate out of Australia. Table 3.2 lists the characteristics of the remaining group.

<table>
<thead>
<tr>
<th>Age in Years</th>
<th>Years working in OT</th>
<th>Years working in HIV OT</th>
<th>OT practice context</th>
<th>Country of OT education</th>
<th>Gender</th>
</tr>
</thead>
<tbody>
<tr>
<td>22 years</td>
<td>0.7 years</td>
<td>0.4 years</td>
<td>Community</td>
<td>Australia</td>
<td>Female</td>
</tr>
<tr>
<td>24 years</td>
<td>3 years</td>
<td>1 year</td>
<td>Acute, Community, Residential</td>
<td>Australia</td>
<td>Female</td>
</tr>
<tr>
<td>25 years</td>
<td>4 years</td>
<td>2 years</td>
<td>Acute, Community</td>
<td>Australia</td>
<td>Female</td>
</tr>
<tr>
<td>26 years</td>
<td>5 years</td>
<td>0.8 years</td>
<td>Community, Residential</td>
<td>Australia</td>
<td>Female</td>
</tr>
<tr>
<td>43 years</td>
<td>15 years</td>
<td>10 years</td>
<td>Community, Palliative</td>
<td>Australia</td>
<td>Female</td>
</tr>
</tbody>
</table>

Mean age = 28 years
Mean years experience as an OT = 5.5 years
Mean years experience as an OT in HIV = 2.8 years
During this phase, the group underwent training in the PRPP Stage One Assessment, and practiced identifying errors in performance using the Stage One scoring rubric on videotaped examples of client performances made available by one group member from archival material in her OT department.

### 3.2.6 Methods: Action Cycle 3

The third action cycle focused on using the PRPP Stage One to assess performance with clients currently seen in practice by members of the group.

This phase was carried out as a pre-test, post-test case study. Clients with HAND known to the therapists in the group were listed, and the type of tasks focused on in therapy with these clients described. The majority of clients seen were men with HAD, and the tasks and routines being addressed covered a range of personal care, home maintenance, community living and leisure tasks.

One client diagnosed with HAD known to three therapists in the group was selected for formal assessment. The therapist currently seeing this client in therapy gained his consent to be videotaped by her while he prepared a shopping list at his home (supported living facility), cashed a pension check at a local cheque-cashing facility, and doing his grocery shopping in a local supermarket.

Analyses of his videotaped performances using the PRPP Stage One were completed collaboratively by the action cycle group using the PRPP Stage One protocol. Task performance mastery was calculated for each task. Errors impacting on performance (Accuracy, Repetition, Omission, Timing) were
counted, and error percentage scores calculated by error type. The assessment data was used to establish occupational performance goals for two tasks, and recommendations were made for intervention using the PRPP Intervention framework as a guide. The therapist carried out these recommendations, and provided follow-up videotaped examples of performance on these same tasks two weeks later. Performance was again analysed by the group, and re-test scores calculated.

3.2.7 Outcome: Stage 1

The feasibility of using the PRPP Stage One in practice for people with HAND, and continuing with the proposed research was confirmed by all members of the Stage 1 pilot phase group.

A peer-reviewed abstract of the case study from Action Cycle 3 was accepted for presentation as a poster at the premier World Federation of Occupational Therapists Congress.


The abstract and an A4 version of the poster are presented on the following pages. A verification of the contribution of the researcher to the paper is presented in Appendix III.
ASSESSMENT OF ‘DOING’ IN CHRONIC CARE: NEW PERSPECTIVES

Abstract:

Occupational therapists working in chronic care programs in the community face unique problems in identifying ‘doing’ goals when the potential to ‘do more’ is questionable. In particular, therapists find it difficult to identify aims of intervention, set specific occupational performance goals and provide evidence of outcome when change is slow.

The purpose of this paper is 1) to present an assessment method being used in a community-based chronic care program in Sydney, 2) to demonstrate how this assessment is used to determine therapy aims, establish specific measurable outcomes and design intervention, and 3) to illustrate how this method is being used to demonstrate program effectiveness.

The assessment method used is based on the procedural task analysis format of the Perceive, Recall, Plan & Perform System of Task Analysis (PRPP System). Specific key community tasks such as using shopping, banking, budgeting and using public transport are assessed, and errors in performance noted. These errors consist of omissions, inaccuracies, inappropriate repetitions and timing delays. Using this format, therapists calculate a total mastery score, as well as, sub-scores that reflect the impact of error type on task performance.

This information provides therapists with detailed information about what to target in therapy, what type of instructional cues and a prompt are required, and also gives them a baseline on which to calculate change. In this paper, case illustrations from community-based HIV/AIDS care will be presented but the content is relevant to therapists working in mental health or any chronic client group in the community.
Assessment of ‘Doing’ In Chronic Care: New Perspectives

Chapter 3: Pilot Study
3.3 PHASE ONE: PILOT STUDY - STAGE 2

3.3.1 Research Question

How can information processing strategy application be measured during real-world task performance in PLWHA who have HAND?

3.3.2 Design

To answer the second exploratory question, the participatory action research project that commenced in Stage 1 continued for another six months with the same group of five therapists.

3.3.3 Methods: Action Cycle 4

The five therapists who participated in Stage 1 were interested in continuing their involvement in the research. All five underwent informal PRPP Stage Two assessment training using videotaped examples of people with HAD performing everyday tasks. The taped examples included the case study completed in Stage 1 of the pilot study and some from the archival files of one occupational therapy department. All members confirmed the suitability of PRPP Stage Two for use with clients who have HAD, and expressed interest in completing formal PRPP training. All five therapists were given an opportunity to complete formal PRPP training. Two were granted time away from work to attend the full, five day training course.
3.3.4 Methods: Action Cycle 5

During Cycle 5 one man with HAD living in residential care who had a productivity goal of working as a volunteer grocery shopper for other residents in his house was identified by the group of therapists. A critical case study was designed to examine in detail the usefulness of the total PRPP Assessment with clients who have HAND. Case study research has been recognized by others as an appropriate framework to study variables that are linked to client performance and outcomes in occupational therapy (Fisher & Ziviani, 2004; Salminen, Harra, & Lautamo, 2006).

The PRPP Assessment (Stage One and Stage Two) was used to identify task performance mastery and information processing strategy application errors that impacted on mastery of the task of grocery shopping. The assessment took place in a local grocery store in the client’s community. The client’s occupational therapist and the researcher were both present for the assessment. Scores were calculated collaboratively by the therapist and researcher, and an interpretation made of the impact of information processing strategy application errors on task performance mastery. Goals were discussed by the group and a therapy plan constructed. Follow up assessment as occurred in Stage 1 of the pilot study was not possible with this case.
3.3.5 Outcome: Stage 2

The feasibility of using the PRPP Assessment in practice for people with HAND and continuing with further research was confirmed by all members of the Stage 2 pilot phase group.

A peer-reviewed journal article of this case study was accepted for publication. The formatted article is included on the following pages. Page numbers and bibliographic style remain in the format of the published article. Appendix IV contains a verification of the contribution of the researcher to the paper.

Assessment of productivity performance in men with HIV associated neurocognitive disorder (HAND) – acceptance letter

WORK: A Journal of Prevention, Assessment & Rehabilitation

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Dear Dr. Ranka,

It is with great pleasure that I conditionally accept your manuscript entitled, Assessment of productivity performance in men with HIV associated neurocognitive disorder (HAND) for publication in WORK: A Journal of Prevention, Assessment, & Rehabilitation.

The reviewers really enjoyed your manuscript and provided some minor edits which are contained in the two reviewer feedback forms and two edited manuscripts.

Once you have made these editorial changes, please e-mail me a copy of your revised manuscript. I would like to receive your revision by July 15, 2009.

Thank you for submitting this very interesting manuscript. I hope to receive more manuscripts from you and your colleagues.

Sincerely,

Karen Jacobs, Ed.D., OTR/L, CPE, FAOTA
Editor, WORK: A Journal of Prevention, Assessment, & Rehabilitation
Assessment of productivity performance in men with HIV associated neurocognitive disorder (HAND) – confirmation of publication date
Assessment of productivity performance in men with HIV associated neurocognitive disorder (HAND)

Judy Ranka
Christine Chapparo

Abstract:

Objectives: The purpose of this paper is to review what is known about return to productivity roles for people who have HIV/AIDS and HIV Associated Neurocognitive Disorder (HAND), to highlight gaps in knowledge and practice for assisting people with HAND to engage in productivity roles, to describe an occupational therapy assessment system that overcomes some of the limitations of current research and practice, and to demonstrate the clinical utility of this instrument for use with clients who have HAND.

Participants: The participant in this study is a man with HIV Associated Dementia (HAD), one sub-type of HAND.

Methods: The real-world impact of HAD on productivity role participation was assessed using the Perceive, Recall, Plan and Perform (PRPP) System of Task Analysis, an ecological assessment method. Productivity tasks assessed were those associated with this man’s desire to become a volunteer grocery shopper. The assessment took place under naturalistic conditions in a grocery store.

Results: The participant demonstrated 28.6% mastery of the grocery shopping task. Performance was impacted primarily by errors of accuracy and timing. Reasons for these errors centered on the participant’s difficulties in applying cognitive strategies to perceive, recall, plan and perform the task.

Conclusions: The PRPP System of Task Analysis shows promise in being able to identify errors in task mastery and the underlying cognitive strategy application errors that impact on mastery in people with HAND.

Keywords: HIV, Activities of daily living, Everyday functioning, Cognition, Neurocognitive Impairment, Assessment, Rehabilitation

1. Introduction:

HIV infection and AIDS remain at pandemic levels [32]. In 2005 the World Health Organization estimated that worldwide there were 40.3 million people infected with HIV [89]. In 2007, the number of people living with HIV in Australia was estimated to be 19,000[9, 80]. In the United States, this number was over 1 million [22, 81]. One impairment that is associated with HIV infection is HIV associated neurocognitive disorder (HAND) [4]. HAND encompasses three broad subtypes: asymptomatic neurocognitive impairment (ANI); mild neurocognitive disorder (MND); and, HIV associated dementia (HAD) [4]. Although the highly active antiretroviral therapy (HAART),
introduced a decade ago, proved effective in enabling people to live healthier, longer [54, 56], and with a lower incidence of HAND [31, 33, 73], in developed countries the prevalence of HAND is increasing [5, 10, 20]. This is especially true of older people with HIV infection and this is not related to the duration of infection [82]. Some estimate that 30-60% of all HIV infected individuals will have at least mild neurocognitive disturbance [41] and 10% of those with advanced HIV disease will have HAD [20]. In developing countries the prevalence of HAND is unclear, but existing evidence suggests the rates are comparable to, or higher than, in the developed world [20, 86, 90]. Several explanations have been offered for this increase. These include the lack of access to HAART, late commencement of HAART, the ineffectiveness of some HAART regimes and the lack of recognition of cognitive impairment by health personnel [20, 31]. Also, reported is the association between the development of HAND and an interruption to or nonadherence to HAART [87].

Regardless of the explanations offered for the recent increase in the incidence of HAND, occupational therapists and other health professionals will be required to provide services to people living with HIV/AIDS who have some form of cognitive impairment. As life expectancy increases in people with this condition, services that focus on enabling people to retain or assume needed or desired productivity roles is paramount. Productivity roles are made up of routines and tasks that enable a person to provide support for self, family or community through the production of goods or provision of services [25, 70, p.499]. They may be acted out or performed within the context of paid or unpaid employment, volunteering, in-house work, household chores or education to achieve this outcome. No services that focus specifically on addressing the productivity needs of people with HAND have been identified. Most assessments used with clients who have HAND assess neuropsychological functioning [41, 74], but lack relevance to the real world [4]. Interventions reported address specific cognitive impairments or focus on specific instrumental activities of daily living. With little guidance from the literature, therapists working with people who have HAND must rely primarily on hypothesis and conjecture to guide program development. In this article, a client-centered and ecologically-valid method of assessment is presented, and its utility in real-world assessment and program design illustrated in one case. To begin, literature about return to productivity roles for people who have HIV/AIDS and HAND is reviewed.

2. HIV/AIDS, Productivity Roles & Participation
Loss of productivity roles, regardless of whether these are associated with paid or unpaid employment, volunteering, in-house work or participation in education and training to achieve productivity outcomes, is prevalent among people with HIV/AIDS [13, 21]. Perceived and real barriers to returning to work
are numerous and may be person-based and/or context-based. Person factors include, for example, lack of confidence, fear, unstable health and specific health complaints, loss of skills, loss of habits and routines associated with being productive and medication side-effects. Contextual factors that pose barriers to return to work include, for example, lack of support, workplace discrimination and the effect of work on income benefits [18, 34, 38, 54, 55, 66, 85]. Braveman, Levin, Kielhofner and Finlayson [19] described these in detail in their review of the literature for the period 1995-2005.

Programs to assist people living with HIV/AIDS return to productive participation have been reported [36, 54, 55, 91] and typically involve a group process approach that includes education, counselling and peer group support. Kielhofner, Braveman, Fogg and Levin conducted the first controlled study of a program that was based on an occupational therapy practice model and a social model of disability. This program (Enabling Self-Determination (ESD)) was built on Employment Options, a program that was previously found to be successful [17]. It included group sessions focused on educating participants about issues associated with return to work (managing personal health, developing skills and habits for independent living, developing time management and communication skills, building vocational confidence and skills and learning self-advocacy) [47, p.38]. Individual sessions focused on identification and development of individual goals and plans for employment. Sessions were carried out by occupational therapists with peer mentors co-leading some groups. Positive results were obtained with the ESD program: participants showed significantly higher levels of participation and productive engagement on measures used [47]. Egan and Hoagland [36] described programs that involved the establishment of in-house job opportunities (receptionist, kitchen work and maintenance work) at three urban residential community organizations who provide transitional/supportive services for persons with HIV/AIDS that were formerly homeless and are now interested in becoming more self-sufficient. Although limitations exist with the programs reported, the model of in-house work provides productive participation options for people living with HIV/AIDS that otherwise might not exist.

In addition to the perceived and real barriers impacting on productivity roles and participation in people living with HIV, but without HAND, the cognitive impairments present in HAND impact significantly on one’s capacity to be productively engaged. Heaton and colleagues [43] report that in a sample of 289 HIV+ men, those with HAND (including those with mild impairment) were three times as likely to be unemployed than those without HAND [45]. Albert and colleagues [1] found that neuropsychological impairment predicted unemployment over and above medical symptoms in a prospective study of employment among men with HAND. In recent research [79], the rate of unemployment associated with
HAND was found to be higher than in HIV+ people without HAND and closer to that of people with schizophrenia, which is known to be high [16, 57]. Other functional limitations that have been associated with HAND include: an increased incidence of driving accidents [53], problems in everyday living and quality of life [12] and difficulty managing medications [2, 46]. While some of these activities are more typical of personal care and instrumental activities of daily living (IADL) [49] than work tasks, per se, they fit within the routines required for one to be productive in any context.

Descriptions of programs to assist those with HAND return to productive participation have not been found. In the only related study, Neundorfer and colleagues [60] investigated the effectiveness of a two month program involving Spaced Retrieval coupled with the use of external memory aids in ten men over 50 years of age who had been identified as having memory and executive function deficits on neuropsychological testing. All participants in this study reported that the program helped them achieve two self-selected functional goals; including remembering to take medications and remembering clinic appointments. The potential for this type of intervention to help persons with HIV adhere to treatment regimens was acknowledged. Programs referred to previously which utilize a group education process, the ESD program described by Kielhofner and colleagues [47], or the in-house work opportunities described by Egan and Hoagland [36], may be effective with those who have mild neurocognitive disturbance (MND), but their use with those who have frank dementia is uncertain.

3. Neurocognitive impairment in people with HAND and predicting participation

The design of any program for people with HAND requires an understanding of the defining characteristics of the neurocognitive impairment, how these are identified and how impairment impacts on productivity roles and performance. The neurocognitive disturbances that result from HAND have been comprehensively described and categorized as falling within the domains of attention and speed of processing, learning and memory, verbal language skills, psychomotor abilities, executive functions (including abstract ability), and other neurocognitive functions; such as, sensory-perceptual skills [4, 41, p.34-38, 71]. Examples of neuropsychological and psychomotor tests that may be used to document impairments in these ability domains have been identified [41 p.46-47] and an outline of criteria for classifying HIV related neurocognitive disorders created [41 p.46, 74]. Others have developed a computerized cognitive test battery to screen for cognitive impairment in people living with HAD [30]. The neuropsychological methods of assessment, such as those identified by Grant [41] above, are reported to be reliable and valid assessments of the cognitive behaviors affected by HIV disease and its treatment, and as such, are now recommended to form part of the assessment of people
suspected of having HAND [4]. Specifically, Grant asserts that these neuropsychological tests assess, “the actual relevant product of the brain: the abilities to perceive, evaluate, decide, act, and remember” [41, p.43]. All of these processes are critical to function optimally in real world contexts.

Although neuropsychological assessment is recommended in the management of people with HAND, questions remain about the capacity of these assessments to predict real-world functioning in home or productivity contexts, and a need for this remains [44, 71, 75]. Typically, impairment of everyday functioning is assessed by self report or report of a knowledgeable informant, or by assessments of instrumental activities of daily living (IADL) [4, 44, 88]. Methods used to assess IADL include The Lawton Instrumental Activities of Daily Living Scale [49] or the Direct Assessment of Functional Status (DAFS) [52]. However, these were designed for use with elderly clients who have Alzheimer’s type dementia, and are reported to be insensitive to the problems experienced by some with HAND, especially those with MND [44]. The degree to which neurocognitive impairment impacts on tasks and routines that contribute to or enable one to fulfill productivity objectives remains uncertain.

To address this gap in knowledge and practice, Heaton and colleagues [44] designed and carried out a comprehensive study to evaluate the functional, or real-world, impact of HAND in a group of 267 HIV-infected individuals. All participants were evaluated on standard neuromedical measures and a battery of neuropsychological tests that covered the domains mentioned earlier, including: verbal skills, attention/working memory, speed of information processing, learning, memory (delayed recall), abstraction/executive functioning, and motor skills. In addition to these, all participants were assessed on functional measures that included: 1) objective, laboratory-based tests of the capacity to perform tasks that are important in everyday living (IADL), and 2) reports of everyday functioning outside of the laboratory (Manifest Functioning) [44, p.320].

The laboratory-based measures of function consisted of some previously established standardized work samples and vocational measures (MESA SF2 [83] and COMPASS [84]), subsets from the Direct Assessment of Functional Status (DFAS) (Financial skills - calculating currency and balancing a checkbook, and Shopping - selecting items from a previously presented grocery list) [52], and revisions to an established test of medication management (Medication Management Test) [2]. New test administration and equipment protocols were established for the Advanced Finances test (paying fictitious bills and managing a fictitious checkbook) and the Cooking test (follow recipes and coordinating a meal).

Manifest functioning, that is, the self-report of everyday functioning outside of the laboratory, was assessed by means of two
questionnaires. The Patient’s Assessment of Own Functioning Inventory (PAOFI) [29], in which a participant reports the frequency with which s/he has difficulties with memory, language and communication, use of his/her hands, sensory-perception, higher level cognitive and intellectual functions, work and recreation [44], was used. Most also completed a modified version of the Lawton and Brody IADL Scale [49] which asks about the degree to which a person functions independently in the areas of financial management, home repair, medication management, laundry, transportation, grocery shopping, comprehension of reading/TV materials, shopping, housekeeping, cooking, bathing, dressing and telephone use.

Results from this study demonstrated that those with neuropsychological impairment (n=99) performed significantly worse on all laboratory measures of everyday functioning compared to those without neuropsychological impairment (n=168). Analyses also revealed that the neuropsychological domains of Abstraction/Executive Function, Learning, Attention/Working Memory and Verbal abilities most strongly and consistently predicted failures on the functional battery. Further, both neuropsychological impairment and impairment on the functional battery were significantly associated with subjective experiences of cognitive difficulties, as well as unemployment and dependence in activities of daily living.

This study makes a significant contribution to the body of knowledge about neuropsychological impairments and real world home and productivity performance in men with HAND. Concurrent validity between the laboratory-based IADL and vocational measures and the neuropsychological measures was demonstrated and this provides early evidence that neuropsychological testing may predict functional impairment. The functional battery used in this study may also supplement neuropsychological testing in future studies where the predicted functional impact of impairment is questioned, or in laboratory studies that aim to identify functional changes that occur as a result of changes to medication regimens.

Limitations remain, however, for health professionals, such as occupational therapists and others, who are engaged in the design of programs aimed at enhancing productivity participation for people living with HAND. First, this study was not designed to inform or guide intervention; it was designed to determine whether neuropsychological impairments are associated with limitations in the performance of functional activities. Second, the laboratory-based measures of function were used to identify that activity limitations exist under these conditions, not to associate specific limitations with specific neuropsychological impairments. This provides less information of use to therapists and others engaged in providing services to clients. Third, laboratory-based measures of function may or may not
correlate with performance and participation in the real world under naturalistic conditions. This study attempted to address this by including an assessment based on self-reporting, and an association was found between impairment on both the neuropsychological testing and the functional battery and the subjective experiences of problems in the real world. However, objective assessment of real-world performance did not occur. Finally, this study focused on selected IADL and vocational skills only. Many clients seen by therapists and other health care workers have difficulty with basic activities of daily living or have a need or desire to perform IADL and vocational tasks not assessed by this functional battery. The standardization and structure of the battery does not cater for changes based on the individual needs and desires of the person being assessed. A need remains for ecologically valid measures that can be used across a range of impairment levels and that can be personalized to the needs, capacities and realities of life for the individuals being assessed [42, 75]. One such measure exists: The Perceive, Recall, Plan and Perform System of Task Analysis [27].

4. The Perceive, Recall, Plan & Perform System of Task Analysis
The Perceive, Recall, Plan & Perform (PRPP) System of Task Analysis is an assessment and intervention system first reported in the literature over ten years ago [26]. It is one of the assessment and intervention systems associated with the Occupational Performance Model (Australia) (OPMA)[24] -- a conceptual illustration of factors impacting on occupational performance and is representative of the domain of concern of occupational therapy. The PRPP Assessment part of the System is a standardized, criterion-referenced measure that examines the effectiveness of cognitive strategy application within the context of everyday task performance. It is an ecological assessment: performance is assessed on tasks of relevance to the person and in contexts where performance typically occurs. The PRPP Intervention part of the System is structured around principles of systematic instruction to improve task performance and incorporates cuing and prompting systems that target specific cognitive strategy application impairments [28].

Criterion-referenced measures are used to determine a person’s competence in a particular set of skills, abilities or knowledge; that is, what they, “can do and what they know, not how they compare to others” [3, p.102]. The quality of achievement is measured against individual standards set by the client situation [50]. Performance that meets expected levels is referred to as competence, skill or mastery. The underlying assumption of the assessment is that cognition makes an indispensable contribution to a person’s competence, skill or mastery in performing tasks and routines, and that a person’s capacity to process the cognitive demands inherent in everyday tasks can be identified and used to determine the need for occupational therapy intervention [26]. The PRPP Assessment is distinct from other
functional evaluations using task observation; for example, The Árnadóttir Occupational Therapy Neurobehavioural Evaluation (A-ONE) [6], the Kitchen Task Assessment (KAT) [11] or the Assessment of Motor and Process Skills (AMPS) [37] in its synthesis of an information processing perspective of cognition and occupational performance.

The PRPP Assessment is considered to be a standardized measure as it meets the criteria of uniform procedures for administration and has a scoring rubric that is representative of client performance [15]. It is designed for use with adults and children, and is not gender, culture or diagnosis specific. Research reported in which the PRPP Assessment was used include some conducted with people who have traumatic brain injury [40, 61, 62] and schizophrenia [7, 8, 77], and on tasks such as return to driving following cerebrovascular accident [78]. Research is currently being carried out using this measure with children who have learning difficulties, typical preschool children and adults with dementia. The effectiveness of the PRPP Intervention has recently been demonstrated in adults who are in the agitated phase of recovery from traumatic brain injury [63].

The PRPP Assessment is a two-stage process (Fig 1). Stage One employs standard behavioral task analysis methods to determine how well a person performs procedures or steps of given tasks [48]. The task or routine is selected based on the needs and desires of the person being assessed. The steps are identified, the naturalistic context in which the assessment will take place is determined and a criteria is set for performance in that context. The choice of context for performance is flexible but is typically the real world context where the task or routine being assessed occurs. Performance is scored by denoting errors in performance using a set error typology. Errors include: errors of omission (the step is omitted), errors of accuracy (the step is performed inaccurately), errors of repetition (performance of the step is repeated unnecessarily) and errors of timing (the time taken to perform the step is excessive or insufficient). Stage One yields data from which a global estimate of error free performance is calculated and expressed as a percentage score [27]. Error impact scores may be calculated by error typology and expressed as an impact percentage score. Scores from Stage 1 are used to establish a baseline measurement of mastery useful in subsequent outcome measurement. Scores are also used to guide the focus of intervention relative to error typologies impacting on mastery.

Stage Two of the PRPP Assessment (Fig 1) focuses on assessing the cognitive behaviors applied during the performance of the Stage One task or routine. This part of the assessment is based on cognitive task analysis procedures. Cognitive task analysis is a family of analysis methods that describe the cognitive processes underlying the performance of tasks and the cognitive strategies used to respond...
adeptly to complex situations [58, 76]. The conceptual view of cognition on which the PRPP Stage Two is based (Fig 2) is derived from an information processing perspective. It is illustrated as a model and adapted from one used in the field of instructional design to explain the process of learning tasks in the workplace [72].

The PRPP Stage 2 assessment conceptually divides cognitive processing strategies used during task performance into four categories: Perceive (behavioral strategies used to attend and gathering sensory information and to form highly discriminative sensory pictures of oneself and the task environment), Recall (behavioral strategies reflecting the processes associated with information storage, recognition and retrieval), Plan (behavioral strategies associated with making plans, decisions and judgments about the nature and quality of performance) and Perform (behavioral strategies for carrying out and adjusting performance). These are depicted as the central ‘Quadrants’ in the PRPP System. Each Quadrant is further broken down into more specific ‘Sub-Quadrants’ of cognitive processing (Fig 2 middle ring). ‘Descriptors’ are the test items on Stage 2 of the PRPP Assessment (Fig 2 outer ring). Descriptors specify particular cognitive processing strategies that are applied by people across all tasks.

On Stage Two of the PRPP Assessment (Fig 1) these descriptor behaviors are rated by an observer on a 3-2-1 scale relative to the extent to which they are judged to contribute to effective performance or mastery on Stage One of the assessment. A score of ‘1’ is assigned when that behavior is absent or inadequate; ‘2’, when the behavior is observed as present but inconsistent or requiring prompts; and ‘3’, when the behavior is observed to be present, consistent and effective for the particular task. Raw scores can be converted to percentage scores that reflect Sub-Quadrant or Quadrant cognitive processing during task performance. Typically with criterion-referenced measures, scores above 85% indicate effective performance [35].

Although the use of the PRPP System of Assessment is expanding in clinical practice and research, the measurement properties of the measure have not been widely published. Early research conducted by Chapparo and Ranka [23] demonstrated high agreement among six testers in identifying the breakdown of steps in Stage 1 for dressing, hygiene, and meal preparation tasks in normal adults. Acceptable to high interrater and intrarater agreement was obtained in the identification of Stage 1 errors in a sample of clients with acquired brain injury, along with high evidence of face and content validity using a panel of experts [23]. Internal consistency of items in each quadrant has been reported as high [39], and interrater and test-retest reliability across a number of studies ranges from 0.64 to 0.99 [51, 59, 64, 65]. Studies using the PRPP System of Task Analysis have demonstrated agreement between PRPP quadrant and subquadrant scores and
neuropsychological measures of cognition in adolescents with early psychosis [77], and between PRPP quadrant and subquadrant scores and measures of cognitive play in normal and learning disabled children when raters were blind to the purpose of the study [14].

The validity and utility of The PRPP System with men who have HAND is currently being investigated in a sample of 30 men living in the Sydney metropolitan area who have been diagnosed with HAD [67-69]. Eight men reside at home, 10 men reside in a supported living context and 12 men are in residential care. The tasks assessed are determined by the individual needs of the participants and assessment is occurring in contexts where task performance would typically occur. One participant in this study has been selected for presentation here to illustrate the use of the PRPP System to assess productivity role performance with people who have HAND. Ethical approval to conduct this research was obtained from the Sydney Southwest Area Health Service ERC Protocol No X06-0148 and the University of Sydney HREC Ref. No. 9729.

5. Case Illustration

Tom (pseudonym) is a 52 year old man with HIV associated dementia who lives in a residential care facility for men with HAD. The facility is located in a Victorian-era mansion in an established neighborhood and retains its home-like atmosphere with the exception of the locked front and back gates. Residents of this facility are men who have a range of cognitive and functional abilities but have all been identified as being unable to manage personal finances or medication regimens. Most have restricted access to the open community because of their cognitive impairments: they can leave the premises but must be supervised. Some can manage personal care without assistance and are able to maintain their own rooms. Others require assistance with basic activities of daily living and have their rooms maintained by care workers. Many need regular nursing care. Tom has lived in this facility for six months. He is able to manage personal care tasks independently, assists with housekeeping for his own room and has limited unsupervised access to the community. Prior to his decline in cognitive functioning, Tom worked as a mail sorter in the customs department at an international airport and was a handyman in his home neighborhood. He has not worked for eight years.

Tom’s personal productivity goals revolved around in-house work: buying small quantities of groceries at the corner store from shopping lists prepared by other residents and the kitchen staff, sorting laundry to assist housekeeping staff and ironing shirts for himself and others. Grocery shopping was his first priority because it involved going off the premises. Tasks and routines identified as critical to Tom achieving this personal productivity goal included: safe navigation to/from the corner store, accurate selection of groceries, accurate handling of money, accurate accounting for money spent, safe transport of groceries and accurate
sorting of groceries by list. To begin, the process was narrowed to selection of groceries from one list. The list prepared consisted of specific products from recognizable brands that would each be located in different parts of a store but would all be visible. The items included one can of tuna with herbs, one tub of butter, one bottle of cooking oil and two onions. The list was reviewed with Tom and he expressed confidence in his ability to complete the task. The mastery level was set at 100% as this was deemed realistic for someone who would be a volunteer shopper for others. Tom’s occupational therapist accompanied him to the store and was present for the assessment but took on a casual, friendship role and did not intervene unless prompting was required.

The naturalistic context in which the assessment took place was the corner store near Tom’s residence. This store is a small, but well stocked, local shop selling food, newspapers, cigarettes, lottery tickets, etc. There is no food preparation area or hot food for sale. The groceries are displayed around the inside perimeter of the store and on both sides of two aisles. At the back of the store there are two cold storage display cabinets with glass doors, one frozen food cabinet and one small free-standing wire shelf unit that displays bread and fresh, long life produce. The cashier is the shop keeper who stands on an elevated platform behind additional display shelves. There is no conveyor belt or bar code scanning system; groceries are handed to the cashier. Prior approval for the assessment to occur was obtained from the store owner.

PRPP Stage One assessment results (Fig 3) revealed that Tom’s mastery of the task was 28.6%; only four of the 14 major steps of selecting groceries (four items) from a list were performed without error. These included getting the basket and placing each of the items in the basket to transport them to the cashier. The highest numbers of errors made during performance were errors of timing (eight of 14 steps = 57.1%). Tom took 24 minutes to complete the task of selecting the groceries and transporting them to the cashier; most time spent was on checking his list and finding the items. He omitted finding one of the items, consequently storing and transporting it was also an omission (14.3% errors of omission). Of the three remaining items, Tom found the sections where these items were located without prompting but initially made incorrect selections (28.6% errors of accuracy). He spent considerable time studying items in view and moving items of the type he was looking for around on the shelf but none of these were the specific items on the list. All of the items were clearly visible but Tom’s actions associated with moving items around concealed some of them. Tom eventually found items but needed prompting for where to look and what to look at in order to identify whether the item was the correct one or not. When Tom indicated he was finished, he checked his list and confirmed his choices. It was not until this point that he realized an item was omitted.
His performance for the eventual completion of this step was similar to that for the completed part of the task. That Tom completed 28.6% of the task without error and only omitted 14.3% of the task suggests that he may improve in his mastery of this task and assume some dimensions of a productivity role associated with being a volunteer shopper. The PRPP Stage Two Assessment yielded additional information about why Tom made these errors.

Insert Fig 4 here

Tom’s performance of the task was also assessed on the PRPP Stage Two Assessment. Individual ‘Descriptor’ scores were summed by Sub-Quadrants to determine the pattern of information processing strategies Tom had difficulty applying to the task of selecting groceries from a list. These are illustrated in a radial graph (Fig 4) in the same configuration as the PRPP Assessment Stage Two conceptual model (Fig. 2). The outer dotted line represents the expected performance. In this case, 95% was set as the processing behavior criterion expected. Tom was expected to have sufficient ability to meet the demands of the shopping task and to apply these behavioral strategies as he performed the task. The inner dashed line illustrates Tom’s performance.

Tom’s errors of timing, accuracy and omission on the PRPP Stage One are explained by his lower than expected performance on all domains of the PRPP Stage Two. The biggest impact on performance were from Tom’s difficulties in the Perceive Quadrant operation of Sensing (44%) and the Plan Quadrant operations of Mapping (33%) and Evaluating (33%). Scores in the Perceive Quadrant reflect that Tom was able to notice (notices) sensory changes in the context and maintain his attention (maintains) for the duration of the task, but had considerable difficulty changing the focus of his attention (modulating) from broad to narrow, and from one part of the visual field to another: Tom stared at his list and at items on the shelf and needed prompting to broaden the field he was attending to. This was associated with difficulties he had in Sensing operations. Tom did not systematically search (searches) the shelf for items that he needed and had difficulty locating (locates) the items he was looking for. Once Tom found an item on his list, he had difficulty making the visual discriminations needed (discriminates) to select one item that was stacked amidst many, and to differentiate between subtle features in the packaging of similar products.

Scores in the Recall Quadrant were lower than expected but reflect knowledge that Tom does have and may use to improve his mastery on the shopping task. Tom used knowledge of product groups (categorizes) to assist him in finding the location of products in the store. He knew what products were (recognizes), but needed confirmation as to whether he was correct. This may be associated with difficulties he experienced in reading the labels on packages, despite wearing glasses. Tom was able to contextualize his performance within
the store (*contextualizes time and place*) but not to duration (*contextualizes to duration*). He was not aware of the time he spent on the individual steps of the task or of the total time spent on the task. Tom did use knowledge about his body (*uses body*) and objects (*uses objects*) to remain safe and use items appropriately (eg. the basket), but re-traced his steps frequently and needed prompting about what the next step was (*recalls steps*).

Plan Quadrant scores reflect that Tom knew the goal (*knows goal*) of the task but had difficulty identifying obstacles (*identifies obstacles*) beforehand and during the task; for example, that items may be obscured by moving them around as he did. He approached the task in a step-wise manner rather than in an organized (*organizes*) manner and this resulted in him spending more time than necessary on the task. Tom ultimately chose (*chooses*) the items on his list but needed prompting and omitted one item. He did not construct a sequence (*sequences*) that was efficient and effective in accomplishing the goal, but his calibration of actions to fit the context was without error (*calibrates*). Throughout the task, Tom did not question his own performance (*questions*) but relied on feedback from the therapist. He did not attempt to analyze the cause of difficulties he experienced (*analyzes*) and judged that his performance was at the level required for someone in the role of volunteer shopper (*judges*).

Scores in the Perform Quadrant illustrate Tom’s abilities to use strategies needed to act on his decisions and complete the task. He was able to start (*starts*) but did not stop (*stops*) himself from moving items around on the shelf for extended periods. His performance flowed (*flows*), he continued through the task (*continues*) and persisted (*persists*) in finding items even though it was difficult, but he stopped before he was finished (*continues*). Tom was slow to carry out the steps and the task (*times*), and had occasional difficulty manipulating products and the basket simultaneously (*coordinates*) but he did not drop anything. He made necessary changes to his actions when required to manipulate groceries and navigate through the crowded spaces in the store (*adjusts*).

PRPP Stage One Assessment findings were used to set short-term goals associated with the productivity role Tom wished to assume. One goal was that Tom will achieve 50% mastery of the task within one week; specifically, that he will accurately select two items on a comparable shopping list, and that he will complete the task within 10 minutes. Attainment of these goals is predicated on a program that will improve his accuracy and increase the fluency of his performance. To achieve this, a PRPP intervention program was designed that focused on developing strategies Tom would use to improve his capacity to process the demands of the task within the naturalistic context that these strategies are to be applied. This included the use of specific prompting systems to develop Tom’s ability to gather sensory information, retain and use knowledge about the
task, plan a strategy, question whether he is keeping to plan, and judge whether he has performed to expected levels. The program of intervention is beyond the scope of this paper.

Summary and Relevance:
HIV Associated Neurocognitive Disorder (HAND) remains an impairment of concern to people living with HIV/AIDS and to health professionals alike. The consequences of HAND, especially the sub-types, MND (Mild Neurocognitive Disorder) and HAD (HIV Associated Dementia), to retention of productivity roles is profound with high rates of unemployment reported. It can be expected that those with the sub-type, Asymptomatic Neurocognitive Impairment (ANI), fear this consequence. Significant advances in laboratory and other methods used to diagnose HAND have occurred and specific neuropsychological impairments associated with HAND have been identified. Laboratory-based methods to assess the impact of these impairments on vocational and instrumental activities of daily living (IADL) demonstrate that the impact is real. Low scores on certain measures of neuropsychological impairment can also predict low scores on these measures of vocational ability and IADL. The utility of these findings to future studies that seek to predict that activity limitations from neuropsychological assessment has been described, as well as, the utility of these findings to future studies, where medication effects are the focus of investigation.

Questions remain, however, about the real-world impact of HAND on a person’s ability to participate in productivity roles and carry out the associated tasks and routines in naturalistic contexts. The high rate of unemployment that exists in men with HAND raises questions about the need for health professionals to consider alternative productivity pathways; such as volunteering and in-house work. Valid and reliable assessment methods with accepted standardization rigor but flexible in task selection and conditions are needed.

This article presents one assessment, The Perceive, Recall, Plan & Perform (PRPP) System, which meets these criteria and addresses the gap that currently exists in practice. Grant [41] asserts that neuropsychological tests used with people who have HAND assess the product of the brain; eg. the brain’s ability to perceive, evaluate, decide, act and remember. The PRPP System assesses the capacity of the person to use these products of the brain within the context of daily life participation. The findings from this assessment provide health practitioners with the detail needed to design intervention aimed at achieving real world participation and to measure outcome.

The case study presented in the paper illustrates the use of the PRPP System with a man who has HIV Associated Dementia. Its use with people who have milder forms of impairment, for example Minimal Neuropsychological Disorder, is also being investigated. The choice of tasks and routines being assessed
with clients who have MND and the contexts in which assessments are taking place are more complex. For example, they include tasks associated with being a commercial cleaner, a purchasing officer and a fashion designer. Limitations exist in the utility of the PRPP System in that training is required to ensure reliable measurement. Publications are in press and training opportunities exist in various parts of the world. Second, as with any assessment, time is required to administer the PRPP System. The ecological nature of the method, however, answers questions of real world impact and so reduces the need for further assessment of this. Directions for future research include using this instrument to measure intervention effect, examining correlations between PRPP results and results from neuropsychological testing, using the PRPP System in cross cultural contexts, and assessing women and children who have HAND.

References:


Available:
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(Available from: Occupational Performance Network / The University of Sydney, Lidcombe, NSW), 2006.
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Chapter 3: Pilot Study


### THE PRPP SYSTEM SCORING SHEET

<table>
<thead>
<tr>
<th>STEPS</th>
<th>ERRORS</th>
<th>STAGE ONE ANALYSIS: CRITERION %</th>
<th>STAGE TWO ANALYSIS RATING</th>
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<td>ATTENDING</td>
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<td>Adjusts</td>
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### Fig 1 The Perceive, Recall, Plan & Perform System of Task Analysis: Assessment Score Sheet [27]
Fig. 2 The PRPP System of Task Analysis: Conceptual model of information processing behaviors
**Fig. 3** PRPPAssessment Stage One results for tasks associated with the productivity role of volunteer shopper: Selecting groceries from a list.

<table>
<thead>
<tr>
<th>Steps</th>
<th>Expected Mastery: 100%</th>
<th>Errors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Acc</td>
<td>Om</td>
</tr>
<tr>
<td>Get basket</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check list</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Find 1st item</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Store &amp; transport</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check list (if needed)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Find 2nd item</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Store &amp; transport</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check list (if needed)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Find 3rd item</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Store &amp; transport</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check list (if needed)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Find 4th item</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Store &amp; transport</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Confirm selections</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

**Mastery: 28.6%** | 28.6% | 14.3% | 0%   | 57.1%
Fig. 4  PRPP Assessment Stage Two results for tasks associated with the productivity role of volunteer shopper: Selecting groceries from a list.
3.4 SUMMARY OF FINDINGS

- Task performance mastery can be measured in naturalistic contexts using the PRPP Assessment Stage One in PLWHA who have HAD.

- The PRPP Assessment Stage One yields information about the types of performance mastery errors made during occupational performance carried out in naturalistic contexts in PLWHA who have HAD.

- Information processing strategies used during occupational performance can be measured in naturalistic contexts using the PRPP Stage Two in PLWHA who have HAD.

- The PRPP Assessment Stage Two yields information about the types of information processing strategy application errors that impact on occupational performance carried out in naturalistic contexts in PLWHA who have HAD.

- The feasibility of using the PRPP Assessment in a larger study was demonstrated sufficiently to warrant its use in the next phase of the research.
CHAPTER FOUR

Phase Two: Descriptive Study - Methods

4.1 OVERVIEW

In this chapter, the methods used to carry out Phase 2 of the research, a descriptive study of the impact of information processing strategy application errors on occupational performance in a larger sample of men who have HAD, are presented. The research aims and research questions are re-stated, and the design of the study is presented. The participants, sampling process and recruitment procedures are described. Ethical approvals obtained to conduct the research are itemized. This is followed by a list of the instruments used in data collection, and the rationale for their use. The chapter ends with description of the data collection process and the procedures used to analyse the data.

4.2 AIMS OF THE RESEARCH

As stated in Section 1.5, the aim of the research was to gain an understanding of how cognitive impairments impact on the occupational performance of men whose impairments are the result of infection with the human immunodeficiency
virus (HIV) using an ecological measurement model, the Perceive, Recall, Plan and Perform (PRPP) System of Task Analysis (Chapparo & Ranka, 1997, 2005).

4.3 RESEARCH QUESTIONS

The following research questions guided this phase of the study:

4.3.1 Research Question 1
What levels of mastery do men with HAD demonstrate in performing everyday tasks in naturalistic contexts as measured by the PRPP System Stage One?

4.3.2 Research Question 2
What information processing strategy application errors are identified by the PRPP Stage Two in men with HAD as they perform everyday tasks in naturalistic contexts?

4.3.3 Research Question 3
What impact does the severity of HAD have on information processing strategy application errors identified by the PRPP Stage Two during the performance of everyday tasks?

4.4 RESEARCH DESIGN

This research was a descriptive study. In descriptive studies the researcher deliberately observes phenomena and then describes what was observed
Descriptive studies answer the questions of ‘what’, ‘where’, ‘when’, and ‘how’. They do not attempt to explain ‘why’ (Babbie, 2004). The PRPP Assessment was used to observe information processing strategy application errors impacting on everyday task performance carried out in naturalistic contexts. Scores obtained from the PRPP Assessment were used to critically examine the performance of the group and form descriptions of their performance. While explanations are offered for what the findings mean, the primary purpose of this first study in a line of research was descriptive, not explanatory.

4.5 ETHICAL APPROVAL

Ethical approval to conduct this research was obtained from the Sydney Southwest Area Health Service (SSWAHS) ERC Protocol No X06-0148 (Appendix V) and the University of Sydney (USyd) HREC Ref. No. 9729 (Appendix VI). Copies of the approved information and consent forms are presented in the Appendices:

- Information for Participants (Appendix VII)
- Participant Consent Form (Appendix VIII)
- Information for the Person Responsible (Appendix IX), and
- Person Responsible Consent Form (Appendix X).

4.6 PARTICIPANTS

4.6.1 Sample

The sample studied in this research consisted of thirty (N=30) English speaking HIV+ men with a diagnosis of HAD living in one of three home contexts in the
Sydney metropolitan area. Home contexts consisted of residential care, supported living, and at home with family or role partners. Those living in residential care (N=12; mean age 53 years) could no longer live without supervision and support from medical personnel. Some could not leave the premises unaccompanied or manage personal care independently. Others could walk short distances to local cafés or shops, maintain their own rooms and carry out simple chores.

Participants residing in a supported living context (group home) (N=10, mean age of 47 years) could no longer manage personal finances or medications but could still maintain their own room, cook simple meals and participate in the community on a limited basis. In addition to these indicators, those in supported living contexts had no other place to live. Those residing at home (N=8, mean age of 46.5 years) were also incapable of living independently but had family or partners who took responsibility for critical aspects of their care. Table 4.1 lists the number of men, age range and mean age of men, and the place of residence of men in the sample.

<table>
<thead>
<tr>
<th>Number</th>
<th>Age Range / Mean</th>
<th>Residence</th>
</tr>
</thead>
<tbody>
<tr>
<td>N=8</td>
<td>42 - 51 years / 46.5 years</td>
<td>At home</td>
</tr>
<tr>
<td>N=10</td>
<td>45 - 49 years / 47 years</td>
<td>Supported living</td>
</tr>
<tr>
<td>N=12</td>
<td>47 - 59 years / 53 years</td>
<td>Residential care</td>
</tr>
</tbody>
</table>

### 4.6.2 Sampling method

A purposive sampling method was used to identify the potential participants in this research. Purposive sampling is, “a type of non-probability sampling in which the [researcher] selects the units to be observed on the basis of [his/her]...
own judgment about which ones will be the most useful or representative” (Babbie, 2004, p.183). Typically, purposive sampling is a method used when the situation does not permit the selection of a random sample. The criteria used to judge suitability of the potential participants was guided by the literature and the research questions. Both inclusion and exclusion criteria were established.

4.6.2.1 Inclusion criterion: Diagnosis of HAD
A diagnosis of HAD was a primary inclusion criterion. Confirmation of the diagnosis was collected by the treating occupational therapists treating from statements recorded in the medical records of each person by their attending physicians.

4.6.2.2 Inclusion criterion: Male
As reported in Section 1.2, little is known about the specific neurocognitive manifestations of any of the syndromes of HAND in women. What has been reported indicates that the pattern varies from that of men (Ojikutu & Stone, 2005; Poundstone, Chaisson, & et al, 2001). To eliminate confounding factors associated with gender, only males were recruited. Few women with HIV/AIDS were being seen by occupational therapists in the recruitment area. No women with HAD were identified by the occupational therapists involved in this research.

4.6.2.3 Inclusion criterion: English language fluency
The PRPP Assessment is not limited for use with English speaking people only. It was determined, however, that recruiting people with dementia who were not
fluent in English might pose problems for the participants and the research process. Although interpreter services were available, it has been reported that communicating through an interpreter might compromise research (Pan, n.d.) (Altarriba & Santiago-Rivera, 1998) by adding a fourth person to the naturalistic contexts where observations took place. To eliminate the possibility of the research causing more confusion for the participants, only English speaking people were recruited.

4.6.2.4 Exclusion criterion: Cognitive impairment from a cause other than HAND
As reported in Section 2.4, there are multiple causes of neurocognitive impairment in PLWHA. These include for example, progressive multifocal leucoencephalopathy (PML), toxoplasmosis, and cryptococcal meningitis. Participants were excluded if they had any history of neurological disorders that produce cognitive impairment, or if the cause of impairment might be explained by reasons other than HAND.

4.6.2.5 Exclusion criterion: Substance abuse
Drug and alcohol abuse are factors that have confounded previous studies about the impact of neurocognitive impairment on everyday life, and exclusion criteria established (Heaton et al., 2004). People recruited for this study had no record of excessive alcohol consumption, marijuana use, or of cocaine, heroin, methamphetamine, methylenedioxymethamphetamine (MDMA) use, or the use of any other hallucinogenic or ‘street drug’ for six months prior to data collection.
4.6.3 Recruitment process

People receiving occupational therapy services who met the above criteria were identified by the occupational therapists who participated in the Phase One of the research (Chapter Three). Thirty five (N=35) people were identified over a twelve month period, all with a diagnosis of HAD. The purpose of the study was explained by the occupational therapist and/or another health professional involved in the care of the person. In instances where the capacity of the person to consent was questioned, a person responsible was identified, and telephone contact was made by the OT or health professional. The purpose of the study was explained to persons responsible, and hard copy versions of the Information for the Person Responsible and Person Responsible Consent form were sent via surface mail. Consent was received for thirty five potential participants, including consent for videotaping.

Subsequently, five people were excluded. Two people were excluded because they had current recorded instances of drug use. One person moved out of the metropolitan region before data collection commenced. Two others were discovered to have a diagnosis of PML. This resulted in the sample size being reduced from 35 to 30 (N=30).

4.6.4 Severity of dementia

The Clinical Staging of the AIDS dementia complex (CSADC) (Price & Brew, 1988) described in Section 2.5 and presented in Appendix II, was used as a measure of the severity of HAD. The CSADC is a five-level staging of AIDS...
dementia complex (now referred to as HAND). The CSADC is a continuous measure with a scoring rubric ranging from 0.5 to 4 on the continuum of dementia (HAD). It is administered through a clinical appraisal of activities of daily living capacity. This tool was selected because the results of other tests used to diagnose HIV-1-associated dementia (HAD) reported in Chapters One and Two (eg. CD4 T-cell counts, viral loads and NP test scores) were not consistently present in the medical records of participants. Information that was available was not always current.

The occupational therapist working with each participant assigned a CSADC stage of HAD using published indicators (Brew, 1999; Brew, Rosenblum, & Price, 1988; Jackson, 1995; Price & Brew, 1988; Zacka, 1995). Each allocation made was confirmed by the team leader responsible for the care of each client as a true reflection of that person's capacity and performance in activities of daily living. Therefore, the scores assigned were deemed to be a true reflection of the severity of HAD as defined by the CSADC. Twelve (N=12) men were appraised as having mild dementia, fifteen (N=15) men were appraised as having moderate dementia, and three (N=3) men were appraised as having severe dementia. Table 4.2 illustrates the distribution of the sample by CSADC score and the home contexts in which participants lived. Apparent is the inconsistency between CSADC scores and the home contexts of participants. Of the men with CSADC scores of 1, eight (N=8) were living at home while four (N=4) resided in a supported living context. The reason for this distribution is that those with mild dementia who resided at home, had family or role partner support at home. Those
with a score of 1 and residing in a supported living context did not have this level of family or role partner support. Similarly, those with a dementia score of 2 and living in residential care facilities were functioning at a higher level than those with a score of 3 but were unable to live without 24 hour supervision and medical care. The severity of dementia and home context goals influenced the choice of occupations assessed.

**TABLE 4.2. Distribution of participants by CSADC score and home context**

<table>
<thead>
<tr>
<th>CSADC Score</th>
<th>At Home</th>
<th>Supported Living</th>
<th>Residential Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild Dementia (N=12)</td>
<td>N=8</td>
<td>N=4</td>
<td>N=0</td>
</tr>
<tr>
<td>Moderate Dementia (N=15)</td>
<td>N=0</td>
<td>N=6</td>
<td>N=9</td>
</tr>
<tr>
<td>Severe Dementia (N=3)</td>
<td>N=0</td>
<td>N=0</td>
<td>N=3</td>
</tr>
</tbody>
</table>

**4.7 INSTRUMENTS**

**4.7.1 The Perceive, Recall, Plan and Perform System Assessment**

The Perceive, Recall, Plan and Perform System Assessment (PRPP Assessment) is a client-centred, criterion-referenced, ecological assessment of occupational performance described previously in Sections 2.7.3.2 and 3.3.5. It was used in this study to gather data about task performance mastery, mastery errors and information processing strategy application behaviours used during occupational performance. Appendix XI contains a copy of the PRPP Assessment score sheet.
Stage One of the PRPP was used to embed data collection within performance of the everyday occupations that were of relevance to the person assessed, and to gather data about their task performance mastery levels. Stage One employs standard behavioural task analysis methods. Tasks are broken down into the steps to be performed. The person is then observed performing the task, and errors in performance defined by the instrument (Accuracy, Repetition, Omission, Timing) are recorded on the score sheet. A percentage score depicting the total amount of error-free performance is calculated (error-free steps/total steps) yielding a total mastery percentage score.

The steps where errors are made are then examined to determine the how many errors of each type were made. Error percentage scores are calculated by counting the number of steps of the total task that were affected by an error type, and dividing this by the total number of steps (steps with accuracy errors/total steps; steps with repetition errors/total steps; steps with omission errors/total steps; steps with timing errors/total steps). This process yields information about the degree to which task performance is impacted on by specific types of errors. In this study, Stage One was used to generate a global estimate of error free performance expressed as a percentage score, and a quantification of the impact of error types on performance--also expressed as a percentage score.

Stage Two of the PRPP was used to collect data about the information processing strategy application capacity of each person as they performed occupations in the real world. Thirty four behavioural descriptors were rated on a 3-2-1 scale as
described in Sections 2.7.3.2 and 3.3.5. Appendix XII contains a list of the 34 descriptors and abridged definitions for each one. A score of 3 is assigned when a strategy application represented by a descriptor was effective. A score of 2 is assigned when a descriptor behaviour raised questions about safety, efficiency or performance effectiveness. A score of 1 is assigned when a descriptor behaviour contributed to the performance of steps on Stage One being unsafe or ineffective.

The Perceive and Perform quadrant raw scores can range between a minimum of 8 to a maximum of 24. Recall and Plan raw scores can range from a minimum of 9 to a maximum of 27. Raw scores can be converted into percentage scores. As with many criterion related measures, PRPP Stage Two Quadrant and Subquadrant Total scores falling above 85% have generally indicated performance that is effective (Aubin, Chapparo, Gélinas, Stip, & Rainville, 2009; Munkehetvit, 2005; Nott & Chapparo, 2007).

4.8 PROCEDURES FOR DATA COLLECTION

4.8.1 Validation of the researcher

The importance of researchers acculturating to facilities where people with dementia reside has been reported by many (Helström, Nolan, Nordenfelt, & Lundh, 2007; Sherrat, Soteriou, & Evans, 2007). These authors stress that where possible, researchers carrying out studies of people with dementia need to become part of the ‘fabric’ of a facility (Altarriba & Santiago-Rivera, 1998). Further, since this research was designed to investigate the typical performances of everyday tasks by people in naturalistic contexts, a familiarization process between the researcher and the participants was imperative. To prepare for data
collection, the researcher met all clients at least one week prior to data collection. In home and supported living contexts, the researcher accompanied the occupational therapist during routine therapy visits for two weeks prior to data collection. In residential care facilities, the researcher became a participant-observer during daily routines, outings and scheduled in-house activities for, on average, \( \frac{1}{2} \) day each week over the course of data collection. All participants recognized the researcher by the time they were assessed performing everyday occupations for research purposes, and her presence was judged by their primary carers to have not interfered with their usual performances.

4.8.2 Data collection process – PRPP Assessment

4.8.2.1 Occupations performed

Each participant was assessed with the PRPP Assessment on from one to four occupations. The variation in number of tasks assessed on each person is not unusual. Typical administration of the PRPP Assessment requires that therapists assess performance on from one to four tasks in order to gain a clear picture of performance (Chapparo & Ranka, 2006). In this study, the number of tasks assessed was also influenced by the participant’s expressed goals and the opportunities for assessments to occur.

The tasks assessed were individually determined. Participants expressed desires about what they needed or would like to do, and currently found difficult. Regardless of whether these tasks were previously performed easily and routinely or not, they now were difficult for the person to perform because of cognitive
impairment. When cognitive impairment resulted in an overestimation of ability, important tasks that were known by staff and/or carers to cause difficulties for participants were identified. In those with severe dementia, personal care or leisure tasks that formed part of that person’s daily routine or were available to them were assessed. In all instances, the person performing the task, had some nominated difficulty doing so and performed of his own free will. In total, 71 task observations occurred. Table 4.3 includes a list of the tasks assessed, the number of times each task was assessed and the home context of people assessed on each task.
TABLE 4.3: Tasks assessed in the study

<table>
<thead>
<tr>
<th>Task Code</th>
<th>Task Assessed</th>
<th>Number of Times Assessed</th>
<th>Home context of those assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Prepare/Wash face</td>
<td>N=2</td>
<td>Residential</td>
</tr>
<tr>
<td>02</td>
<td>Prepare/Brush teeth</td>
<td>N=1</td>
<td>Residential</td>
</tr>
<tr>
<td>03</td>
<td>Prepare/Eat cereal</td>
<td>N=2</td>
<td>Residential</td>
</tr>
<tr>
<td>04</td>
<td>Walk/navigate home from 4 blocks away</td>
<td>N=2</td>
<td>Residential</td>
</tr>
<tr>
<td>05</td>
<td>Make a party invitation</td>
<td>N=1</td>
<td>Residential</td>
</tr>
<tr>
<td>06</td>
<td>Help make a mosaic tile table top</td>
<td>N=2</td>
<td>Residential</td>
</tr>
<tr>
<td>07</td>
<td>Walk/navigate to café 6 blocks away</td>
<td>N=1</td>
<td>Supported</td>
</tr>
<tr>
<td>08</td>
<td>Sort/fold socks</td>
<td>N=1</td>
<td>Residential</td>
</tr>
<tr>
<td>09</td>
<td>Sort/fold towels</td>
<td>N=1</td>
<td>Residential</td>
</tr>
<tr>
<td>10</td>
<td>Assemble 2 item cold sandwich</td>
<td>N=2</td>
<td>Residential</td>
</tr>
<tr>
<td>11</td>
<td>Make a hot drink</td>
<td>N=1</td>
<td>Residential</td>
</tr>
<tr>
<td>12</td>
<td>Make toast and coffee</td>
<td>N=2</td>
<td>Residential</td>
</tr>
<tr>
<td>13</td>
<td>Prepare and bake frozen biscuit dough</td>
<td>N=1</td>
<td>Residential</td>
</tr>
<tr>
<td>14</td>
<td>Purchase 3 items from local corner store</td>
<td>N=4</td>
<td>Residential</td>
</tr>
<tr>
<td>15</td>
<td>Prepare/chop/mix salad</td>
<td>N=1</td>
<td>Residential</td>
</tr>
<tr>
<td>16</td>
<td>Stir-fry 5 item dish</td>
<td>N=1</td>
<td>Residential</td>
</tr>
<tr>
<td>17</td>
<td>Sort/wash/dry 1 load of clothes</td>
<td>N=1</td>
<td>Residential</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Supported</td>
</tr>
<tr>
<td>18</td>
<td>Order, purchase coffee for 3</td>
<td>N=3</td>
<td>Residential</td>
</tr>
<tr>
<td>19</td>
<td>Find numbers &amp; addresses in directories</td>
<td>N=2</td>
<td>Residential</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Supported</td>
</tr>
<tr>
<td>20</td>
<td>Change sheets/make bed</td>
<td>N=4</td>
<td>Residential</td>
</tr>
<tr>
<td>21</td>
<td>Sweep floor / empty ashtrays and trash</td>
<td>N=1</td>
<td>Residential</td>
</tr>
<tr>
<td>22</td>
<td>Find the shortest travel route on a map</td>
<td>N=1</td>
<td>Residential</td>
</tr>
<tr>
<td>23</td>
<td>Grocery shop for 5 items</td>
<td>N=5</td>
<td>Supported</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Home</td>
</tr>
<tr>
<td>24</td>
<td>Cook egg/toast breakfast</td>
<td>N=1</td>
<td>Supported</td>
</tr>
<tr>
<td>25</td>
<td>Find numbers, telephone for appointments and record time/dates</td>
<td>N=3</td>
<td>Home</td>
</tr>
<tr>
<td>26</td>
<td>Deposit money, withdraw cash at local bank &amp; complete accounting record</td>
<td>N=2</td>
<td>Supported</td>
</tr>
<tr>
<td>27</td>
<td>Use public transport to get to a known destination on time</td>
<td>N=4</td>
<td>Supported</td>
</tr>
<tr>
<td>28</td>
<td>Organise, prepare and record the first AM medication regimen</td>
<td>N=2</td>
<td>Supported</td>
</tr>
</tbody>
</table>

Total Observations
N = 71

Key: Home = At home; Supported = Supported Living; Residential = Residential Care
The spread in number of tasks assessed across the sample is illustrated in Table 4.4. Sixty percent of the sample was assessed on 2 tasks.

<table>
<thead>
<tr>
<th>Percent of the Sample</th>
<th>Number of tasks assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.3% (N=1)</td>
<td>1 Task</td>
</tr>
<tr>
<td>60.0% (N=18)</td>
<td><strong>2 Tasks</strong></td>
</tr>
<tr>
<td>33.3% (N=10)</td>
<td>3 Tasks</td>
</tr>
<tr>
<td>3.3% (N=1)</td>
<td>4 Tasks</td>
</tr>
</tbody>
</table>

### 4.8.2.2 Context of assessment

The context for each assessment was determined based on the task being assessed. In each instance, a naturalistic context where performance would typically occur was used. All assessments took place at a time that was convenient to the participant and when the occupational therapist could be present, as required by the ethics committees who approved this research. Any task that typically occurred at a specific time of day was assessed at that time.

### 4.8.2.3 Validity of the process

All performances were described by the occupational therapist as typical of client performance outside the assessment situation.

### 4.8.3 Scoring and reliability

Stage One Mastery and Error type, and Stage Two Strategy Application descriptor scores were assigned by the researcher during and immediately after each
assessment took place, consistent with the scoring protocol of the measure. Scores recorded were discussed with the occupational therapist present during data collection, who also was versed in the PRPP Assessment language and scoring system to confirm the values assigned. Reliability of scoring was examined on 10% of the assessments. Videotaped performances were assessed by a person skilled in administration of the PRPP Stage Two. Scores obtained by the independent assessor and the researcher were statistically compared. The proportion of exact agreement was .93 indicating items were scored reliably.

### 4.9 PROCEDURES FOR DATA ANALYSIS

All data obtained from the sample were de-identified, coded and entered into a Microsoft Office 2003 Excel spreadsheet for storage, retrieval and subsequent import into relevant analysis programs. A two digit number was assigned to identify each person. Additional personal data was entered next in the coding system. PRPP Stage One mastery percentages and error type values (%), and PRPP Stage Two scores (3-2-1) were then entered for each of thirty four descriptors for each task assessed for each person. Table 4.5 depicts the coding system adopted.

<table>
<thead>
<tr>
<th>Person number</th>
<th>CSADC Score</th>
<th>Home context</th>
<th>Task performed</th>
</tr>
</thead>
<tbody>
<tr>
<td>01-30</td>
<td>1 = mild</td>
<td>1 = at home</td>
<td>01 – 28</td>
</tr>
<tr>
<td></td>
<td>2 = moderate</td>
<td>2 = supported living</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 = severe</td>
<td>3 = residential care</td>
<td></td>
</tr>
</tbody>
</table>

**TABLE 4.5. Coding system for case information**
The data were then checked for accuracy and missing values. Missing data exists for the Attending Subquadrant descriptor, *Matches* (Perceive Quadrant), when the task performance observed does not require that sensory features of objects or body parts be matched.

### 4.9.1 Procedures to answer Research Question 1

Question 1 asked, *“What levels of mastery do men with HAD demonstrate in performing everyday tasks in naturalistic contexts as measured by the PRPP System Stage One?”*

Answers to this question were generated using descriptive analysis. The 71 task performance mastery scores obtained on the PRPP Stage One were reduced to one mean score per person. The same reduction process was applied to scores for each error type. The output data from this computation were analysed using descriptive statistics to identify the means, standard deviations and percentiles for mastery and errors. All performances were measured against a pre-determined criterion of 100% as reported in the PRPP Training Manual (Chapparo & Ranka, 2006), and consistent with other studies where the PRPP Assessment has been used (Aubin et al., 2009; Nott & Chapparo, 2007).

### 4.9.2 Procedures to answer Research Question 2

The second question was, *“What information processing strategy application errors are identified by the PRPP Stage Two in men with HAD as they perform everyday tasks in naturalistic contexts?”* Answers to this question were generated
using descriptive analysis, Rasch calibration and modelling, and calculation of
Cronbach alpha reliability coefficients and correlations, all of which are described
in the following subsections.

4.9.2.1 Descriptive analysis of Stage Two scores

The 34 item scores (3-2-1) obtained on the PRPP Stage Two for the 71 task
assessments were converted to a 2-1-0 scale in order to reflect a true zero score.
An average processing score was computed for each person thereby reducing the
number of task performances per case to one per person. Mean Quadrant and
Subquadrant processing scores were computed for the sample. Percentage scores
were analysed using descriptive statistics to identify group means, standard
deviations and percentiles. The expected minimum PRPP Stage Two total
performance and Sub-Quadrant performance percentage score for each person was
85%. Percentage scores below 85% were assumed to reflect difficulty (Chapparo
& Ranka, 2006; Nott & Chapparo, 2007).

4.9.2.2 Rasch modelling

To further describe the nature of information processing strategy application
errors in this sample, PRPP Stage Two descriptors were imported into Winsteps
3.69.1.8 (Linacre, 2010) for analysis using Rasch Measurement Model (RMM)
methods (Rasch, 1960).

The RMM is a type of Item Response Theory model used to evaluate the
measurement properties of assessment tools that gather ordinal level data
(Tennant & Conaghan, 2007). As such, the ordinal rating scores for each of the 34 PRPP Stage Two descriptors were entered into Winsteps. The data control file was set up with each row containing 34 scores corresponding to each Stage Two descriptor item followed by a unique person identifying label, which contained information on the person identifying number, severity of dementia, home context and a numerical code for the task performed. This produced 71 rows of data with a unique person label attached to each row.

The RMM quantifies the difference between ordinal categories by converting the raw ordinal data to an equal-interval unit of data using logarithmic transformation (Rasch, 1960). Items on scales that fit the RMM are said to act as a ‘ruler’ which indicates amounts of the construct the scale seeks to measure (Mallinson, Mahaffey, & Kielhofner, 1998, p.222). The measurement unit of the converted data is referred to as a log-odds probability unit, or logit (Rasch, 1960; Wright & Linacre, 1989). Individual item and person scores are measured in logits on a common ‘ruler’, and are commonly referred to as a Rasch-transformed score or a calibrated score. Data that fit the RMM, and have been Rasch-transformed to interval scores can then be subjected to mathematical manipulation without risk of generating invalid results (Bond & Fox, 2007; Wright & Linacre, 1989).

4.9.2.3 Transformation of PRPP Stage Two scores by means of Rasch calibration

The PRPP Stage Two is an ordinal-level rating scale. The Winsteps output for PRPP Stage Two consisted of scores that were examined to determine how well the converted ordinal level PRPP Stage Two item scores fit the RMM for interval
level data. Goodness-of-fit statistics (infit and outfit), expressed as unstandardised mean square (MnSq) values and standardized z scores, were considered. Outfit items (outlier-sensitive fit statistic) are unexpected outlying observations. Infit items (information-weighted fit statistic) are the unexpected in-lying patterns of observations (Linacre, 2008). Mean square statistics indicate the size of the misfit. The standardized z score indicates the probability of the misfit. The size of the misfit PRPP Stage Two items was examined first, and then the standardized z (zstd) scores indicating the probability of the misfit occurring was considered. For clinical observations, a MnSq range of 0.5 to 1.7 is deemed to fit the RMM (Bond & Fox, 2007). Standardised z scores are a statistic with a distribution like t. The RMM fit range for zstd scores is -2 to +2 (Bond & Fox, 2007). Infit and Outfit z values greater than +2 or less than -2 are generally interpreted as having less compatibility with the model than expected (p<.05). Negative values indicate less variation than modelled, while positive values indicate more variation than modelled and are generally more problematic (Bond & Fox, 2007). A 5% misfit allowance can be applied to account for any misfit that occurs by chance (Smith, 1991). The PRPP Stage Two scores reflect the information processing capacity of people who have difficulty in one or more domains, cases where scores did not fall within acceptable fit ranges were scrutinized further to explain possible reasons for the occurrence.

User-defined scales described by Linacre (Linacre, 2008) were then applied as part of the Winsteps analysis to express Rasch-transformed scores along an interval ‘ruler’.
4.9.2.4 Hierarchical ordering using RASCH methods

The Winsteps output for PRPP Stage Two scores was examined for evidence that the test items fell on an hierarchical continuum of information processing capacity for the sample. The Rasch model predicts that items most difficult for the sample will appear at the top of the vertical ‘ruler’, and those least difficult will appear at the bottom. Similarly, the model predicts that participants with the best ability will appear at the top of the ‘ruler’, and those with the lowest ability will appear at the bottom. The difficulty scores were examined to determine if the mean scores, range and spread of item difficulty matched mean scores, range and spread of person abilities. A linear-ordering of items from least difficult down to most difficult for persons in the sample was constructed. The original output from Rasch displayed this hierarchical continuum in + and - logits. These were converted to percentage values to be consistent with the presentations of scores obtained on the PRPP Stage One.

The Rasch-transformed PRPP Stage Two Quadrant and Subquadrant scores for the 71 observations were then exported to a Microsoft Office 2003 Excel spreadsheet. Mean Quadrant and Subquadrant processing scores were computed for each case thereby reducing the number of task observations per case to one. The new calibrated data set was imported into the Statistical Package for the Social Sciences (SPSS) 16.0 for further analyses. All subsequent statistical analyses were carried out using the Rasch-transformed data. This process has increasingly been applied to similar educational and social science research that
has used ordinal scales of measurement in which the differences among values being measured are unequal (Árnadóttir & Fisher, 2008; Brown, Unsworth, & Lyons, 2009; Chien, Hsu, Tai, Guo, & Su, 2008; Doig & Groves, 2006; Harwell & Gatti, 2001; Hsueh, Wang, Sheu, & Hsieh, 2004).

4.9.2.5 Internal consistency of the calibrated scale

Internal consistency within PRPP Stage Two was evaluated using Cronbach’s alpha (α) on the Rasch-transformed scores to supplement the information gained from the Rasch analysis. Cronbach’s alpha was selected because it can be used with instruments made up of items that can be scored with three or more possible values (Huck, 2008, p.81), as is the case with the PRPP Stage Two Assessment. Cronbach’s alpha was applied to the PRPP Quadrant scores (N=4) and the Subquadrants (N=12) only. A widely accepted applied science cut-off used in this study was that α must be greater than .70 for a set of items to be considered a scale (Field, 2009, p.675; Pallant, 2002, 92).

4.9.2.6 Correlations between scores on the PRPP Stage Two Assessment

To further examine the type of the strategy application errors demonstrated by the sample as reflected by the Rasch-transformed Stage Two scores, Pearson’s product-moment correlation was used to measure (Huck, 2008, p.62) the relationship between the PRPP Total scores and Quadrant scores, and the Subquadrant scores. Pearson’s technique was selected because the Stage Two scores had been transformed into an interval-level measure (Huck, 2008, p.63) by the Rasch modelling process.
Pearson’s product-moment correlation was also used to determine if the PRPP Total scores correlated with the PRPP Stage One Mastery scores. This analysis was selected because each of the two variables (PRPP Total scores, PRPP Stage One total Mastery scores) is a quantitative single score. Stage One total Mastery is a mean percentage score for each person, and PRPP Stage Two scores are the mean Rasch-transformed scores, as described in Section 4.9.2.4.

4.9.3 Procedures to answer Research Question 3

Question 3 asked, “What impact does the severity of HAD have on information processing strategy application errors identified by the PRPP Stage Two during the performance of everyday tasks?” Answers were inferred from descriptive Analysis of Variance to compare the quadrant score profiles of dementia groups, and regression analyses to explore relationship between dementia score and PRPP scores.

4.9.3.1 Item difficulty by severity of dementia

The items and persons on the Rasch vertical ‘ruler’ were examined to identify the linear-ordering of items from most difficult down to least difficult for persons at different stages of dementia.

4.9.3.2 Comparisons between groups with dementia

The data for those with moderate (N=15) and severe dementia (N=3) were collapsed into one group (N=18), and compared with data from those with mild
dementia (N=12). To determine whether there was difference in the pattern of scores on the PRPP Stage Two between men with mild dementia versus those with moderate/severe dementia, a two way (2 x 4) repeated measures ANOVA was computed (Huck, 2008). The dependent variable was severity of dementia (2 groups), and the four PRPP Quadrant scores were used as the 4 within subject, repeated measure independent variables (Perceive, Recall, Plan and Perform scores). To probe the interaction between the variables, polynomial orthogonal contrasts were carried out. The output was plotted with Dementia Severity on the Y axis and Quadrant scores on the X axis.

Similarly, interactions of the dementia groups with the Subquadrant scores were examined to determine if patterns of Subquadrant scores differed between groups. Four additional two way (2 x 3) repeated measures ANOVAs with planned contrasts were computed. In this analysis, the dependent variable remained the severity of dementia (2 groups), and the independent variable consisted of the three Stage Two Subquadrants within a Quadrant. The same statistical process was performed for the three Subquadrants in each of the four Quadrants.

4.9.3.3 Predictive power of the PRPP Assessment and severity of dementia

To determine whether scores on the PRPP Stage Two could predict the severity of dementia, bivariate point biserial correlations and linear regressions were calculated with PRPP Stage Two scores as the independent variable and dementia severity as the dependent variable. Point biserial analysis is a correlational analysis which may be used when one variable is a dichotomous variable.
(Tabachnik & Fidell, 2004). In this part of the study the dichotomous variable was dementia severity level where participants were re-coded as ‘mild dementia’ and comparison participants were coded as ‘moderate/severe dementia’. The coding of a dichotomy determines whether the correlation is positive or negative. The advantage of using point biserial analysis instead of the more common t-test correlation is that the point biserial method simultaneously looks at the existence of a relationship and the strength of that relationship (Peat & Barton, 2005; Tabachnik & Fidell, 2004).

A relationship was identified if the significance level was less than 0.05 ($\alpha < 0.05$). If a relationship between the level of dementia and performance on one PRPP Quadrant was established, the strength of the relationship was obtained from SPSS output. The strength of the relationships was delineated prior to data analysis and is as follows: 0-0.2 = weak relationship, 0.2-0.4 = low moderate relationship, 0.4-0.6 = high moderate relationship, 0.6-0.8 = quite strong relationship and 0.8-1.0 = strong relationship (Heard, 2004). The results of these analyses are outlined in the following Chapter 5.
CHAPTER FIVE

Phase Two: Descriptive Study - Results

5.1 OVERVIEW

The purpose of this chapter is to present the results of Phase Two of the research, the descriptive study. The research questions asked of the data are re-stated and the results obtained for each question presented.

5.2 RESEARCH QUESTION 1: RESULTS

“What level of mastery do men with HAD demonstrate in performing everyday tasks in naturalistic contexts as measured by the PRPP System Stage One?”

5.2.1 Overall performance on PRPP Stage One: Mastery

All participants were assessed on tasks of relevance to them or their contexts, and under naturalistic conditions. The established criterion was 100% mastery. The range of mastery percentage scores as measured by the PRPP Stage One for the sample (N=30) was from 0.50%-60.00% with a mean score of 30.07% and standard deviation of 14.27%. This indicates that all men had difficulty mastering the performance of identified everyday tasks expected of them in their particular naturalistic contexts. Table 5.1 illustrates the Mastery means and distribution...
scores for those with (1) mild dementia (N=12), (2) moderate dementia (N=15), and (3) severe dementia (N=3).

<table>
<thead>
<tr>
<th>TABLE 5.1. Stage One Mastery percentages by level of dementia</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>Mild Dementia</td>
</tr>
<tr>
<td>(N=12)</td>
</tr>
<tr>
<td>Moderate Dementia</td>
</tr>
<tr>
<td>(N=15)</td>
</tr>
<tr>
<td>Severe Dementia</td>
</tr>
<tr>
<td>(N=3)</td>
</tr>
</tbody>
</table>

5.2.2 Mastery errors impacting on performance

When examined as a group, all four types of errors impacted on mastery as measured by the PRPP Stage One. Table 5.2 presents the means, standard deviations and range for PRPP Stage One error scores. This illustrates the degree to which each error type impacted on mastery for the sample as a whole. The most frequent error made was one of Timing (Mean error score = 58.60%). Men were either too fast or too slow in performing the task or a step relative to the timing requirements of the task. Errors of Accuracy were the next most frequent error type impacting on mastery (Mean error score = 43.83%). This was followed by Omission errors (Mean error score = 18.83%) and Repetition errors (Mean error score = 6.67%).
TABLE 5.2. PRPP Stage One error percentages by error type

<table>
<thead>
<tr>
<th>Error Type</th>
<th>Minimum % error</th>
<th>Maximum % error</th>
<th>Mean % error</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy errors</td>
<td>10.0%</td>
<td>70.0%</td>
<td>43.83%</td>
<td>15.57%</td>
</tr>
<tr>
<td>Repetition errors</td>
<td>0.0%</td>
<td>50.0%</td>
<td>6.67%</td>
<td>10.53%</td>
</tr>
<tr>
<td>Omission errors</td>
<td>0.0%</td>
<td>80.0%</td>
<td>12.83%</td>
<td>20.46%</td>
</tr>
<tr>
<td>Timing errors</td>
<td>10.0%</td>
<td>90.0%</td>
<td>58.60%</td>
<td>18.67%</td>
</tr>
</tbody>
</table>

5.2.3 Mastery errors demonstrated by men at different levels of dementia

The performances of men with severe dementia were characterized most by Omission errors: many task steps were not attempted; then Timing errors, where performance was either too fast or too slow for the task requirements. Men with mild dementia made few Omission errors but were inaccurate (Accuracy errors) and generally too slow (Timing errors). Table 5.3 presents mean percentage scores for each error type demonstrated by men with mild, moderate or severe dementia.

TABLE 5.3. PRPP Stage One error percentages by level of dementia

<table>
<thead>
<tr>
<th>Dementia severity</th>
<th>Mean % Accuracy errors</th>
<th>Mean % Repetition errors</th>
<th>Mean % Omission errors</th>
<th>Mean % Timing Errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild dementia</td>
<td>47.92%</td>
<td>5.00%</td>
<td>1.67%</td>
<td>62.33%</td>
</tr>
<tr>
<td>Moderate dementia</td>
<td>41.11%</td>
<td>8.67%</td>
<td>15.00%</td>
<td>57.33%</td>
</tr>
<tr>
<td>Severe dementia</td>
<td>38.33%</td>
<td>3.33%</td>
<td>46.67%</td>
<td>50.00%</td>
</tr>
</tbody>
</table>
5.3 RESEARCH QUESTION 2: RESULTS

“What information processing strategy application errors are identified by the PRPP Stage Two in men with HAD as they perform everyday tasks in naturalistic contexts?”

5.3.1 Overall performance on the PRPP Stage Two: Strategy Application

Scores derived from Stage Two of the PRPP indicated the effectiveness of information processing strategy application during task performance. Scores that fall above 85% indicate sufficient processing for safe, effective performance (Aubin, Chapparo, Gélinas, Stip, & Rainville, 2009; Nott & Chapparo, 2007). The mean total PRPP Stage Two information processing strategy application percentage score for this sample was 55.83%. PRPP Stage Two total scores ranged from 12.05% to 84.37% with a standard deviation of 21.87%. This indicates that none of the men in the sample met the established criterion level for safe and effective application of information processing strategies during tasks performed in contexts.

5.3.2 Types of strategy application errors demonstrated

The information processing strategies posing most problems for men in the sample were those in this Plan Quadrant, followed by the Perceive Quadrant, Perform Quadrant, and Recall Quadrant. Table 5.4 contains the means, standard deviations and percentiles for the four Stage Two PRPP Quadrants.
TABLE 5.4. PRPP Stage Two Quadrant percentage scores

<table>
<thead>
<tr>
<th>PRPP Quadrant</th>
<th>Minimum % Score</th>
<th>Maximum % Score</th>
<th>Mean % Score</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceive</td>
<td>9.10%</td>
<td>87.50%</td>
<td>53.49%</td>
<td>22.55%</td>
</tr>
<tr>
<td>Recall</td>
<td>33.33%</td>
<td>100.00%</td>
<td>75.30%</td>
<td>20.22%</td>
</tr>
<tr>
<td>Plan</td>
<td>0.00%</td>
<td>72.20%</td>
<td>30.75%</td>
<td>23.83%</td>
</tr>
<tr>
<td>Perform</td>
<td>2.00%</td>
<td>97.00%</td>
<td>63.78%</td>
<td>26.29%</td>
</tr>
</tbody>
</table>

In the Plan Quadrant, performances in all three Subquadrants were lower than in any of the remaining nine Subquadrants. The Plan Subquadrant posing most difficulty for the sample was Evaluating (Mean 25.39%). Sensing operations (Mean 30.06%) were most problematic in the Perceive Quadrant. The Perform Quadrant operations associated with Continuing (Mean 47.80%) were most difficult, and the Recalling Schemes operations (Mean 59.50%) posed the greatest Recall Quadrant problems. Table 5.5 below presents the means, standard deviations and range for the PRPP Stage Two Subquadrants.

TABLE 5.5. PRPP Stage Two Subquadrant percentage scores

<table>
<thead>
<tr>
<th>PRPP Quadrant</th>
<th>Minimum % Score</th>
<th>Maximum % Score</th>
<th>Mean % Score</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceive:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attending</td>
<td>22.20%</td>
<td>83.30%</td>
<td>58.72%</td>
<td>20.31%</td>
</tr>
<tr>
<td>Sensing</td>
<td>0.00%</td>
<td>83.30%</td>
<td>30.06%</td>
<td>28.01%</td>
</tr>
<tr>
<td>Discriminating</td>
<td>0.00%</td>
<td>100.00%</td>
<td>82.11%</td>
<td>21.01%</td>
</tr>
<tr>
<td>Recall:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recalling Facts</td>
<td>38.80%</td>
<td>100.00%</td>
<td>83.52%</td>
<td>26.66%</td>
</tr>
<tr>
<td>Recalling Schemes</td>
<td>0.00%</td>
<td>100.00%</td>
<td>59.50%</td>
<td>29.57%</td>
</tr>
<tr>
<td>Recalling Procedures</td>
<td>38.80%</td>
<td>100.00%</td>
<td>83.30%</td>
<td>18.01%</td>
</tr>
<tr>
<td>Plan:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mapping</td>
<td>0.00%</td>
<td>83.30%</td>
<td>27.70%</td>
<td>24.96%</td>
</tr>
<tr>
<td>Programming</td>
<td>0.00%</td>
<td>83.30%</td>
<td>39.09%</td>
<td>22.94%</td>
</tr>
<tr>
<td>Evaluating</td>
<td>0.00%</td>
<td>75.00%</td>
<td>25.39%</td>
<td>28.42%</td>
</tr>
<tr>
<td>Perform:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initiating</td>
<td>8.30%</td>
<td>100.00%</td>
<td>73.95%</td>
<td>26.36%</td>
</tr>
<tr>
<td>Continuing</td>
<td>0.00%</td>
<td>100.00%</td>
<td>47.80%</td>
<td>31.57%</td>
</tr>
<tr>
<td>Controlling</td>
<td>0.00%</td>
<td>100.00%</td>
<td>72.74%</td>
<td>28.56%</td>
</tr>
</tbody>
</table>
The strategy application behaviours that were most difficult for men in the sample for each of the problematic Subquadrants highlighted above were *Monitors* (Sensing Subquadrant), *Contextualises to Duration*, (Recalling Schemes Subquadrant), *Judges* (Evaluating Subquadrant), and *Flows* (Perform Quadrant).

The means, standard deviations and range of scores for each ‘descriptor’ are presented in Table 5.6.
### TABLE 5.6. PRPP Stage Two ‘descriptor’ percentages

<table>
<thead>
<tr>
<th>Data Code</th>
<th>Descriptors</th>
<th>Min. True % Score</th>
<th>Max. True % Score</th>
<th>Mean % Score</th>
<th>St. Dev. % Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PERCEIVE – ATTENDING</strong></td>
<td>Notices</td>
<td>66.60</td>
<td>100.0</td>
<td>91.65</td>
<td>12.78</td>
</tr>
<tr>
<td></td>
<td>Modulates</td>
<td>0.00</td>
<td>50.00</td>
<td>17.78</td>
<td>22.07</td>
</tr>
<tr>
<td></td>
<td>Maintains</td>
<td>0.00</td>
<td>100.0</td>
<td>65.96</td>
<td>36.92</td>
</tr>
<tr>
<td><strong>PERCEIVE – SENSING</strong></td>
<td>Searches</td>
<td>0.00</td>
<td>100.0</td>
<td>32.49</td>
<td>34.83</td>
</tr>
<tr>
<td></td>
<td>Locates</td>
<td>0.00</td>
<td>100.0</td>
<td>45.27</td>
<td>33.52</td>
</tr>
<tr>
<td></td>
<td>Monitors</td>
<td>0.00</td>
<td>50.00</td>
<td>12.78</td>
<td>20.73</td>
</tr>
<tr>
<td><strong>PERCEIVE - DISCRIMINATING</strong></td>
<td>Discriminates</td>
<td>0.00</td>
<td>100.0</td>
<td>78.88</td>
<td>33.02</td>
</tr>
<tr>
<td></td>
<td>Matches</td>
<td>0.00</td>
<td>100.0</td>
<td>85.34</td>
<td>27.07</td>
</tr>
<tr>
<td><strong>RECALL – RECALLING FACTS</strong></td>
<td>Recognises</td>
<td>50.00</td>
<td>100.0</td>
<td>95.55</td>
<td>12.34</td>
</tr>
<tr>
<td></td>
<td>Labels</td>
<td>0.00</td>
<td>100.0</td>
<td>64.99</td>
<td>39.66</td>
</tr>
<tr>
<td></td>
<td>Categorises</td>
<td>33.30</td>
<td>100.0</td>
<td>88.60</td>
<td>20.35</td>
</tr>
<tr>
<td><strong>RECALL – RECALLING SCHEMES</strong></td>
<td>Contextualises to Time</td>
<td>0.00</td>
<td>100.0</td>
<td>59.02</td>
<td>34.92</td>
</tr>
<tr>
<td></td>
<td>Contextualises to Place</td>
<td>0.00</td>
<td>100.0</td>
<td>70.00</td>
<td>30.06</td>
</tr>
<tr>
<td></td>
<td>Contextualises to Duration</td>
<td>0.00</td>
<td>100.0</td>
<td>49.57</td>
<td>37.56</td>
</tr>
<tr>
<td><strong>RECALL – RECALLING PROCEDURES</strong></td>
<td>Uses Objects</td>
<td>50.00</td>
<td>100.0</td>
<td>93.33</td>
<td>14.92</td>
</tr>
<tr>
<td></td>
<td>Uses Body</td>
<td>50.00</td>
<td>100.0</td>
<td>96.39</td>
<td>11.52</td>
</tr>
<tr>
<td></td>
<td>Recalls Steps</td>
<td>0.00</td>
<td>100.0</td>
<td>66.94</td>
<td>32.20</td>
</tr>
<tr>
<td><strong>PLAN – MAPPING</strong></td>
<td>Knows Goal</td>
<td>0.00</td>
<td>75.00</td>
<td>30.82</td>
<td>26.09</td>
</tr>
<tr>
<td></td>
<td>Identifies Obstacles</td>
<td>0.00</td>
<td>100.0</td>
<td>32.91</td>
<td>33.52</td>
</tr>
<tr>
<td></td>
<td>Organises</td>
<td>0.00</td>
<td>75.00</td>
<td>19.44</td>
<td>23.19</td>
</tr>
<tr>
<td><strong>PLAN – PROGRAMMING</strong></td>
<td>Chooses</td>
<td>0.00</td>
<td>100.0</td>
<td>20.97</td>
<td>28.71</td>
</tr>
<tr>
<td></td>
<td>Sequences</td>
<td>0.00</td>
<td>75.00</td>
<td>17.22</td>
<td>22.84</td>
</tr>
<tr>
<td></td>
<td>Calibrates</td>
<td>0.00</td>
<td>100.0</td>
<td>79.16</td>
<td>31.09</td>
</tr>
<tr>
<td><strong>PLAN – EVALUATING</strong></td>
<td>Questions</td>
<td>0.00</td>
<td>100.0</td>
<td>40.14</td>
<td>39.49</td>
</tr>
<tr>
<td></td>
<td>Analyses</td>
<td>0.00</td>
<td>75.00</td>
<td>20.55</td>
<td>27.92</td>
</tr>
<tr>
<td></td>
<td>Judges</td>
<td>0.00</td>
<td>50.00</td>
<td>15.55</td>
<td>21.19</td>
</tr>
<tr>
<td><strong>PERFORM – INITIATING</strong></td>
<td>Starts</td>
<td>0.00</td>
<td>100.0</td>
<td>57.90</td>
<td>34.37</td>
</tr>
<tr>
<td></td>
<td>Stops</td>
<td>0.00</td>
<td>100.0</td>
<td>87.49</td>
<td>28.44</td>
</tr>
<tr>
<td><strong>PERFORM – CONTINUING</strong></td>
<td>Flows</td>
<td>0.00</td>
<td>100.0</td>
<td>27.50</td>
<td>29.70</td>
</tr>
<tr>
<td></td>
<td>Continues</td>
<td>0.00</td>
<td>100.0</td>
<td>61.94</td>
<td>37.44</td>
</tr>
<tr>
<td></td>
<td>Persists</td>
<td>0.00</td>
<td>100.0</td>
<td>51.24</td>
<td>35.27</td>
</tr>
<tr>
<td><strong>PERFORM – CONTROLLING</strong></td>
<td>Times</td>
<td>0.00</td>
<td>100.0</td>
<td>51.94</td>
<td>33.96</td>
</tr>
<tr>
<td></td>
<td>Coordinates</td>
<td>0.00</td>
<td>100.0</td>
<td>79.99</td>
<td>33.46</td>
</tr>
<tr>
<td></td>
<td>Adjusts</td>
<td>0.00</td>
<td>100.0</td>
<td>84.16</td>
<td>28.06</td>
</tr>
</tbody>
</table>
5.3.3 Level of difficulty of items on the PRPP Stage Two

Rasch-modelling of the true percentage values above produced a linear continuum of information processing descriptors from the PRPP Stage Two assessment. Table 5.7 presents the item difficulty and ‘fit’ statistics for the descriptors in percentage values. The difficulty of individual items ranged from 73.13 (Sequences) to 18.42 (Uses Body). Appendix XIII contains the item difficulty and ‘fit’ statistics for the PRPP descriptors in logits, for the reader’s interest.

Goodness-of-fit parameters were applied to both mean square and standardized z score values from the Winsteps output (Table 5.7) to determine how well items ‘fit’ with the unidimensional model (MnSq = 0.5 to 1.7; z std = 0 ± 2). The MnSq infit statistics ranged from .51 to 1.49. Examination of infit MnSq and infit std z scores indicated that most items had acceptable fit with the RMM with the exception of the Plan descriptor Calibrates (MnSq 1.49, z score 2.1). The MnSq outfit statistics ranged from .28 to 3.76. Further examination of the ‘outfit’ statistics revealed a 13% outfit with the RMM, exceeding the 5% acceptable limit (Bond & Fox, 2007). Items that did not fit the model were Categorises (MnSq 3.75, z score 2.3), Starts (MnSq 3.39, z score 3.3), Contextualises to Time (MnSq 2.22, z score 2.1) and Persists (MnSq 1.81, z score 2.3). Outfit problems are of less concern than infit problems, as the outfit statistic is not weighted and is subsequently more susceptible to influence by outlying scores. Rasch analysts pay more attention to infit values than outfit values on the basis that persons whose ability is closest to the item’s difficulty would give maximum insight to that item’s performance (Bond & Fox, 2007). On further examination, items with
larger than expected outfit confirmed the above observations as extremes of performance as measured on these four descriptors within and between cases and observations.

**TABLE 5.7. Order of item difficulty according to Rasch scaling**

<table>
<thead>
<tr>
<th>Item</th>
<th>DIFFICULTY</th>
<th>Calibrated % values of items</th>
<th>Standard Error</th>
<th>INFIT MnSq</th>
<th>zstd</th>
<th>OUTFIT MnSq</th>
<th>Zstd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sequences</td>
<td>73.13</td>
<td>2.24</td>
<td>.60</td>
<td>-1.9</td>
<td>.41</td>
<td>-.9</td>
<td></td>
</tr>
<tr>
<td>Organises</td>
<td>69.41</td>
<td>2.05</td>
<td>.67</td>
<td>-1.6</td>
<td>.49</td>
<td>-.9</td>
<td></td>
</tr>
<tr>
<td>Analyses</td>
<td>67.23</td>
<td>1.94</td>
<td>.52</td>
<td>-2.5</td>
<td>.32</td>
<td>-1.2</td>
<td></td>
</tr>
<tr>
<td>Chooses</td>
<td>66.47</td>
<td>1.94</td>
<td>.69</td>
<td>-1.6</td>
<td>.60</td>
<td>-.6</td>
<td></td>
</tr>
<tr>
<td>Monitors</td>
<td>62.67</td>
<td>1.78</td>
<td>.92</td>
<td>-0.4</td>
<td>.66</td>
<td>-.7</td>
<td></td>
</tr>
<tr>
<td>Flows</td>
<td>62.32</td>
<td>2.59</td>
<td>.62</td>
<td>-1.7</td>
<td>.31</td>
<td>-1.1</td>
<td></td>
</tr>
<tr>
<td>Knows Goal</td>
<td>61.16</td>
<td>1.73</td>
<td>1.06</td>
<td>.5</td>
<td>.94</td>
<td>-.1</td>
<td></td>
</tr>
<tr>
<td>Judges</td>
<td>59.34</td>
<td>2.44</td>
<td>.51</td>
<td>-2.4</td>
<td>.28</td>
<td>-1.3</td>
<td></td>
</tr>
<tr>
<td>Identifies Obstacles</td>
<td>58.68</td>
<td>1.67</td>
<td>.63</td>
<td>-2.5</td>
<td>.51</td>
<td>-1.6</td>
<td></td>
</tr>
<tr>
<td>Modulates</td>
<td>57.86</td>
<td>1.66</td>
<td>.76</td>
<td>-1.3</td>
<td>.63</td>
<td>-.9</td>
<td></td>
</tr>
<tr>
<td>Searches</td>
<td>56.69</td>
<td>2.32</td>
<td>.68</td>
<td>-1.6</td>
<td>.44</td>
<td>-.9</td>
<td></td>
</tr>
<tr>
<td>Questions</td>
<td>54.17</td>
<td>1.56</td>
<td>.70</td>
<td>-1.6</td>
<td>.63</td>
<td>-.9</td>
<td></td>
</tr>
<tr>
<td>Locates</td>
<td>50.96</td>
<td>1.54</td>
<td>1.03</td>
<td>.2</td>
<td>.91</td>
<td>-.3</td>
<td></td>
</tr>
<tr>
<td>Contextualises to Duration</td>
<td>48.85</td>
<td>1.41</td>
<td>.89</td>
<td>-.5</td>
<td>1.13</td>
<td>.4</td>
<td></td>
</tr>
<tr>
<td>Persists</td>
<td>47.93</td>
<td>1.45</td>
<td>1.11</td>
<td>.7</td>
<td>1.04</td>
<td>.2</td>
<td></td>
</tr>
<tr>
<td>Times</td>
<td>47.65</td>
<td>1.46</td>
<td>1.17</td>
<td>1.0</td>
<td>1.81</td>
<td>2.3</td>
<td></td>
</tr>
<tr>
<td>Contextualises to Time</td>
<td>44.05</td>
<td>1.36</td>
<td>1.30</td>
<td>1.6</td>
<td>2.22</td>
<td>2.1</td>
<td></td>
</tr>
<tr>
<td>Starts</td>
<td>43.47</td>
<td>1.36</td>
<td>1.36</td>
<td>1.9</td>
<td>3.39</td>
<td>3.3</td>
<td></td>
</tr>
<tr>
<td>Continues</td>
<td>43.19</td>
<td>1.35</td>
<td>.73</td>
<td>-1.6</td>
<td>.50</td>
<td>-1.0</td>
<td></td>
</tr>
<tr>
<td>Maintains</td>
<td>42.43</td>
<td>1.31</td>
<td>1.06</td>
<td>.4</td>
<td>.65</td>
<td>-.4</td>
<td></td>
</tr>
<tr>
<td>Labels</td>
<td>42.39</td>
<td>1.33</td>
<td>1.09</td>
<td>.5</td>
<td>.88</td>
<td>.0</td>
<td></td>
</tr>
<tr>
<td>Recalls Steps</td>
<td>40.80</td>
<td>1.45</td>
<td>1.34</td>
<td>1.8</td>
<td>1.47</td>
<td>1.1</td>
<td></td>
</tr>
<tr>
<td>Contextualises to Place</td>
<td>39.42</td>
<td>1.48</td>
<td>1.29</td>
<td>1.6</td>
<td>1.83</td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td>Discriminates</td>
<td>35.85</td>
<td>1.46</td>
<td>1.13</td>
<td>.6</td>
<td>2.56</td>
<td>1.7</td>
<td></td>
</tr>
<tr>
<td>Calibrates</td>
<td>34.72</td>
<td>1.54</td>
<td>1.49</td>
<td>2.1</td>
<td>1.78</td>
<td>1.1</td>
<td></td>
</tr>
<tr>
<td>Coordinates</td>
<td>34.01</td>
<td>1.56</td>
<td>1.04</td>
<td>.3</td>
<td>1.77</td>
<td>1.1</td>
<td></td>
</tr>
<tr>
<td>Matches</td>
<td>32.55</td>
<td>1.87</td>
<td>1.09</td>
<td>.4</td>
<td>.50</td>
<td>-.2</td>
<td></td>
</tr>
<tr>
<td>Stops</td>
<td>31.69</td>
<td>1.69</td>
<td>.55</td>
<td>-1.9</td>
<td>.58</td>
<td>-.3</td>
<td></td>
</tr>
<tr>
<td>Adjusts</td>
<td>31.11</td>
<td>1.78</td>
<td>1.42</td>
<td>1.2</td>
<td>1.46</td>
<td>.7</td>
<td></td>
</tr>
<tr>
<td>Categorises</td>
<td>29.18</td>
<td>1.86</td>
<td>1.09</td>
<td>.4</td>
<td>3.76</td>
<td>2.3</td>
<td></td>
</tr>
<tr>
<td>Notices</td>
<td>25.40</td>
<td>2.06</td>
<td>1.09</td>
<td>.4</td>
<td>.72</td>
<td>-.1</td>
<td></td>
</tr>
<tr>
<td>Uses Objects</td>
<td>22.99</td>
<td>2.24</td>
<td>.89</td>
<td>-.3</td>
<td>.39</td>
<td>-.7</td>
<td></td>
</tr>
<tr>
<td>Recognises</td>
<td>18.84</td>
<td>2.70</td>
<td>1.29</td>
<td>.9</td>
<td>.89</td>
<td>.2</td>
<td></td>
</tr>
<tr>
<td>Uses Body</td>
<td>18.42</td>
<td>2.80</td>
<td>.82</td>
<td>-.3</td>
<td>.41</td>
<td>-.5</td>
<td></td>
</tr>
</tbody>
</table>

Notes: SE = Standard error; MnSq = Mean Square; zstd = standardized z scores. Fit parameters: MnSq = 0.5 to 1.7; zstd ~θ±2
The distribution of items is displayed in percentage values on the Winsteps output of the Rasch-calibrated linear scale is illustrated in Figure 5.1. The distribution of items on a logit scale may be found in Appendix XIV, for the reader’s interest.

Figure 5.1 Rasch-calibrated linear ‘ruler’ of persons and items in % values
On the left of the vertical ‘ruler’ are people indicated by their Person Code number described in Section 4.9, Table 4.5. On the right of the ‘ruler’ are the PRPP Stage Two Descriptor Items ordered from easiest (bottom) to most difficult (top). The Items are symmetrically distributed above and below the mean and demonstrate excellent item separation (separation index = 7.98; reliability = .98). The average Person measure was 47.49% (SD=14.40) which was close to the mean for the test Items (Mean 45.75%). There was a broad range of Person ability percentage values, the lowest being 19.93% (Person 04) and the highest being 77.67% (Person 26). Person separation index was 5.31 with a reliability of 0.97. The concentration of Items is around the mean of 45.747% with somewhat fewer Items at the higher and lower end of the continuum, however the overall proximity of Person ability and Item difficulty on the ‘ruler’ indicates that the men and assessment observations were well targeted by the test items.

The ordering of Items from the ‘ruler’ into one linear column using data from Table 5.7 is summarized in Figure 5.2 for the reader’s convenience. The position of each descriptor in the list represents the level of difficulty for that descriptor for the people in the sample. Adequate performance on any one descriptor suggests that those under it should be performed adequately.
### Figure 5.2
Hierarchy of PRPP Stage Two Descriptors produced by Rasch calibration

<table>
<thead>
<tr>
<th>Most Difficult</th>
<th>Least Difficult</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sequences</td>
<td></td>
</tr>
<tr>
<td>Organises</td>
<td></td>
</tr>
<tr>
<td>Analyses</td>
<td></td>
</tr>
<tr>
<td>Chooses</td>
<td></td>
</tr>
<tr>
<td>Monitors</td>
<td></td>
</tr>
<tr>
<td>Flows</td>
<td></td>
</tr>
<tr>
<td>Knows Goal</td>
<td></td>
</tr>
<tr>
<td>Judges</td>
<td></td>
</tr>
<tr>
<td>Identifies Obstacles</td>
<td></td>
</tr>
<tr>
<td>Modulates</td>
<td></td>
</tr>
<tr>
<td>Searches</td>
<td></td>
</tr>
<tr>
<td>Questions</td>
<td></td>
</tr>
<tr>
<td>Locates</td>
<td></td>
</tr>
<tr>
<td>Contextualises to Duration</td>
<td></td>
</tr>
<tr>
<td>Persists</td>
<td></td>
</tr>
<tr>
<td>Times</td>
<td></td>
</tr>
<tr>
<td>Contextualises to Time</td>
<td></td>
</tr>
<tr>
<td>Starts</td>
<td></td>
</tr>
<tr>
<td>Continues</td>
<td></td>
</tr>
<tr>
<td>Maintains</td>
<td></td>
</tr>
<tr>
<td>Labels</td>
<td></td>
</tr>
<tr>
<td>Recalls Steps</td>
<td></td>
</tr>
<tr>
<td>Contextualises to Place</td>
<td></td>
</tr>
<tr>
<td>Discriminates</td>
<td></td>
</tr>
<tr>
<td>Calibrates</td>
<td></td>
</tr>
<tr>
<td>Coordinates</td>
<td></td>
</tr>
<tr>
<td>Matches</td>
<td></td>
</tr>
<tr>
<td>Stops</td>
<td></td>
</tr>
<tr>
<td>Adjusts</td>
<td></td>
</tr>
<tr>
<td>Categorises</td>
<td></td>
</tr>
<tr>
<td>Notices</td>
<td></td>
</tr>
<tr>
<td>Uses Objects</td>
<td></td>
</tr>
<tr>
<td>Recognises</td>
<td></td>
</tr>
<tr>
<td>Uses Body</td>
<td></td>
</tr>
</tbody>
</table>
5.3.4 **Internal Consistency of items on the PRPP Stage Two**

Internal consistency measures using Cronbach’s alpha ($\alpha$) suggest high internal consistency within quadrants of the PRPP Stage Two (Quadrant $\alpha = .86-.93$).

### TABLE 5.8 Internal consistency of PRPP Stage Two items

<table>
<thead>
<tr>
<th>Number of items</th>
<th>$\alpha$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceive Quadrant</td>
<td>.86</td>
</tr>
<tr>
<td>Recall Quadrant</td>
<td>.87</td>
</tr>
<tr>
<td>Plan Quadrant</td>
<td>.93</td>
</tr>
<tr>
<td>Perform Quadrant</td>
<td>.89</td>
</tr>
</tbody>
</table>

5.3.5 **Correlations between items on the PRPP Stage Two**

Pearson’s correlation coefficients ($r$) between the calibrated PRPP Subquadrant and Quadrant scores (Table 5.9) indicated that scores from all Subquadrants are highly correlated with each other ($p<.001$). These correlations demonstrate that all Subquadrants have strong, positive relationships within and between all Quadrants of the PRPP.
Chapter 5: Descriptive Study - Results

** Correlation is significant at the 0.001 level (2-tailed)

5.3.6 Correlations between the PRPP Stage One and the PRPP Stage Two

Pearson correlation coefficients calculated to measure the relationship between the PRPP Stage One Total score and the PRPP Stage Two Total score was .67 (p<.001). While strong, it is not strong enough to suggest that Stage One and Stage Two are assessing exactly the same thing as each other.

---

**TABLE 5.9. Correlation values for Subquadrant and Quadrant scores**

<table>
<thead>
<tr>
<th>PRPP Subquadrants</th>
<th>Perceive Quadrant</th>
<th>Recall Quadrant</th>
<th>Plan Quadrant</th>
<th>Perform Quadrant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attending</td>
<td>.898** p&lt;.001</td>
<td>.864** p&lt;.001</td>
<td>.867** p&lt;.001</td>
<td>.865** p&lt;.001</td>
</tr>
<tr>
<td>Sensing</td>
<td>.951** p&lt;.001</td>
<td>.832** p&lt;.001</td>
<td>.838** p&lt;.001</td>
<td>.865** p&lt;.001</td>
</tr>
<tr>
<td>Discriminating</td>
<td>.731** p&lt;.001</td>
<td>.744** p&lt;.001</td>
<td>.612** p&lt;.001</td>
<td>.682** p&lt;.001</td>
</tr>
<tr>
<td>Recalling Facts</td>
<td>.761** p&lt;.001</td>
<td>.843** p&lt;.001</td>
<td>.639** p&lt;.001</td>
<td>.647* p&lt;.001</td>
</tr>
<tr>
<td>Recalling Schemes</td>
<td>.767** p&lt;.001</td>
<td>.895** p&lt;.001</td>
<td>.723** p&lt;.001</td>
<td>.878** p&lt;.001</td>
</tr>
<tr>
<td>Recalling Procedures</td>
<td>.813** p&lt;.001</td>
<td>.910** p&lt;.001</td>
<td>.772** p&lt;.001</td>
<td>.789** p&lt;.001</td>
</tr>
<tr>
<td>Mapping</td>
<td>.859** p&lt;.001</td>
<td>.820** p&lt;.001</td>
<td>.937** p&lt;.001</td>
<td>.769** p&lt;.001</td>
</tr>
<tr>
<td>Programming</td>
<td>.820** p&lt;.001</td>
<td>.705** p&lt;.001</td>
<td>.902** p&lt;.001</td>
<td>.726** p&lt;.001</td>
</tr>
<tr>
<td>Evaluating</td>
<td>.790** p&lt;.001</td>
<td>.648* p&lt;.001</td>
<td>.902** p&lt;.001</td>
<td>.732** p&lt;.001</td>
</tr>
<tr>
<td>Initiating</td>
<td>.618** p&lt;.001</td>
<td>.780** p&lt;.001</td>
<td>.617** p&lt;.001</td>
<td>.826** p&lt;.001</td>
</tr>
<tr>
<td>Continuing</td>
<td>.808** p&lt;.001</td>
<td>.864** p&lt;.001</td>
<td>.829** p&lt;.001</td>
<td>.925** p&lt;.001</td>
</tr>
<tr>
<td>Controlling</td>
<td>.765** p&lt;.001</td>
<td>.724** p&lt;.001</td>
<td>.807** p&lt;.001</td>
<td>.913** p&lt;.001</td>
</tr>
</tbody>
</table>

** Correlation is significant at the 0.001 level (2-tailed)
5.4 RESEARCH QUESTION 3: RESULTS

“What impact does the severity of HAD have on information processing strategy application errors identified by the PRPP Stage Two during the performance of everyday tasks?”

5.4.1 Item difficulty for men at different stages of dementia

An examination of the items and persons on the Rasch-calibrated ‘ruler’ demonstrated that men with mild dementia are positioned higher on the ‘most to least ruler’ than those with moderate and severe dementia. Figure 5.3 depicts the same vertical ‘ruler’ as that presented in Section 5.3.3 (Figure 5.1), however in Figure 5.3 the case codes have been re-labelled to indicate the severity of dementia of men and their location on the Rasch-calibrated ‘ruler’. An examination of the PRPP Stage Two Items on the right side of the scale and the Persons on the left demonstrates that men with mild dementia were able to effectively apply more information processing strategies than those persons lower on the scale. At the bottom on the right side of the ruler are the Recall descriptors of Uses Body and Recognises. The Persons at a similar level to these Items but located on the left of the ‘ruler’ are primarily those with severe dementia. This indicates that not only did these men have problem with those Recall descriptors but also with all of the descriptors above these on the scale.
Figure 5.3 Rasch-calibrated linear ‘ruler’ depicting the position of people with mild (Mi), moderate (Mod), and severe (Sev) dementia in % values.
5.4.2 Differences in patterns of PRPP Stage Two performance

5.4.2.1 Differences in Quadrants

A 2 x 4 repeated measures Analysis of Variance with planned contrasts indicated consistent differences in performance between the mild dementia group and the moderate/severe group. As can be seen from Figure 5.4, although the pattern of difficulty across Quadrants was similar between the two groups, the mild group performed above the moderate/severe \( (F_{1, 28} = 42.55, p<.001) \).

The Quadrant scores also differed significantly from each other. This was revealed most clearly by the cubic polynomial contrast \( (F_{1, 28} = 244.09, p<.001) \), which supports the reversing pattern evident in Figure 5.4, where the Recall and Perform Quadrants are higher than Perceive and Plan. This pattern appears more pronounced in the moderate/severe group, indicated by a significant interaction of group + cubic contrast \( (F_{1, 28} = 8.27, p=0.008) \). Appendix XVI contains the SPSS output tables for this analysis.
Further examination of the differences in the pattern of performance on the PRPP Stage Two between men at different stages of dementia for each Subquadrant revealed several interesting findings.
5.4.2.2 Perceive Quadrant differences

Figure 5.7 illustrates the difference in Perceive Quadrant performance between the mild group who performed higher than the moderate/severe group ($F_{1, 28} = 31.00$, $p<.001$). The Subquadrants also differed from each other. This was revealed most clearly by the quadratic polynomial contrast ($F_{1, 28} = 83.64$, $p<.001$). This supports the pattern evident in Figure 5.7 where performances on the *Attending* and *Discriminating* Subquadrants are higher than the *Sensing* Subquadrant. Further, there was a difference in the quadratic trend between the two groups ($F_{1, 28} = 11.29; p=.002$). This is evident by the change in pattern apparent between the two groups. Overall, the pattern is more pronounced in the moderate/severe dementia group. Appendix XVII contains the SPSS output tables for this analysis.

![Figure 5.5 Trend lines for Perceive Subquadrant performance](image)
5.4.2.3 Recall Quadrant differences

In the Recall Quadrant, the mild group performed better than the moderate/severe group \( (F_{1,28} = 22.90, p < .001) \) (Figure 5.8). Performances on the Recall Subquadrants also differed from each other. This was revealed most clearly by the quadratic polynomial contrast \( (F_{1, 28} = 10.72, p = .003) \) which supports the pattern evident in Figure 5.8 where the *Recalling Facts* and *Recalling Procedures* Subquadrants are higher than the *Recalling Schemes* Subquadrant. The quadratic contrast for severity was not significant \( (F_{1, 28} = .92, p = .346) \). Although the pattern looks more pronounced for the moderate/severe group, it was not statistically significant. This reflects the high performance of even the most impaired men on those Recall operations. Appendix XVIII contains the SPSS output for this analysis.

![Figure 5.6 Trend lines for Recall Subquadrant performance](image)

**Figure 5.6** Trend lines for Recall Subquadrant performance
5.4.2.4 Plan Quadrant differences

Plan Quadrant operations illustrated in Figure 5.9 indicate that the mild group performed better than the moderate/severe group ($F_{1, 28} = 41.49, p<.001$), especially for \textit{Evaluating} operations. Differences in performances in each of the Plan Subquadrants also differed from each other. This was revealed most clearly by the quadratic polynomial contrast for severity ($F_{1, 28} = 4.19, p=.05$), supporting the pattern evident in Figure 5.9. In this analysis, the quadratic trend moves in the opposite direction between groups. Performance in the \textit{Programming} Subquadrant for those with mild dementia is lower than the \textit{Mapping} and \textit{Evaluating} Subquadrants. In the moderate/severe dementia group, the \textit{Programming} Subquadrant is higher than the other two Subquadrants. This illustrates the difficulties that those with mild dementia had on the Plan operations appearing at the top of the Rasch vertical ‘ruler’, presented in Section 5.4.1, Figure 5.4. No other contrasts were significant. Appendix XIX contains the SPSS output for this analysis.

![Figure 5.7 Trend lines for Plan Subquadrant performance](image)

\textbf{Figure 5.7} Trend lines for Plan Subquadrant performance
5.4.2.5 Perform Quadrant differences.

In the Perform Quadrant, the mild group performed better than the moderate/severe group ($F_{1, 28} = 16.64, p<.001$) (Figure 5.10). There were differences in performance across the Perform Subquadrants, and there were several significant contrasts. The quadratic polynomial contrast for main effect ($F_{1, 28} = 29.59, p<.001$) indicates that Continuing was the most problematic Subquadrant. The linear trend for severity ($F_{1, 28} = 5.40, p=.03$) by Subquadrant interaction suggests that the mild group scored higher on Controlling than Initiating, but the reverse was true of the moderate/severe group. These differences are illustrated by the change in angles of the trend lines for the two groups. Appendix XX contains the SPSS output for this analysis.

![Figure 5.8 Trend lines for Perform Subquadrant performance](image)
5.4.3 Case illustrations

To illustrate what individual patterns of Stage Two strategy application errors looked like, PRPP Stage Two scores for two men were extracted from the calibrated data. Subquadrant mean scores for each man were plotted on a radar graph that was configured to match the PRPP Stage Two model depicted in Section 2.7.3.2 (Figure 2.17) to illustrate their individual processing strategy application capacities.
5.4.3.1 Case 1: Person 03

Person 03 is a man with severe dementia who had a low Total PRPP Stage Two calibrated mean score (24.07%). The tasks performed by this man consisted of preparing/washing his face, preparing/eating cereal, and contributing to the completion of a mosaic tile table top. Figure 5.9 is a radar graph of the Rasch-calibrated mean Subquadrant scores for this person. The capacity to apply Recall Subquadrant strategies associated with *Recalling Procedures* and *Recalling Facts* strategies is apparent in this graph. Also apparent is his capacity to apply Plan Subquadrant *Programming* strategies. Further examination of the data for Person 03 indicated that this Plan Subquadrant processing strength reflects his ability to *Calibrate* his actions to match the conditions of the simple tasks he performed.

![Figure 5.9 PRPP Stage Two Rasch-calibrated mean scores for Person 03, the man with a low total PRPP Stage Two Score](image-url)
5.4.3.2 Case 2: Person 26

Scores for the man with the highest Total PRPP Stage Two calibrated mean score (77.67%) (Person 26) were also extracted from the data. The tasks performed by this man consisted of using public transportation to get to a known destination on time, and to organise, prepare and record the first AM medication regimen.

Figure 5.10 is a radar graph of the Rasch-calibrated Subquadrant mean scores for Person 26. The decline in the Plan Subquadrant strategies of Evaluating and Mapping are apparent in this graph, as is his decline in the Perform Subquadrant of Continuing. Further examination of the data for Person 26 revealed that his task performance was characterised by problems Evaluating difficulties he encountered during performance (Analyses, Judges). He also had difficulty Choosing what to do (Programming Subquadrant). The Perform Quadrant difficulty in the Continuing Subquadrant was the stop/start method (Flows) he used to complete tasks.

![Radar Graph](image)

**Figure 5.10** PRPP Stage Two Rasch-calibrated mean scores for Person 26, the man with a high total PRPP Stage Two Score
5.4.4 Predictive power of the PRPP Stage Two

Point biserial correlation together with discriminant function analysis using regression was carried out as recommended by Tabachnik and Fidell (2004) using the four Quadrants (Perceive, Recall, Plan, Perform) as the predictor variable and the dichotomous dementia severity score (1 = mild; 2 = moderate/severe) as the dependent variable. This analysis demonstrated that all four Quadrants are strongly predictive of performance on the dichotomous dependent variable of dementia severity (R = .84). The R Square value of .70 indicates that the two predictor variables combine to account for 70% of the variability. Appendix XXI contains the SPSS output tables for these analyses.

To explore whether any one of the four quadrants was more predictive of the severity of dementia (mild versus moderate/severe), discriminant function analysis revealed that all four quadrants as a predictor set were highly statistically significant (F_{4,25} = 14.73; p < .001). The Plan Quadrant was the only Quadrant that was statistically significant on its own (t = -2.85; p = .009).

In conjunction with point biserial correlation this suggests that variance of the Perceive, Recall and Perform Quadrants overlaps but that the Plan Quadrant is the only one which adds a unique contribution to explaining the variance, and therefore has more impact on the predictive association with severity of dementia.
5.5 SUMMARY OF FINDINGS: PHASE TWO OF THE STUDY

The following is a summary of the findings of Phase Two of the study.

- Task performance mastery as measured by the PRPP Stage One is compromised in men with HAD.
- Errors that impacted performance of men with HAD as measured by the PRPP Stage One were typically errors of Timing, Accuracy and Omissions. Errors of Repetition were few.
- Information processing strategy application in everyday tasks assessed as measured by the PRPP Stage Two is compromised in men with HAD.
- The processing operations most impaired were identified to be those associated with planning, judging, monitoring, and performing tasks in a fluid manner.
- There are differences in processing difficulties between men with mild dementia and those with moderate or severe dementia.
- Those with more severe dementia demonstrate more problems with recalling information and controlling performance than men with mild dementia.
- The Plan Quadrant score predicted severity of dementia.
6.1 OVERVIEW

The purpose of Chapter Six is to discuss the results obtained from all phases of the research that aimed to investigate the impact of information processing strategy application disorders on everyday task performance in men with HIV-1-associated dementia (HAD). Many group findings were reported in Chapter Five, as well as two individualized case examples of those findings. In this chapter, three major findings are summarized. The similarities and differences between these findings and that from previous research are discussed. Possible reasons for the findings are proposed. The limitations of the study as a whole are presented, and the theoretical, empirical, and practical significance of the research described. Finally, conclusions are drawn with consideration of the scope and limitations of the study, and recommendations are made for further research.

6.2 DISCUSSION POINT 1: MEN WITH HIV DEMENTIA AND TASK PERFORMANCE MASTERY

In Chapter One, mastery was defined as the ability to perform a given task to the skill level determined by the person and/or the requirements of the performance
context. From the perspective of the PRPP Assessment System, mastery is therefore a person-centred concept, with the criterion for successful mastery determined by each individual situation. The findings from this research revealed that all men in the sample had difficulty performing the everyday tasks of relevance to them. The mean Mastery total percentage score for the sample fell below 50%. Across the sample, Timing errors and Accuracy errors reduced the mastery of task performance demonstrated by these men more frequently than other error types. In addition, men with more severe dementia made considerably more errors of Omission. Clearly, men in this sample are not performing in a skilled manner, the relevant everyday tasks that are important to them and others in their particular living contexts. Of note, errors of Repetition were not a defining characteristic of the performances of most men in the sample, indicating low incidence of the perseveration commonly seen in other types of dementia (Pekkala, Albert, Spiro, & Erkinjuntti, 2008)

These findings are consistent with other studies carried out to investigate the impact of HAD on everyday task performance reported in Section 2.5. Previous researchers have found that men with HIV-associated neurocognitive disorder (HAND) have difficulties with employment (Heaton et al., 1996; Heaton et al., 2004; Twamley et al., 2006), driving (Marcotte et al., 2004), adherence with medication regimes (Heaton et al., 2004), household financial management (Heaton et al., 2004), shopping and cooking (Gorman, Foley, Ettenhofer, Hinkin, & van Gorp, 2009; Heaton et al., 2004). Although the findings of this research are largely consistent with those reported in the literature, other differences exist
that may relate to the way function has been assessed, and the level of dementia of people comprising the various research samples.

First, previous researchers have generally utilized laboratory-based methods of assessing IADL, such as the Direct Assessment of Function (DAF) (Lowenstein & Bates, 1992) or the Advanced Finances adaptations to the DAF reported by Heaton and colleagues (2004), rather than in situ assessment. Second, the primary purpose for including measures of everyday task performance in the previous research reviewed appears to be focused more on establishing the ecological validity of traditional neuropsychological tests in predicting the real-world impact of impairment, than investigating functional capacity per se (Antinori et al., 2007; Grant, 2008; Heaton et al., 2004). Third, the tasks assessed by others have been ones chosen by the researchers, and were tests of instrumental activities of daily living (IADL) that relate to the domains reported above (Gorman et al., 2009; Woods, Moore, Weber, & Grant, 2009). Finally, the samples included in other studies have been comprised largely of men with mild neurocognitive disorder (MND), or at the mild end of the dementia spectrum, who were seen in outpatient clinics (Gorman et al., 2009; Woods, Carey et al., 2009).

In this study, the choice of tasks assessed were identified by the men in the sample or their role partners as personally meaningful and desired occupational performance goals. The context for assessment was the real-world home or community context where performance would typically occur. The men in this sample were all diagnosed with HAD, and some were at the severe end of the
spectrum. This produced a list of assessment tasks that varied widely. While some tasks were from the same IADL domains researched by others (e.g. shopping, cooking, paying bills), tasks also included eating cereal and brushing teeth, as well as, some group leisure activities (mosaic tiles, making greeting cards). The central purpose of this study was to gain an understanding of how men with HAD performed tasks in their real-world contexts where the naturally occurring perturbations that typically influence performance were not controlled for.

One of the outcomes of this study is the delineation of error typologies that impact upon task performance at different levels of dementia. Previous researchers have used assessments where everyday tasks have been broken down into steps during simulated scenarios established for assessment, for example, the Direct Assessment of Functional Status – Financial skills and Shopping (Lowenstein & Bates, 1992), or the three-step cooking test designed and used by Heaton et al (2004). In this study, Stage One of the PRPP enabled a detailed task step delineation that was tailored to fit the demands of each of the tasks assessed. Further, use of the PRPP Stage One error typology (Accuracy, Repetition, Omission, Timing) enabled a more critical appraisal of performance breakdown. No other studies reviewed have examined task performance in similar detail, or using these error typologies. The benefit of analysing performance using this error model is that it may provide useful information in planning intervention to sustain or improve task performance, and it enables discrete changes in performance to be measured over time. The link between error typologies and
different levels of dementia found in this study could be used to assist clients and their carers to predict the types of difficulties they may experience in the future, and implement training in compensatory strategies or environmental scaffolds to support and extend declining performance capacity. Further research is required to replicate and extend these findings.

HAND has been associated with psychomotor slowing and reduced coordination as reported in Section 2.4. It was therefore not surprising to find that Timing errors were made by all men in the sample. Most often, performance was too slow. One hypothesis generated by this finding is that the slowness in performance most likely reflected the additional time required by participants to think about what was happening, or to make choices about what to do next. This was especially true of men with mild dementia. This hypothesis is supported by information processing research that links slowness of response to speed of processing. Adults and children with compromised processing capacities have been found to have reduced speed of processing, specifically, reduced reaction time (Kail, 1991; Schmidt & Wrisberg, 2004)

Reaction time represents the time it takes a person to make decisions and initiate actions. There are a number of complex cognitive factors that influence speed of processing reaction time, notably the amount of response alternatives or the number of possible stimulus choices available to the person, each of which leads to a distinct response. According to Hick’s Law, as the number of possible stimulus-response options increase, reaction time increases in a linear fashion.
Errors of timing in this sample may not reflect motor capacities as much as slowed thinking processes involved in response selection, particularly in those men in the mild dementia grouping who performed tasks that were more complex and involved more steps. Reaction time is also dependent upon stimulus-response compatibility. This refers to the degree of fit or the ease of matching between the stimulus and the movement required to respond to a given stimulus (Kato, Endo, Kizuka, & Asami, 2005), or simply put, anticipation. As anticipation increases, people process information faster, and therefore respond faster. One of the findings of this study was that the men had difficulty mentally programming their performance, possibly indicating reduced anticipation. Reduced anticipation could also have contributed to the errors of Timing that characterized performance.

Those who were more disordered in their performance tended to act too quickly, although not impulsively. It is possible that men with severe dementia did not reflect the same amount of Timing error because the tasks they performed generally required less evaluation of response options. Meadows (1993) and others (Der & Dreary, 2006), for example have shown that practice and a person’s familiarity with the task and task complexity will have an impact on speed of processing, with simple, known tasks performed quicker than complex (Der & Deary, 2006; Meadows, 1993). The impact of familiarity through daily practice on timing and accuracy of performance has been illustrated across all ages (Der & Dreary, 2006). The intensity of a stimulus may also impact upon speed and information processing, with the more intense processing of sensory stimulus...
resulting in a shorter reaction time (Demetriou, Mouyi, & Spanoudis, 2010). The results of the *attention* and *sensing* difficulties described in Chapter Five indicate that the men had difficulties processing sensory information that was important for task performance. It is possible that the Timing errors showed by these men also reflected difficulty in processing the many sensory stimuli associated with everyday task performance.

That Repetition errors did not impact upon the performances of men in the sample is an interesting finding, and suggests that that the timing errors found in this study were not characterized by motor perseveration, but by the inefficient processing of information discussed below.

All men made frequent errors of Accuracy. It is possible that the gradual increase in the rate of mistakes where one does the wrong thing may be a more obvious indicator of cognitive decline, along with the need for more time to think about what is or will be happening.

### 6.3 DISCUSSION POINT 2: INFORMATION PROCESSING STRATEGY APPLICATION ERRORS

In Chapter One, information processing strategy application was defined as the cognitive and metacognitive attending, perceiving, remembering and planning behaviours one uses during task performance to optimize mastery. These observable behaviours have been operationalised on the PRPP Stage Two in the form of 34 ‘descriptors’ that represent strategies one uses to ‘perceive’, ‘recall’,
‘plan’ and ‘perform’ everyday tasks. Each descriptor represents a behaviour associated with a specific processing operation (Subquadrant) that relates to the processing focus of the Quadrant.

The findings from this research revealed that all men in the sample had difficulty applying the information processing strategies needed to complete tasks safely, effectively and efficiently in real-world contexts. The mean PRPP Stage Two score for men in the sample was 55.83%. Across the sample, operations in the Plan Quadrant posed the most problem for men, followed by the Perceive Quadrant. Perform Quadrant problems were also evident in both groups. Of interest is that Recall strategies were performed more effectively than those for any of the other Quadrants. In this sample of men with HIV-1-associated dementia, memory loss is not a defining characteristic of everyday performance, as is the case with other forms of dementia (Pekkala et al., 2008).

6.3.1 Perceive strategies
Perceive Quadrant strategy application errors were characterized most by problems with the descriptor, Monitors. Monitors is a Sensing Subquadrant descriptor. It is not surprising that this descriptor was high on the Rasch-calibrated linear ‘ruler’. Monitors entails the behaviours one uses to detect changes in the task and context as performance occurs. It is a form of ‘online’ attention that is controlled partly by ‘bottom-up’ and partly by ‘top-down’ information processing operations described and illustrated in Sections 2.6.3 and 2.6.4. Men in this sample had great difficulty sensing that their performance was
inaccurate or that steps were left out. Consequently, safety issues were of concern in many of the performances assessed. While this was especially true of men with more severe dementia, it was also characteristic of those with mild dementia.

*Modulates* was the Attending Subquadrant descriptor of most concern. *Modulates* represents behaviours associated with flexibility and allocation of attention to suit the task. It entails shifting the focus of attention from narrow to broad and from one part of the task to another. While men in the sample were able to *Notice* sudden sensory changes during task performance, such as someone speaking to them, a light turning on, a horn sounding, by looking, listening or moving, they generally remained too focused on one element of the task step or task and often missed critical information both central and peripheral to the task. This may partly explain the prevalence of Accuracy errors noted previously. Some, especially those with more severe dementia, also had difficulty *Maintaining* their attention for the duration of some tasks. This was a more inconsistent strategy application error than *Monitors* and *Modulates*. Most demonstrated the capacity to concentrate on tasks they were engaged in without difficulty. These findings are consistent with most research reported by others that has correlated problems with attention and most measures of IADL (Gorman et al., 2009; Hardy, Castellon, Hinkin, Levine, & Lam, 2008; Woods, Carey et al., 2009), especially driving (Marcotte & Scott, 2009).

Recently, Levine and colleagues (2007) investigated an existing model of attention operations used in real-world situations proposed by Mirsky and Duncan
(2001) and Mirsky et al. (1991) in men with HIV/AIDS. Through factor analytic studies, these authors proposed that four factors are essential to real-world attention: (a) *focus/execute*, which is the capacity to selectively attend to stimuli and execute responses required by the task; (b) *encode*, the ability to briefly maintain information in memory; (c) *shift*, or the capacity to shift focus from one stimulus to another; and (d) *sustain*, the capacity to maintain focus for appreciable length of time (Levine et al., 2007, p.54). Levine and colleagues added a fifth element, *stabilize*, which indicates the, “consistency or stability with which a person can respond to a designated target stimulus” (2007, p.59). Although these factors involve more than attention mechanisms, the link between the elements of attention and the PRPP Stage Two descriptors *Notices, Modulates*, and *Maintains* is clear. The findings of this research support dimensions of the model of attention described by Levine et al (2007) and Mirsky and Duncan (2001). This study is singular in the identification of the specific types of attention and sensory processing deficits to be found in men with HAD during everyday task performance, and provides real-world examples of how these difficulties manifest in naturalistic contexts.

### 6.3.2 Recall strategies

As discussed in Section 6.2, the Recall Quadrant operations were performed best by men in the sample. Neuropsychological assessments of Recall in men with HAND typically focus on the domains of learning and delayed recall as reported in Section 2.4.1. The memory impairments identified by tests have been described as difficulty in recollecting recently acquired information, difficulty
learning stories and lists, non-verbal learning, remembering complex designs and prospective memory, e.g., time-based remembering of intentions (Grant, 2008). Men in this sample, even the most disordered, knew the names of people they lived with, remembered where their room was, walked to the dining room in time for meals, described situations and items reported in the news (albeit at a simple level), knew how to use objects and their own body, and could carry out simple procedures. Those with mild impairment also could recall facts, locations and acquired procedures. It is not surprising that the Rasch-calibrated linear ‘ruler’ placed the Recall Quadrant descriptors of Uses Body, Recognises, and Uses Objects at the bottom of the most to least difficulty hierarchy (Section 5.3.4, Figure 5.2).

The most difficult and consistent Recall Quadrant strategy application difficulty experienced by the sample was the descriptor, Contextualises to Duration. This descriptor requires a person to use knowledge about how long tasks take in order to time their performances (Ranka, 2006). Men in the sample, especially those at the mild end of the dementia spectrum had difficulty knowing how long things took, and how much time had been spent on a task step, whole task or daily routine. Men at the low end of the spectrum had similar difficulties but on tasks that were less complex. They did not seem to know that they were generally taking too long. This may explain in part, the frequency of Stage One Time errors as discussed in Section 5.2.
The findings in this study appear to differ from other neuropsychological research that shows poor performance on tests of learning and memory correlate with measures of IADL (Albert et al., 1995; Castellon, Hinkin, Wright, & Barclay, 2009; Hinkin et al., 2002; Marcotte et al., 2006). The details of this NP research were presented in Section 2.5. There are several possible explanations for the discrepancy. First, the tasks being performed in this research were real-world everyday tasks of importance to the person being assessed. The assessments were carried out in a familiar environment, where the participant was able to use deep knowledge about the task and context to assist performance. Second, the neuropsychological tests used in other studies were dependent upon language and use of new and complex cognitive information that included recalling word lists, recounting stories read to them or remembering visual patterns presented. This study used occupations that were less dependent upon language and recall of novel and complex information per se. Third, tests used in other research often test more than one cognitive domain, despite the nominated ‘title’ of the measure. For example, the capacity to apply strategies to attend, learn, and use executive functions are all cognitive skills needed for most neuropsychological test items (Grant, 2008; Woods, Carey et al., 2009). Low scores on tests of learning and recall may be accounted for in part by impairments in other domains associated with the test items, such as attention and speed of processing. It is not surprising therefore, that in people with dementia, the outcome of such tests is a general picture of difficulties with most cognitive capacities. The behavioural descriptors on the PRPP Stage Two however, attempt to isolate these cognitive strategies into more discrete behavioural units that identify particular difficulties in
performance. Fourth, although the men were assessed on tasks that posed some difficulty for them, they were tasks that were known. Procedural memory has been shown to be the most resistant to decay in everyday activities of people with dementia (Norton & Ostergaard, 2001; Vance, 2008). Although it would be interesting to study the difference between novel and known tasks using the same measures in future research, the purpose of this study was to gain an understanding of the difficulties experienced by men with HAD when performing tasks that were known and relevant.

6.3.3 Plan strategies

As described at the beginning of this discussion, Plan Quadrant operations were the most problematic for the sample overall. ‘Plan’ encompasses the metacognitive elements of information processing described in Section 2.6. They are the higher order cognitive and metacognitive operations responsible for ‘top-down’ processing. Metacognitive operations enable one to formulate a plan to achieve a goal, construct a specific sequence of steps that have elements of novelty and complexity, organize the task to begin and remain organized, and keep the goal and plan in mind as responses are executed. It is not surprising that the Plan Quadrant descriptors of Sequences, Organises, Analyses, and Chooses were the highest on the linear least to most difficult ‘ruler’ produced by Rasch modelling.

These findings parallel theoretical and conceptual models of information processing (Lerner, 2002; Norman & Shallice, 1986; Schmidt & Wrisberg, 2004;
Sohlberg, Mateer, & Mateer, 1993) summarised in Section 2.6.3. They are also consistent with other studies using the PRPP System of Task Analysis, in which planning skills have been identified as one of the most impaired areas of information processing strategy application in adults with neurological and psychological impairment (Aubin, Chapparo, Gélinas, Stip, & Rainville, 2009; Fry & O'Brien, 2002; Nott & Chapparo, 2007; Still, Beltran, Catts, & Chapparo, 2002).

In this study, there were interesting differences between the men when grouped by level of dementia. Men with mild dementia had more problems with Programming operations (Sequences) than the Mapping or Evaluating operations. Their problems were more consistent with ‘plan-following’ rather than constructing a plan. Similar problems have been identified in other samples of people with frontal lobe dysfunction (Gouveia, Brucki, Malheiros, & Bueno, 2006). Although men at the moderate to severe end of the spectrum had very disordered planning, they demonstrated fewer problems Mapping and Evaluating than with Programming operations. This probably reflects that men with mild dementia performed tasks that included some sequential complexity (such as shopping). In comparison, men at the other end of the spectrum were assessed on tasks which were less complex and may have been carried out largely by using knowledge from the past (Recalls Procedures).
Metacognitive processes described in models of information processing include the construct, executive function (Borkowski & Burke, 1996). Dysexecutive syndrome has been identified in people with schizophrenia (Chan, Chen, Cheung, & Cheung, 2004) and HIV (Castellon, Hinkin, & Myers, 2000). Executive function is a frontal lobe operation central to the ability to multitask (Burgess, 2000). It is one part of the ‘top-down’ processing cycle where plans that have been conceptualized are made ready for execution. Multiple operations are involved. These include a controlled engagement in tasks, and the purposeful control of attention mechanisms during performance (Castellon et al., 2000) (Chan et al., 2004). That people with HAD have been shown to have difficulties with executive function (Gorman et al., 2009) is not surprising. What is interesting is that men at the asymptomatic end of HAND (ANI) have also been shown to demonstrate problems with neuropsychological test items that identify executive dysfunction, especially on items that require divided attention, concentration and metacognitive control over behaviour (Castellon et al., 2000).

Methods used to assess executive function in men with MND have included standard neuropsychological tests such as the Wisconsin Card Sorting Test, Stroop, Category Test and the Trail Making Test (Section 2.4.1) (Burgess et al., 2006; Grant, 2008). In this research, several descriptors on the PRPP Stage Two address executive functions. These include all the Plan Quadrant descriptors, as well as the Perceive descriptors of *Modulates* and *Monitors*, and the Perform Quadrant descriptors of *Starts*, *Flows*, and *Persists*. In this research, the performance of men with mild dementia was characterized by difficulties with
these descriptors. This is not surprising in view of the superordinate role that metacognition and executive functions play in task performance. What is different about this research is that the real-world manifestations of executive dysfunction have been identified and described. Other studies where the PRPP Assessment has been used with people with different neurocognitive diagnoses, have also found metacognitive and executive operations to be similarly impaired, for example, people with schizophrenia living in the community (Aubin et al., 2009) and children with learning disabilities (Pulis, 2002).

Recently, the focus of much research is on the cognitive domain of prospective memory (Woods, Dawson et al., 2009). Woods and colleagues identified that limitations in the performance of self-management of medication regimens using mock medication administration scenarios was associated with problems in “remembering to remember” (Woods, Dawson et al., 2009, p. 42), and remaining focused on the goal. In another study, Woods et al. (2009) identified that non-adherence to HAART regimens was associated with an impairment in time-based prospective memory. Men had difficulty incorporating time dimensions into their plans. This further supports the findings of this research where Contextualises to Duration was identified as a problem.

In this study, prospective memory would be associated with the descriptor, Knows Goal. This strategy entails having a goal in mind, and keeping the goal at the forefront of ‘thinking’ and ‘doing’ behaviours during task performance. In other PRPP research carried out on children with learning disability, Knows Goal has
loaded with some Recall descriptors (Pulis, 2002), which is consistent with Woods’ ‘remembering to remember’ concept above, and perhaps changes its functional focus to ‘knowing that you have to remember’ as a critical step of the task.

The neurological manifestations of HIV infection described in Section 2.3.3 are reported to disrupt the functional connectivity of the basal ganglia and neocortex, and the neural networks that depend on the integrity of these frontostriatal loops (Castello, Sherman, Courtney, Melrose, & Stern, 2006). The basal ganglia is a major structure involved in planning movement that has been mapped out in the neocortex. Knows Goal is central to these mapping operations, as is Contextualises to Duration.

6.3.4 Perform strategies

Men in this sample demonstrated a consistent difficulty in operations associated with the Continuing Subquadrant. The major descriptor error here was Flows. Performances of both groups were generally characterized by a stop-start method of acting. Men at both ends of the spectrum lacked a smooth flow in performance. Despite the frequent stops and re-starts, men often continued with the task and persisted in spite of difficulties. These errors may partly explain the Control Subquadrant difficulties men demonstrated with the descriptor Times. As discussed previously, their performances were not well-timed. The Perform Subquadrant of the PRPP Stage Two assesses the degree to which a person can apply the strategies required to start and stop performance, continue to the end of
a task and execute responses in a controlled manner. It is not a test of motor capacity.

AIDS Dementia Complex was first characterized as a subcortical dementia consisting of cognitive and motor impairments (Price, 1987). Neuropsychological domains assessed in people with HAND include motor tests, such as the Grooved Pegboard and Finger Tapping (Heaton et al., 2004). Associated impairments have been described as psychomotor slowing and reduced coordination (Grant, 2008) (See Section 2.4.1 for a complete description). As discussed previously, the neurological structures most often implicated in people with HAD include the basal ganglia (Castello et al., 2006), a structure involved in planning and smoothing out movement. In the sample studied in this research, the Perform Quadrant problems that were apparent are not those typically associated with central motor control difficulty.

Recently, it has been postulated that the coordination difficulties typically observed in people with HAND, may be explained by other causes (Grant, 2008). Most notably, people who have low CD4 T cell counts and chronic immune responses experience a deregulation of macrophages (Avison, Nath, & Berger, 2002; Cinque et al., 2004; Hult, Chana, Masliah, & Everall, 2008). The toxicity caused by HIV infected macrophages crossing the blood-brain barrier most likely accounts for peripheral neuropathies often seen in late stage HIV infection (Hult et al., 2008), as described in Section 2.3.2.
Some men in the sample were known to have peripheral neuropathies. They demonstrated postural distortions, a shuffling gait and mild in-coordination during task performance. Within the limits of their motor impairment, however, they could still apply the information processing strategies needed to Coordinate performance. A difference was observed between men at the mild end of severity versus those at the moderate/severe end. Those at the mild end of the dementia spectrum performed better on the Control Subquadrant descriptors than on the Initiating or Continuing descriptors. Men with moderate and severe dementia performed worse on the Control descriptor than the other two. This may be indicative of the influence of motor impairment but may also be indicative of Perceive, Recall and Plan difficulties already discussed and their role in regulating activity output in general.

6.4 DISCUSSION POINT 3: THE PRPP SYSTEM AND OCCUPATIONAL PERFORMANCE

6.4.1 Occupational performance

This research was grounded in the Occupational Performance Model (Australia) (Chapparo & Ranka, 1997), a conceptual model of the factors and interrelationships that shape and enable human occupational performance. Specific to this research, the relationships between HIV and the brain, the cognitive impairments created by HIV-1 infection and the impact of these impairments on everyday task performance in naturalistic contexts were investigated. Figure 6.1 illustrates the constructs of the OPM(A) and relationships between them that were central to this research (Figure 6.1).
The organiser of occupational performance represented in this model is one’s occupational roles. Roles may be assumed because of personal desires or some external demand. Occupational roles define a person. Fulfilment of occupational roles is predicated on the performance of routines and tasks required by each role.

In this study, the tasks selected for assessment were consistent with the occupational role requirements of each man in the study and, where relevant, his role partners. This differs from other research carried out with men who have HAD where assessment tasks were predetermined and based on research needs.

Burgess and colleagues criticized researchers in neuropsychology for retaining a “construct-driven” approach to investigation, and questioned the utility of continuing with these lines of research (Burgess et al., 2006, p.194). They
lamented the paradox of current executive system assessment, where researchers and clinicians attempt to assess a person’s ability to set goals, plan and organize behaviour in the context of an unstructured world, yet use a test situation in which highly structured tasks are presented in a highly controlled environment. In contrast, these authors propose that research be “function-led” where the interaction between the individual and situational context is considered. A move in this direction, Burgess, et al. (2006) argue, could yield assessments that have better representativeness and generalisability. The novel approach to study the impact of HAD on task performance adopted in this study represents a deviation from traditional approaches used to assess people with HAND, and opens a new line and method of investigation.

6.4.2 Occupational performance and criterion-referenced assessment

In this research, the PRPP Stage One was used to embed assessment in the real-world needs of the person. The use of a criterion-referenced approach where each person was measured against his own performance requirements yielded quantitative information about the performance mastery, and the characteristics of error patterns that impacted on mastery. Occupational therapy is not concerned with the general, but rather, the particular: the successful performance of a particular person or persons in a particular situation. Most therapists are required to assess particular and unique situations of occupational performance, and make judgments about their effectiveness, reflecting the postmodern shift in occupational therapy assessment practices away from a largely reductionistic,
instrument focused position, towards an emphasis on individual need and effectiveness within specific environments (Chapparo & Ranka, 2005).

There are few occupational focused assessment instruments that give guidance for doing this in an objective manner. Those that do have adopted variations of criterion related assessment. Criterion-referenced assessments measure how well a person performs against an objective or criterion rather than another person. Criterion-referenced assessments are mastery-oriented, where all concerned know of the expected standard. The "bell curve" is skewed heavily to the right as all participants are expected to succeed to the level nominated by their situation. Some assessments use a standard list of tasks that must be attempted, and a scoring rubric that maintains a ‘normative’ view of acceptable performance based on statistical analysis of the performance of many people, for example Assessment of Motor and Process Skills (AMPS) (Fisher, 2006). The PRPP however, has applied the philosophy of criterion assessment further by allowing the client situation to determine the tasks for analysis, and the client situation to determine the level of mastery needed (Stage One). The standard scoring rubric is determined by a standardized, objective scoring guideline that assessors use to judge observed information processing behaviour (Stage Two). This study has further confirmed the place of criterion referenced assessment in occupational therapy assessment practice that is characterized by ecological validity.

An assumption underlying the PRPP System of Assessment is that Stage One, which measures occupational performance, and Stage Two, which measures
cognitive strategy application are associated. This assumption is illustrated in Figure 6.1 by propositional arrows that flow from ‘Cognition’ to ‘Self Maintenance’, ‘Leisure’, ‘Rest’ and ‘Productivity’. This theoretical proposition finds support in the results outlined in Section 5.3.7 where the statistical relationship between the PRPP Stage One Total score and the PRPP Stage Two Total score was strong. Moreover, the relationship indicated that while the relationship was strong, it was not strong enough to suggest that Stage One and Stage Two are assessing exactly the same construct.

Although not a primary focus of this research, Stage One of the PRPP was also used to measure outcome, as discussed and demonstrated in Section 3.3.2. Proof of effectiveness of occupational therapy intervention is a common theme in occupational therapy literature (Law & MacDermid, 2008). The ability to produce evidence hinges partly on the availability and use of standardized measures that reflect the core purposes of occupational therapy, the successful performance of needed or chosen daily life tasks, and enhanced participation in real world contexts where people live, work, play and rest. Measures that possess standardization rigour, are client-centred, and based on an ecological occupational performance perspective, are central to measuring the effectiveness of occupational therapy practice. This pilot research has demonstrated the utility of the PRPP Stage One as an assessment and outcome measure for occupational therapists who work with people with have HAND.
6.4.3 Occupational performance and cognitive ethology

The men in this research had an infection of the core elements of ‘body’ (Figure 7.1) that impacted on the brain (‘mind’) and produced cognitive impairment. This research did not seek to identify the cognitive disorder, per se. Rather, the focus in this study was how men with cognitive impairments used cognition to perform everyday tasks within complex real-world situations. This use of cognition is observed through the behaviours one demonstrates as tasks are performed. As defined in Section 1.7.7, strategies are the salient attending, perceiving, remembering and planning behaviours one used to perform tasks and routines in the real world. In this study, the PRPP Stage Two was used to identify information processing strategy application capacities and errors. The PRPP scores reflect a capacity to use strategies needed for safe, effective and efficient performance. This is markedly different from other research that investigated the impact of cognitive impairment on everyday life.

Kingstone and colleagues (2008, p.371) admonish neuropsychology for adhering to laboratory-based investigations of function in various cognitive domains, and asserts that adhering to them, “will fail to generate valid theories of human cognition and behaviour in natural settings”. These authors propose a novel research framework called ‘cognitive ethology’ (Kingstone et al., 2008, p.317). Cognitive ethology focuses on the study of the naturally occurring variability in human cognition as it is used in real-world settings. Research aligned with this perspective, they assert, can lay the foundational observations of human cognition on which theories and ecologically valid experimentation can be built (Kingstone
The use of the PRPP Stage Two in this pilot study has provided rich observations of how cognition is used in the real-world, congruent with the tenets of cognitive ethology. The efficacy of using the PRPP System in future research has been demonstrated.

The use of Rasch measurement methods (RMM) (Rasch, 1960) to convert the ordinal data obtained from the PRPP Stage Two into an interval-level scale yielded a hierarchy of information processing difficulty. The least difficult items at the bottom of the linear ‘ruler’ were the Recall Quadrant descriptors of Uses Body, Recognises and Uses Objects, as well as the Perceive Quadrant descriptor of Notices. These descriptors are some of the most basic information processing strategies. Notices, the ability to spontaneously react to sensory information from the context, task or body (Chapparo, 2006), is central to survival. Recognises is a fundamental memory process, the ability to know what objects, people, sensory experiences are (Ranka, 2006). The two Recalling Procedures descriptors, Uses Objects and Uses Body, are also at the core of information processing. Difficulty with these dimensions of information processing is characteristic of people with severe cognitive impairment (Baddeley, 2004; Carter, 2009). The descriptors of most difficulty for men in the sample were those at the top of the linear ‘ruler’, Sequences, Organises, Analyses, and Chooses. These are all metacognitive operations involved in planning, and have been demonstrated to be susceptible to even mild cognitive disturbance (Carter, 2009; Eysenck & Keane, 2000; Risberg & Grafman, 2006). This research provides further validation of the theoretical
foundation to the PRPP Stage Two and its conceptual alignment with theories of information processing.

The use of the Occupational Performance Model (Australia) to ground this research in occupational therapy, and the use of the PRPP System Assessment to evaluate occupational performance mastery, and information processing strategy application needed to achieve mastery in this pilot research about men with HAD is unique. It represents the first investigation of the impact of information processing strategy application disorders on occupational performance in people with HAND. It is hoped that the findings from this research will lead to the design of occupational therapy programs that seek to enhance the occupational performance and participation options for men, women and children whose performance is affected by any of the HIV associated neurological disorders.

6.5 LIMITATIONS

Any consideration of the significance of these findings must be viewed with caution. This study was a pilot study and examined the performances of 30 men living in a major metropolitan area only. Future studies involving a larger sample are needed to confirm the findings. Task performances of people in smaller communities or rural areas were not investigated. Although many lived in suburban areas of the city, the naturalistic contexts where performances were assessed were often busy and fast-paced. It is not known to what extent this influenced men who were originally from more rural areas. Similarly, no women were included in the sample. Others have reported that HAD is more severe and
impacts differently on women (Poundstone, Chaisson, & et al, 2001; Wojna et al., 2006). It is not known to what extent the performances of everyday tasks by women may have differed from that of men. Regardless, the findings provide new information about the characteristics of task performance and information processing strategy application of men with HAD that has not been previously reported.

Second, while men in the sample were all diagnosed with HAD, the heterogeneous nature of the sample most likely influenced the findings. This is the risk associated with using bespoke ecologically valid assessments of real-world performance (Burgess et al., 2006) and new research paradigms (Kingstone et al., 2008), as discussed in Section 2.5.5.

A third limitation is that the results of neuropsychological assessment were either not available or not current for most of the sample. It would be interesting to see what correlations between scores on the PRPP Stage Two and neuropsychological tests would reveal. Also important is that the measure of dementia used, the Clinical Staging of the AIDS Dementia Complex (CSADC) is an observational measure from which a score is assigned. The protocol for diagnosing HAND (Antinori et al., 2007) however, specifies that results from neuropsychological testing and laboratory measures of viral load and CD4 T cell count are critical to establishing the clinical staging of HAND. More objective confirmatory information about HAD would strengthen the findings. Similarly, no measures of Instrumental or Basic Activities of Daily Living were used. The reason for this
was two-fold: first, therapists had limited time available to participate in the research with many working part-time only. They were unable to commit to the time required to administer additional assessments. Second, although the Klein-Bell Activities of Daily Living Scale (Klein-Bell) (Klein & Bell, n.d.) and the Kohlman Evaluation of Living Skills (KELS) (McGourty, 1979, 1999) have relevance, one focuses on IADL and the other focuses on BADL. Neither could provide information about everyone in the sample.

These limitations reinforce the need to view these results with caution.

6.6 SIGNIFICANCE

Despite the limitations listed above, this research makes a significant contribution to occupational therapy theory and practice for people living with HIV/AIDS who have an HIV-associated neurocognitive disorder (HAND), especially for those with HIV-1-associated dementia (HAD).

6.6.1 Theoretical contribution

This pilot research represents an attempt to integrate information processing theory, occupational performance and the primary neurocognitive impairment that results from HIV/AIDS. This research focused on several constructs defined by the OPM(A) (Chapparo & Ranka, 1997) including the interaction between the internal and external dimensions (person characteristics and contextual factors) of occupational performance. This research makes a significant contribution to
understanding how the core elements (mind) of a person and their capacities are impacted by HAD, and how the impairments created (cognition) affects the use of cognitive strategies during the performance of human occupations (roles, routines, tasks) in real world external contexts, and with reference to a person’s goals in the here (space) and now (time). This provides a platform from which future studies that align with occupational therapy and cognitive ethology can emerge.

The findings from this research make a significant contribution to the understanding of information processing theory as a framework for occupational therapy assessment and intervention with people with HAD. This research supports the conceptual foundation of the PRPP System of Assessment, in particular through a generation of a theoretical hierarchy of information processing strategies that is consistent with current information processing theory. The generated hierarchy links occupational therapy foundations with underlying theories of information processing and learning.

6.6.2 Clinical contribution

Findings from this research demonstrated the utility of an occupation-embedded assessment system that can be used with clients who have HAD. This represents a significant addition to the assessment options available to occupational therapists who work with such people. The assessment of tasks of relevance to the person removes the cultural limitations that exist with many measures available to occupational therapists. The migration of HIV infected people from other localities and cultures to Western countries poses unique challenges for
occupational therapists needing to assess the impact of impairment on occupational performance. The PRPP System of Assessment will provide therapists with a feasible option.

6.6.3 Empirical contribution

Data generated in the course of this research add to the empirical evidence supporting the PRPP System of Assessment. This research is one of few to have applied Rasch modelling to data generated by the PRPP Stage Two, and provides empirical data outlining a hierarchy of information processing strategies used during occupational performance in men with HAD. The interval-level data produced by the RMM enabled statistical procedures to be carried out on the data to investigate further the characteristics of information processing strategy application errors demonstrated by men with HAD in real-world situations. This represents the first known research of this kind.

6.7 RECOMMENDATIONS FOR FUTURE RESEARCH

More research that investigates the impact of HAD on everyday task performance and information processing strategy application errors with larger samples is required. New lines of research may seek to investigate the impact of sub-groups of people with HAD, as well as those with MND and ANI. It is not known to what extent information processing strategy application errors impact on the performances of women and children. This requires investigation. New methods of administration of the PRPP Stage One and/or Stage Two might include interview formats that seek to obtain the views of role partners about a partner’s
task performance mastery, as well as to better understand the perceived impact of HAD, MND or ANI as reported by those with this diagnosis. Research is required to examine the correlations between traditional neuropsychological measures, laboratory-based measures of function and the PRPP Stage One and Two to examine what relationships exist between real-world performance and that which is assessed in the laboratory. Research is needed to examine whether the measurement of mastery on the PRPP Stage One correlates with more traditional methods of I/BADL assessment. Finally, it would be interesting to examine more closely the influence of the context on performance mastery, as well as on information processing strategy application capacity during occupational performance.

6.8 CONCLUSIONS

This study investigated the impact of information processing strategy application errors on the performance of everyday tasks carried out in real-world contexts in a sample of 30 men with HAD. With consideration of the limitations of the study, conclusions that may be drawn from the research include the following:

- Task performance mastery as measured by the PRPP Stage One is compromised in men with HAD.
- Errors impacting performance of men with HAD as measured by the PRPP Stage One are typically errors of Timing, Accuracy and Omissions but may include Repetition
• Information processing strategy application as measured by the PRPP Stage Two is compromised in men with HAD.

• Specific information procession operations can be observed and scored as men with HAD perform everyday tasks in real-world contexts.

• The processing operations most impaired were identified to be those associated with planning, judging, monitoring, and performing tasks in a fluid manner.

• There are differences in processing difficulties between men with mild dementia versus those with moderate or severe dementia.

• Those with more severe dementia demonstrate more problems with recalling information and controlling performance.
REFERENCES


American Occupational Therapy Association, I. (n.d.). Occupational Performance History Interview (OPHI): (Available from AOTA, 4720 Montgomery Lane, P.O. Box 31220, Bethesda, MD 20824-1220).


van As, M., Myezwa, H., Stewart, A., Maleka, D., & Musenge, E. (2009). The International Classification of Function, Disability and Health (ICF) in


APPENDIX I

Criteria for HIV-associated neurocognitive disorders (HAND)
(Antinori, et al., 2007, p. 4)

HIV-associated asymptomatic neurocognitive impairment (ANI)

1. Acquired impairment in cognitive functioning, involving at least two ability domains, documented by performance of at least 1.0 SD below the mean for age, education-appropriate norms on standardized neuropsychological tests. The neuropsychological assessment must survey at least the following abilities: verbal-language, attention/working memory, abstraction/executive, memory (learning, recall), speed of information processing, sensory-perceptual, motor skills.

2. The cognitive impairment does not interfere with everyday functioning.

3. The cognitive impairment does not meet the criteria for delirium or dementia.

4. There is no evidence of another pre-existing cause for theANI.

HIV-1-associated mild neurocognitive disorder (MND)

1. Acquired impairment in cognitive functioning, involving at least two ability domains, documented by performance of at least 1.0 SD below the mean for age, education-appropriate norms on standardized neuropsychological tests. The neuropsychological assessment must survey at least the following abilities: verbal-language, attention/working memory, abstraction/executive, memory (learning, recall), speed of information processing, sensory-perceptual, motor skills. Typically, this would correspond to a MSK [Memorial Sloan Kettering] scale stage of 0.5 to 1.0.

2. The cognitive impairment produces at least mild interference in daily functioning (at least one of the following).

   a) Self-report of reduced mental acuity, inefficiency in work, homemaking, or social functioning.

   b) Observation by knowledgeable others that the individual has undergone at least mild decline in mental acuity with resultant inefficiency in work, homemaking, or social functioning.

3. The cognitive impairment does not meet the criteria for delirium or dementia.

4. There is no evidence of another pre-existing cause for the MND.
HIV-1-associated dementia (HAD)

1. Marked acquired impairment in cognitive functioning, involving at least two ability domains; typically the impairment is in multiple domains, especially in learning new information, slowed information processing, and defective attention/concentration. The cognitive impairment must be ascertained by neuropsychological testing with at least two domains 2 SD or greater than demographically corrected means. (Note that where neuropsychological testing is not available, standard neurological evaluation and simple bedside testing may be used, but this should be done as indicated in algorithm; see below).

2. Typically, this would correspond to an MSK scale stage of 2.0 greater.

3. The cognitive impairment produces marked interference with day-to-day functioning (work, home life, social activities).

4. The pattern of cognitive impairment does not meet criteria for delirium (e.g. clouding of consciousness is not a prominent feature); or, if delirium is present, criteria for dementia need to have been met on a prior examination when delirium was not present.

5. There is no evidence of another, pre-existing cause for the dementia (e.g. other CNS infection, CNS neoplasm, cerebrovascular disease, pre-existing neurologic disease, or severe substance abuse compatible with CNS disorder).

NOTES:
* If there is a prior diagnosis of ANI, but currently the individual does not meet criteria, the diagnosis of ANI in remission can be made.
* If the individual with suspected ANI also satisfies criteria for a major depressive episode or substance dependence, the diagnosis of ANI should be deferred to a subsequent examination conducted at a time when the major depression has remitted or at least 1 month after cessation of substance use.
* If there is a prior diagnosis of ANI, but currently the individual does not meet criteria, the diagnosis of ANI in remission can be made.
* If the individual with suspected ANI also satisfies criteria for a major depressive episode or substance dependence, the diagnosis of ANI should be deferred to a subsequent examination conducted at a time when the major depression has remitted or at least 1 month after cessation of substance use.
* If there is a prior diagnosis of HAD, but currently the individual does not meet criteria, the diagnosis of HAD in remission can be made.
* If the individual with suspected HAD also satisfies criteria for a severe episode of major depression with significant functional limitations or psychotic features, or substance dependence, the diagnosis of HAD should be deferred to a subsequent examination conducted at a time when the major depression has remitted or at least 1 month has elapsed following cessation of substance use. Note that the consensus was that even when major depression and HAD occurred together, there is little evidence that pseudo dementia exists and the cognitive deficits do not generally improve with treatment of depression.
APPENDIX II

Clinical Staging of the AIDS dementia complex
(Price & Brew, 1988)

<table>
<thead>
<tr>
<th>Stage</th>
<th>Characteristics</th>
</tr>
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<tbody>
<tr>
<td>Stage 0</td>
<td>(normal)</td>
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<tr>
<td></td>
<td>Normal mental and motor function</td>
</tr>
<tr>
<td>Stage 0.5</td>
<td>(equivocal / subclinical)</td>
</tr>
</tbody>
</table>
|           | Absent, minimal, or equivocal symptoms 
without impairment of work or capacity to 
perform ADL. Mild signs (snout response, 
slowed ocular or extremity movements) may 
be present. Gait and strength are normal |
| Stage 1   | (mild)                                                                          |
|           | Able to perform all but the more demanding aspects of work or ADL but with 
unequivocal evidence (signs or symptoms that may include 
performance on neuropsychological testing) of 
functional intellectual or motor impairment. 
Can walk without assistance.               |
| Stage 2   | (moderate)                                                                      |
|           | Able to perform basic activities of self-care but cannot work or maintain the 
more demanding aspects of daily life. 
Ambulatory, but may require a single prop.  |
| Stage 3   | (severe)                                                                        |
|           | Major intellectual incapacity (cannot follow news or personal events, cannot 
sustain complex conversation, considerable slowing of all output) or motor 
disability (cannot walk unassisted, requiring 
walker or personal support, usually 
with slowing and clumsiness of arms as well). |
| Stage 4   | (end stage)                                                                     |
|           | Nearly vegetative. Intellectual and social comprehension and output are at a 
rudimentary level. Nearly or absolutely mute. Paraparetic 
or paraplegic with urinary and fecal incontinence. |

NOTE: ADL = activities of daily living
APPENDIX III

Authorship Statement

March 25, 2019


To whom it may concern,


* Concept and design of the research
* Analysis of the findings
* Writing the abstract
* Critical appraisal of the content presented
* Corresponding author with the Conference Committee

My contributions to the paper were:

* Co-writing the presentation content
* Collecting data used in the research
* Participating in the analysis of the data
* Participating in the presentation of the paper

Yours sincerely,

Kylie Tobler

PhD Candidate (Anthropology)
University of Sydney
25 March 2010.
APPENDIX IV

Authorship Statement

As co-author of the paper, “Ranka, J., & Chapparo, C. (2010). Assessment of productivity performance in men with HIV associated neurocognitive disorder (HAND). WORK: A Journal of Prevention, Assessment, & Rehabilitation, 36(2), __-____”, I confirm that Judy Ranka has made the following contributions:

- Concept and design of the research
- Data collection, analysis and interpretation of the findings
- Writing the paper and critical appraisal of content
- Corresponding author for communication with the journal

My contribution to the paper was:

- Critical appraisal of content
- Editing and discussion consistent with the supervisory process

Christine Chapparo

Signed: [Signature]
Date: 3/3/2010
APPENDIX V

Ethics Approval - SSWAHS

5 September 2006

Dr C Chapparo
School of Occupation
& Leisure Sciences
UNIVERSITY OF SYDNEY NSW 2006

Dear Dr Chapparo,

Re: Protocol No X06-0148 - “Identification of the effect of information processing impairment on the performance of everyday tasks in men with AIDS dementia complex (ADC)”

The Executive of the Ethics Review Committee, at its meeting of 31 August 2006, considered your correspondence of 28 August 2006. In accordance with the decision made by the Ethics Review Committee, at its meeting of 9 August 2006, approval is now granted to proceed.

You are asked to note the following:

- This approval is valid for four years, and the Committee requires that you furnish it with annual reports on the study’s progress beginning in September 2007.

- This approval relates to the ethical content of the study only, and you are responsible for the following:
  - negotiating individual arrangements with the Heads of service departments in those situations where the use of their resources is involved,
  - arranging an identity pass for any researcher who is not employed by the Sydney South West Area Health Service. You and the researcher should present yourselves at the Security Department, Level 5, Building 64, Royal Prince Alfred Hospital with a copy of this approval letter, and
• if appropriate, informing the study sponsor that the membership and procedures of the SSWAHS Ethics Review Committee (RPAH Zone) comply with the National Statement on Ethical Conduct in Research Involving Humans.

• If you or any of your co-investigators are University of Sydney employees or have a conjoint appointment, you are responsible for informing the University’s Risk Management Office of this approval, so that you can be appropriately indemnified.

Yours sincerely,

Lesley Townsend
Secretary
Ethics Review Committee (RPAH Zone)

HERCIEXCOR05-09
APPENDIX VI

Ethics Approval - USyd

The University of Sydney

1 December 2006

Dr Christine Chapparo
School of Occupation & Leisure Sciences
Faculty of Health Sciences
Cumberland Campus – C42
The University of Sydney

Dear Dr Chapparo

Title: Identification of the effect of information processing impairment on the performance of everyday tasks in men with Aids Dementia Complex (ADC) (Ref. No. 9729)
PhD Student: Ms Judy L Ranka

Your application was reviewed by the Executive Committee of the Human Research Ethics Committee (HREC), and in doing so have ratified your study to cover the PhD Student, Ms Judy L Ranka.

The Executive Committee acknowledges your right to proceed under the authority of the Sydney South West Area Health Service Ethics Review Committee (RPAH Zone).

Please note, this ratification has been given only in respect of the ethical content of the study.

Any modifications to the study must be approved by the Sydney South West Area Health Service Ethics Review Committee (RPAH Zone) before submission to the University of Sydney Human Research Ethics Committee.

Yours sincerely

Gail Briody
Senior Ethics Officer
Ethics Administration

cc Ms Judy L Ranka, School of Occupation & Leisure Sciences, Faculty of Health Sciences, Cumberland Campus – C42, The University of Sydney
APPENDIX VII

Information for Participants

The University of Sydney

School of Occupation and Leisure Sciences
Faculty of Health Sciences
Cumberland Campus C42
PO Box 170 (East St.)
 Lidcombe NSW 1825
Judy Ranka, BSc, MA, OTR
Email: J.Ranka@fla.usyd.edu.au

Identification of the effect of information processing impairment on the performance of everyday tasks in men with AIDS Dementia Complex (ADC)

INFORMATION FOR PARTICIPANTS

Introduction

Occupational therapists are concerned with peoples' abilities to perform typical everyday tasks and participate in life to the fullest. We are aware of the memory and thinking difficulties that HIV/AIDS creates for some people but are not yet able to concretely identify these difficulties. As a result, therapists lack objective information on which to plan the best intervention to assist people to perform everyday tasks better.

You are invited to take part in a research study into the effects of memory and thinking problems resulting from HIV/AIDS on task performance in men who have these problems.

The objective is to determine if we can identify and describe these difficulties more clearly. If this is possible, therapists will be able to use the information to plan therapy that is more specifically tailored to a person's task performance problems and needs.

The study is being conducted within this institution by Judy Ranka, a lecturer from the University of Sydney's School of Occupation and Leisure Sciences as part of the requirements of the degree of Doctor of Health Sciences and her supervisor, Dr. Christine Chapparo, a senior lecturer in the same School.

Study Procedures

If you agree to participate in this study, you will be asked to sign the Participant Consent Form. You will then be asked to allow Judy to observe you during your occupational therapy session performing two everyday tasks that you find difficult. Judy will be writing down what abilities she sees you have and also the difficulties you encounter in performing these tasks. The results of the assessment Judy
Identification of the effect of information processing impairment on the performance of everyday tasks in men with AIDS Dementia Complex (ADC)

completes will be discussed with you and your occupational therapist so you will know what has been written down during the observation.

Some of the men who agree to participate in this study will be asked if it is okay to have one or both of the sessions videotaped. The purpose of videotaping is so that Judy can ensure that her observations are accurate. If you are one of the people who are asked to give permission to be videotaped, you can refuse without any consequences or further questioning.

Risks

All procedures - whether for diagnosis or treatment, routine or experimental – involve some risk of injury or distress. We anticipate that the risks involved in participating in this study are minimal. We do understand that the difficulties you encounter may be frustrating and cause you to become stressed. We will make every attempt to ensure that you do not feel overwhelmed by the difficulties you experience in doing the tasks we observe. If you do feel that what we ask of you is too difficult, we will stop the observation.

Benefits

While we intend that this research study furthers medical knowledge and may improve treatment of people with AIDS Dementia Complex in the future, it may also be of direct benefit to you. If you wish, the findings from the assessment may be used to design a program to assist you in doing the things you need and want to do more easily.

Costs

Participation in this study will not cost you anything, nor will you be paid.

Voluntary Participation

Participation in this study is entirely voluntary. You do not have to take part in it. If you do take part, you can withdraw at any time without having to give a reason. If you are asked to give permission to be videotaped, you do not have to consent to this either.

Whatever your decision, please be assured that it will not affect your medical treatment or your relationship with the staff who are caring for you. Of the people treating you, only your occupational therapist will be aware of your participation or non-participation, or your consent or non-consent to videotaping.

Confidentiality

All the information collected from you for the study will be treated confidentially, and only the researchers named above will have access to it. The study results may be presented at a conference or in a scientific publication, but individual participants will not be identifiable in such a presentation. If you are videotaped, the packaging will not contain any information that can identify you. The tapes will only be viewed by
Identification of the effect of information processing impairment on the performance of everyday tasks in men with AIDS Dementia Complex (ADC)

the researchers and will be kept securely in a locked filing cabinet in Judy's office in the School of Occupation & Leisure Sciences at the University of Sydney. Only the researchers have access to the key to this office and the filing cabinet key. Once the statistics have been carried out to ensure the observations made were accurate, the tapes will be permanently stored in this secure space for the mandatory period of seven years and then physically destroyed before being discarded.

Further Information

When you have read this information, Judy Ranka or another member of staff you nominate, will discuss it with you further and answer any questions you may have. If you would like to know more at any stage, please feel free to contact Judy Ranka on 9351 9207. This information sheet is for you to keep.

Ethics Approval

This study has been approved by the Ethics Review Committee (RPAH Zone) of the Sydney South West Area Health Service. Any person with concerns or complaints about the conduct of this study should contact the Secretary on 02 9515 6766 and quote protocol number X06-0148.

Date: 28 August, 2006

Judy Ranka

Dr. Christine Chapparo
APPENDIX VIII

Participant Consent

The University of Sydney

School of Occupation and Leisure Sciences
Faculty of Health Sciences
Cumberland Campus C42
PO Box 170 (East St.)
Lidcombe NSW 1825

Judy Ranka, BSc, MA, OTR
Email: J.Ranka@hrs.usyd.edu.au

Identification of the effect of information processing impairment on the performance of everyday tasks in men with AIDS Dementia Complex (ADC)

PARTICIPANT CONSENT FORM

I, [name]

Of [address]

have read and understood the Information for Participants on the abovementioned research study

and have discussed the study with [name]

I have been made aware of the procedures involved in the study, including any known or expected inconvenience, risk, discomfort or potential side effect and of their implications as far as they are currently known by the researchers.

I freely choose to participate in this study and understand that I can withdraw at any time. I also understand that I can refuse to be videotaped and can stop the videotaping at any time.

I also understand that the research study is strictly confidential.

I hereby agree to participate in this research study.

NAME: [name]

SIGNATURE: [signature]

DATE: [date]

NAME OF WITNESS: [name]

SIGNATURE OF WITNESS: [signature]

Date: 28 August, 2006

Information Processing Impairment Study: Judy Ranka
APPENDIX IX

Information for Person Responsible

The University of Sydney

School of Occupation and Leisure Sciences
Faculty of Health Sciences
Cumberland Campus C42
PO Box 170 (East St.)
Lidcombe NSW 1825

Judy Ranka, BSc, MA, OTR
Telephone: +61 2 9351 9207
Email: J.Ranka@fhs.usyd.edu.au
Facsimile: +61 2 9351 9197

Identification of the effect of Information processing impairment on the performance of everyday tasks in men with AIDS Dementia Complex (ADC)

INFORMATION FOR THE PERSON RESPONSIBLE

Introduction

Occupational therapists are concerned with peoples’ abilities to perform typical everyday tasks and participate in life to the fullest. We are aware of the difficulties that AIDS Dementia Complex (ADC) creates for people but are not yet able to concretely identify these difficulties. As a result, therapists lack objective information on which to plan the best intervention to assist people to perform everyday tasks better.

The person for whom you are responsible for making medical decisions (hereinafter referred to as “your relative/friend”) is invited to take part in a research study into the effects of dementia on task performance in men who have this condition. The objective is to determine if we can identify and describe these difficulties more clearly. If so, therapists will be able to plan intervention that is more specifically tailored to a person’s task performance problems and needs.

The study is being conducted within this institution by Judy Ranka, a lecturer from the University of Sydney’s School of Occupation and Leisure Sciences as part of the requirements of the degree of Doctor of Health Sciences and her supervisor, Dr. Christine Chapparo, a senior lecturer in the same School.

Study Procedures

If you agree to your relative/friend’s participation in the study, you will be asked to sign the Guardian Consent Form. You will then be asked to allow Judy to observe this person during his occupational therapy session performing two everyday tasks that he finds difficult. Judy will be writing down what abilities she sees he has and also the difficulties he encounters in performing the selected tasks. The results of the assessment Judy completes will be discussed with your relative/friend, his occupational therapist and you (if you are interested) so he and you know what has been written down during the observation. Some of the men who participate in this study will be asked if it is okay to have one or both sessions videotaped. The purpose of videotaping is so that Judy can ensure that her observations are accurate. Anyone who is asked to give permission to be videotaped can refuse without any consequences or further questioning.
Further Information

If you would like to know more at any stage, please feel free to contact Judy Ranka on 9351 9207. This information sheet is for you to keep. When you have read this information, Judy Ranka or another member of staff you nominate, will discuss it with you further and answer any questions you may have.

Ethics Approval

This study has been approved by the Ethical Review Committee (RPAH Zone) of the Sydney South West Area Health Service. Any person with concerns or complaints about the conduct of this study should contact the Secretary on 02 9515 6786 and quote protocol number X06-0148.

Date: 28 August, 2006

Judy Ranka

Dr. Christine Chapparo

Voluntary Participation

Participation in this study is entirely voluntary. You do not have to consent for him to take part in it. If he does take part, you or he can withdraw at any time without having to give a reason. If he is asked to give permission for videotaping, he does not have to consent to this either. Whatever your decision, please be assured that it will not affect his medical treatment or his relationship with the staff who are caring for him. Of the people treating him, only his occupational therapist will be aware of his participation or non-participation, or his consent or non-consent to be videotaped.

Confidentiality

All the information collected from him for the study will be treated confidentially, and only the researchers named above will have access to it. The study results may be presented at a conference or in a scientific publication, but individual participants will not be identifiable in such a presentation. If videotaping of your relative/friend does occur, the packaging will not contain any information that can identify him. The tapes will only be viewed by the researchers and will be kept securely in a locked filing cabinet in Judy's office in the School of Occupation & Leisure Sciences at the University of Sydney. Only the researchers have access to the key to this office and the filing cabinet key. Once the statistics have been carried out to ensure the observations made were accurate, the tapes will be permanently stored in this secure space for the mandatory period of seven years and then physically destroyed before being discarded.
PERSON RESPONSIBLE CONSENT FORM

I, ...................................................................................................................

[name]

Of ....................................................................................................................

[address]

have read and understood the Information for Person Responsible on the 

abovenamed research study .................................................................

and have discussed the study with ..........................................................

I have been made aware of the procedures involved in the study, including any 

known or expected inconvenience, risk, discomfort or potential side effect and of 

their implications as far as they are currently known by the researchers.

I freely choose to allow my relative/friend to participate in this study and understand 

that I can withdraw his participation at any time. I also understand that I can refuse 

to allow my relative/friend to be videotaped and can stop the videotaping at any time.

I also understand that the research study is strictly confidential.

I hereby agree for my relative/friend to participate in this research study.

NAME: .............................................................................................................

SIGNATURE: ............................................................................................... 

DATE: ............................................................................................................

NAME OF WITNESS: ..................................................................................

SIGNATURE OF WITNESS: ...........................................................................

Date: 28 August, 2006
APPENDIX XI

PRPP System Assessment Score Sheet

<table>
<thead>
<tr>
<th>Client Name:</th>
<th>Date:</th>
<th>Task:</th>
</tr>
</thead>
</table>

3(-) = Performance of this descriptor meets criterion expectations; reasonable time, without assistance; without prompts
2(?) = Performance of this descriptor meets criterion expectations but indicates concern due to timing or prompts needed
1(0) = Performance of this descriptor does not meet criterion expectations; inhibits performance

### STAGE ONE ANALYSIS: CRITERION %

<table>
<thead>
<tr>
<th>STEPS</th>
<th>ERRORS</th>
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### STAGE TWO ANALYSIS RATING

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<th></th>
<th>1(0)</th>
<th>2(?)</th>
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<tr>
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### PERCENTAGE SCORE:

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## APPENDIX XII

**Abridged definitions of PRPP Stage Two ‘descriptors’**

<table>
<thead>
<tr>
<th>ATTENDING</th>
<th>SENSING</th>
<th>DISCRIMINATING</th>
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<tbody>
<tr>
<td><strong>Notices</strong></td>
<td><strong>Searches</strong></td>
<td><strong>Discriminates</strong></td>
</tr>
<tr>
<td>Spontaneously reacts by head turning or looking, reaching or listening.</td>
<td>Active and systematic seeking of sensory information by looking, listening, feeling, smelling</td>
<td>Differentiates between</td>
</tr>
<tr>
<td><strong>Modulates</strong></td>
<td><strong>Locates</strong></td>
<td><strong>Matches</strong></td>
</tr>
<tr>
<td>Spontaneous narrowing and broadening of focus, shifting attention from one part of the task to another.</td>
<td>Finds body parts, objects and parts of the environment that are needed for the task</td>
<td>Fits together, associates same sizes, shapes, objects body parts</td>
</tr>
<tr>
<td><strong>Maintains</strong></td>
<td><strong>Monitors</strong></td>
<td></td>
</tr>
<tr>
<td>Sustaining attention long enough for task completion</td>
<td>Responds by action to sensory input when body or environment changes during task performance</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PERCEIVE</th>
<th>RECALLING FACTS</th>
<th>RECALLING SCHEMES</th>
<th>RECALLING PROCEDURES</th>
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<td><strong>RECALLING SCHEMES</strong></td>
<td><strong>RECALLING PROCEDURES</strong></td>
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<tr>
<td><strong>RECALL</strong></td>
<td>Recognises</td>
<td>Contextualises to Time</td>
<td>Uses Objects</td>
</tr>
<tr>
<td>Shows recognition of objects, body parts and the task environment</td>
<td>Knows when task occurs</td>
<td>Interacts with and uses known objects appropriately</td>
<td></td>
</tr>
<tr>
<td><strong>Labels</strong></td>
<td><strong>Contextualises to Place</strong></td>
<td><strong>Uses Body</strong></td>
<td></td>
</tr>
<tr>
<td>Names objects, body parts and the task environment. Understands and uses language</td>
<td>Knows where task occurs</td>
<td>Demonstrates the general &amp; specific body movements necessary to place self in known positions</td>
<td></td>
</tr>
<tr>
<td><strong>Categorises</strong></td>
<td><strong>Contextualises to Duration</strong></td>
<td><strong>Recalls Steps</strong></td>
<td></td>
</tr>
<tr>
<td>Groups objects or body parts according to the task</td>
<td>Knows how long task takes</td>
<td>Performs the general and specific procedures and steps needed for known tasks</td>
<td></td>
</tr>
<tr>
<td>PLAN</td>
<td>MAPPING</td>
<td>PROGRAMMING</td>
<td>EVALUATING</td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
<td>-------------</td>
<td>------------</td>
</tr>
<tr>
<td>Knows Goal</td>
<td>Has an outcome, Formulates an outcome. Keeps outcome in mind</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identifies Obstacles</td>
<td>Examines scheme of action. Explores &amp; identifies potential constraints of task completion</td>
<td></td>
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<tr>
<td>Organises</td>
<td>Arranges objects and body to begin task. Rearranges environment as task progresses</td>
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<tr>
<td>INITIATING</td>
<td>CONTINUATING</td>
<td>CONTROLLING</td>
<td></td>
</tr>
<tr>
<td>Starts</td>
<td>Flows</td>
<td>Times</td>
<td></td>
</tr>
<tr>
<td>Begins expected performance. Restarts after interruption</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Smooth performance. Easy transitions. No stop-starting</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Correct speed. Performs within functional/expected time frame</td>
<td></td>
</tr>
<tr>
<td>Stops</td>
<td>Continues</td>
<td>Coordinates</td>
<td></td>
</tr>
<tr>
<td>Stops at times appropriate to expected performance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Completes task to expected level</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Smooth musculoskeletal performance. Freedom from tremor, weakness</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Persist</td>
<td>Adjusts</td>
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</tr>
<tr>
<td></td>
<td>Keeps going when obstacles arise</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Musculoskeletal adjustments are made to match the plan</td>
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APPENDIX XIII

Rasch-generated order of difficulty of PRPP Stage Two
Descriptors in logits

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<th>Infit MnSq</th>
<th>zstd</th>
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Notes: SE = Standard error; MnSq = Mean Square; zstd = standardized z scores.
Fit parameters: MnSq = 0.5 to 1.7; zstd =0±2
### Appendix XIV

Rasch-calibrated linear ‘ruler’ for PRPP Stage Two Items and Persons – in logits

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<td>231126 241126 261126 +</td>
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<td>301127</td>
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<tr>
<td>201122 261128       +</td>
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<tr>
<td>4</td>
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<tr>
<td>281123 271126       +</td>
</tr>
<tr>
<td>Organises</td>
</tr>
<tr>
<td>221223 271126       +</td>
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<td>Analyses</td>
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<td>3</td>
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<tr>
<td>301128</td>
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<tr>
<td>251128 271128       +</td>
</tr>
<tr>
<td>Chooses</td>
</tr>
<tr>
<td>221229 251128       +</td>
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<tr>
<td>Monitors</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>132223</td>
</tr>
<tr>
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</tr>
<tr>
<td>241128 181217       +</td>
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<tr>
<td>Judges</td>
</tr>
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</tr>
<tr>
<td>052314 122314        +</td>
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<tr>
<td>Identifies Questions</td>
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<td>052309 142219 171219 181224</td>
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<tr>
<td>Modulates Searches</td>
</tr>
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<td>0</td>
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<tr>
<td>122311 132227        +</td>
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<td>C.Dur Persists Times</td>
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<tr>
<td>013304 281128        +</td>
</tr>
<tr>
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<td>092318 102312 122227</td>
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<td>052316 062320 083239</td>
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<td>Maintains Labels</td>
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<td>022302 142223 212228</td>
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<td>062318 072320 082314 291126</td>
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<tr>
<td>C.Place</td>
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<td>062322 072313 082317 102318 162226</td>
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<td>Coordinates</td>
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<tr>
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<td>S Matches</td>
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<td>022304 043306        +</td>
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<td>&lt;less&gt; &lt;freq&gt;</td>
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Note: Person codes have been left intact. See Section 4.9, Table 4.5 for coding structure, and Section 4.8.2, Table 4.3 for task list.
APPENDIX XV

Statistical output: ANOVA
Independent Variable – Quadrants
Dependent Variable – Dementia Severity

GLM Perceive Recall Plan Perform BY Severity
/WSFACTOR=Quadrants 4 Polynomial
/METHOD=SSTYPE(3)
/PLOT=PROFILE(Quadrants*Severity)
/PRINT=DESCRIPTIVE
/CRITERIA=ALPHA(.05)
/WSDESIGN=Quadrants
/DESIGN=Severity.

## Tests of Between-Subjects Effects

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<th>F</th>
<th>Sig.</th>
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## Tests of Within-Subjects Contrasts

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APPENDIX XVI

Statistical output: ANOVA
Independent Variable – Perceive Subquadrants
Dependent Variable – Dementia Severity

GLM Attending Sensing Discriminating BY Severity
/WSFACTOR=PerceiveSubquadrant 3 Polynomial
/METHOD=SSTYPE(3)
/PLOT=PROFILE(PerceiveSubquadrant*Severity)
/PRINT=DESCRIPTIVE
/CRITERIA=ALPHA(.05)
/WSDESIGN=PerceiveSubquadrant
/DESIGN=Severity.

Tests of Between-Subjects Effects

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Tests of Within-Subjects Contrasts

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<td>446.648</td>
<td>1</td>
<td>446.648</td>
<td>2.615</td>
<td>.117</td>
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<tr>
<td>Severity</td>
<td>Quadratic</td>
<td>2711.637</td>
<td>1</td>
<td>2711.637</td>
<td>11.236</td>
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</tr>
<tr>
<td>Error (PerceiveSubquadrant)</td>
<td>Linear</td>
<td>4782.115</td>
<td>28</td>
<td>170.790</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Quadratic</td>
<td>6727.659</td>
<td>28</td>
<td>240.274</td>
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<td></td>
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</tbody>
</table>
APPENDIX XVII

Statistical output: ANOVA
Independent Variable – Recall Subquadrants
Dependent Variable – Dementia Severity

```
GLM RecallFacts RecallSchem RecallProced BY Severity
/WSFACTOR=Recallsubquadrant 3 Polynomial
/METHOD=SSTYPE(3)
/ELOF=PROFILE(Recallsubquadrant*Severity)
/PRINT=DESCRIPTIVE
/CRIERIA=ALPHA(.05)
/WSDESIGN=Recallsubquadrant
/DESIGN=Severity.
```

### Tests of Between-Subjects Effects

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>505971.706</td>
<td>1</td>
<td>505971.706</td>
<td>596.956</td>
<td>.000</td>
</tr>
<tr>
<td>Severity</td>
<td>19411.338</td>
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<td>19411.338</td>
<td>22.898</td>
<td>.000</td>
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<tr>
<td>Error</td>
<td>23736.378</td>
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<td>847.728</td>
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</table>

### Tests of Within-Subjects Contrasts

<table>
<thead>
<tr>
<th>Source</th>
<th>Recallsubquadrant</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recallsubquadrant</td>
<td>Linear</td>
<td>51.414</td>
<td>1</td>
<td>51.414</td>
<td>.358</td>
<td>.555</td>
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<tr>
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<td>Quadratic</td>
<td>2694.376</td>
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<td>2694.376</td>
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<td>.003</td>
</tr>
<tr>
<td>Recallsubquadrant * Severity</td>
<td>Linear</td>
<td>8.340</td>
<td>1</td>
<td>8.340</td>
<td>.658</td>
<td>.511</td>
</tr>
<tr>
<td></td>
<td>Quadratic</td>
<td>231.084</td>
<td>1</td>
<td>231.084</td>
<td>.619</td>
<td>.346</td>
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<td>Error (Recallsubquadrant)</td>
<td>Linear</td>
<td>4026.265</td>
<td>28</td>
<td>143.795</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Quadratic</td>
<td>7040.876</td>
<td>28</td>
<td>251.480</td>
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<td></td>
</tr>
</tbody>
</table>
APPENDIX XVIII

Statistical output: ANOVA
Independent Variable – Plan Sub quadrants
Dependent Variable – Dementia Severity

GLM Mapping Programming Evaluating BY Severity
/WSFACTOR=Plansubquadrant 3 Polynomial
/METHOD=SSTYPE(3)
/PLOT=PROFILE(Plansubquadrant*Severity)
/PRINT=DESCRIPTIVE
/CRITERIA=ALPHA(.05)
/WSDESIGN=Plansubquadrant
/DESIGN=Severity.

Tests of Between-Subjects Effects

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>106147.973</td>
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<td>106147.973</td>
<td>108.846</td>
<td>.000</td>
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<tr>
<td>Severity</td>
<td>40463.817</td>
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<td>40463.817</td>
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<tr>
<td>Error</td>
<td>27306.064</td>
<td>28</td>
<td>975.217</td>
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</table>

Profile Plots

Tests of Within-Subjects Contrasts

<table>
<thead>
<tr>
<th>Source</th>
<th>Plansubquadrant</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear</td>
<td>Plansubquadrant</td>
<td>65.566</td>
<td>1</td>
<td>65.566</td>
<td>.317</td>
<td>.578</td>
</tr>
<tr>
<td>Quadratic</td>
<td>Plansubquadrant</td>
<td>.025</td>
<td>1</td>
<td>.025</td>
<td>.000</td>
<td>.988</td>
</tr>
<tr>
<td>Linear</td>
<td>Plansubquadrant</td>
<td>222.227</td>
<td>1</td>
<td>222.227</td>
<td>1.076</td>
<td>.308</td>
</tr>
<tr>
<td>Quadratic</td>
<td>Plansubquadrant</td>
<td>420.745</td>
<td>1</td>
<td>420.745</td>
<td>4.188</td>
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<tr>
<td>Linear</td>
<td>Error(Plansubquadrant)</td>
<td>5732.642</td>
<td>28</td>
<td>206.523</td>
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<td></td>
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<tr>
<td>Quadratic</td>
<td>Error(Plansubquadrant)</td>
<td>2812.748</td>
<td>28</td>
<td>100.455</td>
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</table>
APPENDIX XIX

Statistical output: ANOVA
Independent Variable – Perform Subquadrants
Dependent Variable – Dementia Severity

GLM Initiating Continuing Controlling BY Severity
/WSFACTOR=Perfsubquadrant 3 Polynomial
/METHOD=SSTYPE(3)
/PLOT=PROFILE(Perfsubquadrant*Severity)
/PRINT=DESCRIPTIVE
/CRITERIA=ALPHA(.05)
/WSDESIGN=Perfsubquadrant
/DESIGN=Severity,

Tests of Between-Subjects Effects

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>337921.725</td>
<td>1</td>
<td>337921.725</td>
<td>232.936</td>
<td>.000</td>
</tr>
<tr>
<td>Severity</td>
<td>24138.758</td>
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<td>24138.758</td>
<td>16.639</td>
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<td>Error</td>
<td>40620.002</td>
<td>28</td>
<td>1450.714</td>
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</table>

Tests of Within-Subjects Contrasts

<table>
<thead>
<tr>
<th>Source</th>
<th>Perform subquadrant</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig</th>
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</thead>
<tbody>
<tr>
<td>Performsubquadrant</td>
<td>Linear</td>
<td>6.996</td>
<td>1</td>
<td>6.996</td>
<td>.027</td>
<td>.870</td>
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<td>Quadratic</td>
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<td>6633.176</td>
<td>29.594</td>
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<tr>
<td>Performsubquadrant * Severity</td>
<td>Linear</td>
<td>1380.092</td>
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<td>1380.092</td>
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<td>.605</td>
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<td>77.966</td>
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<td>.560</td>
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<td>255.407</td>
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<td>Quadratic</td>
<td>6275.886</td>
<td>28</td>
<td>224.138</td>
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APPENDIX XX

Statistical output: Point by serial correlation and Regression analysis
Independent Variable – Quadrants
Dependent Variable – Dementia Severity

![Correlation Table]

**Correlation is significant at the 0.01 level (2-tailed).**
REGRESSION
/DESCRIPTIVES MEAN STDDEV CORR SIG N
/MISSING LISTWISE
/STATISTICS COEFF OUTS R ANOVA
/CRITERIA=PIN(.05) POUT(.10)
/NOORIGIN
/DEPENDENT Severity
/METHOD=ENTER Perceive Recall Plan Perform
/RESIDUALS OUTLIERS(MAHAL)
/SCATTERPLOT=(*ZRESID ,*ZPRED)
/SAVE MAHAL COOK.

---

**Model Summary**

<table>
<thead>
<tr>
<th>Mode</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.838*</td>
<td>.702</td>
<td>.654</td>
<td>.293</td>
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</tbody>
</table>

---

a. Predictors: (Constant), Perform, Perceive, Recall, Plan  
b. Dependent Variable: Dementia severity based on dementia scale

---

**ANOVA**

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
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<tbody>
<tr>
<td>1 Regression</td>
<td>5.055</td>
<td>4</td>
<td>1.264</td>
<td>14.733</td>
<td>.000</td>
</tr>
<tr>
<td>Residual</td>
<td>2.145</td>
<td>25</td>
<td>.086</td>
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<td></td>
</tr>
<tr>
<td>Total</td>
<td>7.200</td>
<td>29</td>
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<td></td>
</tr>
</tbody>
</table>

---

a. Predictors: (Constant), Perform, Perceive, Recall, Plan  
b. Dependent Variable: Dementia severity based on dementia scale
<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
</tr>
<tr>
<td>1 (Constant)</td>
<td>2.604</td>
<td>.308</td>
</tr>
<tr>
<td>Perceive</td>
<td>.000</td>
<td>.008</td>
</tr>
<tr>
<td>Recall</td>
<td>-.012</td>
<td>.009</td>
</tr>
<tr>
<td>Plan</td>
<td>-.022</td>
<td>.008</td>
</tr>
<tr>
<td>Perform</td>
<td>.012</td>
<td>.006</td>
</tr>
</tbody>
</table>

a. Dependent Variable: Dementia severity based on dementia scale