THE DEVELOPMENT AND VALIDATION OF THE SCREENING TEST FOR THE EARLY PREDICTION OF SCHOOL SUCCESS (STEPSS): A SCREEN OF COGNITIVE FUNCTIONING IN FOUR- AND FIVE-YEAR OLD CHILDREN WITH VARYING HEALTH CONDITIONS

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ABSTRACT

The purpose of the present study was to construct and validate a brief screening instrument to support parent(s) and preschool/kindergarten teachers in monitoring and screening for cognitive impairment and/or delay in preschoolers. The target population of interest is all preschoolers *at-risk* for poor psychosocial and school outcomes due to chronic and acute dysfunction of the central nervous system (CNS). The accessible populations of interest to the present study are pediatric cancer survivors, preschoolers with alcohol related neurodevelopmental disorder (ARND), being preterm low birth weight, and/or diagnosed with various learning disabilities. The past practice of waiting until an *at-risk* child experienced poor school outcomes before being referred for cognitive assessment toward tailoring an intervention is no longer defensible. For the present study, a 61-item screening instrument (18 memory items, 19 verbal ability items, 15 attention items, and 9 demographic items) was pilot tested with parents, playschool teachers, and kindergarten teachers to rate preschoolers on overt behaviours associated with cognitive functioning. A criterion-referenced framework was used to establish a performance standard and set a cut score based on a sample of 151 normally functioning preschoolers aged 4:0- to 5:11-years. The various empirical and substantive analyses conducted resulted in a revised scale of 28 items (10 memory, 11 verbal ability, and 7 attention) titled, *Screening Test for the Early Prediction of School Success* (STEPSS). Given the need for a future study to validate the STEPSS with clinical groups of preschoolers, the screening instrument is intended to provide the empirical evidence needed to refer *at-risk* preschoolers for assessment with more comprehensive cognitive batteries. Constructing and validating the STEPSS is important for two reasons: 1) to fill a gap in the types of instruments available for monitoring and assessing cognitive functioning in *at-risk* preschool populations; and 2) to alleviate the current delay

in targeting interventions for preschoolers because of the practice of depending upon the school system to monitor and identify poor cognitive functioning.

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DEDICATION

This dissertation is dedicated to the memory

of

Dr. Richard Alan (Al) Yackulic

1947 – 2002

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I would like to acknowledger Dr. Yackulic for encouraging me to enter the department's doctoral program, his contribution to this dissertation during his brief term as my advisor, and for encouraging me to take several advanced measurement courses at the Centre for Research in Applied Measurement and Evaluation (CRAME) at the University of Alberta.

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CHAPTER I

Introduction

Overview

The purpose of this study was to develop an early screening instrument for detecting cognitive impairments in 4:0- to 5:11-year old children. The proposed instrument will be a brief screen for use by parents and/or playschool and kindergarten teachers to rate observable behaviours associated with cognitive functioning in the domains of memory, attention, and verbal ability. The intent is to target all preschoolers, 4:0- to 5:11-years, *at-risk* for poor cognitive outcomes due to acute or chronic dysfunction of the central nervous system (CNS).

A screening instrument that yields reliable scores and that can be validly interpreted provides the basis of a referral decision for more comprehensive testing with a cognitive battery. The focus of the screen is the early detection of learning impairments toward improving the academic and psychosocial outcomes for preschoolers in the primary grades. The accessible *at-risk* populations considered for the present study include preschoolers who are pediatric cancer survivors, preterm low birth weight (preterms), diagnosed with alcohol related neurodevelopmental disorder (ARND), or who have been assessed with various learning disabilities. The types of cognitive deficits typically found in pediatric cancer patients are included in the definition of *at-risk* children and are similar to those experienced by preterms, children with ARND, and those assessed with learning disabilities (Butler & Mulhern, 2005).

Learning disabilities, like the other health conditions identified herein, are associated with negative effects on cognition and subsequently learning and school outcomes (Rose, Feldman, Jankowski, & Van Rossem, 2006). However, Mercer (1999) reports that when children with learning disabilities receive earlier interventions (teaching them specific cognitive strategies like rehearsal), performance typically improves, sometimes to a level of normal functioning. The consequence of not monitoring *at-risk* preschoolers, and not identifying those with low cognitive functioning, is that a disproportionately high number (> 27%) will continue needing special educational assistance at later points in their school career (Eiser, 1998).

The challenge is to accurately screen for low cognitive performance within the general population of *at-risk* preschoolers, and particularly within clinical groups where the disease and/or its treatment places them in a higher risk category. In other words, there is a need to identify those children who fall below an acceptable cognitive standard relative to typically or normally functioning preschoolers. Preschool pediatric cancer survivors are typically more susceptible to the negative effect of aggressive treatment therapies (craniospinal irradiation and chemotherapy) than older children and adolescents (Eiser, 1998). Preventing a substantial delay in cognitive remediation improves the prognosis for successful school outcomes by shortening the duration of cognitive decline and reducing the intensity of the deficit (Hightower & Braden, 1991). Early intervention is especially critical for children under 5-years of age. The plastic nature of the preschoolers' brain enables it to compensate for some trauma or injury by shifting function from the site of the insult to other cells and structures surrounding the site (Stiles, 2000).

The role that neural plasticity plays in cognitive development is an important consideration in identifying low cognitive performance in *at-risk* preschoolers. Stapp (1999) argues that neural plasticity is greatest before neural circuitry is completed (typically age 4-years) and brain organization starts to stabilize. Consequently, an immature neural substrate contains sufficient uncommitted resources to reorganize around insult or injury. Studies of pediatric clinical populations support the claim that adults who suffer brain injury early in life do not manifest the same magnitude of cognitive impairment as adults with later occurring injuries (Stiles, 2000).

Cancer is the second leading cause of death (after unintentional injuries) in American children ages 1 to 14 years (Ward, 2000). Similarly in Canada cancer is the second leading cause of death for children ages 5- to 9-years and the third leading cause of death (behind both unintentional injuries and congenital anomalies) for children ages 1- to 4-years (Public Health Agency of Canada, 1997). Children under the age of 17-years are affected by various types of cancer at a rate of 130 per million (0.0001%) in Canada (British Columbia [BC] Children's Hospital & Health Centre, 2007). In 2008, cancers of the CNS accounted for 16.0% of new cases and 24% of deaths in Canadian children (Canadian Cancer Statistics, 2008). The promising news is that while the general incidence of cancer in children younger than 15-years of age has been increasing by 1.0% per year, the cure rate is increasing by 1.4% per year (Ward, 2000).

In contrast to older age groups, pediatric cancer patients respond better to treatment reflecting a steady decline in the mortality rate over the last 20 years (BC Children's Hospital & Health Centre, 2007). However, aggressive treatment options (effects of craniospinal irradiation and chemotherapy) continue to put children *at-risk* for

learning and/or intellectual disabilities (Butler & Mulhern, 2005). Chemotherapy causes damage in the form of alterations to brain metabolism and blood flow resulting in cognitive side effects that include: a) an inability to focus one's thoughts; b) an inability to remember things; c) a reduced capacity to multitask; d) an inability to focus and execute under conditions of demanding attentional processing; and e) a heightened susceptibility to distraction (Rodgers, Horrocks, Britton, & Kernahan, 1999).

The late effects of cancer and/or its aggressive treatment emerge as soon as one to two years after treatment is started (Butler & Mulhern, 2005). The expectation of cognitive decline in most pediatric cancer survivors has increased awareness of the benefits of early screening. Ward (2000) asserts that "the possibility of experiencing no late effects from cancer treatment is nearly impossible but the possibility of experiencing slight late effects is good if thorough assessment and competent care are provided" (p. 21). The proposed screening instrument has the potential to improve the monitoring of *at-risk* preschoolers leading to earlier assessment. Identification of the specific cognitive problems in childhood cancer survivors can increase the probability of better support delivered to the children and more successful school outcomes.

Research to minimize the late effects of damage to the CNS now spans a broad spectrum of chronic and acute health disorders. Studies show that premature birth is associated with a high incidence of cognitive deficit and/or delay, which typically translates into poor academic outcomes (Aylward, 2002; Rose et al., 2005). Preterm infants (those born at fewer than 37 weeks gestation) have comprised as much as 75% of annual infant death rates in the United States over the past two decades (Shiono & Behrman, 1995). The developmental sequelae for most preterm children include mild to

moderate problems in cognition, attention, and neuromotor functioning (Hack, Klein, & Taylor, 1995).

Previous research also indicates that over 60% of children with fetal alcohol spectrum disorder (FASD) show deficits in attentional capacity, particularly visually focused attention (Mattson, Calarco, & Lang, 2006). Attentional impairment is a typical problem associated with the interference with embryonic development due to the effects of ARND (Mattson, Calarco, & Lang, 2006). The cognitive difficulties associated with a diagnosis of FASD is still an emerging field; however, enough research has been conducted to identify a general decline in intelligence, learning, and visuospatial functioning (Mattson et al., 2006).

Learning disorders vary in a preschool population and are associated with a variety of health conditions. However, they are typically characterized as cognitive impairment and/or delay associated with CNS dysfunction (Mercer, 1999). Children labelled as learning and intellectually disabled are characterized as having: a) more difficulty with visual, short-term memory tasks than normally functioning controls; and b) more memory problems associated with the limited use of cognitive strategies (organization and rehearsal) (Mercer, 1999).

The clinical literature on preschoolers with varying acute and chronic health conditions of the CNS consistently identifies attention and memory deficits (Armstrong, Blumberg & Toledano, 1999; Mulhern & Palmer, 2001; Packer & Metha, 2002). More specifically, preterm children typically experience speech and language delay problems by the time they enter primary grades (van Baar et al., 2005). In addition, an information-processing framework suggests the cognitive/language relationship to be integral to

preschool development and useful in identifying acceptable standards for 4:0- to 5:11-year old children (Owens, 1992). Further, brain plasticity includes the notion of preferential preservation of language, under conditions of early brain injury, over other cognitive domains like visuospatial functioning (Stiles, 2000).

An information-processing framework provides an explanation of how the unobservable cognitive processes are associated with overt behaviour. A basic model of information-processing includes three stages: 1) perception; 2) decision-making and response selection; and 3) response programming and execution (Johnson & Proctor, 2004). An investigation of patterns of acquiring cognitive skills and abilities in 4:0- to 5:11-year olds includes three assumptions: 1) a need to mentally act on information to know it; but 2) there is limited attentional capacity; and 3) information moving through the system is mediated by memory capacity.

Purpose of the Study

The past practice of waiting until preschoolers, like pediatric cancer survivors, experience poor school outcomes before they receive comprehensive cognitive assessment to tailor an intervention is no longer defensible (Bulter & Mulhern, 2005). Early school success is considered essential to the foundation for adult productivity in a technological society (Butler & Mulhern, 2005). The problem is to develop a better (improved cost and time efficiency) and earlier way to monitor and screen for cognitive impairment and/or delay, especially in clinical groups of preschoolers. The present study proposes a new cognitive screening instrument to support parents, and potentially preschool and kindergarten teachers, in the regular monitoring of behaviours associated with cognitive functioning in *at-risk* preschoolers.

The purpose of the present study was to construct and validate a brief screening instrument to rule out (or rule in) cognitive impairment and/or delay. The screening instrument will facilitate rating overt behaviours of 4:0- to 5:11-year old preschoolers in the cognitive domains of memory, attention, and verbal ability. The intent is to have an easily administered, scored, and interpreted screening instrument for non-professionals in assessment that would constitute an early first step in the detection of cognitive problems. A criterion-referenced framework was used to establish this threshold point (cut score) for a population of typically functioning 4:0- to 5:11-year old preschoolers.

The present study investigates the following three research questions:

1) To what extent does the proposed screening instrument demonstrate evidence for construct-related validity?

2) To what extent does the proposed screening instrument demonstrate internal consistency and inter-rater agreement?

3) To what extent does the screening instrument correctly classify preschoolers as *at-risk* and *not-at-risk* for cognitive impairment based on a criterion-referenced framework?

A few international inventories, designed to tap multiple domains including psychosocial dimensions, have been developed. For example, there are the Quality of Life Questionnaire – Cancer 3 (Aaronson et al., 1992), the Disquol (Eiser & Morse, 2001), the Children's Behavioural Questionnaire (CBQ; Rothbart, Ahadi, Hershey, & Fisher, 2001), and the Preschool Behaviour Questionnaire (B-PBQ) (Behar & Stringfield, 1974). The CBQ and the B-PBQ were designed to study social competencies from preschool to junior high school with the following two-component structure: 1)

aggressive-hyperactive-distractible; and 2) anxious-fearful (Tremblay, Desmarais-Gervais, Gagnon, & Charlebois, 1987).

The Canadian inventories, the Health Utilities Index (HUI) Mark 2 and 3 (Furlong, Feeny, & Torrence, 2002), are generic multi-attribute measures of a person's health status and include health related quality-of-life scales that are frequently employed in studies exploring late physical and psychological effects of pediatric cancer treatment (Barr & Klavans, 2001; van Zwanenberg et al., 2000). The HUI Mark 2 measures the attribute of cognition based on the extent to which children learn and remember their schoolwork (Furlong et al., 2002). However, none of international or Canadian instruments address the need for a screening instrument to be used as a first step in the early detection of cognitive impairment and/or delay in preschool children, regardless of the etiology of the impairment.

Delimitations of the Study

The target population for the proposed screening instrument is ultimately all preschool children *at-risk* due to various acute and chronic health conditions affecting the CNS. The sample obtained for the present study was a sub-group of preschoolers ages 4:0– to 5:11-years. However, the objective for the sample was to exclude various high risk clinical groups, like those identified herein, and was intended to be representative of typical or normal cognitive functioning preschoolers within the 4:0- to 5:11-year age range. There was an expectation of some mild to moderate intellectual and learning disabilities within the obtained sample for the present study.

Limiting the sample to children less than 6:0-years old was done because this upper limit represents an important delineation point of cognitive development. White

(1996) describes this maturation point as an observable shift in cognitive capacity and a transition which discriminates older age-groups from preschoolers on the basis of testability. This shift involves the acquisition of cognitive competencies like more sophisticated reasoning about numbers, a better understanding of abstract relationships, and understanding their world more fully (Sameroff & Haith, 1996).

Jones, Rothbart, and Possner (2003) also report testable differences that separate children 4:0-years of age and older from younger preschoolers on the basis of cognitive capacity. For example, Luria's tapping task demonstrates that children 3:0- to 3:6-years make many errors and in particular tend to default to mimicking the test administrator. This type of error is never reported for typically functioning children over the age of four. In addition, when tested on the ability to inhibit responses (to the inappropriate animal in the bear-elephant task) the 37-41 month group averages 22% successful inhibitions compared to an average of 76% successful inhibitions in the 46-48 month group.

Developers of the Wechsler Preschool and Primary Scale of Intelligence – Third Edition (WPPSI-III) (Wechsler, 2002) report that preschoolers under 4:0-years of age should be assessed differently from older children based on substantive change in executive functioning. Three-year olds are typically developmentally delayed in two important areas: 1) they are typically unable to make reliable inferences when multiple causes are available or when basic rules are violated (e.g., do not understand that a ball will not fall straight down if its motion is impeded); and 2) they typically demonstrate a high level of confounded effect in the area of language development (Wechsler, 2002).

Definition of Terms

Cognitive Ability	The psychological result of perception, learning and reasoning. This construct covers a broad range of abilities including, but not limited to attention, language, executive functioning, working memory, long-term memory, processing speed, visuospatial processing, sensorimotor functioning, auditory processing, and quantitative knowledge.
Cognitive Remediation	Systematic attempts to improve cognitive functioning following a brain injury. (Butler & Mulhern, 2005)
Cognitive Domain	A collection of tasks that share a common representation system and a common set of procedures for operating on these representations to perform tasks (McShane, 1991, p. 318)
Criterion-Referenced Test	One that provides for translating test scores into a a statement about the behaviour to be expected of an individual with that score or their relationship to a specified subject matter. Most criterion-referenced tests involve a cut score where an individual passes if they exceed the cut score and fails if they do not (Wikipedia).
Information-Processing Change	Change is mainly behavioural, quantitative, and continuous, but qualitative discontinuous shifts and reorganizations in development can also occur. Changes and processes are universal, although considerable contextual variability exists. (Rebok, 1987)
Information-Processing Mechanisms	Transitional systems underlying the progression from one developmental level to the next. They demonstrate that children employ increasingly sophisticated rules for tasks (like the way they encode a problem) with increasing age. (Rebok, 1987)
First-Level Screening Instrument	Brief instrument to support parents (or adults in a primary care giving role), kindergarten teachers, and play school teachers in rating observable behaviours associated with cognitive

	functioning in the domains of memory, attention, and verbal ability in a preschool population.
Intellectual Disability	An individual is considered to have an intellectual disability when: 1) the person's IQ score is below 70-75; 2) there are significant limitations in adaptive skill areas (communication, self-direction, health and safety, functional academics, etc.); and 3) the disability originated before the age of 18-years. (The Americans with Disabilities Act)
Intervention	This is a psychological strategy for enriching cognition (or preventing decline) typically within a controlled setting based on using mechanisms of training and practice (e.g., a series of remedial loops to constantly reinforce prerequisite skills). (Rebok, 1987)
Late Effects	The effects of aggressive medical treatment for chronic health conditions like cancer (i.e., intrathecal chemotherapy, craniospinal irradiation, or a combination of the two) that affect a child's physical and mental health later in life. (Cancer Reference Information, 2007)
Learning Disability	A general designation to describe a wide range of disabilities including severe learning disabilities. Typically assumed that no person should be labelled learning disabled unless central nervous system (CNS) dysfunction is the suspected cause. There are a number of widely accepted characteristics of learning disabilities (diminished capacity for basic reading skill, reading comprehension, written expression, mathematics calculation, mathematics reasoning) where the identifying behaviour must persist over time. (Mercer, 1997)
Normally Functioning Preschoolers	Preschoolers aged 4-years to 5-years 11 months who have no observable cognitive abnormalities or children who have not been referred to a professional for evaluation resulting from any such anomaly. (Mattson & Riley, 1995)

Organization of the Dissertation

The balance of the written dissertation is organized in six chapters. Chapter II includes: a) the clinical evidence of cognitive deficits associated with health conditions like cancer, ARND, preterm low birth weight, and various learning disabilities; and b) the background on information-processing theory relative to the cognitive development of 4:0- to 5:11-year old children. Chapter III includes: a) the reasons for constructing and validating a first-level cognitive screening instrument; b) considerations for the development of an initial draft of the cognitive screening instrument; and c) the internal structure of the domains of memory, attention, and verbal ability.

Chapter IV includes both a methods and results section for the content validation process. The methods section includes: a) the development of a *Judges' Content Rating Form*; b) the process for calculating Judges' discrepancy ratings; and c) a description of the content review experts. The results section contains an examination of: a) the discrepancy of judges' ratings from the median; b) item relevance for the three domains; c) revisions to items meeting the criteria for inclusion in the screening questionnaire; and d) the evidence for content-related validity.

Chapter V includes both a methods and results section for pilot testing the initial draft of the proposed screening instrument. The methods section includes: a) a description of the screening instrument; b) a description of the obtained sample of 4:0- to 5:11-year old preschoolers; c) a description of how the data was collected and organized; d) a description of the content review experts for the substantive interpretation of the statistical factor analyses; and e) a description of the methods used for statistical analyses. The results section includes: a) the extent to which the instrument demonstrates evidence

of internal consistency; b) the extent to which the pilot tested screening instrument demonstrates evidence for inter-rater agreement; c) the extent to which the exploratory factor analyses demonstrates evidence for construct validity; and d) the extent to which empirical evidence is supported by a substantive/psychological interpretation.

Chapter VI includes the following results pertaining to establishing a cut score for a revised version of the STEPSS: a) an examination of norms (age and gender) inside a criterion-referenced framework; b) developing a threshold point for classifying at-risk cognitive status based on applying the obtained data to the theoretical normal curve; c) computing the decision consistency estimates for an initial cut score; and d) examining the stability of the initial cut score and recommending a final cut score.

Chapter VII includes a discussion of: a) the extent to which the present study shows support for construct validity of the proposed screening instrument; b) the extent to which the proposed screening instrument can be consistently interpreted for classifying 4:0- to 5:11-year old preschoolers as *at-risk* or *not-at-risk* for cognitive impairment or delay; c) possibilities of future research; and d) limitations of the study.

CHAPTER II

Literature Review

Overview

The long-term health and social functioning of children *at-risk* due to chronic or traumatic brain injury (TBI) has come more into focus in recent years (Armstrong & Reaman, 2005). An important component of long-term success (improved functioning as adolescents and adults) is the early detection of cognitive impairment leading to more timely intervention in the preschool years. Screening instruments are tools that provide a first step in a systematic process for early detection. Consequently, an easily administered assessment tool that supports parents, playschool teachers, and kindergarten teachers through an efficient and systematic process for monitoring clinical groups of children is important toward achieving better patient outcomes, like improved quality of the school experience.

Developing a screening test to systematically rate cognitive functioning in preschoolers involves understanding the relationship of neurological mechanisms associated with behaviours in a preschool population. These cognitive mechanisms provide an explanation of how brain activity is the proximal cause of overt behaviour (Pennington, 1999). Cognition, in a broad sense, is characterized as the information-processing abilities of the brain (Gregory, 1999). Ashcraft (1989) further defines cognitive functioning as "the collection of mental processes and abilities used in perceiving, remembering, thinking, and the act of using those processes" (p. 10).

An improved understanding of the connections between neuropsychological structures and patterns of observable behaviour is better able to inform rehabilitation

planning for children with TBI. Comprehensive cognitive batteries can effectively "evaluate the degree to which damage affects the capacity to process information in a functional domain, and, as a result, the development of competency in other domains" (Kemp et al., 2001, p. 7). Armstrong and Reaman (2005) assert that recent collaboration with psychologically-based research is an important development in the search for a cure for childhood cancer. The success in cure rates for cancer has served to expand the search for a cure to include considerations for an optimal quality of survivorship. Further, they suggest that "the focus of this research for the next decade should be on the development of intervention studies that address acute problems, lessen the impact of late effects of treatment, and ultimately prevent these effects by better diagnostic classification and targeted treatment" (p. 90).

The common referral question for clinicians is whether a preschooler in a given clinical group displays evidence of cognitive impairment severe enough to develop a plan for rehabilitation (Butler & Mulhern, 2005). The notion of classifying preschoolers into an *at-risk* category, based on a threshold point of low cognitive functioning, involves determining how observable behaviour is associated with cognitive functioning. This chapter includes: a) clinical evidence for cognitive deficits in a preschool population; and b) background on information-processing theories.

Clinical Literature

Poor socialization and academic outcomes for pediatric cancer survivors was the impetus for the present study. However, constructing a general screening instrument was recommended by local health professionals in Saskatoon because of similarities pediatric cancer survivors experience in developmental disruption with other childhood medical

problems affecting neurological mechanisms. Local pediatric oncologists argued that the cognitive delay and impairment typically experienced by cancer patients is similar to those deficits experienced by preterms, children diagnosed with ARND, and a those children with various learning disorders. This section discusses the effects on cognition experienced by preschoolers with the following health conditions: a) cancer, b) preterm low birth weight, c) ARND, and d) various learning disabilities. The progression from one health condition to the next will focus on deficits affecting a common subset of cognitive domains.

Pediatric Cancer Survivors

It is generally accepted that at least 30% of children who receive aggressive treatment for cancer experience some degree of cognitive impairment (Butler & Mulhern, 2005). The level of impairment experienced remains substantial in spite of a tendency to replace cranial radiation therapy (CRT) with intrathecal chemotherapy. Research indicates that chemotherapy is the less harmful alternative given the increasing concern for the child's long-term neuropsychological status and quality of life (Copeland, Moore, Francis, Jaffe, & Culbert, 1996). However, Eiser (1998) reports that chemotherapy can still produce substantive effects on a child's mood and behaviour (sleep disturbances and listlessness).

Childhood cancers, such as acute lymphoblastic leukemia (ALL), neuroblastoma, Wilm's tumour, retinoblastoma, and hepablastoma, have a high probability that those affected experience some level of cognitive decline (Rodgers et al., 1999; Ward, 2000). Neurologic damage in children aggressively treated for cancer, especially brain tumors, can now be documented on magnetic resonance imaging (MRIs) and computerized

tomography scans (CTs) (Ochs, Mulhern, Fairclough, Parvey, Whitaker, Ch'ien, Mauer, & Simone, 1991). Whereas neuroradiographic tests make the previously unobservable cognitive processes observable under clinical conditions, they are still not able to fully evaluate neurologic functioning, psychological status, and ability to function in every-day life (Packer & Mehta, 2002).

The focus of this section is on identifying common cognitive deficits, across the various types of childhood cancer. In keeping with the notion of a brief screening instrument, the intent is to identify a subset (or core group) of cognitive domains that would retain enough sensitivity to accurately classify those preschoolers from various clinical groups experiencing below average cognitive functioning. The clinical literature advises that it is the biological substrates of core cognitive abilities (the neurotransmitter serotonin is released as children learn and it is related to memory capacity) that influence observable behaviour associated with cognitive functioning (Butler & Mulhern, 2005).

The heterogeneity of cancer survivors as a group is a concern for classifying preschoolers as *at-risk* given that the types of cancer (brain tumours) vary by histology as well as location (Butler & Mulhern, 2005). For pediatric cancer survivors to benefit from the proposed screening instrument they will have to be diagnosed with cancers that affect the CNS such as pediatric brain tumors. Preschoolers, with these types of cancer, will also have to have completed an active treatment phase (off of aggressive treatment like chemotherapy or craniospinal irradiation) and be in what is termed a maintenance phase of therapy to be considered reliable enough to be assessed for cognitive functioning (Vlcková et al., 2008).

Medical advances in the treatment of cancers now report a five-year survival rate for 78% of children diagnosed with cancer before 15-years of age (see Table 1) (Alvarez, Scully, Miller, Armstrong, Constine, Friedman, & Lipshultz, 2007). The five-year survival timeframe starts from the point children are diagnosed with cancer (BC Children's Hospital & Health Centre, 2007). Increasingly, more children are surviving beyond the initial five years with no recurrence of the cancer and are then considered cured of the disease. This success in cure rates is the motivation for increased interest in the quality of life toward adolescent and adult productivity for children in these types of clinical groups.

Table 1
Five-Year Survival Rate for Pediatric Cancer Patients

Types of Cancer:	Distribution of Childhood Cancer	5-Year Disease Free Survival with Appropriate Treatment
Overall	-	78%
Leukemia (ALL)	30%	85%
Brain	19%	70%
Lymphoma	13%	75%
Kidney	6%	90%
Neuroblastoma	8%	Stage 3,4 10-20% Stage 1,2 75-90%
Bone Cancer	5%	72%
Sarcoma	7%	65%
Retinablastoma	3%	95%
Liver	1%	45%
Others	8%	-

Table adapted from BC Children's Hospital and Health Centre, 2007.

In the 1960's few pediatric cancer patients were expected to live more than a few months (Duhamel, Redd, & Vickberg, 1999). The improvement in childhood cancer

prognosis has been approximately 45% since the early 1960's (BC Children's Hospital and Health Centre, 2007). The downside to an improved survival rate is an increase in the number and aversiveness of side effects of aggressive cancer treatment (Duhamel et al., 1999). Chemotherapy (or intrathecal therapy) and radiation therapy are both linked to learning disabilities in children, which not uncommonly can appear after a delay of several months. These deficits typically include lower than average IQ scores, poor academic achievement, and problems with visual motor skills, memory and attention.

CRT is shown to cause structural changes in the brain, such as the loss of white matter and atrophy, which is associated with general deficits in memory, attention, and general information-processing functions (Armstrong et al., 1999; Packer & Metha, 2002; Mulhern and Palmer, 2001). Further, Butler and Mulhern (2005) report poorer performance on nonverbal tasks compared to normally functioning controls. Nonverbal abilities affected by CRT include fluid abilities which involves the child's ability to problem solve, act quickly, and encode short-term memories.

Children diagnosed with cancer typically endure a period of aggressive treatment followed by a period of recovery. The assumption for most of these patients is that the disease and/or the aggressive treatment will cause some damage to the CNS. The recovery period has been conceptualized in terms of neural plasticity and described as a period of *reorganization of brain function* (Riccio & Wolfe, 2003). This reorganization alters the typical development pattern of neuropsychological structures and the corresponding behavioural domains. Younger children have an advantage over older adolescents and adults in terms of recovery of brain function that is typically not evidenced in adults (Riccio & Wolfe, 2003). The developing brain is capable of

reorganizing patterns and systems of neural connections in ways that the mature brain cannot (Stiles, 2000).

Cohen (1997) asserts that cancer patients with frontal lobe injuries exhibit both reduced working memory capacity and language production. Rodgers et al. (1999) report that this type of brain insult in children treated for ALL results in a decrease in speed of information-processing when compared to sibling controls. As more evidence emerges, the particular aspects of cognitive functioning affected by aggressive cancer treatment are becoming clearer, even if the underlying source of these deficits remains somewhat unclear. Rodgers et al. (1999) report that damaged frontal lobes result in general academic decline and more specifically cognitive deficits in the areas of attentional ability, memory, mathematical ability, abstract reasoning, and verbal ability.

Mulhern and Palmer (2001) report that pediatric cancer survivors were found to have declines in performance IQ, perceptual organization, and freedom from distractibility that were "not due to loss of previously acquired information but instead due to a failure to acquire new information at a rate commensurate with age peers" (p. 11). Eiser (1998) agrees that the interrelatedness of attentional capacity (freedom from distractibility) with other cognitive domains can influence a more general cognitive decline. Eiser (1998) also reports that the symptoms of cognitive impairment studied most frequently in child cancer patients are reduced IQ scores and memory deficits due to distractibility. In addition, Armstrong, Blumberg, and Toledano (1999) report that a commonly observed deficit (from CRT treatment) is in attention and concentration, particularly an inability to sustain attention (more so than hyperactivity/impulsivity).

In summary, damage from childhood cancers and its aggressive treatment (brain tumours, structural changes, atrophy) disrupt the maturational blueprint or timetable for normal cognitive development in preschoolers (Stiles, 2000). The types of brain insults discussed herein can translate into learning difficulties characterized as poor concentration, poor understanding of simple instructions, and the need for repeated teaching to accomplish relatively simple tasks. Additionally, Stiles (2000) reports that left hemisphere damage effects language processing, which by extension affects other higher order cognitive functions like executive functioning.

Preterm Low Birth Weight Children (Preterms)

This section examines the similarities in cognitive impairment between preterms and pediatric cancer survivors. Underdeveloped major organs and the general stress of fighting to survive experienced by preterms places them *at-risk* for neurodevelopmental delay and long-term impairment. Typically deficits experienced by preterms are described as developmental disabilities and disorganization disorders that affect mainly cognitive functions like memory and language (Mélo, Lopes, Morsch, Monteiro, Rocha, Borges, & Reis, 2004). The survivorship of preterms discussed herein further supports the notion of a core set of cognitive deficits characterized by poor executive functioning, memory difficulties, and attentional problems.

Preterms, generally characterized as those born at fewer than 37 weeks gestation, have comprised as much as 75% of annual infant death rates in the United States over the past two decades (Shiono & Behrman, 1995). However, it is becoming more common for very preterm children, those born between 25 and 30 weeks gestation, to survive with intensive care treatment (van Baar, van Wassenaer, Briët, Dekker, & Kok, 2005). The

recent improvements in neonatal intensive care have seen the survival rates for very low birth weight infants steadily rise from those in the 1960s. These medical successes have increased the interest in monitoring the cognitive functioning of these children. Similar to pediatric cancer survivors, early academic and social success is considered essential toward the development of productive adults.

Preterms are not a homogeneous group. Low birth weight varies along a continuum of slightly low birth weight (2,500 to 3,000 grams) to moderately low weight (2,000 to 2,500 grams) to very low birth weight (750 to 2,000 grams). However, as a group they are deemed *at-risk* for developmental problems for several reasons: a) premature birth resulting from earlier health conditions/difficulties; b) being born at too early a gestation period is damaging to underdeveloped major organs like the brain and lungs; and c) brain damage could arise in the neonatal period from the necessary intrusive treatment (van Baar et al., 2005). Whereas preterms in general have a lower IQ scores, IQ is significantly correlated with gestational age and with birth weight (Mélo et al., 2004). For example, previous studies show the decline in intelligence for very low birth weight children at an average IQ score of 94 (Hack, Klein, & Taylor, 1995).

Preterms generally have higher rates of subnormal growth, illnesses, and neurodevelopmental problems (Hack et al., 1995). The developmental sequelae for most preterms includes mild to moderate problems in memory, verbal ability, attention, and neuromotor functioning (psychomotor instability) (Hack et al., 1995; Mélo et al., 2004). School problems are frequently reported in very preterm children and are associated with developmental delay, speech/language delay, and/or behavioural problems at an early school age (van Baar et al., 2005). More specifically, memory impairments include

deficits in short-term memory, preserved recognition memory, super-span learning, and memory decay (Geva, Eshel, Leitner, Fattal-Valevski, & Harel, 2006).

Rose et al. (2006) report that information processing difficulties assessed at 7-months on 54 preterms fully accounted for the cognitive deficits assessed with the Bayley Mental Development Indexes (MDIs) at 3-years of age. The measures used for the longitudinal study were attention, processing speed, memory, and representational competence. Rose et al. (2006) also conclude that these types of specific cognitive deficits are indicative of a more general cognitive compromise experienced at later ages.

Luciana et al. (1999) report that working memory differences found in 7- to 9-year old neonatal intensive care unit (NICU) survivors are not readily apparent in less difficult tasks such as two and three item searches. However, their research comparing 40 NICU survivors (those with an extended hospital stay of 7 to 100 days) to a control group did find that children with histories of neonatal intensive care treatment have a high incidence of working memory deficits. For example, the NICU group required more planning time in the more difficult four and five move Tower of London tasks. A high incidence of memory deficits in school-aged preterms is corroborated in a number of additional studies (Rose, Feldman, Jankowski, Van Rossem, 2005; Curtis, Lindeke, Georgieff, & Nelson, 2002; Isaacs, Lucas, Chong, Wood, Johnson, & Marshall, 2000; Luciana, Georgieff, Mills, & Nelson, 1999).

Relatively subtle initial cognitive impairments are also suggested to impede the cognitive progress in preterm children and result in late effects and/or delayed acquisition of new cognitive skills (Riccio & Wolfe, 2003). For example, subtle deficits affecting more complex verbal processes like the understanding of syntax, abstract verbal skills,

verb pronunciation, and mean length of utterance tend not to be observed until later school years. Consequently, early monitoring and remediation of deficits in verbal skills becomes critical to success in later social and academic endeavours (Aylward, 2002).

Preterms also show similar deficits to pediatric cancer survivors in terms of the detrimental effect of reduced processing speed. Pediatric cancer survivors typically demonstrate impaired processing speed compared to sibling controls (Rodgers et al., 1999). Similarly, previous research suggests that preterms at the age of 3-years show reduced processing speed capability (Rose et al., 2006). Processing speed is an important indicator of cognitive functioning because: a) it has an underlying influence on the more complex cognitive functioning associated with memory, attention/executive functioning, and verbal ability; and b) it has a strong correlation with general fluid intelligence (Jolie, Huisman, Scholte, Hamel, Kemner, & Lamme, 2007). For example, on visual discrimination tasks (contrasting textures at varying degrees of orientation) Jolie et al. (2007) conclude that faster feedback connections are positively correlated with better cognitive performance.

In summary, a consequence of premature birth is typically a disturbance to the natural development processes of preschoolers (van Baar et al., 2005). The types of damage to the CNS resulting from immature major organs and/or intrusive treatment in neonatal care can interfere with the brain's basic building blocks for neuromotor, socioemotional, and cognitive capacities. Consequently, the insults to the CNS gradually manifest themselves as cognitive functioning problems in school in the form of speech/language delay, memory impairments, and attentional deficits. Some research

suggests that up to 75% of preterms show one or more cognitive disability leading to school problems (van Baar et al., 2005).

Alcohol Related Neurodevelopmental Disorder (ARND)

Alcohol related neurodevelopment disorder (ARND) is characterized in terms of negative cognitive outcomes due to heavy prenatal exposure to alcohol (Mattson, Calarco & Lang, 2006). Cognitive developmental and associated behavioural anomalies are typically reported in children prenataly exposed to alcohol (Mattson & Riley, 1995). The more severe diagnosis of fetal alcohol syndrome (FAS) is characterized by a general decline in intelligence. Typically FAS children are classified as low cognitive functioning bordering on mildly mentally handicapped with average IQ scores of about 70. While borderline IQ sores are likely in an ARND population, the lack of age-appropriate socialization and communication skills are moderated by secondary disabilities like mental health problems (American Academy of Pediatrics, 2000).

FAS is one of the most commonly identifiable causes of mental retardation (American Academy of Pediatrics, 2000). In the United States prevalence of ARND births is 5.2/10,000 (0.005%) in the general population. In selected subgroups, including Native Americans, the prevalence rate for ARND at birth is considerably higher at about 30/10,000 (0.03%).

ARND is associated with a continuum of diagnoses related to the degree of prenatal exposure to alcohol. Diagnoses range from mild and moderate prenatal exposure to alcohol (PEA) to the more severe diagnosis of FAS. The less severe PEA condition does not have obvious growth deficiencies and facial dysmorphia. A diagnosis of FAS requires that a child meet all three of the following characteristics: 1) pre- and/or

postnatal growth deficiency; 2) facial dysmorphology; and 3) central nervous system (CNS) dysfunction (Mattson, Calarco & Lang, 2006).

Discerning between a diagnosis of PEA and FAS is not straightforward as many affected children do not exhibit all three characteristics and subsequently do not qualify for the FAS diagnosis. The lack of specificity in an FAS diagnosis and an absence of definitive diagnostic criteria make the classification of *at-risk* children difficult (American Academy of Pediatrics, 2000). However, children diagnosed with ARND are collectively considered *at-risk* for cognitive delay or impairment that can cause lifelong disabilities.

Identifying neuropsychological problems in children with FAS is still an emerging field, but it includes deficits like a general decline in intelligence, learning, and visuospatial functioning (Mattson, Calarco & Lang, 2006). More specifically, Jacobsen and Jacobsen (2002) report that preschool children diagnosed with a chronic health condition like ARND show neural deficits linked to poor declarative memory skills, particularly recall and sequencing. Mattson et al. (2006) indicate that attentional difficulties are found in approximately 60% of children diagnosed with FAS. Previous studies have attempted to delineate which aspects of attention are most affected and the indication is that visual attention is typically more impaired than auditory attention (Streissguth, Bookstein, Sampson & Barr, 1995). In addition, a diagnosis of FAS typically involves a negative effect on a child's capacity for shifting attention (the ability to move attention to a new relevant target).

In summary, damage from ARND disrupts the normal development for preschoolers and results in abnormal cognitive functioning. Preterms diagnosed with

ARND (Mattson et al., 2006; van Baar et al., 2005) can suffer the effects of cognitive immaturity associated with a delay in the maturation of cerebral fibers in the CNS and particularly the frontal lobe. The frontal lobe is an important area for executive control functions like planning, coordinating, and controlling. The high probability of frontal lobe dysfunction results in manifestations like poor attention and concentration, inadequate language production, memory deficits, and impaired judgement, comprehension, and abstract reasoning (American Academy of Pediatrics, 2000).

Learning Disabilities

For a long time, learning disabilities were considered an academic learning problem where the child's home environment (a poor upbringing) contributed to reading and learning problems (Learning Disabilities Association of Canada [LDAC], 2002). Typically, monitoring *at-risk* children did not start until formal education began in the first grade. Recently there is a better understanding of learning disabilities as a medical problem associated with neurological mechanisms (LDAC, 2002).

Learning disability has a broad interpretation and includes a wide range of severe chronic conditions such as cerebral palsy and epilepsy. Learning disorders are characterized as cognitive impairment and/or delay caused by CNS dysfunction (LDAC, 2002). Learning disabilities are due to neurobiological factors or injury that alters brain functioning (LDAC, 2002). The CNS dysfunction typically results in observable discrepancies between the estimated cognitive capacity and actual academic performance of children (Mercer, 1999). For example, previous studies on the long-term effects of frontal lobe injury report a strong relationship between the presence of distractors (inattention) and verbal working memory (Silver & Feldman, 2005).

The population with learning disorders is a heterogeneous group; each child can exhibit difficulty in one academic area but not necessarily in another (Mercer, 1999). Severe learning disabilities may interfere with the acquisition and use of verbal ability, written language, reading (comprehension, word recognition), and mathematics (computation, problem solving) (LDAC, 2002). Whereas the range and combination of cognitive deficits is large, a primary characteristic of learning disabilities is that persists over time.

The United States Department of Education reported that in 1994 4.09% of children and adolescents 6- to 21-years of age had a learning disability (Mercer, 1999). Within the general population, verbal ability impairments (listening, speaking, understanding) are the most common disabilities (21.6%). In a previous study of 242 elementary students with learning disabilities, Gibbs and Cooper (1989) reported mild to moderate language deficits in 90.0% of the children.

Mercer (1999) suggests that preschoolers *at-risk* for learning disabilities can be assessed on behaviours associated with impairment and/or delay in receptive language, expressive language, visual perception, auditory perception, hyperactivity, attention span, and self-regulation. In addition, Mercer (1999) argues that parents aware of typical developmental milestones for preschoolers can observe skills like the use of multiple word phrases and sentences, the correct use of pronouns, and indicators of academic readiness (alphabet knowledge). Current thinking supports Mercer's (1999) position on learning disabilities identification and intervention and that family members and caregivers should be responsible for monitoring development and school preparation of preschoolers (National Joint Committee on Learning Disabilities [NJCLD], 2006). The

NJCLD has developed a number of developmental milestones that typical preschoolers should demonstrate by the time the reach 4-years of age (demonstrating object permanence, ability to do rhyming, understanding simple directions and means-ends relationships [using a stool to reach a cookie jar]).

Greater concern for monitoring the cognitive functioning of various *at-risk* preschoolers, in general, will benefit those with learning disabilities. Mercer (1999) argues that preschoolers demonstrating problems with attention span and language production is predictive of later learning problems and poor school outcomes. Consequently, like cancer, ARND, and preterm children, it is no longer acceptable to wait until entry into the primary grades to diagnose low cognitive functioning due to learning disabilities. It has become more important to expose preschoolers to high quality learning opportunities, prior to kindergarten, to rule out (or rule in) learning disabilities (NJCLD, 2006).

In the United States in 1985, the *National Joint Committee on Learning Disabilities and the Preschool Child* outlined the needs and issues to facilitate the identification and treatment of preschool children with learning disabilities. They have outlined the following program for preschoolers: 1) examine risk and protective factors; 2) conduct systematic observations of individual children; 3) assess developmental status; 4) create rich and varied learning opportunities; 5) plan and deliver support services; and 6) provide intervention based on assessment data (NLCLD, 2006).

Children with learning disabilities also differ from controls in the basic information stored in long-term memory (Mercer, 1999). However, it is not clear as to whether this type of memory deficit is a function of poor performance in searching and

retrieving information or decreased performance due to difficulties in prior knowledge acquisition (Mercer, 1999). Mercer (1999) reports that studies examining the memory processes of individuals with learning disabilities, identify cognitive deficits involving visual, short-term memory tasks. Children in these studies are also suggested to have more memory problems associated with the limited ability to use of cognitive strategies like organization, rhyming, and rehearsal.

In summary, damage to the CNS from learning disabilities due to neurobiological factors or injury that alters brain functioning disrupts the normal cognitive development of preschoolers. The types of brain insults discussed herein can translate into learning problems characterized as poor attention span, language production, and short-term memory functioning. Typical cognitive milestones to monitor for delay after 4-years of age include the following: a) limited receptive vocabulary; b) reduced expressive vocabulary (late talker); c) difficulty understanding one-step instructions; d) immature syntax; and e) limited phonological awareness (rhyming) (NJCLD, 2006).

Summary

The four health conditions, and related treatments, discussed herein all demonstrate evidence for damage to the CNS that can disrupt the normal cognitive development of preschoolers. Additionally, these health disorders all show that this disruption has lifelong implications in all areas of life, not just education. For success, preschoolers, with these varying health conditions, require early monitoring and identification of cognitive delay and/or impairment, timely specialized assessments, and interventions involving both home and school (specific skill instruction, accommodations, compensatory strategies, self-advocacy skills) (LDAC, 2002).

Identification of a subset of cognitive domains to frame the construction of a brief screening instrument was supported in the review of clinical literature. Cognitive deficits reported in all four health conditions suggested common functioning problems in the domains of memory, attention, and verbal ability. Identifying a subset (or core group) of three cognitive domains moves the focus of this section to a framework of information-processing theory. The next level of discussion involves better understanding the association between observable behaviours in a population of 4:0- to 5:11-year olds and unobservable cognitive processes.

An Information-Processing Framework

Information-processing theory (IPT) provides a framework to examine the neurological processes of the brain as the proximal cause of overt behaviours in preschoolers. An information-processing model explains the unobservable cognitive processes relative to normal development for 4:0- to 5:11-year old children. Overt behaviours reflect the sensing of stimuli via the perceptual processes toward providing a suitable (or typical) response for normally developing preschoolers (Mercer, 1999). This section includes: a) a basic model of information-processing; b) the assumptions of an information-processing framework; c) the background on information-processing theories; and d) a contemporary information-processing framework.

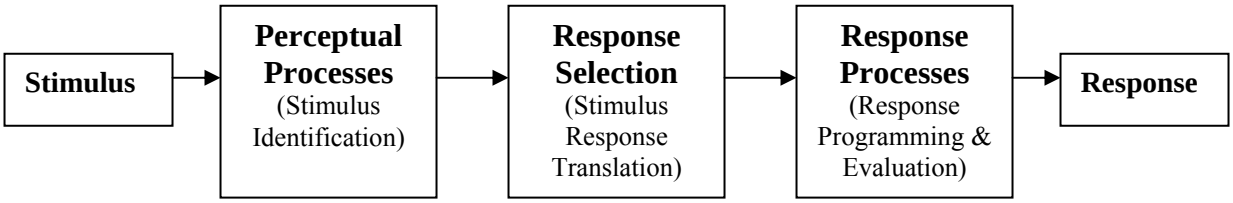
A Basic Model of Information-Processing

Information-processing involves the cognitive activities utilized by a child to manage information about people, things, and how they function to solve problems and interact with the environment (Frankel, 1989). IPT is not a single theory; rather it invites a number of assumptions about how information is acquired, stored, and retrieved. These

assumptions are based on the notion that people mentally process information in order to 'know it' (Frankel, 1989). In other words, the mental action taken by children in order to make sense of input from the environment is a way to define thinking.

IPT explains the cognitive mechanisms by which information from a stimulus is translated to a response (Johnson & Proctor, 2004). A basic model of information-processing includes three stages: 1) perception (stimulus identification); 2) decision-making and response selection, and; 3) response programming and execution (Johnson & Proctor, 2004) (see Figure 1). The serial nature of the stages are described as follows, "a stage does not necessarily correspond to a particular circuit or structure in the brain, but indicates a function (or process) carried out during a period of time" (Johnson & Proctor, 2004, p. 32). IPT is a serial process because it manipulates information in a step-wise fashion, one byte at a time. Further, it is considered a bottom-up process because it is initiated by the individual's capacity to pay attention to stimuli in the environment.

Figure 1
Basic Model of Information-Processing



Based on Johnson & Proctor (2004).

The theoretical basis for the model in Figure 1 comes from cognitive psychology and reflects the concept of chunking (combining meaningful units like digits or words)

along with the limited capacity of short-term memory (Miller, 1956; Welford, 1976). Welford (1976) explains basic IPT models as follows: a) perceptual processes are taking in information through our senses and temporarily storing these inputs prior to sorting them out; b) response selection is selecting inputs that are seen as relevant to a decision and storing them in short-term memory; and c) response process is a decision made by comparing the information in short-term memory with previous experiences stored in long-term memory. Welford (1976) also suggests that the action taken and the results are stored in long-term memory for future reference.

Assumptions of Information-Processing Systems

The present study is particularly interested in IPT assumptions about features or changes to preschoolers through maturation, experience, and training. Four and five-year old children are typically developing rapidly in terms of acquiring more mental capacity and strategies for problem solving and interacting with their environment. It is the controlled processes (cognitively effortful processes) in IPT that are potentially most useful in assessing cognitive functioning in an *at-risk* preschool population. Frankel (1989) describes these controlled processes, or strategies, as: 1) available to consciousness; 2) having the potential to interfere with the execution of other effortful processes; 3) improve with practice; and 4) are influenced by individual differences in intelligence, motivation, and education.

The several IPTs that exist have the following characteristics in common: a) processing information is characterized as being part of a system; b) processing information is accomplished when information is coded and recoded as it moves through the system; c) the system is believed to have structural features that are not under the

direct control of the individual; and d) the system is believed to have features that are changed through maturation, experience, and training (Mercer, 1997). From these characteristics there are three assumptions to consider in a guiding framework: 1) children need to mentally act on information to know it; 2) preschoolers have a limited attentional capacity for dealing with information; and 3) information moves through and is mediated by the memory system.

The first assumption is that an individual processes information from stimuli in their environment, which means "mentally acting on information in order to know it" (Bjorklund, 1995, p. 96). Stimuli are either internal (already in one's memory store) or external. The corresponding mental actions are referred to as operations, processes, procedures, strategies, or components (Bjorklund, 1995). Reading the words on a page would be an external stimulus. Word recognition engages the preschoolers' short-term/working memory to do something with the information in order to remember it. The strategy for deciding what action the information calls for is typically constrained by preschoolers' attentional capacity.

A second assumption is that preschoolers have a limited capacity for dealing with information (Bjorklund, 1995). Given the constant exposure to stimuli (external and internal), Barber (1988) suggests that "performance on a task requiring the faithful mapping of a set of stimuli onto a set of responses, each uniquely specified by a particular stimulus, will be degraded to the extent that the central channel is noisy" (p. 18). Therefore, the addition of nontrivial operations (even those happening involuntarily) tend to interfere with the mental operation and execution of other operations. This assumption

underlies the ability to manage controlled (effortful) processes and further suggests a need to assess *at-risk* preschoolers' attentional capacity.

The third assumption is that information moves through the processing or memory system and is mediated by memory capacity (Bjorklund, 1995). Bjorklund (1995) and Barber (1988) support that the processing of information occurs serially and as follows: 1) encoding – the acquisition of the stimulus and the formation of an internal representation; 2) classification – the memorized representations of the stimuli (matching with the memory set); 3) response selection – translating the input from stage 2 into a response code by reference to the mapping rules (pattern recognition within a context of connectionist IPT); and 4) response execution – the organization of the response, the movements necessary, and their execution.

Some early research on IPT (see Case, 1992b) has withstood the test of time and indicates that, "cognitive development depends heavily on learning to use the available capacity more efficiently" (Halford, 2002, p. 560). Increasing processing efficiency is also related to evidence that the frontal cortex continues to develop for at least 20 years after birth. Case (1992b) asserts that frontal lobe development is associated with the development of working memory in children ages 4:0- to 10:0-years. Consequently, preschoolers with health conditions affecting the CNS are *at-risk* for deficits in processing efficiency that are associated with their ability to manage controlled processes.

In summary, the assumptions of IPT support the importance of memory and attentional capacity relative to a preschoolers' ability to think and act in a normal way. Attentional capacity is critical to initiating information-processing on relevant stimuli and toward minimizing distractions from any extraneous cognitive noise or load. Attention

and working memory are interrelated in the role of learning. To the extent they are not naturally mature, delayed, and/or impaired working memory and attention limit extraneous cognitive load and contribute to the learning process of constructing cognitive schemata (Sweller & Van Merriëboer, 1998).

The following section discusses the background of IPT relative to cognitive development for preschoolers 4:0- to 5:11-years of age. Given the rapid cognitive development typical of normally functioning preschoolers, this next level of discussion is investigating areas where there is stability in patterns of differences within preschool populations. These patterns provide support for the assessment and testability of developmental groups within preschool populations.

IPT and Cognitive Psychology

IPT provides a framework for examining the following fundamental issues in cognitive development: a) how the mind is structured; b) to what extent are changes domain-general or domain-specific; c) to what extent is development constrained in preschoolers by maturation and experience; and d) to what extent is change discontinuous (notion of stages) or continuous. In this section, these natural maturation changes in preschoolers are examined according to the following background perspectives on IPT: 1) communications theory; 2) early theory of computation; and 3) acquisition of language skills.

IPT "was developed by communication engineers but was quickly adopted by psychologists, intrigued by the prospect it seemed to offer for supplying a metric for assessing human performance across situations" (Barber, 1988, p. 16). Developmental cognitive psychologists are particularly interested in investigating conditions in early

years that predict later behaviours that moderate social and academic success (Bjorklund, 1989). Cognitive psychologists are typically looking for stability in patterns of differences (milestone changes in cognitive functioning) to guide the identification of distinct developmental groups. For example, reading, or word recognition, suggests separate skill levels for 3-, 4-, and 5-year olds. Three-year olds are typically described as taking part in a reading activity by filling in words based on prompts, whereas 4-year olds usually try to read from memory, and 5-year olds read many words by sight (Brigance, 1991).

IPT was a primary influence in the re-emergence of cognitive psychology (Anderson, 1990). Secondary influences have been the emergence of computational theories and developments in the field of linguistics. As a result, IPT is a framework of assumptions concerning how humans acquire, store, and retrieve information (Bjorklund, 1995). Chomsky (1980, as cited in McShane, 1991), in favour of this, argues, "the cognitive system should not be viewed as one general system with one set of principles but as a series of largely self-contained cognitive resources, each obeying principles specific to itself" (p. 7). Consequently, the brain can be viewed as a communication system that manages cognitive capacity relative to maturational processes (D'Amato et al., 1999).

Communications theory spawned the concept of information as an abstract way of analyzing the processing and coding of knowledge (McShane, 1991). Further, "the cognitive system could be modeled as a series of channels that carried information, processes that changed information at critical points in its passage through the channels, and stores that retained information" (McShane, 1991, p. 6). Encoding to the long-term

memory store is an example of the process using channels. Acquiring knowledge constitutes steps along the channel where newly encoded information is compared for fit with, expansion of, or modification of currently held concepts/schemas. The resulting information and response are retained in long-term memory for future reference.

The evolution of IPT also requires some discussion of the controversy between linguistic determinism and cognitive determinism. Determinism is the viewpoint that events are caused by previous events. Consequently, the debate centers on the relative merits of language shaping thought verses one's beliefs and state of mind being prerequisite to using appropriate language (de Villeirs & de Villiers, 2000). Vygotsky supports a more integrated approach to the cognitive-language relationship and suggests that, "cognition precedes language but, in turn, is influenced by linguistic structures" (Owens, 1992, p. 137).

The controversy between linguistic and cognitive determinism invites the question of whether language alone can explain all aspects of thought. Piaget argues no and suggests that: "the structures that characterize thought have their roots in action and sensori-motor mechanisms that are deeper than linguistics" (Owen, 1992, p. 137). Subsequently, Piaget perceives verbal ability as a cognitive activity that is something more than just the acquisition of language (Owens, 1992). This perspective fits with current thinking on the interrelatedness of cognitive domains (see Wechsler, 2002) and that language interacts with domains like memory and attention when trying to measure a related cognitive ability.

The field of linguistics has also had a marked influence on computational models of IPT. Chomsky (1965, as cited in McShane, 1991) was instrumental in detailing rule-

based models of the basic units and processes involved in generating sentences for a given language. Chomsky's work is important in explaining language production and as such, "these models hold considerable interest as proposals about the type of computational machinery necessary to generate language" (McShane, 1991, p. 7). Consequently, computational models provide a framework for evaluating the observed verbal abilities of preschool-age child (Seville & Hancox, 1995). The computational model suggests regularities (patterns) for age-related developmental groups of children pertaining to the order in which grammatical construction is gradually acquired. For example, the use of classes of adjectives, or verbs, can be evaluated because they have a precise logical-semantic-syntactic common behaviour in progressively higher-order word combinations (Ninio, 1988). Therefore, computational theory suggests a predictable age-related progression in preschoolers from the rote reproduction of utterances to the acquisition of increasingly complex grammatical constructions.

The theory of computation influenced a way of thinking about what a system capable of manipulating information could and could not do (McShane, 1991). This reflects the early work of Turing (1936, as cited in McShane, 1991) which demonstrates that complex problems (thought processes) can be solved in a systematic way by a mechanical procedure. Therefore, IPT has been described as an individual's capacity to manipulate "the precise steps that are involved in processing precisely specified units of information" (McShane, 1991, p. 6).

Digital computer-based theories suggest that, "information is stored as symbols in particular memory locations from which it is fetched as required by a central processing unit" (McShane, 1991, p. 322). How information is acquired for the central processing

unit is based on how people select, extract, maintain and use information available in and from the environment (Mercer, 1999). Stimulus factors in the environment present the context for individuals to sense relevant information, store it in short-term memory and sort it out, and subsequently recode the information as transformations within the information-processing system.

A symbol, within digital computer-based theory, is defined as an abstract characterization of how information is represented in the brain (McShane, 1991). Owens (1992), in support of this theory, suggests that, "the ability to represent one thing with another can be regarded as one of the most fundamental cognitive prerequisites for language acquisition" (p. 136). In the symbolic model of cognition, the assumption is that neural circuits are the implementation hardware for symbols. Thus, symbols are not considered part of the architecture of the cognitive system, rather they are considered the products or outputs. Subsequently, the central processing unit carries out logical, serial operations on the data it receives and then activates the response selection to store the outputs either in working memory or long-term memory.

Cognitive development can also be described in terms of continuous and discontinuous processes (Bjorklund, 1989). Continuous cognitive functions change quantitatively (rate or amount), while the underlying processes generally stay the same as the individual matures. For example, memory span is a continuous cognitive function and age-related differences (during development) are attributable to quantitative increases in mental capacity (Bjorklund, 1989). In contrast, discontinuous cognitive functions change qualitatively (in type or kind) over time and are associated with observable behaviour changes.

Identifying developmental groups within a preschool population are largely based on the qualitative shifts between distinct ways of reasoning (first referred to by Piaget in 1952). Qualitative changes in children's overt behaviours or responses are useful in describing what cognitive changes take place and how the developmental shift can be explained (Wechsler, 2002). For example, typical 3-year olds are developmentally distinct from 4- and 5-year olds based on expressive language skills. A typical 3-year old is expected to have fluent and clear speech most of the time, however, the standard for 4- and 5-year olds is being able to tell a long story sticking to the topic, and using adult-like grammar consistently (Bowen, 1998).

Qualitative change involves investigating the following aspects of preschool developmental progress: 1) what cognitive skills are developed; and 2) what knowledge is acquired or learned. Evidence for *what* develops is well documented in the literature and incorporated into cognitive tests such as the WPPSI-III, the NEPSY, and the WISC-III, amongst others. The *what* that develops is the child's ability to think, talk, read, do mathematical problems, and so on. These abilities are described as developing basic cognitive capacities like working memory (categorization, associating correlated events, integrating information), cognitive strategies, metacognition, and an expanding knowledge base.

A part of *what* develops, as preschoolers mature, is the ability to form increasingly complex representations of stimulus input. A representation is based on encoding all relevant information from external stimuli while accounting for age-related capacity, ability, and individual interest. McShane (1991) asserts that: "it is a commonplace observation that children of different ages extract different information

from the same stimulus event" (p. 17). Improved mental efficiency is achieved in several ways: a) by chunking two or more representations into a single representation; b) by discarding irrelevant representations; and c) by chunking procedures together (McShane, 1991). The process of cognitive development involves increasing one's capacity to use cognitive resources, like working memory and processing speed, more efficiently.

Explaining *how* cognitive development works is considerably more difficult. The problems are in the limited methods available to researchers (McShane, 1991). Since it is not possible to observe a cognitive system directly, researchers attempt to explain *how* information-processing works based on behavioural output. Some theories have come close to explaining how certain domains of information-processing develop. For example, Dennet (1991) argues that connectionist theories offer a good explanation of language acquisition as a symbol manipulated architecture. However, it is not yet possible to fully explain the *how* phenomenon.

Younger preschool children are limited in their ability to encode objects in terms of visual/imaginal properties of stimuli and utilize relatively few features (Frankel, 1989). As children mature they are more likely to represent an object in terms of a greater number of abstract, symbolic features. Thus, getting preschool children to engage in the behaviour of retelling a story they have heard several times, provides for a qualitative range of performance based on the level of detail in the memory representation (Frankel, 1989). Performance standards developed for 4-year olds suggest there is a discernible quality in the meaningful literary experiences experienced for this age group (The Preschool Network Center for Development and Disability, 2002). These types of output can be used to assess long-term memory functioning. Rose et al. (2006) argues that

memory capacity is directly linked to and becomes critical in accruing knowledge, however, it does not provide a basis for describing *how* the cognitive processes involved work.

In support the case for predictable and testable differences, IPT (see Klahr, 1992; Siegler, 1983) includes two basic assumptions about children's cognitive development. First, that, "a given child thinks about a given topic in a single way at most points in development" (Siegler, 1996, p. 219). Second, that identifying the way of thinking that children use at particular ages is a major goal of the theories. Siegler (1996) suggests that, "information-processing approaches tend to focus at the yet more specific level of N-year-olds' strategy for remembering a certain type of material, their rule for solving a particular kind of problem, or their understanding of a particular concept" (p. 219). Qualitative differences exist between 3- and 4-year olds on their respective ability to participate as active and effective learners (The Preschool Network Center for Development and Disability, 2002). Specifically, 4-year olds are able to demonstrate better understanding of cause/effect relationships (explaining that plants die without water).

In summary, the concepts of communications theory, computational theory, and linguistic determinism are essentially computational in nature and identify specific mechanisms required for cognitive functioning. The literature discussed herein supports the assessment and testing of developmentally distinct groups of children based on predicting performance with cognitive abilities like increasingly complex grammatical constructions. The early focus in IPT on linguistic determinism suggests the interrelatedness of verbal abilities with other cognitive domains like attention and

memory. Therefore, normally developing preschoolers can be characterized as: a) thinking changes and increases in complexity as memory capacity improves; b) language functions of association and generalization improve; and c) attentional capacity improves. The next level of discussion includes more contemporary types of IPT in examining the three cognitive domains of memory, attention, and verbal ability as an appropriate framework for a brief screening instrument.

Types of Information-Processing Theories

More contemporary IPT has undergone some modifications compared to the traditional Piagetian approach (Owens, 1998). The emphasis shifted from cognitive structures of thought and developmental stages to the channels of processing information and the mechanisms of change within (Owens, 1998). For example, the main issue separating Neo-Piagetian theory from other more contemporary IPT is, "whether there was any change in them mind's general capacity with age, of a sort that permits a parallel set of transformation in the structure of children's knowledge across a variety of domains at once" (Case, 1991, p. 44). Therefore, the maturation changes in preschoolers are examined according to the four following perspectives: 1) neo-Piagetian theories; 2) psychometric theories; 3) production-system theories; 4) connectionist theories; and 5) evolutionary theories (Seigler, 1998).

Neo-Piagetian theories (see Case, 1985) propose that automatization of response selection, biologically based increases in working memory, and strategy construction (representational operations, logical operations, formal operations) are the main developmental mechanisms. This builds upon Piaget's general hypothesis that: "cognitive development is a coherent process of successive qualitative changes of cognitive

structures (schemata), each structure and its concomitant change derived logically and inevitably from the preceding one" (Owens, 1992, p. 142).

The Neo-Piagetian theory places an emphasis on memory capacity and executive functioning and how efficiently they are used as foundational elements of information-processing. Piaget did not attempt to delineate the domain of memory because he did not understand it as a distinct aspect of cognition. Piaget's view of memory is as a number of interactive subcomponents (working memory, short-term memory, long-term memory) of several more fundamentally distinct cognitive domains.

Piaget understood the interrelatedness of memory functions and the importance of schemas for processing information. Acute and chronic brain damage puts children at high risk for an inability to form new memories (forgetting information too quickly) and negatively affects their ability to understand their environment. The subcomponents of memory are vital to schemas and an ability to organize knowledge for future understanding of social rules, scripts, archetypes and rubrics. Memory capacity and increasingly more efficient use are considered important to the progression of qualitative cognitive changes experienced by preschoolers.

Piaget characterized cognitive development as a process of acquiring successive mental representations of increasing complexity. More contemporary IPT suggests that children's thinking is continuously changing as opposed to Piaget's more structured view of age-defined transition periods (Seigler, 1998). Fodor (1980, as cited in Thomas & Karmiloff-Smith, 2002) asserts that: "increases in complexity during cognitive development are necessarily maturational and that learning is merely a process that uses experience to select among subsets of representational primitives already available to the

cognitive system at that point in development" (p. 576). Whether one accepts a more structured IPT approach to cognitive development or a model based upon continuous change, there is agreement that normally functioning children acquire more complex cognitive abilities and knowledge in a predictable fashion.

Psychometric theories (see Sternberg, 1985) propose that information-processing contributes to an analysis of intelligence and that strategy construction, encoding, and automatization are key developmental mechanisms. Underlying psychometric intelligence theory is a model suggesting that intelligence is a combination of interrelated cognitive abilities that can be measured by mental testing. For example, a typical performance test used for a multi-dimensional assessment would be the ability to do series completion tasks (a measure of visual perception, organization, and concentration) (Wechsler, 2002). As such, working memory capacity (relative to attending to the organization of materials) is considered to be one of the seven primary mental abilities that psychologist L. L. Thurstone argues are part of a general intelligence factor.

Production-system theories (see Klahr & Wallace, 1976) provide computer simulation models of how the cognitive system modifies its own operation and that generalization (regularity detection and redundancy elimination), encoding, and strategy construction are the main developmental mechanisms. The basic premise of a production-system theory is that a cognitive skill is composed of conditional statements known as production rules (Hochstein, 2002). A production rule is a description of action to be taken if a condition is met. For example:

> *If the goal of an assessment for a preschooler is to classify a shape,*
> *and, the shape has four equal sides,*
> *THEN, classify the shape as a square.*

This type of cognitive task is achieved by stringing together production rules and applying them to working memory (Hochstein, 2002).

Connectionist theories (see MacWhinney, Leinbach, Taraban, & McDonald, 1989) explain the process of acquiring language based on associative competition (symbolic units excite and inhibit each other throughout the network simultaneously) and generalization. This theory assumes that the mind is a large set of simple elementary units that interact to produce complex results which form patterns in the network. This theory emphasizes that information is stored in multiple locations throughout the brain in the form of networks of connections (Huitt, 2003). The important concept in this theory is that the processes (as parallel operations) are intimately linked to language and knowledge and have a large discrete symbolic context (Chandrasekaran, Goel, & Allemang, 1988).

Finally, evolutionary theories (see Seigler, 1998) explain how variation and selection influence cognitive development. Associative competition, strategy construction, and generalization are suggested to be the key developmental mechanisms. Evolutionary theories emphasize domain-specific processes rather than domain-general processes. An evolutionary theorist would argue that cognition consists of many mental rules for reasoning about evolutionary important domains (parenting, predator avoidance, object permanence) (Shapiro & Epstein, 1998). This contrasts the view that the mind includes a smaller number of general-purpose rules of reasoning (executive functions – problem solving, working memory – rehearsal strategies) that tend to be content free. Therefore, an evolutionary theorist would argue that a child's stored information about playing a game like checkers would constitute a domain unto itself, and the interaction of

experience and maturation within this domain would influence behaviour and performance in playing checkers (Shapiro & Epstein, 1998).

The various types of IPT discussed herein support using an information-processing framework for the present study. These include: 1) an assumption of general (or specific) mental rules associated with observable behaviours; 2) that the ability to process and manipulate symbols and abstract thought is linked to language acquisition; 3) that cognitive skills can be explained in terms of production rules (stimulus identification, processes for selection/translation and responding) which are dependent upon memory capacity; 4) that memory is a foundational component of other cognitive domains and increased memory capacity follows a predictable course in normal preschool children; and 5) that information-processing theories help explain the association of cognitive functioning to the observable behaviour of preschool children.

CHAPTER III

Development of a Cognitive Screening Instrument

This chapter includes three sections: 1) the reasons for a brief cognitive screening instrument; and 2) the considerations in developing an initial draft of the cognitive screening instrument; and 3) the internal structure of the proposed instrument. The first section discusses the reasons why screening for impairment with a cognitive assessment tool is appropriate for clinical populations of preschoolers. The second section discusses the principles for constructing and validating a screening instrument. The third section discusses the logic to the content of the instrument, which includes developing item banks for the three domains of memory, attention, and verbal ability.

The Reasons for a Cognitive Screening Instrument

This section discusses the reasons for constructing and validating a short screening instrument for assessing cognitive functioning in clinical populations of preschool-age children. The primary reason is the lack of a brief screening tool for assessing mild to moderate cognitive impairment (impairment which is not undisputed) for a number of developmental groups (see Steenland, Auman, Patel, Bartell, Goldstein, Levey, & Lah, 2008; Ouvier, Hendy, Bornholt, Black, 1999), but particularly 4:0- to 5;11-year olds. The need for early monitoring and screening of preschoolers *at-risk* for cognitive impairment and/or delay is discussed relative to shifting this responsibility from professionals (school psychologists) to non-professionals, such as parents in a primary care giving role. Whereas testable differences between developmental groups in a preschool population are generally accepted (see Siegler, 1996) when assessed by

professionals, the following discussion investigates the evidence for non-professionals to reliably assess overt behaviour associated with cognitive functioning.

The purpose of screening is to identify children in need of further diagnostic evaluation (Gregory, 1999). For the present study, screening for impairment with a short cognitive assessment tool is appropriate for a preschool population for the following reasons: a) high risk for cognitive delay and/or impairment for preschoolers with varying chronic and acute medical conditions affecting the CNS; b) alleviate the current situation which is typically one of delays into the primary grades before any cognitive assessment happens for *at-risk* preschoolers; and c) a short screening test might prove useful in deciding whether an *at-risk* preschooler should be referred for expensive, time-consuming, and anxiety producing testing with a comprehensive cognitive battery.

The clinical literature reviewed herein (see Packer & Metha, 2002; Riccio & Wolfe, 2003; van Baar et al., 2005), demonstrates the importance of early diagnostic evaluation for children *at-risk* due to the following medical conditions: a) cancer; b) ARND; c) preterm low birth weight; and d) various learning disabilities. The monitoring and screening of these *at-risk* 4:0- to 5:11-year olds is important for two reasons: 1) to establish a base rate of cognitive functioning; and 2) to establish a regular and systematic process for early detection of cognitive delay and/or impairment. To achieve regular and early monitoring, of a minimal cost and efficient nature, requires shifting the screening process away from professionals in assessment testing like school psychologists.

For the present study, the screening instrument is intended for use by parents, playschool teachers, and kindergarten teachers typically untrained in intelligence or achievement test administration and interpretation. It is assumed that a parent or teacher

familiar with the day-to-day functioning of an individual preschooler is able to rate overt behaviours based on two scenarios: 1) overt behaviours naturally occurring in a home environment (easily distracted from tasks by typical household noises); and 2) overt behaviours associated with a more structured learning environment like playschool (knows other children's names in their playschool class).

Regular screening with a brief assessment tool has the potential to rule out (or rule in) impaired or delayed cognitive functioning in clinical populations of preschoolers (pediatric cancer survivors). The screening instrument, proposed in the present study, would provide an evidence-base for referring *at-risk* preschoolers for more comprehensive cognitive assessment sooner than later. However, this involves determining the extent to which parents (or adults in a primary care giving role), playschool teachers, and kindergarten teachers can reliably rate overt behaviours in a normally functioning population of 4:0- to 5:11-year olds.

Monitoring cognitive functioning through the use of repeated assessments is considered basic to the standard of care for *at-risk* preschoolers, particularly pediatric cancer survivors, due to the likely onset of late effects (Riccio & Wolfe, 2003). Research demonstrates that children treated for TBI can experience rapid changes (declines) in brain function (Riccio & Wolfe, 2003). It is suggested that monitoring and/or reassessment occur at least every six months.

Parents of preschoolers in various clinical populations (particularly those who have supported their child through aggressive cancer treatment like irradiation and chemotherapy) are typically willing to conduct regular monitoring of cognitive functioning. The ability to reliably classify *at-risk* or *not-at-risk* for cognitive delay or

impairment and predict the need for early intervention is an important step toward normalizing the *at-risk* child's life (DuHamel, Redd, & Johnson-Vickberg, 1999). Parents are now more aware of the need to stay alert for late effects with children having medical conditions affecting the CNS. For example, observing deficits in attentional capacity, which is likely affecting functioning in other cognitive domains, suggests a need for regular monitoring (Noll, MacLean, Whitt, Kaleita, Stehbens & Waskerwitz, 1997).

Instruments like the Behavioural Assessment System for Children (BASC) (see Reynolds & Kamphaus, 1998) demonstrate that parents can reliably rate overt behaviours and consequently play an enhanced role in monitoring *at-risk* preschoolers. The BASC has a parent rating form for the preschool age group of 4:0- to 5:11- year olds and has established good psychometric properties, like high reliability coefficients, for the composite scale scores (behavioural symptoms index, adaptive skills, internalizing problems, and externalizing problems) in the range of 0.86 to 0.92 (Reynolds & Kamphaus, 1998). Parents are asked to rate a preschooler's overt behaviours in both a community-based environment (preschool programs and playschool) and the home setting.

The BASC also demonstrates moderately-high reliability (0.70) for predicting deficits in the domain of attention. Rodgers et al. (1999) argue that attentional capacity is a building block for more complex or higher order cognitive activities. This research points to declines in both reaction times and freedom from distractibility aspects of attention for children diagnosed with learning disabilities and other acute or chronic health conditions of the CNS. These underlying deficits in attention are associated with later difficulties in higher-order cognitive processes like memory and reasoning (Rodgers

et al., 1999). The interface between brain function and behaviour has improved the understanding of chronic impairments like attention-deficit/hyperactivity disorder (Riccio, Hynd & Cohen, 1996) and conduct disorder (Moffit, 1993).

In addition, the Conners' Rating Scales are used for assessing childhood attentional problems with separate parent and teacher checklists specific to observable behaviour in home and school situations. Previous research validates the use of parent and teacher reports using ADHD samples (Helton et al., 2006). Research also indicates that behavioural and conduct problems in children diagnosed as ADHD are similar to some behaviours observed in children suffering the late effects of cancer. For example, when comparing children diagnosed and treated for ALL with sibling controls, the cancer patients generally demonstrated a deficit in maintaining focus over a period of time (Rodgers et al., 1998).

The Tests of Specific Cognitive Abilities for 3-Year Olds (TSCA-3) was one of the first test batteries to assess four different cognitive abilities in children as young as 3-years old. Singer et al. (1984) report that abilities like verbal functioning, memory, perceptual speed, and spatial orientation could be reliably and validly measured in young preschoolers. Although a number of brief evaluations are used for speech and language delay (Early Language Milestone Scale – for birth to 36 months, Screening Kit for Language Development – for 30 to 48 months, Clinical Linguistic and Development, among others) these tests were not designed for screening purposes or for a 4:0- to 5:11-year age group. Nelson et al. (2006) indicates that an optimal method of screening for speech and language delay has not yet been established.

Additional cognitive batteries exist for assessing general intelligence in preschoolers. The Specific Cognitive Abilities Test (SCA) (DeFries & Plomin, 1985; Rice, Corley, Fulker, & Plomin, 1986) is designed to measure verbal performance, visuospatial perception, perceptual speed, and memory in 4-year olds. In addition, the Cognitive Abilities Test (CAT; Detterman, 1988) designed for students (K to 12) focuses on measuring fluid intelligence (working memory, deductive and inductive reasoning). These comprehensive test batteries measure a broad spectrum of intellectual handicaps associated with negative outcomes for the school experience (Aylward, 2002). These tests attempt to target strengths and weaknesses for interventions to improve the following: a) below average IQ scores; b) lags in language development; c) reduced attentional capacity; and d) a high incidence of learning disabilities.

Limitations of Cognitive Screening Instruments

As a diagnostic tool of cognitive functioning, the proposed screening instrument is limited to the role of providing evidence for a decision whether to refer an *at-risk* preschooler for more comprehensive cognitive testing. As such, first-level screening tests are only prerequisites to intervention and treatment planning. A brief screening instrument is limited in that it would not typically identify strengths and intact systems important to the targeting and development of effective treatment programs (Riccio & Wolfe, 2003). Comprehensive assessment with test batteries like the NEPSY (a developmental neurological assessment instrument) is able to enhance the design of interventions by targeting both strengths and weaknesses. Typically, the results of comprehensive batteries provide the clinician with a description of the client's mental capacities and implications for treatment flow from this description (Gregory, 1999).

Summary

In summary, there are several reasons that support the development of a brief screening tool for use by non-professionals in monitoring and assessing cognitive functioning of *at-risk* preschoolers. Evidence for parents, playschool teachers, and kindergarten teachers as reliable raters is partially supported through experience with parent forms on established tests like the BASC and the Conners' Rating Scales. For the following reasons, it is important to investigate an enhanced role for parents and teachers in screening for cognitive impairment: a) high risk for cognitive impairment in preschoolers with acute and chronic health conditions affecting the CNS; b) children as young as 3:0-years of age can be reliably and validly tested for patterns of cognitive differences; c) an improved prognosis for academic and social success with early identification of cognitive impairment and targeting of appropriate interventions; and d) help alleviate typical delays in assessing *at-risk* children until they are into primary grades.

Development of Initial Draft of a Cognitive Screening Instrument

The proposed instrument for the present study has been titled the Screening Test for Early Prediction of School Success (STEPSS). The STEPSS is designed to assist in the decision about the need for further cognitive testing with a comprehensive cognitive battery. Therefore, the STEPSS is a first step in the process of targeting the appropriate intervention and treatment for *at-risk* preschoolers diagnosed with various medical conditions affecting the CNS. The STEPSS has the potential to prevent substantial delays in cognitive remediation which would improve the prognosis for successful school

outcomes by shortening the duration of cognitive decline and reducing the intensity of the deficit.

The STEPSS is intended to be a quick and reliable screening test of cognitive functioning of benefit to parents, playschool teachers, and kindergarten teachers to provide worthwhile information about the *at-risk* preschooler's cognitive state. It is important to be clear that the STEPSS is not a screen for readiness for an academic program (child's level of preparedness for Grade 1). Rather, it is intended as a developmental screen to be used to identify preschoolers who may need special services and/or further diagnosis. Therefore, the construction and validation of the STEPSS required the following considerations: a) be brief; b) able to be administered in the home and/or school environment; c) easy to score and interpret by non-professionals; d) have results available quickly; and e) have adequate psychometric properties (Ouvier et al., 1999).

Ideally, the STEPSS would have approximately 30 items (8 to 10 items for each of the domains of memory, attention, and verbal functioning) and have an internal consistency of ≥ 0.80. An adequately reliable instrument is important in attributing differences in screening scores to the differences in cognitive functioning between preschoolers, rather than chance (Santos, 1999). Nunnaly (1978) indicates that reliability coefficients ≥ 0.70 are acceptable in developing assessment scales.

The STEPSS would address the need for a brief screening test to complement the numerous, rather lengthy, existing cognitive test batteries. The STEPSS needs to be brief for efficient use by non-professionals in assessment. To define brief, a comparison with the Bayley Infant Development Screen, intended for infants 3- to 24-months, is useful.

The Bayley Infant Development Screen, to identify developmental delay of neurologic impairment, contains 78 items and is typically completed in ten minutes (Sattler, 1988). Therefore, the proposed STEPSS, containing less than half the content of the Bayley test (targeted at ≤ 30 items), would likely be able to be completed within approximately ten minutes by individuals like parents in a primary care giving role.

Ouvier et al. (1999) support the need for a short initial screen for cognitive functioning in children as young as 5-years of age. In addition to being easy to administer and suitable for use in a variety of settings, including clinical settings, such a screen should also be: a) easy to score; and b) easy and quick to interpret using a cut score. The proposed STEPSS would include a simple summative scoring system that would have higher scores reflect better cognitive functioning. A simple summative scoring system would lead the non-professional administrator to a decision about the need for further cognitive assessment based on an appropriately sensitive cut score for delineating *at-risk* from *not-at-risk*.

Development of the STEPSS was based on a criterion-referenced framework that required consideration for a threshold point (cut score) for delineating *at-risk* from *not-at-risk* in preschoolers. Wechsler (2002) suggests that cognitive development in normally functioning children is characterized by a predictable pattern of steady growth and progression. Hedemann et al. (2002) support setting performance standards and benchmarks for preschoolers as young as 4-years old. For example, children 4-years of age and older demonstrate a more practical understanding of early literacy skills (takes turns, attends to and acknowledges the speaker) during play and daily activities compared to younger children.

The Internal Structure of Memory, Attention, and Verbal Ability

This section discusses the content for each of three cognitive domains (memory, attention, and verbal ability) used for constructing the STEPSS. In addition, the discussion includes identifying the components within each domain (expressive and receptive language; shifted, divided, and selective attention) in relation to developmental benchmarks for a 4:0- to 5:11-year old preschool population. Finally, the discussion identifies the guidelines used (the tests that items were selected from) to develop the item banks for memory (64 items), attention (91 items), and verbal ability (115 items).

The clinical literature reviewed for the present study suggests that a subset of cognitive domains comprised of verbal ability (Aylward, 2002; Owens, 1992), memory (Geva et al., 2006; Mercer, 1999), and attention (Eiser, 1998; Hack et al., 1995) provide adequate content to screen 4:0- to 5:11-year olds for cognitive functioning. This subset of three cognitive domains contains sufficient behavioural items, associated with cognitive functioning, to identify developmental delay or neurologic impairment in preschoolers with varying medical conditions affecting the CNS.

IPT within a criterion-referenced framework required that there be well-defined cognitive domains (Popham, 1978). This meant providing an operational definition for development of the item banks for each of the three domains of memory, attention, and verbal ability (see Appendix 1). The overall purpose of the constitutive definitions is "to describe with as much clarity as possible what is meant by the examinee's test performance" (Popham, 1978, p. 92). The definitions employed in the present study are:

1) Memory:

> The extent to which children 4-years to 5-years, 11 months display the ability to temporarily store and perform a set of cognitive operations on information that

requires the management of the limited capacity of short-term memory. For the older end of the target group this may include memory span which is defined as the ability to attend to and immediately recall temporally ordered elements in the correct order after a single presentation. However, for the most part, observable memory deficits will be based on the preschoolers' ability to recall basic personal information and procedural items (i.e., what to do in situations) that they would have been repeatedly exposed to.

2) Verbal Ability:

The extent to which children 4 years to 5-years, 11 months display observable, day-to-day behaviours associated with a "socially shared code or conventional system for representing concepts through the use of arbitrary symbols and rule-governed combinations of these symbols" (Owens, 1988, p. 4). Implicit in this broad characterization of language is that there are three major, but not necessarily equal components (i.e., form, content, and use), of language that further characterize cognitive functioning in this broad domain by indicating either a receptive or expressive function. The form component (e.g., voice quality, intonation, and rate of speech) relates to behaviours associated with subcomponents that connect sounds or symbols with meaning (i.e., syntax, morphology, and phonology) (Owens, 1992). The content (semantics) component relates to behaviours associated with "aspects of language concerned with the rules governing the meaning or content of words or grammatical units" (Owens, 1992, p. 528). The use (pragmatic) component relates to behaviours associated with "aspects of language concerned with language use within a communication context" (Owens, 1992, p. 530).

3) Attention:

The extent to which children 4 years to 5 years, 11 months display observable, day-to-day behaviours associated with the ability to sustain focus and alertness over time, shift attention as required (regulate activity level – hyperactivity), and have appropriate response inhibition (control impulsivity). This also includes behaviours associated with executive functions (higher-order cognitive abilities that assist with self-regulation) such as action planning, reasoning (understanding rules), and problem-solving. Implicit in attention is demonstrating an ability to organize, prioritize, and begin and complete tasks (Fine & Kotkin, 2003). In other words, "behaviour of a person that modifies the probability of subsequent behaviour so as to alter the probability of a later consequence" (Barkley, 1998).

Empirical evidence from cognitive test batteries (see Wechsler, 2002; Korkman et al., 1998) indicates that the domains of memory, attention and verbal ability are positively correlated with one another. An information-processing framework invites: "an attempt to discover empirically, principles that are general across tasks and that would constitute the basic organizational structure of cognition" (McShane, 1991, p. 316).

Given that the three cognitive domains are interrelated, it was still important to undertake an examination of the internal components for each of these domains. This was necessary toward guiding the initial development of item banks by providing adequate content to ensure sufficient relevance and representation.

Memory

The clinical literature on neurologic impairment and/or developmental delay associated with memory, reviewed for the present study, suggested that the deficits were at the level of working/short-term memory and long-term associative memory. Mercer (1997) argues for long-term memory as an important component for assessing preschooler progress. The suggestion is that overt behaviours associated with memory include both: a) working memory and the mechanism of chunking representations and/or procedures; and b) the associate long-term store.

Evidence of adequate long-term memory functions demonstrates the capacity to consolidate the presence of one stimulus to predict the presence of another. If preschoolers are not able to: "recognize events in the environment as similar to each other then there is no possibility of learning because present experience cannot be interpreted in light of past experience" (McShane, 1991, p. 327). This relates to analogical reasoning skills where a child would map from a familiar structure (existing associative store) to an unfamiliar structure, the stimuli or target of interest (Halford, 2002).

The memory domain is considered to be somewhat more complex, compared to attention and verbal ability, because it includes an additional layer within which to classify cognitive issues such as decay, forgetting, and retrieval (Ashcraft, 1989). One layer of classification is episodic verses autobiographical memory. Episodic memory is characterized as the child's ability to remember past specific events and to organize the

recall of these events (Gathercole, 1998). Episodic memory is more recent memory of events (compared to autobiographical memory) where the child is more of a passive observer of events. For example, a child remembering the processes in involved with going to MacDonald's to order, purchase, and eat. In comparison, autobiographical memory tends to be more long term where the child would provide some interpretation of the events from their personal frame of reference. For example, retelling a familiar story with reasonable accuracy.

Maturation during the preschool years typically results in improved capacity for remembering past events and for the successful future recall of these same events. Another classification layer is serial memory, which is suggested to be a good measure of working memory capacity and has components (serial positioning effects) based on the number of items to order or sequence (Ashcraft, 1989). The positioning components of serial memory are described as a *primacy* effect (tendency to remember things at the front of a list more so than the middle) and a *recency* effect (tendency to remember the last few things on a list rather than those in the middle). These positioning effects, along with an ability to use rehearsal typically improve as the child matures. Interestingly, the clinical literature on cognitively *at-risk* preschoolers reviewed for the present study did not identify memory deficits at the component level characterized as autobiographical, episodic, and serial memory.

Verbal Ability

Assessing verbal ability in a preschool population typically requires items at a level of subcomponents characterized as expressive (word knowledge and verbal concept formation) and receptive (auditory reception and comprehension) language skills

(Wechsler, 2002). The clinical literature on the verbal ability domain, reviewed for the present study, identified attentional problems interrelated with expressive and receptive language deficits (repeating sentences of 6 to 10 syllables, following verbal directions) (see Brigance, 1991). Additionally, the literature discussed these skills being dependent upon and overlapping with other processes like working memory.

Interestingly, verbal deficits were not typically described at the more specific level of the five functions of language (syntax, semantics, phonology, morphology, and pragmatics). This developmental progress is facilitated by adult interactions (verbal mediation, reciprocal interaction) to promote the acquisition of rules that manipulate symbols (Marcus, 2000). If a subcomponent of language, like phonological processing, is severely impaired, then this impairment can also influence a deficit in other sub-components like comprehension of language (Korkman et al., 1998). Consequently, a deficit in the capacity to determine which speech sounds are used to signal differences in meaning would delay forming rules concerning comprehension.

Developmentally, typical 4-year olds have increased their vocabulary to approximately 1,500 words, with approximately 15,000 words used each day (Owens, 1997). At this age, preschoolers can tell simple stories and most of their sentences average 4 or 5 words and contain a subject. The 4-year old demonstrates good use of interrogative words and can join sentences together using conjunctions such as *and*, *but*, and *if*. A typical 5-year old vocabulary has expanded to about 2,200 words and can use very adult-like language. For example, they can use relative pronouns in their sentences (I know who lives next door). In addition, the 5-year old is starting to understand the use of comparative terms like '*more…than'*, albeit in a limited way. The 5-year old is

comparatively a better conversationalist and demonstrates some ability to entertain by telling stories and showing a sense of humour.

Attention

The content of the attention domain can be described in terms of selective, sustained (divided), and/or shifted attention (Barber, 1988). Selective attention is characterized by an individual's ability to target, recall and manipulate the information. Sustained attention is described as the ability to maintain alertness or vigilance over a period of time (Rodgers et al., 1999). Shifted attention is described as the ability to change the focus of attention in an adaptable and flexible way (Rodgers et al., 1999). Jones, Rothbart and Posner (2003) report that preschoolers who too easily shift attention tend to have difficulty in maintaining focus in later primary grades.

Blumberg, Torenburg, and Randall (2005) suggest that a preschoolers' capacity for selective attention influences their memory functioning. One hundred and two early preschoolers (mean age 42.7 months) and 106 late preschoolers (mean age 53.8 months) were tested on memory for location using a model of a scaled down room configuration. Findings indicate improved memory capacity when the items had more relevance to the preschoolers. Therefore, selective attention to items, based on a relevant or irrelevant status, is considered a factor in the recall of the spatial positioning of items. McShane (1991) suggests that assessing cognitive development in preschoolers involves targeting their working memory capacity, because it is interrelated with various cognitive domains. Nieuwenstein (2004) also supports memory being dependent upon attentional capacity and that learning *what* to attend to is an important and progressive developmental skill.

The *Auditory Attention* and *Response Set* subtest of the NEPSY is considered a core test for 5-year olds. This test assesses the "child's ability to be vigilant and to maintain selective auditory attention, as well as the child's ability to shift set, to maintain a complex mental set, and to regulate responses to contrasting and matching stimuli" (Korkman et al., 1998, p. 7). The test has two parts: a) auditory attention (selective attention to rapidly presented auditory stimuli); and b) response set (complex auditory attention). Aspects of this test (responding to words on a tape) separate 5-year olds from younger preschoolers on the basis of testability because hearing sensitivity is a developmental process from infancy to approximately 7- to 10-years of age (Spreen et al., 1995). An item to consider for assessing 5-year olds might look like: 'my 5-year old can repeat a sequence of four numbers in reverse order after hearing them only once'.

Attentional capacity is interactive with and influential on executive functioning in preschoolers (Korkman et al., 1998). The status of a preschoolers' cognitive development can be assessed in terms of their capacity to attend to stimuli in the environment and form an intention (Korkman et al., 1998). Adults direct a child's attention to events in the environment through gesture, verbal mediation, and reciprocal interaction. Consequently, a preschooler's level of receptive language comprehension is interrelated with attentional capacity. This capacity is considered very important in the toddler and preschool years toward predicting proficient oral and written language skills (Korkman et al., 1998).

Summary of Internal Structure of Memory, Attention, and Verbal Ability

Content specifications for screening cognitive functioning in 4:0- to 5:11-year old preschoolers initially identified seven subcomponents within the domains of memory, attention and verbal ability. Presented in Table 2 are the indicators and measures that

operationalize the domain definitions in the preceding section. The subcomponent specifications reported in Table 2 provided a content framework for developing the three item banks.

Table 2
Guiding Internal Structure for Attention, Memory and Verbal Ability Domains

Subcomponent:	Definition:	Example of an Overt Behaviour:
Attention:		
Focused/Selective	ability to target, recall, and manipulate information (ignore distractors)	Takes some time to think about things before starting a task.
Divided/Sustained	ability to maintain alterness or vigilance over a period of time	Can remain at a 10 to 12 minute task until it is completed.
Shifted	ability to change the focus of attention in an adaptable way	Engages in make-believe play for 10 minutes.
Memory:		
Working	ability to temporarily take in sensory information and manipulate it	Recalls 3 objects seen in a picture.
Long-Term	ability to use memory strategies (rehearsal)	Sings at least 5 lines of a familiar song.
Verbal Ability:		
Expressive	ability to speak and use language	Can tell a 3-5 part story in the correct order.
Receptive	ability to listen and understand language	Answers 'why' questions with an explanation.

Development of Item Banks

The present study utilized two resources for developing item banks for each of the domains of memory, attention, and verbal ability. First, developmental milestones or

benchmarks relative to the cognitive development of normally functioning 4-year olds were considered. Second, a number of existing cognitive batteries were examined that included items for preschoolers in the domains of memory, attention, and verbal ability.

In the first case, developmental milestones from the National Joint Committee on Learning Disabilities (2006) were considered. Preschoolers that are delayed in cognition, communication, emergent literacy skills, and motor and sensory abilities place them at high risk for poor school outcomes and a diagnosis of a learning disability. General

Table 3
Delayed Developmental Milestones For 4-Year Olds

Delay in General Cognitive Skills:
- Not demonstrating object permanence
- Limited understanding of means-end relationships (using a stool to reach a cookie jar)
- Lack of symbolic play behaviour

Delay in Memory:
- Inability to follow directions in a sequence
- Lack of ability to order and sequence
- Unable to plan a task or activity

Delay in Receptive and Expressive Language Skills:
- Limited receptive vocabulary
- Reduced expressive vocabulary (late talkers)
- Difficulty understanding simple (one-step) directions
- Immature syntax

Delay in Emergent Literacy Skills:
- Slow speed for naming objects and colours
- Limited phonological awareness (rhyming, syllable blending)
- Limited print awareness (book handling, recognizing environmental print)

Delay in Attention and Behaviour:
- Distractibility/inattention
- Impulsivity
- Hyperactivity
- Difficulty changing routines or handling disruptions to routines
- Perseveration (constant repetition of an idea)

Adapted from: 1) National Joint Committee on learning Disabilities (2006); and 2) Arkansas Early Childhood Education Framework Benchmarks correlated with Brigance Preschool Screen-II

developmental milestones for 4-year olds (delays in the permanent acquisition of cognitive abilities) are reported in Table 3.

In the second case, existing comprehensive cognitive batteries were examined for items specific to rating preschoolers 4:0- to 5:11-years of age. Most of these instruments, like the WPPSI-III (Wechsler, 2002), are individually administered clinical instruments for assessing the intelligence of children, which is based on functioning in specific cognitive domains. The eleven cognitive batteries considered for the present study are reported in Table 4.

Table 4
Cognitive Batteries Utilized in Developing Item Banks

Bayley Scales of Infant Development – Second Edition (BSID-II)
The Behaviour Assessment System for Children (BASC)
The Bzoch – League Receptive – Expressive Emergent Language Scale – Second Edition
Children's Memory Scales (CMS)
A Developmental Neuropsychological Assessment (NEPSY)
Portage Guide to Early Education Checklist
Revised Brigance Diagnostic Inventory of Early Development
Wechsler Intelligence Scale for Children – Fourth Edition (WISC-IV)
Wechsler Preschool and Primary Scale of Intelligences – Third Edition (WPPSI-III)
Woodcock-Johnson III Tests of Cognitive Abilities (WJ-III)
The Bzoch-League Receptive-Expressive Emergent Language Scale Second Edition for the Measurement of Language Skills in Infancy

The two resources were not necessarily considered in the development of every item included in the three item banks. However, many of the items were included as a result of considering conventional milestones in cognitive development for 4:0- to 5:11-year olds and corresponding items found in existing cognitive batteries. For example, an item included in the memory item bank (Repeats familiar rhymes) was adapted from a similar item taken from the *Portage Guide to Early Education* (Repeats rhymes, songs, or dances for others). This item reflects cognitive performance relative to a delayed

milestone for the 4:0- to 5:11 year age group in terms of limited phonological awareness in terms of rhyming (see Table 3) and further operationalizes the memory definition in terms of recall of information the preschooler would have been repeatedly exposed to. Additionally, this item fits with the long-term memory indicator of demonstrating the ability to use memory strategies like rehearsal (see Table 2).

The resulting item bank for memory included 64 items related to working/short-term memory and long-term associative memory. The attention item bank included 91 items related to selective, divided, and shifted attention. The verbal ability item bank included 115 items related to expressive and receptive language skills. The items in each bank are included in the content Expert Rating Forms provided in Appendix 1.

CHAPTER IV

Content Validation

The goal of the present study was to construct and validate a screening instrument to rule out (or rule in) *at-risk* cognitive functioning within a preschool population. Previous research supporting the testability of children has been one of the most relevant changes to assessment (Wechsler, 2002). For the present study, a criterion-referenced framework was used as a guide in the establishment a cognitive performance standard for normally or typically functioning preschoolers aged 4:0- to 5:11-years. The content validity of a criterion-referenced measure requires clear specifications of the content domains and depends upon the extent to which the measure is representative of the domains (Linn, 1980).

The methodology and results for the content validation portion of the study are presented in this chapter. The methods include a description of: a) the content expert rating form used by the judges to rate the relevance and representativeness of the initial pool of items; b) the sample of content review experts; c) content reviewer's tasks; and d) the statistical methods used to summarize the judge's ratings. The results include: a) the degree to which each test item fit the domain to which it was referenced; and b) the degree to which the relevant items for each domain represented the domain.

Methods

Content Expert Rating Form

The *Content Expert Rating Forms* included a constitutive definition for each of the cognitive domains of memory, attention, and verbal ability (see Appendix 1). The items are the operationalization of the constitutive definitions to identify the overt

behaviours associated with a generally accepted meaning (Linn, 1980). These definitions provided a consistent reference for independent judges to rate the relevance and representativeness of the items. On this basis, the content reviewers were asked to judge the degree to which an item fit with the respective domain.

Each definition was followed by a listing of the pool of items initially referenced to that definition. Each item was accompanied by a four-point scale ranging from *No Fit* to *Excellent Fit*. The interrelatedness of the three domains of memory, attention, and verbal ability suggested that there was a need for an easy mechanism for the judges to indicate that a given item was a better fit with one of the other two domains. Therefore, each item included the following fill-in-the-blank sentence: "If 'No Fit', item may be representative of _____ domain."

At the end of the *Content Expert Rating Form* the judges were asked to respond to two open-ended questions. The first question was "Now that you have rated the items, how well does the assessment material sample the (memory, attention, or verbal ability) domain and/or observable behaviours representative of cognitive performance in preschoolers 4- to 5-years?" The second question was: "Are there any items that you would recommend as 'having an excellent fit' that have been omitted from this item bank?" The second question was designed to meet the condition of content validity that each of the domains were adequately sampled (Linn, 1980).

A covering information letter (see Appendix 2) that introduced the present study was included with the *Content Expert Rating Form*. The letter explained the rationale for developing the screening instrument, the target population that would be surveyed utilizing the questionnaire, and a summary of the tasks involved in this portion of the

study (Rogers, 1999). The information letter also served as a *Consent Form* which included the directions for completing the *Content Expert Rating Form*.

Sample of Content Reviewers

A total of 222 professors from 20 universities in Canada, 17 universities in the United States, 2 universities in Scotland, 1 university in the Netherlands, 1 university in Australia, and 1 university in New Zealand were approached by email and asked to participate as content validation judges. The professors belonged to various Departments of Education, Psychology, Educational Psychology, Human Development and Applied Psychology, Psychological Sciences, and Developmental and Clinical Neuropsychology. In addition, 1 child psychiatrist in Western Canada and 2 child psychologists from a Child Development Centre in Western Canada were contacted by email and invited to participate.

The judges were identified by the description of their areas of specialization or expertise on the respective university websites. The biographical description needed to indicate research in an area of cognitive development related to children in one or more of the domains of attention, memory, and verbal ability. Aside from being faculty or an adjunct to the aforementioned departments, judges were also required to have a PhD degree.

Content Reviewers' Tasks

The task of the content experts was to judge the fit between the items and the domain to which the items were referenced (Hambleton, 1980). Each panel member independently reviewed the items. The content reviewers were asked to judge each item on the basis of its degree of fit with the definition for the domain (Crocker & Algina,

1986). If the reviewers selected the option 1 *(No Fit)* for any item, they were requested to indicate if the item fit either of the other two domains.

Once all the tasks had been completed, the judges were asked to place the *Content Expert Rating Form* in the pre-paid self-addressed envelope and return it to the researcher. The content reviewers were requested to complete the judging of items within one month of their receipt of the package. All rating packages returned were used in the analysis.

Results

The results are presented in four sections: 1) a description of the participants (content reviewers) who participated in the study; 2) an examination of interjudge agreement for each item in the questionnaire (Rogers, 1999); 3) an examination of the degree of fit or item relevance (Rogers, 1999); and 4) recommended modifications to items rated as acceptable for inclusion in the draft of the screening instrument.

Participants

From the 225 individuals approached, 37 agreed to have the *Content Expert Rating Form* sent to them to complete. Eleven individuals agreed to review the 64 memory items, 14 individuals agreed to review the 115 verbal ability items, and 12 individuals agreed to review the 91 attention items. None of the 37 potential content experts agreed to reviewing/rating all 270 items in the three domains. The overall participation rate, based on returned *Content Expert Rating Forms,* was 26 (11.6%). However, the participation rate for those experts who initially agreed to participate, and who returned completed questionnaires, was 70.3%.

Eight (72.7%) of the experts who initially agreed to participate returned completed *Content Rating Forms* for memory. The background information for these

eight content experts for the memory domain is reported in Table 5. All eight content reviewers were from Canadian universities. Five content reviewers belonged to Departments of Psychology or Applied Psychology and three reviewers belonged to Departments of Educational Psychology.

Table 5
Memory Content Area Judges' Background Information

Judge	Degree	Years of Experience	Research Area
1	PhD	n/a	cognitive developmental psychology, developmentally-based assessments
2	PhD	n/a	early memory development
3	PhD	n/a	early reading development
4	PhD	7	how young infants learn new information, remember this information over time, and apply this knowledge to new learning situations
5	PhD	7	higher cognitive functions in memory, attention and language
6	PhD	n/a	memory and cognitive development
7	PhD	8	language and cognitive development during preschool years
8	PhD	31	Cognitive processes underlying reading, comprehension processes and spatial cognition for how students learn to use and think about maps

Nine (64.2%) of the experts who initially agreed to participate returned completed *Content Rating Forms* for verbal ability. The background information on the nine content experts for the verbal ability domain is reported in Table 6. Eight of the content reviewers were from Canadian universities and one reviewer was from an American university.

Five content reviewers belonged to Departments of Educational Psychology, three reviewers belonged to Departments of Psychology or Applied

Table 6
Verbal Ability Content Area Judges' Background Information

Judge	Degree	Years of Experience	Research Area
1	PhD	6	child development, early cognitive and language development
2	PhD	8	speech and language pathology, cognition, brain and behaviour relationships
3	PhD	9	cognitive neuroscience and speech comprehension
4	PhD	3	speech and language development and acquisition
5	PhD	19	developmental psychology – how children learn language, basic mechanisms that underlie acquisition of reading and writing
6	PhD	13	language impairment, learning disabilities and pediatric neuropsychology
7	PhD	n/a	early childhood development and education, early language, literacy and cognitive development
8	PhD	11	reading acquisition, psychology of language, cognitive disabilities, cognitive development
9	PhD	6	understanding child factors that promote early school readiness and success, cognitive development and assessment of young children

Psychology, and one reviewer belonged to a Life Sciences Centre.

Nine (75.0%) of the experts who initially agreed to participate returned completed *Content Rating Forms* for attention. The background information on the nine content

experts for the attention domain is reported in Table 7. Three of the content reviewers were from Canadian universities, four reviewers were from American universities, and two reviewers were from universities in the Netherlands. Three reviewers belonged to Departments of Psychology or Applied Psychology, two reviewers belonged to Departments of Educational Psychology, two reviewers belonged to Departments of Psychological Sciences, and two reviewers belonged to Departments of Developmental and Clinical Neuropsychology.

Table 7
Attention Content Area Judges' Background Information

Judge	Degree	Years of Experience	Research Area
1	Ph.D.	5	Special needs for children
2	Ph.D.	n/a	Attention, conscious and unconscious perceptual processing, & word recognition
3	Ph.D.	6	Attention, behaviour and academic disorders in children
4	Ph.D.	6	ADHD issues in preschoolers
5	Ph.D.	n/a	Childhood attention deficits
6	Ph.D.	36	Applied developmental psychology
7	Ph.D.	n/a	Cognitive development in toddlers and preschoolers
8	Ph.D.	30	Attention: theory and practice
9	Ph.D.	n/a	Childhood attention deficits

Identification of Aberrant Judges

In step one of the analysis of the judge's ratings, the cumulative difference between the median rating for each item and each judge's rating of each item in the

respective item bank was calculated. The following statistic was used to calculate the level of agreement among the judges:

$$JDM_j = \sum_{k=1}^{K} |X_{kj} - Md_k|,$$

where JDM_j is judge j's discrepancy from the median, X_{kj} is the rating given by judge j to item k, Md_k is the median of the ratings given by judges to item k, K is the number of items, and $|X_{kj} - Md_k|$ is the absolute value of the difference between the rating given by judge j to item k and the median of the ratings given by all the judges to item k (Rogers, 1999).

The *JDM_j's* were used to identify aberrant judges. The ideal outcome is for each judge's discrepancy from the median score to be zero (Rogers, 1999). This would indicate that a given judge's rating of fit was the same as the median value calculated for all judges.

Missing data in the calculation of the *JDMs* for each judge were handled by using a mean score: a cumulative rating score divided by the total number of items rated. This was done to compensate for the bias of a zero being calculated into each judge's discrepancy.

Memory Items

The *JDM_j's* for the eight judges rating the memory items ranged from 27.00 to 61.50 (see Table 8). The detail on each judges' rating of all the memory items is listed in Appendix 3. One judge, judge 3, was sufficiently different from the other judges to be considered an aberrant judge. The incongruence of judge 3 was a systematic preference for rating items at either extreme, that was either assigning a *1 (No Fit)* or a *4 (Excellent*

Fit). Judge 3 only chose a fit option of either *2 or 3* for only eight (12.5%) of the 62 items he/she rated. Therefore, the ratings for judge 3 were removed prior to completing any further analyses. Following the removal of judge 3, the JDM_j's were recomputed and ranged from 20.00 to 59.60.

Table 8
Summary Statistics of Memory Judges' Discrepancy from the Median

Judge	Number of Items **Not** Responded To	JDM	JDP
3	2	61.50	-
5	4	59.00	59.60
1	2	49.50	50.80
4	1	44.00	48.00
2	2	39.00	42.10
7	1	31.00	33.00
8	1	29.00	30.50
6	1	27.00	20.00

Note: JDM = Judges Discrepancy from the Median (Judges 1-8); JDP = Judges' Discrepancy from the Median (Judge 3 removed).

Verbal Ability Items

The *JDM* scores for the nine language judges ranged from 59.38 to 92.54 (see Table 9). The detail on each judges' ratings of all the language items is listed in Appendix 3. One judge, judge 8, was considered aberrant. The *JDM* score for judge 8 (92.54) exceeded the *JDM* score of the next most discrepant judge by a value of 11.47 (JDM_9 = 81.07). The pattern of inconsistency across the items for Judge 8 was deemed sufficient to make the entire set of responses suspect. Therefore, ratings that judge 8 provided were

removed. Following removal of judge 8, the *JDM* scores for the remaining eight judges ranged from 62.40 to 85.00.

Table 9
Summary Statistics of Verbal Ability Judges' Discrepancy from the Median Ratings of 115 Items

Judge	Number of Items Not Responded To	JDM	JDP
8	1	92.54	-
9	1	81.07	75.43
1	4	78.24	85.00
6	9	75.46	70.70
4	1	74.00	67.00
5	1	70.63	75.87
2	0	65.00	65.00
7	0	63.00	64.00
3	9	59.38	62.40

Note: JDM = Judges Discrepancy from the Median (Judges 1-9); JDP = Judges' Discrepancy from the Median (Judge 8 removed.

Attention Items

The *JDM* scores for the nine attention judges ranged from 38.50 to 79.32 (Table 10). The detail on each judges' rating of all the attention items is listed in Appendix 3. One judge, judge 4, was considered aberrant. Judge 4 had a large a proportion of missing data (34% of items were not rated). Judge 4 may not have fully understood the task and/or may not have been knowledgeable about the content of the specific attention items that were not rated. Therefore ratings for judge 4 were removed. Following removal of judge 4 the *JDM* scores for the remaining eight judges ranged from 41.00 to 77.40.

Table 10
Summary Statistics of Attention Judges' Discrepancy from the Median ratings of 91 Items

Judge	Number of Items **Not** Responded to	JDM	JDP
2	1	79.32	73.98
4	31	77.90	-
5	7	77.88	77.40
6	3	75.68	76.18
9	3	71.27	67.77
7	2	63.50	65.00
1	3	60.10	56.66
3	1	43.06	43.56
8	0	38.50	41.00

Note: JDM = Judges' Discrepancy from the Median (Judges 1-9); JDP = Judges' Discrepancy from the Median (Judge 4 removed).

Item Relevance

The extent of item fit or item relevance within each of the three cognitive domains was assessed using two statistics. First, the degree of ambiguity among the retained judges' ratings for each item was computed using the following formula:

$$R_k = {}_hX_{kj} - {}_lX_{kj'} + 1,$$

where R_k is the range of the ratings for item k, ${}_hX_{kj}$ is the highest rating for item k given by judge j, and ${}_lX_{kj'}$ is the lowest rating for item k given by judge j' (Rogers, 1999). Second, each item's central tendency (the median score) was examined to determine whether judges collectively felt there was a fit between the item and the definition of the domain to which it was referenced (Rogers, 1999). Item relevance, based on an acceptable median score (≥ 3.00), was mediated by the corresponding value of R_k.

Approximately half of the items referenced to memory (54.7%), to verbal ability (49.6%), and to attention (51.6%) had median values greater than or equal to 3.0. However, only a few items in each domain had item ambiguity values of 1.0 or 2.0 (eight items for memory, seven for language, and two for attention). The minimum number of items per subscale needed was eight so that an adequate level of precision (low error of measurement) could be achieved. Therefore, it was necessary to modify the criteria in two ways; increase the item ambiguity (R_k) to 3, and accept a minimum number of judges with ratings less than three. Applying these three criteria, an adequate number of items were found for each domain (sub-scale) with Mdn $\geq$ 3.0, $R_k \leq 4.0$, and number of judges' ratings < 3.0 no more than one.

Memory Items

From the 21 items that met the inclusion criteria, three items were dropped due to being either redundant or too difficult for the target group of preschoolers Table 11). Item 49 (Can repeat a sentence with 9 words) was dropped as being too difficult compared to retaining item 4 (Can repeat a sentence with 3 words [kitty ran away]) and item 12 (Can repeat a sentence of 5 words). Content reviewer's comments on item 49 were 'the item is difficult' and 'it depends upon the complexity of the syntax'. Item 5 (Can repeat 3 numbers [in the same order as presented] when asked) was dropped because of the content reviewers' perceptions that it was too easy. Several comments on item 5 were aligned with the theme that the item 'will likely get little variance in responses'. Item 48 (Can repeat 5 numbers [in the same order as presented] when asked) was dropped due to it being redundant with item 26 (Can repeat 4 numbers [in the same order as presented]

Table 11

Summary Statistics of 7 Judges' Ratings for 18 Memory Items with a Median Score ≥ 3.00, $R_k \leq 4.0$, and number of judges' ratings < 3.0 no more than 1.

Criteria:	Quest. No.:	Item Bank No.:	Median (R_k):	No. of Judges Rating < 3.00
Mdn ≥ 3.0 and $R_k \leq 2.0$:				
	24	60	4.0 (1.0)	0
	26	63	4.0 (1.0)	0
	27	64	4.0 (1.0)	0
	21	52	4.0 (2.0)	0
	14	24	3.5 (2.0)	0
	13	23	3.0 (2.0)	0
Median ≥ 3.0 and a $R_k \leq 4.0$ with only 1 judge rating < 3.0:				
	11	4	4.0 (3.0)	1
	12	12	4.0 (3.0)	1
	15	26	4.0 (3.0)	1
	16	32	4.0 (3.0)	1
	18	40	4.0 (3.0)	1
	19	42	4.0 (3.0)	1
	20	45	4.0 (3.0)	1
	22	53	4.0 (3.0)	1
	25	62	4.0 (3.0)	1
	17	34	3.5 (3.0)	1
	23	57	3.5 (3.0)	1
	10	2	3.0 (3.0)	1

Note: Median values and range (R_k) given for each item (R_k in parentheses).

when asked). To establish a performance standard for 4- and 5-year olds it was deemed more appropriate to use less difficult items. The summary of the judges' ratings for the remaining 18 items is presented in Table 11.

Verbal Ability Items

From the 21 items that met the inclusion criteria, two items were dropped due to being redundant. Item 50 (Tells how common objects are used) and item 49 (Answers simple 'how' questions) were combined with item 35 (Comprehends and answers simple questions) to form one item (Answers simple 2-step questions [e.g., how do you turn on the TV?]). Several of the content reviewers' comments on item 49 were aligned with a theme of "need to clarify the difference

between simple and complex". Table 12 contains a summary of the judges' ratings for the 19 retained items.

Table 12
Summary Statistics of 8 Judges' Ratings for 19 Verbal Ability Items with a Median Score ≥ 3.00, Rk ≤ 4.0, and number of judges' ratings < 3.0 no more than 1.

Criteria:	Quest. No.:	Item Bank No.:	Median (Range):	No. of Judges Rating < 3.00
Mdn ≥ 3.0 and $R_k \leq 2.0$				
	32	35	4.0 (2.0)	0
	28	7	3.5 (2.0)	0
	30	24	3.5 (2.0)	0
	41	101	3.5 (2.0)	0
	42	102	3.5 (2.0)	0
	46	115	3.5 (2.0)	0
Median ≥ 3.0 and a $R_k \leq 4.0$ with only 1 judge rating < 3.0:				
	29	14	4.0 (3.0)	1
	31	33	4.0 (4.0)	1
	34	55	3.5 (3.0)	1
	36	63	3.5 (3.0)	1
	38	86	3.5 (3.0)	1
	43	103	3.5 (3.0)	1
	33	39	3.0 (3.0)	1
	35	60	3.0 (3.0)	1
	37	80	3.0 (3.0)	1
	39	90	3.0 (3.0)	1
	40	91	3.0 (3.0)	1
	44	109	3.0 (3.0)	1
	45	110	3.0 (3.0)	1

Note: Median values and range (R_k) given for each item (R_k in parentheses).

Attention Items

From the 18 items that met the inclusion criteria, three items were dropped due to being redundant, too vague and/or would not discriminate. Item 38 (Has a shorter attention span than you would expect) and item 39 (Has difficulty staying alert and paying attention) were both dropped due to difficulty and discrimination concerns. Content reviewers' comments on item 38 were 'too ambiguous' and 'no benchmark to compare'. Content reviewers' comments on item 39 were "needs to be more specific" and "how long? – it depends upon the activity." Item 61 (Has trouble concentrating) was suggested to be an easier item and would address the content of both

items 38 and 39. Item 29 (Can put together two parts of a shape to make a whole) was dropped because it was considered to vague and redundant with item 30 (Can use blocks to build simple enclosures [e.g., animal pens or yards]). The summary of the judges' ratings for the 15 retained items is presented in Table 13.

Table 13
Summary Statistics of 8 Judges' Ratings for 15 Attention Items with a Median Score ≥ 3.00, Rk ≤ 4.0, and number of judges' ratings < 3.0 no more than 1.

Criteria:	Quest. No.:	Item Bank No.:	Median (Range):	No. of Judges Rating < 3.00
Mdn ≥ 3.0 and $R_k \leq 2.0$				
	-	-	-	-
Median ≥ 3.0 and $R_k \leq 4.0$ with only 1 judge rating < 3.0:				
	49	13	4.0 (3.0)	1
	58	70	4.0 (3.0)	1
	61	85	4.0 (3.0)	1
	56	62	4.0 (4.0)	1
	52	37	3.5 (3.0)	1
	57	69	3.5 (3.0)	1
	54	57	3.5 (4.0)	1
	59	71	3.5 (4.0)	1
	47	2	3.0 (3.0)	1
	48	3	3.0 (3.0)	1
	50	14	3.0 (3.0)	1
	53	43	3.0 (3.0)	1
	60	80	3.0 (3.0)	1
	51	30	3.0 (4.0)	1
	55	61	3.0 (4.0)	1

Note: Median values and range (R_k) given for each item (R_k in parentheses).

Evidence for Content-Related Validity

The result of the panel review process identified that 52 items met the inclusion criteria (18 memory items, 19 verbal ability items, and 15 attention items) (see Table 14). The seven subcomponents of these three domains were all represented and included multiple items that ranged from 3 items (selective attention) to 14 items (expressive language). This was considered initial evidence that the item banks adequately sampled the domains to which they were referenced and the fact that only domain scores, and not

sub-domain scores, were to be reported. Further, the number of items for each domain exceeded the minimum value of eight.

Table 14
Summary Specifications for the Content of the Draft Screening Instrument

Cognitive Domain:	Number of Items:	Percentage of Domain:	Percentage of Total Items:
Memory:			
Working	7	38.9	13.5
Long-Term	11	61.1	21.2
Verbal Ability:			
Receptive	5	26.3	9.6
Expressive	14	73.7	26.9
Attention:			
Shifted	5	33.3	9.6
Selective	3	20.0	5.8
Divided	7	46.7	13.5
Total:	52		100.00

For the memory domain, the results of the content expert review are consistent with previous clinical research. The clinical literature suggests that behaviours associated with both the working memory and long-term memory capacity of preschoolers need to be included when assessing their memory. Seven items in the questionnaire (11, 12, 15, 16, 22, 24, and 26) assess working memory performance and the remaining 11 items assess long-term memory (see Appendix 4).

For the verbal ability domain, the results of the content expert review are also consistent with previous clinical research. The clinical literature suggests that behaviours associated with both expressive and receptive language skills need to be included when assessing the cognitive functioning of preschoolers. Five items (28, 29, 31, 32, and 38) assess receptive language skills and 14 items assess expressive language ability (see Appendix 4).

For the attention domain, the results of the content expert review are also consistent with the previous clinical research. The clinical literature suggests that behaviours associated with selective (focused), divided (sustained), and shifted attention need to be included when assessing attention of preschoolers. Five items (48, 50, 57, 58, and 60) assess shifted attention, three items (47, 49, and 54) assess selective (or focused) attention, and seven items assess sustained attention (see Appendix 4).

Item Revisions

The judges recommended a number of revisions to improve clarity of the items and their subsequent interpretation. The revisions made for 17 of the 52 items that met the inclusion criteria are reported in Table 15.

The draft of the STEPSS, including the revised items in Table 15, that was pilot tested as part of the present study is included in Appendix 5. This initial version was in booklet form (108.0 mm x 139.5 mm) and used a rather non-descript title of *Cognitive Ability Rating Scale: A Brief Screening Form*. In addition to the 52 cognitive assessment items, the questionnaire included five demographic items for the preschoolers and four demographic items for the parent or teacher rater.

Summary

The expert panel review conducted for the present study demonstrated some support for content validity of the STEPSS based on a degree of fit with the guiding framework (7 subcomponents) identified in Chapter II (see Table 2). However, the validation process for the proposed STEPSS instrument was not considered complete at this expert panel review stage. Messick (1988) suggests that validity requires an integrated, evaluative judgment of the degree to which empirical evidence and theoretical rationales support the adequacy and appropriateness of inferences based on test scores. Further, the evaluative or substantive judgment resembles content

validity in that it refers to the degree to which the test items are consistent with the operational definition of the constructs being assessed. The item analyses, factor analytic procedures, and the substantive content review of the factor pattern that best met simple structure to further examine the validity evidence are examined in the next chapter.

Table 15
Item Revisions Recommended by the Content Review Experts and Adopted for the Second Draft Questionnaire

Item as reviewed in the item bank:	Item as presented in the draft questionnaire:
Memory:	
Tells their age when asked.	Tells their correct age when asked.
Remembers their house address.	Knows their house address.
Remembers the name of the city/ town they live in (or closest to).	Knows the name of the city/town they live in (or closest to).
Tells other children's names in their daycare, playschool, or kindergarten class.	Knows other children's names in their daycare, playschool, or kindergarten class.
Remembers the time of day for their favourite TV program.	Remembers the time of day for their favourite TV show.
Verbal Ability:	
Understands commands using two related actions (e.g., run fast, talk quietly).	Follows commands related to actions (e.g., run fast, talk quietly).
Comprehends and answers questions.	Answers simple 2-step questions (e.g., How do you turn on the TV?).
Uses words, 'sister', 'brother', 'grandmother', 'grandfather'.	Uses relationship words such as 'sister', 'brother', 'grandmother'.
Can tell a 3-5 part story in sequence.	Can tell a 3-5 part story in the correct order.
Uses 'yesterday' and 'tomorrow' meaningfully.	Uses words like 'yesterday' and 'tomorrow' meaningfully.
Attention:	
Attends to music or stories for 5 to 10 minutes.	Attends to music or stories for at least 5 minutes.
Engages in make-believe play, imitating an adult, for 5 to 10 minutes.	Engages in make-believe play for 10 minutes.
Easily distracted by extraneous stimuli (e.g., typical household noises).	Easily distracted from tasks by typical household noises.
Can use blocks to build simple enclosures (e.g., animal pens or yards).	Can use blocks to build simple structures (e.g., animal pens or yards).
Can do an activity (e.g., play with toys, watch TV) for at least 20 minutes.	Can do an activity (e.g., play with toys, watch for at least 15 minutes.
Is unable to wait for events (e.g., rewards, birthdays, etc.).	Has trouble waiting for events (e.g., rewards, birthdays, etc.).
Avoids, hesitates, or has difficulty with tasks needing sustained attention.	Avoids or has difficulty with tasks needing longer periods of attention.

Underscore (__) indicates where items were changed by new or additional wording.

CHAPTER V

Pilot Testing

The proposed STEPSS instrument is intended to support parents in monitoring all preschoolers cognitively *at-risk*. However, the resulting test scores must be interpreted based on comparative performance standard for typical preschool cognitive performance. As such, the pilot testing conducted as part of the present study, is based on yielding a clear picture of what adequate cognitive performance means for an undifferentiated sample of 4:0- to 5:11-year olds (Popham, 1978).

The objective was to obtain a sample of preschoolers representative of the Saskatchewan population of preschoolers in this age range. Representativeness of the sample was determined based on how well it matched the Saskatchewan population on the following variables: 1) age; 2) gender; 3) race and ethnic distributions; 4) parent education level (grade 11 or less, high school graduate, four or more years of technical school or college); and 5) parental status (two-parent families versus single-parent families).

The methodology and results for the pilot testing portion of the study are presented in this chapter. The methods section includes: a) a description of the screening instrument; b) a description of the sample of 4:0- to 5:11-year old preschoolers; c) a description of how the data was collected and organized; d) a description of the content review experts for the substantive interpretation of the statistical factor analyses; and e) a description of the methods of statistical analyses that were used. The results section includes: a) the extent to which the scales for memory, attention and verbal ability demonstrated evidence of internal consistency; b) the extent to which the pilot tested

screening instrument demonstrated evidence for inter-rater agreement; c) the extent to which the exploratory factor analyses demonstrated evidence for construct validity; and d) the extent to which the statistical factor analyses was supported by a substantive or psychological interpretation of the retained factors.

Methods

Piloted Screening Instrument

The piloted version of the STEPSS possessed some characteristics of a test battery because it included subscales for memory, attention, and verbal ability. The memory domain included 18 items, the attention domain included 15 items, and the verbal ability (titled language in the questionnaire) domain included 19 items. Parents and teachers were asked to rate overt behaviours using a five-point Likert-type response format. The frequency response options were: 1 *(Not at All)*; 2 *(Rarely)*; 3 *(Occasionally)*; 4 *(Usually)*; and 5 *(Consistently)*. In addition, there were five demographic items specific to the preschooler and four demographic items specific to the rater. The 61 item screening instrument was pilot tested with parents, playschool teachers, and kindergarten teachers who rated preschool children aged 4:0- to 5:11-years.

Data Collection

Most of the 151 parents retained for the present study were recruited based on their child/children attending a daycare, playschool, preschool program, and/or kindergarten in the province of Saskatchewan. Programs, other than kindergartens, were contacted directly. In contrast, the kindergarten programs required a top-down process of approvals starting with the central office of the respective school division.

The terms *daycares* and *preschool programs* were used to search the Internet to identify prospective facilities throughout the province. Listings provided contact information for preschool programs within the urban centre as well as the surrounding rural area. The daycares and preschools were contacted by phone. This involved: a) identification of the researcher and the university; b) an explanation of the study and its purpose; c) the anticipated role of the preschool program staff (distributing packages to parents); d) an explanation of what was included in the package for distribution to parents (a combined letter of introduction and informed consent [see Appendix 2], questionnaire, and self-addressed stamped return envelope); and e) an explanation that the consent form made it clear that parents' participation was voluntary.

The contacted official of the participating daycares and preschools indicated the number of children attending their respective program. The required number of packages was mailed to the respective program coordinator or staff member designated to distribute the packages to parents. A covering letter (see Appendix 2) was included with the questionnaire packages along with an additional package provided to the contacted official to provide the details of what was being distributed to parents.

In the case of the kindergarten children, the first step was a letter of invitation to participate in the study (see Appendix 2) sent to the Coordinator of Research or Board Chair of the school division. Nine school divisions in Saskatchewan were contacted and of the four that replied three agreed to participate. The participating school divisions were all urban school divisions and one was public and two were Catholic.

The process to recruit kindergarten teachers varied among the three participating school divisions. The researcher had approval in one school division to contact

kindergarten teachers directly following a letter sent out to the principals stating that the study received approval from the division office. In a second school division, a letter was sent out to principals saying that the study was approved at the division office and if the principal chose to participate he/she should contact the researcher. Lastly, in the third division a package of materials explaining the study, along with the expectations for the kindergarten teacher, was sent to each of the principals in the school division (see Appendix 2).

In total, 8 of 96 possible kindergarten classes in the 3 school divisions participated (3 of 42 programs in the public school division and 5 of 54 programs in the two Catholic school divisions). The teachers of these classes were contacted directly to discuss two levels of possible participation: 1) level 1 - distribute packages to all parents that agree to cooperate and also conduct a second assessment (rating) of students where prior approval of parents is granted (see consent form in Appendix 2); or 2) level 2 - just distribute packages to all parents that agree to cooperate (see covering letter in Appendix 2). The eight participating kindergarten classes produced 67 (44.1%) of the completed questionnaires.

Twenty-eight (18.4%) of the completed questionnaires were received from parents of 4- and 5-year old preschoolers who were recruited through advertisements (on the City of Saskatoon on-line classified ads and posters placed in various child care facilities) and personal contacts. These participants had packages mailed directly to their residence.

Data Analysis

The following six analyses of the pilot test results were conducted: 1) an examination of the scale reliability for memory, attention, and verbal ability; 2) an examination of the evidence for interrater agreement; 3) an examination of the factor structure within the three domains; 4) an evaluative judgment of the extent to which the empirical evidence fits with a substantive or psychological interpretation; 5) a re-examination of the factor structure within the three domains where items were removed; and 6) an examination of the psychometric properties based on the recommended items for a next version of the STEPSS.

To examine the internal consistency for each of the domains of memory, attention and verbal ability scale reliabilities were conducted. The item-domain correlation with all domain items included, the item-domain correlations with adverse domain items removed, and the internal consistency for each domain were calculated. Cronbach's alpha was used as an indication of what percentage of the variance for each scale was systematic in measuring each of the three domains (Pedhazur & Schmelkin, 1991). The intent was that the final scales for each domain should have an internal consistency value of 0.80 or above.

The reliability analyses were also used as a guideline for culling poor items from the scales for memory, attention and language. Discarding a poor item was based on two considerations: 1) where items did not correlate adequately with the overall scale (typically < 0.25) (Judd, Smith & Kidder, 1991); and 2) where removal of an item improved Cronbach's alpha.

The second step in the analyses was to examine the evidence for inter-rater agreement. This was examined using the formula for the Mean Absolute Deviation (MAD):

$$MAD = \frac{\sum_{i=1}^{n_i} | R_{ij} - R_{ij'} |}{n_i}$$

where, n_i is the number of items, $_j$ designates the rater, and R_{ij} is the rating given to item $_i$ by Rater $_j$ and $R_{ij'}$ is the rating given item *i* by Rater *j'* (Rogers, 1999). The MAD statistic refers to the degree to which ratings from individuals are interchangeable because they are essentially the same rating (Kozlowski & Hattrup, 1992). If the MAD is small, the values for the two raters (mother and father or one parent and a teacher) are clustered closely to one another. If the MAD is large, this indicates that at least some of the values are quite far apart.

Inter-rater agreement is an important consideration for any test where judgment plays a role in scoring (Cohen, 1997). Large differences in the MAD statistic for two parents and/or a parent and teacher reflects one or more of the following three reasons: 1) parents and/or teachers may interpret the items differently; 2) parents and/or teachers may have formed different impressions of the preschooler because they pay attention to different areas of behaviour; and 3) preschoolers may behave differently in front of one parent compared to the other or the respective playschool or kindergarten teacher (Reynolds & Kamphaus, 1992).

The third step in the analyses was an examination of the factor structure within each of the three domains of memory, attention, and verbal ability. The number of factors within each domain was determined by using the Kaiser-Guttman rule and the two-line

analysis of the scree test applied to the results of principal component and image analysis followed by varimax rotation of all image factors. Principal axis extraction was conducted for the range of retained factors yielded by these three procedures followed by a varimax rotation and a direct oblimin transformation. The factor pattern that best met the criteria of simple structure (Thurstone, 1947) and that was clearly interpretable was retained.

The fourth step involved determining the interpretability of each factor in terms of substantive or psychological meaning. The substantive interpretation of the factor structure for each domain was provided by a content expert in each domain. The process involved a face-to-face meeting with each content expert.

The fifth step in the analyses was a re-examination of the factor structure within each of the three domains following recommendations from the substantive reviewers. The factor analysis was re-conducted using principal axis extraction followed by both a varimax rotation and a direct oblimin transformation.

The sixth step was an examination of the psychometric properties of the recommended factors in the shortened version of the STEPSS. The means, standard deviations, and internal consistency coefficients were computed for each of the three components (memory, verbal ability, and attention) in addition to the instrument as an overall scale. Finally, the correlations between the three components (factors) were examined.

Results

Participants

Of the 1,670 questionnaires sent out between October 15, 2006 and January 24, 2007, a total of 165 (9.9%) parents of preschool age children aged 4:0- to 5:11-years responded to the pilot screening instrument. However, only 151 participants were retained due to the low response rate from ethnic groups other than Caucasian. For example, only 13 (8.0%) of the 165 parents who responded were parents of Aboriginal preschoolers (5 First Nations and 8 Métis). This percentage is well below the overall provincial percentage of 27.4 % for Saskatchewan (Saskatchewan Learning, 2002). Thus, the sample was restricted to Caucasian parents.

Of the 151 parents, 138 (91.4%) were female and 13 (8.6%) were male (see Table 16). Of the 64 parents who considered themselves the *primary caregiver* for the child, 63 (98.4%) were female and 1 (1.6%) was male. Seventy-two (85.7%) of the 84 parents who considered themselves *equal caregivers* to the child were female and 11 (14.3%) were male. Two female participants classified themselves as *non-parent guardians*.

The sample included 20 (13.3%) single parents and 130 (86.7%) parents in a two-parent family. Only one of the 20 single parents was male. Female participants from two-parent families (n = 118, 77.6%) were better educated than single female parents (n = 19, 12.5%) with 94 (79.7%) having obtained a technical school diploma or university degree compared to 12 (63.2%) of single female parents. In addition, a smaller percentage of females from two-parent families, 9 (7.6%), had a high school diploma or less (something equivalent to or lower than Grade 11) compared to 5 (26.3%) single female parents.

Table 16
Demographic Data for Caucasian Parents Based on the Age of the Child (Total Sample = 151)

	4:0 4:6	4:7 4:11	5:0 5:6	5:7 5:11	**Total**
Male	4	1	5	3	13
Female	38	37	31	32	138
Primary Caregiver	19	14	16	15	64
Equal Caregiver	23	24	18	19	84
Reduced Role					
Guardian			1	1	2
Missing data (relationship)					1
Grade 11 or less	1	2		1	4
High School	2	3	2	5	12
Post-Secondary					
(no Diploma)	7	3	3	6	19
Tech. Graduate	14	14	14	11	53
Univ. Graduate	18	16	17	12	63
Single Parent	6	1	5	8	20
Two Parents	35	37	31	27	130
Missing data (Parental status)					1

There was a small difference between the proportion of females in single-parent families (61.1%) versus two-parent families (69.0%) residing in a city with a population > 30,000. There were larger differences in proportions reported between the two groups for residing in a city or town < 30,000 (single parent [33.3%] verses two-parent [19.0%]) and residing in a rural area (single parent [5.6%] verses two-parent [12.1%]).

Eighty-two (53.9%) of the preschool children were male and 69 (45.4%) of the children were female (Table 17). The combined urban sample (large urban centers > 30,000 and smaller urban centers < 30,000) for the current study was 130 (87.8%). The rural sample of preschoolers (i.e., typically from centers with a population of < 1,000) was 18 (12.1%). The targeted distribution of preschoolers by residence for the province was 60% in urban areas, 30% in rural areas, and 10% on First Nations reserves

(Saskatchewan Learning 2002). A representative sample of preschool children by urban and rural residence for the province of Saskatchewan was not achieved.

Table 17
Demographic Data for Caucasian Children for Age by Gender, Place of Residence and Program
(Total Sample = 151)

	4:0 4:6	4:7 4:11	5:0 5:6	5:7 5:11	Total
Male	21	20	20	21	82
Female	21	18	16	14	69
Total	42	38	36	35	151
Urban > 30,000	27	21	26	24	98
Urban < 30,000	7	12	8	5	32
Rural	8	3	2	5	18
Missing data (Resides)					3
Not Attending	4	2	2	1	9
Playschool	37	30	5	1	73
Kindergarten		5	29	33	67

Substantive Review Participants

The validation procedure, for the present study, required a substantive judgment process to help interpret the results of the factor analysis. A content expert in each of the domains of memory, attention, and verbal ability was recruited to review the factor pattern that best met simple structure. This involved an evaluative judgment of the degree of fit between the empirical evidence and theoretical rationales to further support the adequacy and appropriateness of inferences based on the STEPSS test scores (Table 18).

The content experts for memory and verbal ability were recruited based on: a) their knowledge and research experience in their respective content area; b) their prior involvement with the study; and c) local accessibility for a face-to-face consultation. Both had acted as panel reviewers that judged the relevancy and representativeness of the items (see Chapter IV, Tables 8 and 9).

The content expert recruited for attention had not been previously connected with the study. However, the individual met the criteria of having extensive clinical knowledge and research experience with children in the area of attention, especially ADHD.

As shown in Table 18, two of the content experts had a PhD degree, while the third had an MD. Two worked at universities for 15 and 27 years. The content expert in verbal ability had 10 years experience as a speech/language pathologist prior to working at a university.

Table 18
Content Experts Background Information

Reviewer:	Type of Degree	Years of Exp. in the Field	Years Working at University	Total
Memory	PhD Experimental Psychology – Cognitive Development	15	15	15
Attention	MD, FRCPC - Child Psychiatry	27	27	27
Verbal Ability	PhD Educational Psychology – Special Education	14	4	18

Item and Scale Analysis

Memory

The 18 items for the memory domain had a high internal reliability coefficient of 0.89 (see Table 19). Item 25, *Remembers the time of day for their favourite TV show*, was considered a poor item and removed for two reasons: 1) a relatively low *corrected item-total correlation* of 0.36; and 2) a reported frequency of 26.7% that children did not

watch TV on a regular basis. The factor analysis for the memory domain was conducted on the remaining 17 items.

Table 19
Internal Consistency for the Memory Scale (Cronbach's Alpha Coefficient .89)

Item:	Corrected Item-Total Correlations:	Alpha if Item Deleted:
10. Tells their correct age when asked.	.57	.89
11. Can repeat a sentence with 3 words (e.g., Kitty ran away).	.54	.89
12. Can repeat a sentence of 5 words.	.56	.89
13. Knows their house address.	.60	.89
14. Knows the name of the city/town they live in (or closest to).	.56	.89
15. Can repeat 4 numbers (in the same order as presented) when asked.	.57	.89
16. Recalls 3 objects seen in a picture.	.63	.89
17. Repeats familiar rhymes.	.60	.89
18. Can remember events (e.g., going to McDonalds) from the previous week.	.55	.89
19. Knows other children's names in their daycare, playschool, or kindergarten class.	.45	.89
20. Tells his/her phone number when asked.	.57	.89
21. Sings at least 5 lines of a familiar song.	.56	.89
22. Retells a story (from a picture book) with reasonable accuracy.	.70	.88
23. Remembers an emergency phone number (e.g., 911).	.58	.88
24. Tells what is missing when one object is removed from a group of three.	.58	.89
25. Remembers the time of day for their favourite TV show.	.36	.90
26. Retells 5 main facts from a story heard several times.	.63	.89
27. Tells familiar story without pictures for cues.	.68	.88

Verbal Ability

The 19 items for the verbal ability domain had a high internal reliability coefficient of 0.92 (see Table 20). None of the language items were considered poor, based on internal consistency, as they all contributed to the total scale score with

corrected item-total correlations within a range of 0.44 to 0.72. In addition, removal of any of the items would not increase Cronbach's alpha.

Table 20
Internal Consistency for the Verbal Ability Scale (Alpha Coefficient .92)

Item:	Corrected Item-Total Correlations:	Alpha if Item Deleted:
28. Follows commands relate to actions (e.g., run fast, talk quietly).	.44	.92
29. Responds to commands using 'on', 'under', 'up', and 'down'.	.58	.92
30. Asks questions, What's this (that)?	.53	.92
31. Can answer the telephone and talk to a familiar person.	.47	.92
32. Answers simple 2-step questions (e.g., How do you turn on the TV?).	.66	.92
33. Tells if an object is big or little.	.54	.92
34. Understands three common prepositions (e.g., on, in, under, between).	.61	.92
35. Uses the correct order to ask questions (e.g., can I, does he).	.72	.91
36. Can express future events with 'going to', 'have to', and 'want to'.	.73	.91
37. Names an object that does not belong in a particular class (e.g., one that's not an animal).	.66	.91
38. Understands the use of passive sentences (e.g., girl was hit by a boy).	.70	.92
39. Uses contractions like 'can't', 'don't', and 'won't' correctly.	.59	.91
40. Uses relationship words such as 'sister', 'brother', and 'grandmother'.	.62	.92
41. Answers 'why' questions with an explanation.	.70	.92
42. Can tell a 3-5 part story in the correct order.	.65	.92
43. Can tell the opposite of common words (e.g., short – tall, close – far).	.62	.92
44. Use words like 'yesterday' and 'tomorrow' meaningfully.	.57	.92
45. Asks the meaning of new or unfamiliar words.	.57	.92
46. Uses pronouns (e.g., he, she, them) consistently and correctly.	.71	.91

Attention

The 15 items for the attention domain had a high internal reliability coefficient of 0.81 (see Table 21). Item 54, *Takes some time to think about things before starting a task*, was considered a poor item due to its low corrected item-total correlation of 0.17 and that

Table 21
Internal Consistency for the Attention Scale (Alpha Coefficient .81)

Item:	Corrected Item-Total Correlations:	Alpha if Item Deleted:
47. Attends to music or stories for at least 5 minutes.	.42	.80
48. Engages in make-believe play for 10 minutes.	.49	.80
49. Easily distracted from tasks by typical household noises.	.46	.80
50. Doesn't listen to what is said.	.50	.80
51. Can use blocks to build simple structures (e.g., enclosures like animal pens or yards).	.36	.80
52. Can do an activity (e.g., play with toys, watch TV) for at least 15 minutes.	.48	.80
53. Has trouble waiting for events (e.g., rewards, birthdays).	.28	.81
54. Takes some time to think about things before starting a task.	.17	.82
55. Has trouble concentrating.	.57	.79
56. Can remain at a 10 to 12 minute task until it is completed.	.53	.79
57. Has difficulty organizing tasks or activities.	.41	.80
58. Often fails to follow instructions or fails to finish chores.	.49	.80
59. Makes careless mistakes.	.48	.80
60. Can do 'Simon Says' types of activities.	.39	.80
61. Avoids or has difficulty with tasks needing longer periods of attention.	.52	.79

its removal slightly improved the Cronbach's Alpha coefficient to 0.82. The factor analysis for the attention domain was conducted on the remaining 14 items.

Parents Inter-Rater Agreement

For the sample of 151 preschoolers, 165 parents and/or guardians of preschoolers participated by completing a screening questionnaire. This included 10 couples who completed separate ratings of the same child. This sub-sample of parents was used to compute inter-rater agreement for each of the three subscales (memory, verbal ability, and attention) and the composite scale. The results are reported in Table 22.

Table 22
Parent Rater Agreement for the Memory, Attention and Verbal Ability Subscales and the Composite of All Items

Case:	Memory (17 items)	Attention (14 items)	Verbal Ability (19 items)	Composite (50 items)
4:00 – 4:11:				
Case 1	.28	.60	.53	.46
Case 163	1.22	.73	.21	.71
Case 190	.11	.07	.21	.13
Case 198	.77	.67	.37	.60
5:00 – 5:11:				
Case 2	.22	.47	.18	.27
Case 4	.44	.53	.05	.33
Case 50	.00	.27	.11	.11
Case 70	.11	.07	.00	.06
Case 121	.33	.47	.63	.48
Case 189	.28	.60	.74	.54

Note: Each cell in the table represents the case for one preschooler as rated by two parents based on the MAD statistic.

The inter-rater agreement for parents on the memory scale (Table 22) is considered quite good as eight out of ten pairs of raters (cases) had less than half a score point difference across 17 items. The only exception on memory is Case 163 where the discrepancy exceeded one score point. The father rated this 4-year old male consistently lower than the mother on nine of the 17 items and on six items by 2 or more score points. The consistency of the father's lower rating makes this discrepancy difficult to explain,

given that both parents reported their relationship with their child as one of *equal caregivers*.

The inter-rater agreement for parents on the attention scales (Table 22) is considered good as five out of ten pairs of raters (cases) had less than half a score point difference across 14 items. The remaining cases on attention were all within 0.73 of a score point. The inter-rater agreement on the verbal ability scale was considered quite good as seven out of ten cases had less than half a score point difference across 19 items. The other cases on verbal ability were all within 0.75 of a score point.

Overall, the parent inter-rater agreement for the memory, attention, and verbal ability scales shows quite good consistency among the parent raters. The inter-rater agreement for the composite scale is also considered good (across 50 items) as seven out of 10 pairs of raters were less than 0.50 of a score point difference. However, these preliminary results, while promising, need to be interpreted cautiously due to the small number of pairs of parents. A potential ceiling effect with the obtained sample (Caucasian preschoolers residing in urban areas) may be producing a bias in parent responses. If a ceiling effect exists, this may be an indication that the items are too easy for the 4:0- to 5:11-year olds.

Parent/Teacher Inter-Rater Agreement

The examination of rater consistency included two couples and six individual parents who agreed to also have a separate rating of their preschooler conducted by their teacher. Including teachers was based on two considerations: 1) teachers pay attention to different areas of behaviour than parents; and 2) children tend to behave differently in one setting compared to another (Reynolds & Kamphaus, 1992). This subsample of nine

cases was used to determine inter-rater agreement among parents and kindergarten teachers (see Table 23).

The inter-rater agreement among parents and teachers for the memory scale is considered good as four of nine pairs of raters (cases) had less than half a score point difference across 17 items (see Table 23). Three of the other cases were within 0.64 of a point score. The two exceptions were cases 70 (father) and 200 (mother) where the discrepancy exceeded one score point. For case 70, the father (self-reported as an *equal caregiver*) rated the 5-year old female lower than the teacher on five items, three of which had two or more score point differences. The teacher rated this preschooler lower on seven items, six of which had a one score point difference. For case 200, the teacher rated this 5-year old male lower on seven items, five of which had a two or more score point difference. The mother only rated the preschooler lower on three items, only one of which had a discrepancy greater than one.

Table 23
Parent/Teacher Inter-Rater Agreement for the Memory, Attention and Language Subscales and the Composite of All Items

Case:	Memory (17 items)	Attention (14 items)	Verbal Ability (19 items)	Composite (50 items)
5:00 – 5:11:				
Case 70 (Father)	1.06	.80	.63	.83
Case 70 (Mother)	.63	.73	.63	1.06
Case 185 (Mother)	.28	.87	.32	.28
Case 189 (Father)	.33	.47	.84	.56
Case 189 (Mother)	.28	.53	.11	.29
Case 200 (Mother)	1.11	.80	.58	.83
Case 201 (Mother)	.61	.60	.37	.52
Case 204 (Mother)	.56	.67	.74	.65
Case 206 (Mother)	.39	.67	.37	.46

Note: Each cell in the table represents the case for one preschooler as rated by one parent and one teacher based on the MAD statistic.

The inter-rater agreement among parents and teachers for the attention scale is considered adequate (see Table 23). While all differences were less than or equal to 0.87, only one of the nine cases resulted in less than half a score point difference across the 14 items.

The inter-rater agreement among parents and teachers for the verbal ability scale is considered good as four of the nine cases had less than half a score point difference across 19 items. The other cases were all within 0.85 of a score point. Altogether, the inter-rater agreement for the memory, attention, and verbal ability scales shows good consistency among the parent and kindergarten teacher raters.

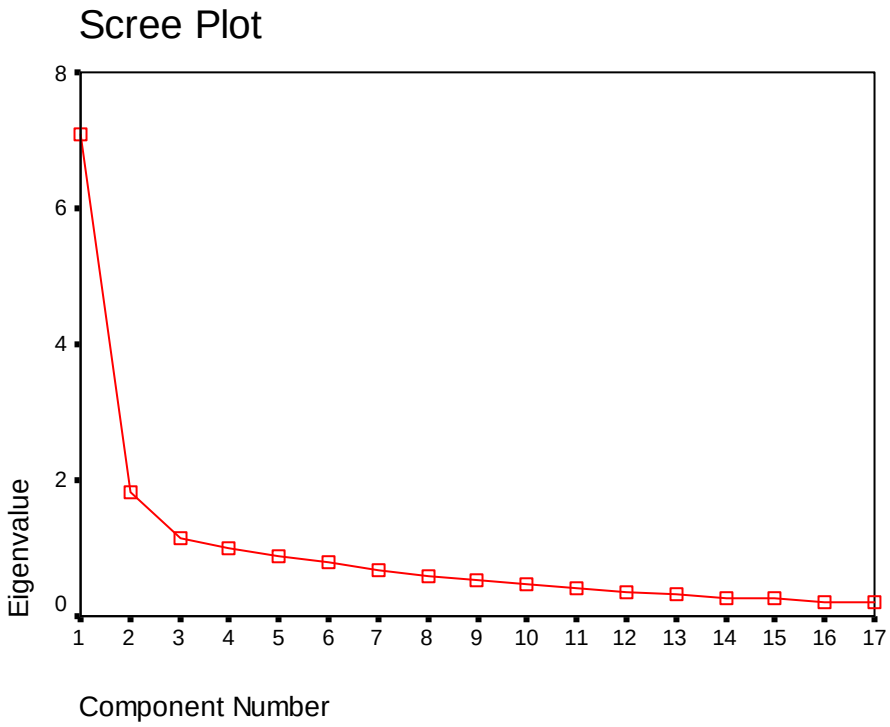
Factor Analysis

Memory

Principal components analysis was first performed on the 17 memory items to help determine the number of factors to retain (Preacher & MacCallum, 2003). Four eigenvalues exceeded a value of 1.0, suggesting that there were four factors (Tabachnick & Fidell, 2001). The scree test indicated that there were two factors (see Figure 2). Lastly, image plus varimax suggested that there were four factors (Kaiser, 19630.

Principal Axis extraction followed by both a varimax rotation transformation and direct oblimin ($\delta = 0$) was conducted for two, three, and four factors. The oblique factor pattern with three factors best met simple structure and with two exceptions (2 items loading equivalently on two factors) could be easily interpreted. The pattern is reported in Table 24. Initially factor 1 was named *long- term* memory, factor 2 was named

Figure 2
Memory Components



declarative memory, and factor 3 was named *short-term/working* memory. The factor correlations were 0.29 between factor 1 and factor 2, 0.24 between factor 1 and factor 3, and 0.53 between factor 2 and factor 3.

Substantive Interpretation of the Statistical Factors for Memory

As indicated earlier, the expert in the area of memory reviewed the pattern matrix reported in Table 24. The expert did not indicate a concern with possible removal of the two items that loaded equivalently on two factors (*Recalls 3 objects seen in a picture* and *Knows the name of city/town they live in*). Rather she suggested that if they were retained, then the first item should be included in short-term/working memory and the latter item should be included in long-term memory.

Table 24
Pattern Matrix for the Memory Domain

Item:	Factor: 1	2	3	h^2
Retells a story (from a picture book) with reasonable accuracy.	**.911**	-.087	.044	.722
Tells familiar story without pictures for cues.	**.740**	.059	-.028	.571
Retells five main facts from a story heard several times.	**.732**	-.040	-.002	.507
Sings at least 5 lines of a familiar song.	**.680**	-.057	.066	.477
Can remember events (e.g., going to McDonalds) from the previous week.	**.585**	-.143	.243	.471
Repeats familiar rhymes.	**.564**	.029	.179	.475
Tells what is missing when one object is removed from a group of three.	**.540**	.087	.137	.447
Knows other children's names in their daycare, playschool, or kindergarten class.	**.331**	.128	.151	.251
Tells their correct age when asked.	**.302**	.206	.192	.311
Tells phone number when asked.	-.100	**.866**	.079	.706
Knows their house address.	-.056	**.848**	.060	.701
Remembers an emergency phone number (e.g., 911).	.097	**.731**	-.052	.592
Can repeat a sentence with 5 words.	.071	.042	**.773**	.681
Can repeat a sentence with 3 words.	.044	.035	**.762**	.634
Can repeat 4 numbers (in the same order) when asked.	.200	.210	**.433**	.447
Recalls three objects seen in a picture.	**.369**	.132	**.359**	.352
Knows the name of city/town they line in.	**.300**	**.329**	.092	.340

Principal Axis extraction, Direct Oblimin transformed (rotation converged in 9 iterations).

Factor 1. The nine remaining items that loaded on factor 1 were interpreted as episodic memory (remembering of events) and/or autobiographical memory and were judged to be tied to the child's sense of self. The perception was that these items reflected things that the child should have experienced and/or witnessed about themselves. Whereas performance on these items has some potential to vary among preschoolers based on environmental factors (amount of time parents had interacted reading with a child), they were viewed as much more stable items than the factor 2 items. As such,

these factor 1 items were perceived as good measures for assessing long-term memory functioning in preschoolers.

Factor 2. The three long-term memory items that loaded on factor 2 (*Knows their house address*, *Tells phone number when asked*, and *Remembers an emergency phone number [e.g., 911]*) were interpreted as having a relative standing in terms of importance in the child's life. These items were perceived as more or less important depending upon the influence of the parent(s). In other words, a child could fail on these items because of a lack of teaching by the parent(s). The expert reviewer also perceived these items as not happening that often for a typical preschooler and therefore not having the same special significance to the child as factor 1 or possibly even factor 3 items. The value of the factor 2 items for screening preschoolers was perceived as very limited due to the mediating influence of the parent(s).

Factor 3. The three items loading on Factor 3 (*Can repeat a sentence with 3 words*, *Can repeat a sentence with five words*, and *Can repeat 4 numbers [in the same order] when asked*) were interpreted as tasks requiring serial memory. Requiring a specific order to the recall task suggested an important way to assess short-term memory or simple working memory. The item, *Can repeat 4 numbers (in the same order) when asked*, is an example of the requirement for a preschooler to use strategic rehearsal.

A serial position effect refers to "differences in the average amount recalled as a function of where on the list an item was presented" (Bjorklund, 1989, p. 158). Whereas learning disabled children have been reported to be similar to non-disabled children, when matched for IQ, on the recency effect (see Bjorklund, 1989) differences have appeared when the primacy effect (ability to recall items from the beginning of a list) has

been assessed. The primacy effect is considered a discerning factor in determining a child's ability to use a memory strategy. Overall, factor 3 was perceived as important for assessing preschoolers because all three items were assessing short-term memory and simple working memory functions.

The expert reviewer suggested that working memory is a better indicator of cognitive abilities effected by acute and/or chronic brain damage than items that assess long-term memory. She suggested that serial position recall is a harder skill for preschoolers than free recall because it demands some rehearsal and therefore requires more working memory. It was brought to her attention that the original wording of the item; *Can repeat 4 numbers [in the same order as presented] when asked*, was to assess this task *[in the reverse order as presented]*. The reviewer acknowledged the limited rehearsal capabilities in younger preschoolers and that it may not be appropriate to screen preschoolers with reverse order recall items, particularly 4-year olds.

Summary

The recommendation of the expert reviewer was to include items in only two memory factors in the next version of the STEPSS. The expert deemed it important to retain factor 1 (renamed to episodic or autobiographical memory) and factor 3 (renamed to serial memory). She also recommended removing all three items in factor 2 (declarative memory) as the items were not stable because of being too dependent upon parent(s) teaching the content.

The expert remained neutral on whether to remove the two memory items that loaded equivalently on two factors. Therefore, a judgment was made by the researcher, in the interests of culling items closer to an ideal of 8-10 items per domain, to remove these

two items. Consequently, the memory domain was culled to 12 items (9 episodic and 3 serial) based on the substantive judgment of the expert reviewer. The removal of these five items required re-factoring the memory domain.

Re-Factoring Memory. Principal Axis extraction followed by both a varimax rotation and an oblique transformation ($\delta = 0$) was conducted for the two factors. The oblique factor pattern with two factors best met simple structure and was the most clear interpretation. The pattern is reported in Table 25. Seven of the eight items in factor 1 are episodic or autobiographical memory and one item is serial memory. Factor 2 is now comprised of only one episodic/autobiographical and one serial memory item. Two items (*Knows other children's names in their daycare, playschool, or kindergarten* and *Can repeat a sentence with 3 words*) did not load on either factor. The removal of these two

Table 25
Rotated Component Matrix for the Memory Domain

	Factor:		
Item:	1	2	h^2
Sings at least 5 lines of a familiar song.	**.808**	.107	.551
Repeats familiar rhymes.	**.799**	.083	.558
Retells a story (from a picture book) with reasonable accuracy.	**.774**	.014	.586
Tells familiar story without pictures for cues.	**.658**	-.002	.435
Retells five main facts from a story heard several times.	**.581**	-.115	.439
Tells what is missing when one object is removed from a group of three.	**.577**	-.175	.496
Can repeat 4 numbers (in the same order) when asked.	**.548**	-.062	.348
Can remember events (e.g., going to McDonalds) from the previous week.	**.447**	-.106	.273
Knows other children's names in their daycare, playschool, or kindergarten class.	.195	-.273	.183
Can repeat a sentence with 5 words.	.111	**-.687**	.585
Tells their correct age when asked.	.126	**-.581**	.450
Can repeat a sentence with 3 words.	-.130	-.103	.909

Principal Axis extraction, Direct Oblimin transformed (rotation converged in 5 iterations).

items required another re-factoring of the remaining 10 items in the memory domain.

Principal axis factoring followed by a direct oblimin transformation ($\delta = 0$) was conducted for the two factors. Only one factor was extracted (see Table 26) and therefore the solution could not be transformed. Factor 1 is now comprised of eight episodic or autobiographical memory items and two serial memory items. The internal consistency for this 10-item memory scale is 0.87 (Cronbach's alpha coefficient).

Summary

The exploratory nature of the present study made it important to integrate the evaluative judgment of a content expert in memory with the empirical factor analytic evidence. Empirical evidence alone would not have removed the three items in factor 2 on the basis of their instability due to the dependence upon the level of parent interaction/teaching with a given preschooler. The resulting 10-item factor memory was

Table 26
Factor Matrix for the Memory Domain

Item:	Factor: 1	h^2
Retells a story (from a picture book) with reasonable accuracy.	**.756**	.572
Repeats familiar rhymes.	**.718**	.515
Sings at least 5 lines of a familiar song.	**.705**	.497
Tells what is missing when one object is removed from a group of three.	**.705**	.498
Retells five main facts from a story heard several times.	**.680**	.462
Tells familiar story without pictures for cues.	**.649**	.421
Can repeat a sentence with 5 words.	**.606**	.368
Can repeat 4 numbers (in the same order) when asked.	**.594**	.353
Tells their correct age when asked.	**.551**	.303
Can remember events (e.g., going to McDonalds) from the previous week.	**.535**	.286

Principal Axis extraction, Direct Oblimin transformed (rotation converged in 4 iterations).

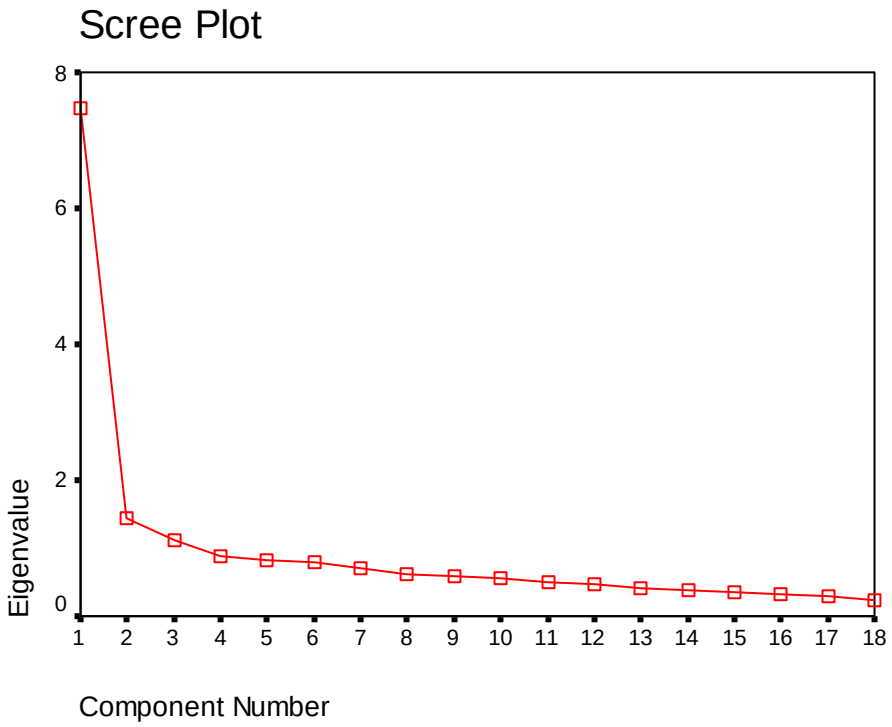
deemed to be an episodic component. Eight of the 10 items fit with an assessment of a preschoolers' capacity to retain personal experiences such as times, places, details of events, and other contextual knowledge (Ashcraft, 1989). In other words, this factor assesses the preschoolers' ability to retain a mental movie of things they have heard or seen, typically more than once. Assessing this long-term memory capacity is supported in IPT based on the premise that the more one attends to the details of an event, the more mental processing the individual must do, and the more likely they are to remember the event.

Verbal Ability

Principal components analysis was first performed on the 19 verbal ability items to help determine the number of common factors. Three eigenvalues exceeded a value of 1.0, suggesting that there were three factors. The scree test indicated that there was one factor (see Figure 3). Lastly, image plus varimax suggested that there were two factors.

Principal Axis extraction followed by a varimax rotation and an oblique transformation was conducted for two factors. The oblique factor pattern with two factors best met simple structure. The pattern is reported in Table 27. Factor 1 was comprised of seven expressive items, one receptive item, and three items requiring both verbal ability skills. Factor 2 was comprised of four expressive items, three receptive items, and one item requiring both verbal ability skills. The factor correlation between factor 1 and factor 2 was 0.64. The factor correlation is considered high and possibly indicative of a unifactor.

Figure 3
Language Components



Substantive Interpretation of Statistical Factors for Verbal Ability

As indicated earlier, the expert in the area of verbal ability reviewed the two factor pattern reported in Table 27. The expert did not indicate a concern with the possible removal of the one item that loaded equivalently on both factors (*Can answer the telephone and talk to a familiar person)*. Upon review of the written comments indicating that the item presented a problem in the consistency of interpretation about what talking actually referred to (ability to say hi verses carry on a conversation), the expert deemed the item ambiguous.

The expert's initial suggestion was that factors within a verbal ability domain would be highly interrelated. The expert examined whether the factors reflected

Table 27
Pattern Matrix for the Verbal Ability Domain

Item:	Factor: 1	2	h^2
Asks the meaning of new or unfamiliar words.	**.780**	-.213	.508
Can express future events with 'going to', 'have to' or 'want to'.	**.713**	.067	.573
Can tell a 3 – 5 part story in the correct order.	**.706**	-.020	.477
Names an object that does not belong in a particular class (one that's not an animal).	**.690**	-.008	.472
Answers 'why' questions with an explanation.	**.678**	.084	.548
Understands the use of passive sentences (e.g., girl was hit by a boy).	**.660**	.115	.634
Can tell the opposite of common words (e.g., short – tall, close – far).	**.653**	.020	.440
Uses the correct order to ask questions.	**.653**	.103	.548
Uses pronouns (he, she, them) consistently and correctly.	**.619**	.176	.564
Uses words like 'yesterday' and 'tomorrow' meaningfully.	**.475**	.130	.329
Answers simple 2-step questions.	**.425**	.239	.505
Can answer the telephone and talk to a familiar person.	.347	.335	.341
Responds to commands using 'on', 'under', 'up' and 'down'.	-.090	**.814**	.587
Understands three common prepositions (e.g., on, in).	.100	**.585**	.450
Follows commands related to actions (e.g., run fast, talk quietly).	.045	**.567**	.401
Tells if an object is big or little.	-.026	**.549**	.350
Uses relationship words like 'sister', 'brother', 'grandmother'.	.216	**.430**	.367
Asks questions, What's this (that)?	.143	**.385**	.375
Uses contractions like 'can't'.	.293	**.325**	.315

categories within the five functions of language (syntax, semantics, phonology, morphology, and pragmatics) (see Owens, 1988). However, there was not a clear delineation of items along these functional categories. Factor 1 was comprised of five semantic items, three syntax items, and one pragmatic item. Factor 2 was more consistent

and was comprised of six semantic items and one pragmatic item. However, as most of the items for the two factors were semantic items (69%) there was deemed no substantive basis for a two factor solution based on the five functions of language.

The expert then examined the two factor solution to determine if the factors reflected the skill categories of expressive and receptive language functioning. The expert suggested that the earlier acquisition of receptive language skills compared to an ability to express language may have resulted in parents rating expressive items lower than receptive items for normally functioning preschoolers. Factor 1 had seven expressive items, one receptive item, and three items requiring both verbal ability skills (*Answers 'why' questions with an explanation, Can tell the opposite of common words [e.g., short – tall, close – far],* and *Answers simple 2-step questions [how do you turn on the TV?]*). Factor 2 had four expressive items and three receptive items. As such, there was no clear delineation of factors using a frame of expressive and receptive language skills.

The expert commented that the factor 2 items were easier items for preschoolers compared to the factor 1 items from a developmental language perspective. Factor 1 contained relatively harder items, at least for 8 of the 11 items. The expert suggestion was that the two-factor structure shown in Table 27 could be interpreted based on language acquisition benchmarks for 4- and 5-year old age groups. This framework was described as a *harder item* factor (or later acquired verbal ability skills) verses an *easier item* factor (verbal ability skills typically acquired by the time a preschooler reaches age 4).

Interpreting the two-factor pattern as typical language acquisition patterns for 4- verses 5-year olds based on relatively easier (factor 2) and harder (factor 1) items has some support from cognitive development tests like the *Revised Brigance Diagnostic*

Inventory of Early Development (Brigance, 1991). All seven of the easier items in factor 2 are referenced in this version of the *Brigance Diagnostic Inventory* as typically acquired verbal ability skills for 4-year olds. Eight of the 11 harder items (factor 1) are referenced in this test as being typically acquired verbal ability skills for preschoolers 4:6 years and 5:0 years. The three other items in factor 2 lack the precision to designate an age standard for acquisition in the *Brigance Diagnostic Inventory*. For example, the *Brigance* suggests that, '*Answers simple two-step questions'* could be an easier item if the question included terms like 'next to' or 'around the'. However, the item is also identified as a relatively harder item if the verbal directions included more sophisticated terms like 'beside the' or inside the'.

Summary

The expert evaluation provided a perspective for interpreting the two-factor pattern based on relatively easier (factor 2) and harder (factor 1) items. In addition, the recommendation was to remove the one ambiguous item (*Can answer the telephone and talk to a familiar person).* The removal of this one item required that the 18 remaining items in the verbal ability domain be re-factored.

Re-Factoring Verbal Ability. Principal Axis extraction followed by both a direct oblimin and a varimax rotation transformation were conducted for the two factors. The oblique factor pattern with two factors again best met simple structure. The factor pattern is reported in Table 28. However, a clear interpretation of the two factors based on language acquisition patterns (relatively easier and harder items for 4- and 5-year olds) was no longer clear.

Re-factoring the 18 items in verbal ability moved five of the items to the alternate factor. Four of the relatively easier items (see original factor 2, Table 27) now load on the harder factor 1. Factor 1 in Table 28 now includes seven harder items, four easier items, and two less precise items. Additionally, one of the less precise items in the harder factor.

Table 28
Re-Factored Pattern Matrix for the Verbal Ability Domain

	Factor:		
Item:	1	2	h^2
Uses pronouns (he, she, them) consistently and correctly.	**.815**	-.130	.540
Uses the correct order to ask questions.	**.820**	-.107	.568
Understands the use of passive sentences (e.g., girl was hit by a boy).	**.756**	-.104	.479
Can express future events with 'going to', 'have to' or 'want to'.	**.726**	.047	.574
Understands three common prepositions (e.g., on, in).	**.670**	.068	.514
Uses contractions like 'can't'.	**.606**	-.047	.332
Can tell the opposite of common words (e.g., short – tall, close – far).	**.501**	.077	.308
Uses words like 'yesterday' and 'tomorrow' meaningfully.	**.479**	.046	.261
Follows commands related to actions (e.g., run fast, talk quietly).	**.454**	.102	.278
Can tell a 3 – 5 part story in the correct order.	**.448**	.195	.354
Responds to commands using 'on', 'under', 'up' and 'down'.	**.426**	.213	.347
Names an object that does not belong in a particular class (one that's not an animal).	**.397**	.211	.313
Asks the meaning of new or unfamiliar words.	**.347**	.145	.208
Answers 'why' questions with an explanation.	.332	.317	.350
Answers simple 2-step questions.	-.029	**.798**	.607
Asks questions, What's this (that)?	-.022	**.663**	.421
Tells if an object is big or little.	.146	**.661**	.586
Uses relationship words like 'sister', 'brother', 'grandmother'.	.127	**.589**	.462

(originally in factor 1) now loads on the easier factor 2. Factor 2 now includes three easier items and one less precise item.

Substantively, or psychologically, the two factors cannot be clearly interpreted. Therefore, a finding of a single factor for the verbal ability domain is supported by the following three results: 1) as indicated earlier, the expert's initial suggestion was that factors within a verbal ability domain are highly interrelated (0.64); 2) the one factor solution suggested by the scree plot (see Figure 3); and 3) a second factor would only add 7.49 % to the proportion of explained variance accounted for by the first factor (40.01%).Further, Marcoulides and Hersberger (1997) argue that in a relative sense, it is of questionable value to retain a function that only increases the amount of variance accounted for by less than 10 %.

Given the acceptance of the 18 verbal ability items as a unifactor, a judgment was made to cull the 18 verbal ability items by imposing a more stringent factor loading cutoff. Based on precedent from the developers of the WPPSI-III, factor loadings below .50 have been deemed as poor items and subsequently dropped from their respective factors (Lichtenburger & Kaufman, 2004). Therefore, seven items (within a range of 0.332 to 0.479) were removed (see table 28). The remaining 11 verbal ability items are reported in Table 29. The internal consistency for this 11-item verbal ability scale is 0.86 (Cronbach's alpha coefficient).

Summary

Integrating the evaluative judgment of a content expert in the verbal ability analysis provided additional support for a one-factor solution. Given a unifactor for the

verbal ability domain, a judgment was made to impose a more stringent loading value (≥ 0.50) to further cull the items closer to the ideal number of 8-10 items in each of the three

Table 29
Remaining 11 Verbal Ability Items Based on Factor Loadings ≥ .500

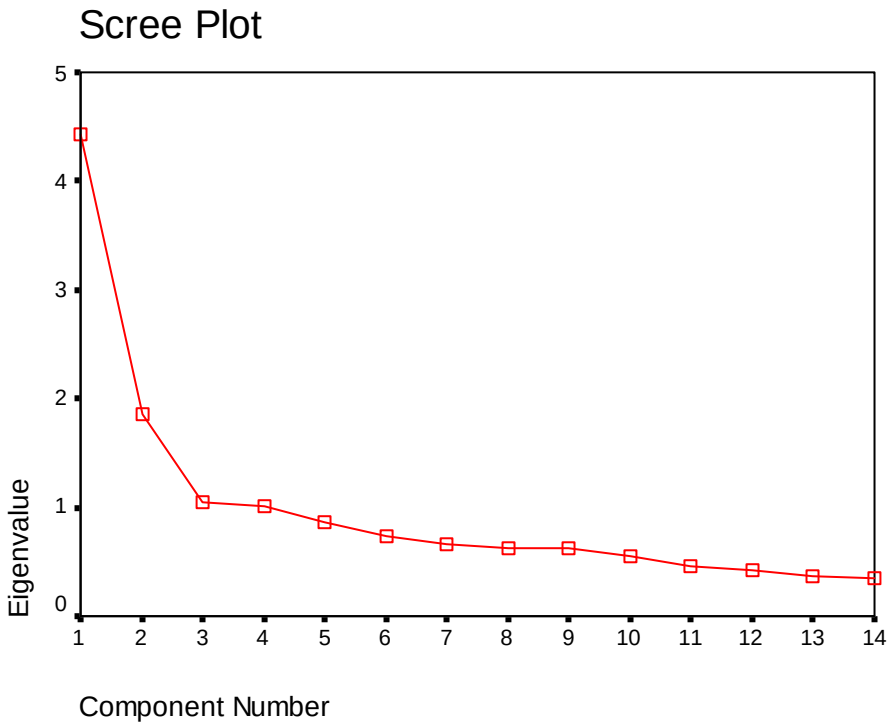
Item:	Factor: 1
Uses pronouns (he, she, them) consistently and correctly.	.815
Uses the correct order to ask questions.	.820
Answers simple 2-step questions.	.798
Understands the use of passive sentences (girl was hit by a boy).	.756
Can express future events with 'going to', 'have to', or 'want to'.	.726
Understands three common prepositions (e.g., on, in).	.670
Asks questions, What's this (that)?	.663
Tells if an object is big or little.	.661
Uses contractions like 'can't'.	.606
Uses relationship words like 'sister', 'brother', 'grandmother'.	.589
Can tell the opposite of common words (short – tall, close – far).	.501

domains. This process of using a more stringent loading value is unique to the verbal ability domain and it was understood this has implications on item analysis in the other two domains. Interestingly, if the same process was used to cull items in memory and attention it would potentially effect only one item in attention that loaded at 0.848 (see Table 33).

Attention

Principal components analysis was first performed on the 14 attention items to help determine the number of common factors. Two eigenvalues exceeded a value of 1.0, suggesting that there were two factors. The scree test indicated that there were two factors (see Figure 4). Lastly, image plus varimax suggested that there were two factors.

Figure 4
Attention Components



Principal Axis extraction followed by a varimax rotation and an oblique transformation was conducted for two factors. The oblique factor pattern with two factors best met simple structure. The pattern is reported in Table 30. Factors 1 and 2 were not clearly interpretable due to an overlap of attention subcomponents (selected, divided, and shifted) between these two factors. Factor 1 was a combination of shifted, divided and selective attention items and Factor 2 was a combination of divided and shifted attention items. The correlation between factor 1 and factor 2 is 0.32.

Substantive Interpretation of Statistical Factors for Attention

As indicated earlier, the expert in the area of attention reviewed the two factor pattern in Table 30. The content expert advised that rating attention in preschoolers is a

Table 30
Pattern Matrix for the Attention Domain

Item:	Factor: 1	2	h^2
Has trouble concentrating.	**.679**	.124	.536
Often fails to follow instructions or fails to finish chores.	**.606**	-.026	.357
Doesn't listen to what is said.	**.579**	.140	.413
Avoids or has difficulty with tasks needing longer periods of attention.	**.572**	-.009	.323
Easily distracted from tasks by typical household noises.	**.564**	-.014	.312
Makes careless mistakes.	**.529**	.185	.384
Has trouble waiting for events (e.g., rewards, birthdays).	**.521**	-.182	.237
Has difficulty organizing tasks or activities.	**.412**	.117	.217
Can do an activity (e.g., play with toys, watch TV) for at least 15 minutes.	-.104	**.734**	.496
Engages in make-believe play for 10 minutes.	.055	**.708**	.531
Can remain at a 10 to 12 minute task until it is completed.	.286	**.452**	.378
Can do 'Simon Says' types of activities.	.074	**.369**	.161
Can use blocks to build simple structures (e.g., enclosures like animal pens or yards).	-.058	**.365**	.121
Attends to music or stories for at least 5 minutes.	.168	**.357**	.199

more difficult task compared to rating school age children because what constitutes typically rated behaviour in preschoolers is more an ability to socialize, rather than actually attending to cognitive tasks.

The content expert's perspective on assessing attentional functioning in preschoolers was that it required addressing how it relates to attention deficit hyperactivity disorder (ADHD). Screening preschool children for ADHD requires consideration for two aspects of behaviour: 1) inattention; and 2) hyperactivity. Further, typical treatment for ADHD (medication with methylphenidate) in young children is

more effective in addressing behavioural issues resulting from hyperactivity. The cognitive and behavioural issues related to inattention are not so successfully treated. It is not uncommon for young children treated for ADHD to have long-term inattention impairments in the school environment.

The content expert advised that when the intent is to screen preschoolers for attentional deficits, at the end of the day what is assessed is inhibition (ability to inhibit interference during recall). Barkley's 1998 Model of Attention supports this perspective and indicates that behavioural inhibition begins to emerge ahead of functions like working memory, self-regulation of affect, motivation, and arousal. As such, an item like, '*Easily distracted from tasks by typical household noises*' provides a measure of inhibition by assessing the ability to block out distracters.

The expert further advises that seven of the eight items in Factor 1 are similar to the nine Inattentive Subscale items used in the Swanson, Nolan, and Pelham-IV (SNAP-IV) Parent and Teacher Rating Scale developed by James Swanson at the University of California (see Table 31). The expert advised that he regularly uses the SNAP-IV scale in his psychiatric practice for assessing ADHD. If a client is rated at 3 (quite a bit) or higher

Table 31
The Inattentive Subscale of the SNAP-IV Rating Scale

Often fails to give close attention to details or makes careless mistakes in schoolwork.
Often has difficulty sustaining attention in tasks or play activities.
Often does not seem to listen when spoken to directly.
Often does not follow through on instructions and fails to finish schoolwork.
Often has difficulty organizing tasks and activities.
Often avoids, dislikes, or reluctantly engages in tasks requiring sustained mental effort.
Often loses things necessary for activities (e.g., school assignments, pencils or books).
Often is distracted by extraneous stimuli.
Often is forgetful in daily activities.

on six out of the nine items this is confirmation of a diagnosis of ADHD-PI (primarily inattentive).

The expert's perspective is supported by Barkley (1998) who asserts that ADHD represents a developmental delay in response inhibition processes. Further, the ADHD-PI subtype is characterized by the following: a) sluggish cognitive style and selective attention deficit; b) memory retrieval problems; c) impaired academic achievement, particularly in reading; and d) a different and more benign developmental course.

The expert advised that one item from Factor 1, *Has trouble waiting for events (e.g., rewards, birthdays),* is a better fit with the Hyperactivity Subscale of the SNAP IV. The remaining seven items in Factor 1 are deemed useful in screening for inattention in preschoolers. The expert indicated support for this type of early screening in preschoolers as it is common to diagnose inattention only when *at-risk* children begin to demonstrate difficulties in the school environment.

For factor 2 (see Table 30) the expert advised that the items tended to be specific examples or performance based versions of items in factor 1. For example, *Can do an activity (e.g., play with toys, watch TV) for at least 10 to 15 minutes* and *Can remain at a 10 to 12 minute task until it is completed* were considered examples of the factor 1 item, *Avoids or has difficulty with tasks needing longer periods of attention*. Therefore, the expert's recommendation was to remove all factor 2 items on the basis of redundancy.

Re-Factoring Attention. Principal Axis extraction followed by both a direct oblimin and a varimax rotation transformation were conducted for the remaining seven items. Only one factor was extracted and is reported in Table 32. The internal consistency for this seven-item scale is 0.78 (Cronbach's Alpha coefficient).

Table 32
Factor Matrix for the Attention Domain

Item:	Factor: 1	h^2
Has trouble concentrating.	.723	.523
Doesn't listen to what is said.	.644	.415
Makes careless mistakes.	.619	.384
Often fails to follow instructions or fails to finish chores.	.599	.358
Avoids or has difficulty with tasks needing longer periods of attention.	.539	.291
Easily distracted from tasks by typical household noises.	.519	.270
Has difficulty organizing tasks or activities.	.484	.234

Principal Axis extraction, Direct Oblimin transformed (rotation converged in 5 iterations).

Summary

The exploratory nature of the present study, made it important to integrate the evaluative judgment of the content expert in attention with the empirical evidence. Empirical evidence alone would not have removed the six items on factor 2 (see Table 30) or the factor 1 item (*Has trouble waiting for events (e.g., rewards, birthdays)* based on it being a better measure of hyperactivity than inattention. The resulting 7-item factor recommended for inclusion in the next version of the proposed STEPSS instrument was deemed to be an inattention factor. The substantive/psychological perspective supports assessing preschoolers cognitive status based on inattention issues which affect school performance and are found to persist even in children treated with medication (methylphenidate) for ADHD.

Psychometric Properties of the Three Components/Factors

The empirical evidence along with the evaluative judgement of the content experts resulted in the retention of 28 items recommended for inclusion in the next draft of the proposed STEPSS. These items are reported in Table 33.

Eight to 10 items was the target number of items per domain (sub-scale) keeping in mind retaining an internal consistency coefficient of at least ≥ 0.70 and ideally ≥ 0.80. The internal consistency of the 10-item memory sub-scale, the 11-item verbal ability sub-scale, and 7-item attention sub-scale were respectively, 0.87, 0.86, and 0.78. Overall, the 28-item full scale STEPSS reported a reliability coefficient of 0.91.

Table 33
Recommended Items for a Next Draft of the Proposed STEPSS

Memory:

1. Retells a story (from a picture book) with reasonable accuracy.
2. Tells familiar story without pictures for cues.
3. Retells five main facts from a story heard several times.
4. Sings at least 5 lines of a familiar song.
5. Can remember events (e.g., going to McDonalds) from the previous week.
6. Repeats familiar rhymes.
7. Tells what is missing when one object is removed from a group of three.
8. Tells their correct age when asked.
9. Can repeat a sentence with 5 words.
10. Can repeat 4 numbers (in the same order as presented) when asked.

Verbal Ability:

11. Can express events with ‘going to’, ‘have to’ or ‘want to’.
12. Understands the use of passive sentences (e.g., the girl was hit by the boy).
13. Can tell the opposite of common words (e.g., close-far, short-tall).
14. Uses the correct order to ask questions.
15. Uses pronouns (he, she, them) consistently and correctly.
16. Tells if an object is big or little.
17. Answers simple 2-step questions.
18. Understands three common prepositions (e.g., on, in).
19. Uses contractions like ‘can’t’.
20. Uses relationship words like ‘sister’, ‘brother’, ‘grandmother’.
21. Asks questions, What’s this (that)?

Attention:

22. Has trouble concentrating.
23. Doesn’t listen to what is said.
24. Often fails to follow instructions or fails to finish chores.
25. Makes careless mistakes.
26. Avoids or has difficulty with tasks needing longer periods of attention.
27. Easily distracted from tasks by typical household noises.
28. Has difficulty organizing tasks or activities.

The correlations between the three domains (components) ranged from low-moderate (0.29) to high-moderate (0.69) and were all significant at the 0.01 level. The correlation between the 10-item memory component and the 11-item verbal ability component was 0.69. The correlation between the memory component and the 7-item attention component was 0.29. The correlation between the verbal ability component and the attention component was 0.33.

The establishment of a performance standard for the STEPSS was initially based on criterion-referenced information from a sample of 151 Caucasian preschoolers ages 4:0- to 5:11 years. The psychometric characteristics for the three sub-scales (memory, verbal ability, and attention) and the full scale STEPSS are reported in Table 34.

Table 34
Psychometric Characteristics: Full Scale and Sub-scales

Scale:	N	Items	Range	Mean	SD	I.C.	SEM
Full Scale	151	28	66 - 138	121.63	10.31	.91	0.84
Memory Sub-scale	151	10	22 - 50	45.90	4.79	.87	0.39
Verbal Ability Sub-scale	151	11	28 - 55	51.26	4.48	.86	0.36
Attention Sub-scale	151	7	16 - 34	24.46	3.60	.78	0.29

Note: I.C. is internal consistency (Cronbach's Alpha)

Summary

The following two research questions were addressed in this chapter: 1) the extent to which the screening instrument demonstrated internal consistency and inter-rater agreement; and 2) the extent to which the STEPSS demonstrated evidence of construct validity. The results presented in this chapter provided both empirical evidence and evaluative judgment in recommending a shortened 28-item version of the STEPSS. The STEPSS now includes 10 memory items, 11 verbal ability items, and 7 attention items.

The 28 items listed in Table 33 needed to be examined further in terms of developing cut scores for each of the three subscales (memory, verbal ability, and attention) and a cut score for the STEPSS as a composite scale. The next chapter included an examination of the processes to establish a performance standard based on the obtained sample of Caucasian 4:0- to 5:11-year old preschoolers.

CHAPTER VI

Establishing Cut Scores

Overview

In the present study, the intent was to establish cut score(s) to separate *at-risk* preschoolers from *not-at-risk* preschoolers based on criterion-referenced information. However, the obtained sample for the present study suggested two possible biases to be considered: 1) participation by ethnic preschoolers, like First Nations and Métis, were too small to be included in the present study; and 2) a disproportionately small number (13.9%) of preschoolers resided in rural areas. Consequently, the sample, used within a criterion-referenced framework, to examine a cognitive performance standard and establish cut score(s) consisted predominately of 151 urban-dwelling Caucasian preschoolers.

Examining Normative Information

Establishing a cut score is based on identifying discernible cognitive differences between an *at-risk* and *not at-risk* group (Rogers, 1999). However, prior to establishing cut score(s), it was necessary to examine if identifiable sub-groups, based on age and gender, might perform differently as measured by the screening instrument (Cronbach, 1984). Treating 4:0- to 5:11-year old boys and girls as one group would negatively impact the ability to consistently rule out (or rule in) risk for cognitive impairment and/or delay if there were indeed meaningful differences on these two demographic variables. Therefore, a 2 x 2 (age-by-gender) fixed effects analysis of variance was conducted to determine if there were reliable differences based on age, gender, and the interaction between these two variables. To further protect against Type II error, the level of

significance was set at 0.20. Given unequal sample sizes, Type III sums of squares were computed.

These results are reported in Table 35. Although some pair-wise comparisons were significant, no meaningful differences between age or gender groups were found. The four significant findings in Table 35, all reported effect sizes that were very small indicating that a meaningful amount of variance was not accounted for (Cohen, 1988, 1992). Consequently, establishing cut score(s) for the present study was based upon the 4:0- to 5:11- year old Caucasian preschoolers performing as a single group.

Table 35
Tests of Between Subjects Effects for Sex, Age and Sex by Age

	Mean	Mean	Type III SS	df	F	Sig.	Eta Sq.	Power
Sex:	Male:	Female:						
Memory	45.52	46.50	0.677	(1,147)	3.308	0.071*	0.022	0.439
Verbal Ability	50.96	51.72	0.186	(1,147)	1.010	0.317	0.007	0.170
Attention	23.62	25.47	2.864	(1,147)	11.967	0.001*	0.075	0.930
Age:	4-yrs:	5-yrs:						
Memory	45.65	46.37	0.357	(1,147)	1.743	0.189*	0.012	0.259
Verbal Ability	51.11	51.57	0.070	(1,147)	0.378	0.539	0.003	0.094
Attention	24.68	24.41	0.011	(1,147)	0.046	0.830	0.000	0.055
Sex x Age:	M/4-yr:	M/5-yr:						
Memory	46.00	45.05	1.385	(1,147)	6.769	0.010*	0.044	0.734
Verbal Ability	51.22	50.71	0.282	(1,147)	1.534	0.217	0.010	0.234
Attention	23.95	23.29	0.037	(1,147)	0.154	0.695	0.154	0.068
	F/4-yr:	F/5-yr:						
Memory	45.31	47.70	1.385	(1.147)	6.769	0.010*	0.044	0.734
Verbal Ability	51.00	52.43	0.282	(1,147)	1.534	0.217	0.010	0.234
Attention	25.41	25.53	0.037	(1,147)	0.154	0.695	0.154	0.068

** Significant at the 0.20 level (two-tailed)*

Dimensionality of the STEPSS

A judgment was made to establish an overall cut score for the composite 28-item STEPSS instrument. In addition, a judgment was made to establish a cut score for each of

the three sub-scales of memory, attention, and verbal ability. Establishing a cut score (or critical value) for each of the sub-scales was intended to facilitate an examination of the validity of the cognitive performance standard for the case where a rating on one of the three sub-scales is substantially lower compared to the other two sub-scales. In the case of an extreme difference, the lowest possible score on each item in a subtest of the WPPSI-III, the indication is that the child lacks the ability to be measured on that subtest (Wechsler, 2002).

The decision to establish an overall cut score was based on the following three reasons: 1) full-scale IQ scores are suggested to the best measure of cognitive ability on tests like the WISC-III (Sattler, 2001); 2) the screening instrument was only intended to rule out (or rule in) cognitive risk, not identify strengths; and 3) the relative difficulty in clearly interpreting subcomponents in two of the three cognitive domains (memory and verbal ability). Whereas the memory domain was predominately a measure of episodic/autobiographical memory (8 items), it also included two additional serial memory items. The verbal ability domain was not clearly interpretable in terms of either expressive or receptive language or the five functions of language and was considered a general unifactor.

Methods

Participants

The cut scores were set using the same sample used to conduct the factor analysis and to determine the psychometric characteristics of the sub-scales and the full scale. The sample included 151 male and female Caucasian preschoolers ages 4:0 – to 5:11-years.

Establishing a Cut Score

The methodology for establishing the cut scores is presented in this section. Establishing the cut scores included the following: 1) identifying a cognitive performance standard for 4:0- to 5:11-year old preschoolers to set the cut scores where cognitive impairment and/or delay is ruled out (or ruled in); and 2) examining the evidence for how adequate the full scale cut score is relative the seriousness of the decision to accurately refer preschoolers for more comprehensive assessment.

Identifying a Cognitive Performance Standard

The STEPSS needs to be a more sensitive instrument compared to using a base rate of memory, attention, and verbal ability deficits found in the general population of preschool children. The STEPSS needs to produce an incremental effect (in accurate detection and referral) over the base rate for these types of cognitive deficits estimated to range between 5.0-8.0% (U.S. Dept. of Health & Human Services, 2009). Adequate sensitivity of the STEPSS (few under-referrals or *False Negatives*) is important toward not missing preschoolers truly in need of a referral decision toward comprehensive assessment and subsequently tailoring an intervention (see Figure 5). Mild to moderate deficits in memory, attention, and verbal ability, typical in clinical groups like pediatric cancer survivors, can persist as late effects in 40.0-60.0% of cases (Aylward, 2002).

Figure 5
Sensitivity and Specificity

Rating Classification:	< - 1Std. Dev.	≥ - 1 Std. Dev.
At-Risk Group	True Positive (Correct Decision)	False Negative
Not-At-Risk Group	False Positive	True Negative (Correct Decision)

There are two aspects that need to be considered when establishing a performance standard (cut score): 1) how well the cut score differentiates between the *at-risk* group and the *not-at-risk* group; and 2) how stable the cut score is based on estimating decision consistency. To address this first point, the rate of *False Positives* and *False Negatives* is examined. As seen in Figure 5, the *True Positive* designation for the *at-risk* group represents the sensitivity of the screening test (Weiss & Zurich, 2008). This is an indication of how effective the instrument is in classifying preschoolers who actually are cognitively impaired or delayed. The *True Negative* designation in Figure 5.0 for the *not-at-risk* group is an indication of how effective the instrument is in ruling out preschoolers not actually cognitively impaired or delayed.

Tests like the WPPSI-III, to which the STEPSS will be evaluated for the extent to which it is predictive of diagnostic outcome, has a convention that separates low-average cognitive performance from borderline functioning. The theoretical normal curve provides for comparison of cognitive performance relative to a standardized distribution for the WPPSI-III (Wechsler, 2002). In theory, utilizing the convention of 1.0 standard deviation below the mean score on a normally distributed sample would classify the bottom 16.0% of preschoolers as borderline or potentially at-risk. The American Cancer Society (2007) reports a high probability of cognitive impairment (10 to 20 IQ points or approximately one standard deviation below average) for pediatric cancer survivors.

A judgment was made that the performance standard to rule out or rule in cognitive impairment and/or delay would be set at one standard deviation below the mean score for the sample obtained for the present study. By convention, the bottom 16.0% of preschoolers are deemed unable to perform the memory, verbal ability, and attention

tasks at an acceptable standard (frequency and/or quality) compared to performance of preschoolers at or above the performance standard (Rogers & Ricker, 2006).

Setting a Cut Score

The Peng and Subkoviak (1980) procedure for estimating decision consistency was used to set the initial cut score set for the 28-item STEPSS. This involved an examination of the stability of the agreement index (p_o) and the increase over chance (κ) by using the STEPSS.

Estimating decision consistency from one pilot administration of the cognitive screening test was based on the assumption that a preschooler's cognitive abilities remained unchanged from one testing occasion (parental rating) to the next (Rogers, 1999). To the degree that this assumption would be violated, the Peng-Subkoviak procedure would yield overestimates of: a) the estimated degree of agreement; and b) the possible increase over chance achieved by using the test (Rogers, 1999).

The Peng-Subkoviak method assumes that both the cognitive screening test and its hypothetical form were administered and the joint distribution of scores is bivariate normal. Further, an unbiased estimate of variance is needed:

$$\text{Estimated } \sigma^2 = \frac{n\left(\sum X_j^2 - \left(\sum X_j\right)^2\right)}{n(n-1)},$$

where n is the cell size for the group and j is the number of individual observed scores in the group. The unbiased estimate is used to compute a modified Kuder-Richardson 21 coefficient be calculated as follows:

$$\text{Estimated } \alpha^{21} = \frac{k}{k-1}\left[1 - \frac{\mu(k-\mu)}{k\sigma^2}\right],$$

where k is the number of items in the subscale of the screening instrument, and is the estimated mean.

Given the values, the Peng-Subkoviak involves determining the normal deviate corresponding to the cut score corrected for continuity:

$$Z = \frac{C - \mu - 0.50}{\sigma},$$

where C is the cut score for the 4:0- to 5:11-year old group.

The Peng-Subkoviak method provides for an estimate of p_o and κ. The proportion of preschoolers consistently classified as at-risk and not at-risk (p_o) is computed as follows:

$$\text{Estimated } p_o = 1 + 2(p_{zz} - p_z)$$

where p_z and p_{zz} are located in the table adapted from Gupta (1963). To determine a satisfactory value for p_o it is necessary to consider the seriousness of the decisions being made with the test (Subkoviak, 1988). As a general rule, an instrument used to make serious decisions should be sufficiently long to have an agreement coefficient of 0.85 or higher (Subkoviak, 1988).

Cohen (1960) introduced κ to correct p_o for chance:

$$\text{Estimated } \kappa = \frac{p_{zz} - p_z^2}{p_z - p_z^2},$$

where κ represents a measure of the improvement over chance (Rogers, 1999).

Results

Establishing a cut score for the 28-item STEPSS included two analyses. The first analysis involved an examination of the normality of the sample, and in particular the

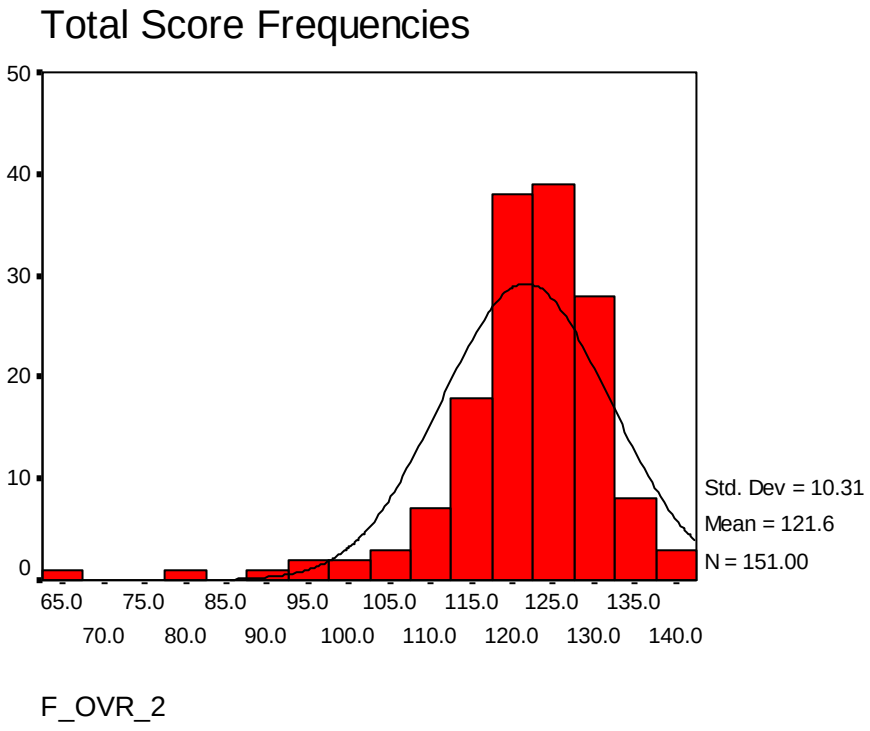
possibility of a ceiling effect. The second analysis involved a decision consistency analyses that included examining the stability of cut scores around a threshold point of one standard deviation below the mean score.

Examining the Normality of the Sample

The comparison of the sample in the present study to the theoretical normal curve is shown graphically in Figure 6. The distribution of 4:0- to 5:11-year old preschoolers slightly exceeded the convention of ± 2.0 as a guideline for unacceptable skewness, or a relative lack of symmetry. The skewness value of -2.03 (std. error of skewness = 0.197) indicated a negatively skewed distribution (Brown, 1997). In addition, the sample's kurtosis value of 7.20 (std. error of kurtosis = 0.392) exceeded the guideline of > 5.0 indicative of an extreme positive kurtosis. The leptokurtic distribution as seen in Figure 6 shows a higher peaked distribution than desirable. This is attributable to 79 preschoolers (53.02%) falling into the range between the mean score and one standard deviation above the mean.

The leptokurtic distribution of the sample for the present study suggested the need to examine the possibility of a ceiling effect. At issue with this lack of symmetry, is that the sample in the present study was limited to Caucasian 4:0- to 5:11-year olds predominately from urban areas and this group may have a biasing effect on the relative difficulty of the items. The frequency distribution of the 28-items of the STEPSS needed to be examined for the extent to which the preschoolers were rated as having high scores close to the maximum score possible (Pedhazur & Schmelkin, 1991). The results are reported in Table 36.

Figure 6
Present Study Data Frequencies Compared to Theoretical Normal Curve



As shown in Table 36, only three items were rated as *Consistently* by more than 90.0% of parents. The remaining 18 of 21 memory and verbal ability items had parental ratings of *Consistently* ranging from 45.4 to 89.5%. The seven attention items demonstrated better variability, in terms of relative difficulty of items, compared to both the memory and verbal ability items. The attention items had comparable rating percentages in both the *Rarely* and *Sometimes* response options. The overall variability of the 28-items that comprise the STEPSS indicates good sensitivity to differentiate among preschoolers 4:0- to 5:11-years of age on all three subscales.

Table 36

Frequency Distribution of the 28-Items of the STEPSS (percentages of n = 151 that were rated in each response option)

Item:	Not at All	Rarely	Sometimes	Usually	Consistently
1. Retells story (from picture book) with reasonable accuracy.	0.7	2.0	4.6	30.9	60.5
2. Tells familiar story without pictures for cues.	1.3	3.9	13.2	34.9	45.4
3. Retells 5 main facts from a story heard several times.	0.7	0.7	13.2	34.2	50.0
4. Sings at least 5 lines of a familiar song.	2.0	1.3	7.2	14.5	74.3
5. Can remember events from the previous week.	0	0	3.3	13.8	82.2
6. Repeats familiar rhymes.	0.7	1.3	3.3	22.4	71.7
7. Tells what is missing when one object is removed from a group of three.	0	2.0	5.9	27.0	64.5
8. Tells their correct age when asked.	0	0	1.3	4.6	93.4
9. Can repeat a sentence with 5 words.	0	0.7	2.0	9.9	86.8
10. can repeat 4 numbers (in the same order as presented) when asked.	0.7	0.7	5.9	17.8	73.0
11. Can express events with ‘going to’, ‘have to’, or ‘want to’.	0	1.3	5.9	23.0	69.1
12. Understands the use of passive sentences.	0	2.0	9.2	38.2	50.0
13. Can tell the opposite of common words (e.g., close-far).	1.3	3.9	5.3	28.3	60.5
14. Uses the correct order to ask questions.	0	1.3	6.6	28.3	63.2
15. Uses pronouns (he, she, them) consistently and correctly.	0	3.3	9.9	27.0	59.2
16. Tells if an object is big or little.	0	0	2.0	3.9	93.4
17. Answers simple 2-step questions.	0	0.7	2.0	15.8	80.9
18. Understands three common prepositions (e.g., on, in).	0	0.7	3.3	11.2	84.2
19. Uses contractions like ‘can’t’.	0.7	1.3	6.6	22.4	68.4
20. Uses relationship words like ‘sister’, ‘brother’, ‘grandmother’.	0	0	1.3	8.6	89.5
21. Asks questions, What’s this (that)?	0	0.7	1.3	4.6	92.8
22. Has trouble concentrating.	15.8	42.1	37.5	3.3	0.7
23. Doesn’t listen to what is said.	2.0	32.9	60.5	3.3	0.7
24. Often fails to follow instructions or fails to finish chores.	15.8	42.1	31.6	8.6	1.3
25. Makes careless mistakes.	3.9	47.4	43.4	3.9	0.7
26. Avoids or has difficulty with tasks needing longer periods of attention.	4.6	32.2	55.9	5.9	0.7
27. Has difficulty organizing tasks or activities.	12.5	45.4	34.2	5.9	1.3
28. Easily distracted by from tasks by typical household noises.	5.3	8.6	39.5	38.8	7.2

Setting the Cut Score

Initially setting a cut score at 112 for the proposed STEPSS instrument classified 15 (9.93%) of the sample for the present study as *at-risk* for cognitive impairment and/or delay. To further examine the validity of the initial cut score it should be re-examined for stability in the agreement index (p_o) and the increase over chance (κ) by using the STEPSS.

Re-Examining the Cut Score

The criterion used to re-examine the performance standard was cut scores 1, 2, and 3 points above and below the initial cut score. The initial cut score of 112, which was one standard deviation below the mean, had a value of p_o at 0.92 and the value of κ was 0.69. The results are reported in Table 37. The values of the p_os and κs for the three cut scores above and below the 112 varied from 0.89 to 0.94 and from 0.64 to 0.72 respectively.

A convention for interpreting the agreement coefficient (p_o) is to meet or exceed a value of 0.85 (Subkoviak, 1988). Subkoviak (1988) suggests that, "tests used to make serious decisions should be sufficiently long to guarantee an agreement coefficient exceeding 0.85" (p. 52). The agreement coefficients for the range of cut scores reported in Table 37 all exceed the stated guideline. Therefore, the stability of the cut score in the range reported was considered adequate. The range of kappa values suggested that use of the screening test accounted for a 64.0% to 72.0% increase over chance.

An examination of Table 37 revealed that a judgment was required relative to the serious nature of the decision-making for the proposed STEPSS instrument. The

Table 37
Possible Cut Scores for the 28-Item Composite Scale (STEPSS)

Cut-score:	z-score	Est. p_o	Est. k	Percentage *At-Risk*
115	-0.75	0.89	0.69	26/149 (17.45%)
114	-0.85	0.90	0.66	25/149 (16.78%)
113	-0.95	0.92	0.72	22/149 (14.77%)
112	-1.05	0.92	0.69	15/149 (9.93%)
111	-1.15	0.93	0.66	12/149 (8.05%)
110	-1.25	0.94	0.66	12/149 (8.05%)
109	-1.35	0.94	0.64	10/149 (6.71%)

Estimated p_o – the proportion of preschoolers consistently classified as at-risk and not at-risk.
Estimated κ - the possible increase over chance that has been achieved by using the screening instrument.

judgment was based on two considerations: 1) that it is better to be more sensitive in terms of limiting the potential number of under-referrals of *at-risk* preschoolers; and 2) the cut score demonstrating the highest combination of decision consistency estimates (p_o and κ). For purposes of future research using the STEPSS, the cut score was set slightly higher than one standard deviation below the mean at 113 given $p_o = 0.92$ and $\kappa = 0.72$. Setting the cut score at 113 increased the number of preschoolers classified as *at-risk by* seven (from 9.93% to 14.77%),

Given that the intent of the STEPSS is to provide a new instrument to support parents in the monitoring of at-risk preschoolers, the instrument needs to be easy to administer, score, and interpret. An important aspect to keeping interpretation simple is that all scores falling at or below the cut score (whether one point below or 10 points

below) are considered equally serious for making a referral decision for more comprehensive assessment. The change in cut score (from 112 to 113) now includes seven additional preschoolers and this suggested an examination their respective scoring profiles (sub-scale scores) on the STEPSS. The results are reported in Table 38.

Table 38
Characteristics of Seven Preschoolers Re-Classified as At-Risk Based on Changing the Initial Cut Score from 112 to 113.

Case:	Sex:	Age:	Total Mem.	Lower or = 42* (Y) or (N)	Total Verbal	Lower or = 47** (Y) or (N)	Total Atten.	Lower or = 21*** (Y) or (N)
20	F	4:0-4:6	43	N	43	Y	27	N
22	F	4:0-4:6	38	Y	50	N	25	N
31	F	4:0-4:6	40	Y	47	Y	26	N
39	M	4:0-4:6	42	Y	48	N	23	N
50	F	4:7-4:11	40	Y	47	Y	26	N
92	F	5:7-5:11	45	N	47	Y	21	Y
99	M	5:7-5:11	44	N	48	N	21	Y

** A critical value for the memory sub-scale at one standard deviation (4.0) below the mean.*
*** A critical value for the verbal ability sub-scale at one standard deviation (4.0) below the mean.*
**** A critical value for the attention sub-scale at one standard deviation (4.0) below the mean.*

All seven of these preschoolers shown in Table 38 were rated at an overall score of 113, which is the initial cut score set for the 28-item composite scale. Additionally, each preschooler was rated at or below a suggested critical value (for consistency also one standard deviation below the respective sub-scale mean) on at least one of the three sub-scales. These scoring profiles suggested that a rating giving any one of them even one additional score point would put them above the initial composite scale cut score (classified as *not at-risk*) while still below a critical value in one of the areas of memory, verbal ability, or attention. The exploratory nature of the present study, combined with the limitations and possible bias in the normative sample used for this criterion-referenced cut score, suggested that some caution should be used in a decision about the number of cut scores for the STEPSS.

Summary

The seven scoring profiles for preschoolers in the present study, that fall right on the cut score of 113, suggested that the scoring system for the STEPSS should take into account performance on each of the three sub-scales of memory, verbal ability, and attention. In the interest of adequate sensitivity (a low number of under-referrals or false negatives) it would be better to encourage a referral decision based on low functioning in either a sub-scale or on the full scale. Therefore, a judgment was made to have cut scores for each of the three sub-scales based on the convention of one standard deviation below the mean.

The mean scores for the subscales of memory, verbal ability, and attention are M = 46.20, M = 51.33, and M = 24.56 respectively. The standard deviations for the memory, verbal ability, and attention sub-scales are SD = 4.04, SD = 3.85, and SD = 3.51 respectively. Rounding all values to the nearest whole number set the cut scores for memory, verbal ability, and attention at 42, 47, and 21 respectively.

CHAPTER VII

Discussion

The findings of the present study provide preliminary validity evidence to support further development of the STEPSS. The present study focused on constructing and validating a revised 28-item version of the STEPSS to the point of establishing cut scores to rule out (or rule in) cognitive impairment and/or delay. The STEPSS is intended to support parents, playschool teachers, and kindergarten teachers in the early monitoring and screening of preschoolers aged 4:0- to 5:11-years. The use of four cut scores (a full scale cut score along with one for each of the sub-scales of memory, verbal ability, and attention) suggest an easy to score and interpret screening instrument toward a referral decision for more comprehensive testing.

A sample of 151 Caucasian preschoolers were used within a criterion-referenced framework to set a cognitive performance standard based on their functioning as one developmental group. Previous research indicates that normally functioning 4:0-to 5:11-year olds are sufficiently distinct from younger preschoolers and older children on the basis of cognitive testability (White, 1996). Wechsler (2002) agrees that preschoolers under 4:0-years of age should be assessed differently based on comparative age-related limitations in executive functioning. For example, 4:0- to 5:11-year olds have typically progressed beyond reading from prompts (typical of 3-year olds) and usually demonstrate two expressive language characteristics: 1) ability to read from memory; and 2) being able to tell a longer story and stick to the topic. This age group of preschoolers is also distinct from older children in that they do not typically acquire the following skills and abilities until they make the shift in cognitive capacity at approximately 6:0-years of age:

1) more sophisticated reasoning about number; and 2) a better understanding of abstract relationships (White, 1996).

The target population for the STEPSS is all 4:0- to 5:11-year old preschoolers that would be at-risk for poor psychosocial and academic outcomes as they enter into the primary grades. This covers a wide range of varying health conditions, however, the present study focussed on four medical conditions (pediatric cancer survivors, preterms, ARND, and various learning disabilities) that demonstrated some consistency in cognitive deficits in the domains of memory, verbal ability, and attention. These four clinical groups of preschoolers suggest accessible populations for two considerations: 1) to better understand the types of cognitive deficits they experience toward focussing the screening items; and 2) potential groups to facilitate an examination of the predictive or concurrent validation of the STEPSS.

The information-processing framework used for the present study, established an association between *what* cognitive processing typically develops in preschoolers and how varying health conditions affecting the CNS negatively impact these patterns of development. The *what* that develops cognitively in 4:0- to 5:11-year old preschoolers (ability to speak in multi-word phrases and sentences, ability to remember details from past events) is associated with overt behaviours and therefore can be rated qualitatively and/or quantitatively. A primary care-giver (parent or guardian) or a preschool teacher who is familiar with the preschooler for an appropriate amount of time could conduct a rating for quality and frequency of cognitive performance.

Acquiring benchmarks for expressive language skills and remembering (memory strategies) are associated with preschoolers' attentional capacity which is important

toward learning to manage controlled (effortful) cognitive processes. Case (1992b) asserts that normal frontal lobe development is associated with improved verbal working memory in children 4:0-years and older. Consequently, understanding the normal pattern of development for attentional capacity in 4:0- to 5:11-year olds is important and interrelated with memory and verbal ability in the processing and consolidation of information. Examining frontal lobe development is an important consideration because the four health conditions discussed herein are linked by deficits to the frontal lobe areas of the brain.

An information processing framework supports that normally developing preschoolers 4:0- to 5:11-years of age progress in a predictable way. These identifiable patterns inform the interpretation of test scores by allowing for a comparison of preschoolers to normative data for diagnostic outcomes. However, the STEPSS, as a first-level screening test, is not designed as an assessment tool. The STEPSS does not screen for both strengths and weaknesses. The STEPSS is intended to classify higher risk for poor cognitive functioning. For example, a parent can judge when one of 28 tasks cannot be performed quantitatively (low or no frequency), or when a child persists in performing a task one way and it contradicts the identified task (poor quality). The STEPSS is not a diagnostic tool, however, completing the process of validating this screen will involve its ability to predict diagnostic outcomes on comprehensive measures such as the WPPSI-III and the NEPSY-II.

The STEPSS is designed to be an easily accessible and cost efficient instrument to support parents in the regular monitoring of preschoolers. In the case of more identifiable and accessible populations of *at-risk* preschoolers, like pediatric cancer survivors, the

parent(s) can become part of the multi-disciplinary team to improve the follow-up care during the maintenance phase of treatment (off of aggressive chemotherapy). The parent(s) can be actively involved in the early first stages of a referral judgment as to whether a given preschooler displays evidence of cognitive impairment severe enough for more comprehensive assessment toward tailoring an intervention.

The revised STEPSS demonstrates adequate psychometric properties toward completing the predictive (concurrent) validation of the STEPSS using one or more accessible clinical groups of preschoolers. The STEPSS, as a composite 28-item scale, demonstrates very good internal consistency ($\alpha = 0.91$). Additionally, the sub-scales of memory, verbal ability, and attention show good internal consistency ($\alpha = 0.87$, $\alpha = 0.86$, and $\alpha = 0.78$ respectively). The preliminary evidence indicates that, as a composite scale, the STEPSS demonstrates a 72.0% increase over chance classification of preschoolers as being cognitively impaired and/or delayed.

Setting a full scale cut score for the STEPSS of 113 for a future validation studies is supported by preliminary evidence for good agreement in classifying higher risk (estimated $p_o = 0.92$). This exceeds the conventional guideline of 0.85 for this type of tests (Subkoviak, 1988) and supports the importance of the STEPSS not initially resulting in too many under-referrals (false negatives). However, the limitations of the sample obtained for the present study (predominately urban, Caucasian preschoolers), suggest the estimate of consistently and accurately classifying 92% of 4:0- to 5:11-year old preschoolers as either *at-risk* or *not-at-risk* should be interpreted cautiously. Quantitative evidence alone is not a sufficient process for evaluating a performance standard, and the

judgment of experts should also be considered in terms of a functional classification of preschoolers to strengthen the evidence for a final cut score (Posavac & Carey, 2003).

The present study also finds preliminary evidence for adequate inter-rater agreement for parents and for a parent and teacher. Inter-rater agreement was considered good if there was less than one score point difference across the three sub-scales as pilot tested (18 memory items, 19 verbal ability items, and 15 attention items). For parent raters (n = 10 – 4 pairs for 4:0- to 4:11-years and 6 pairs for 5:0- to 5:11-years), the inter-rater agreement for the memory, attention, and verbal ability scales shows good consistency. With one exception, parent inter-rater agreement was within 0.78 of a score point. For parent/teacher raters (n = 9 – 9 pairs for 5:0- to 5:11-years) the inter-rater agreement also shows good consistency. All parent/teacher inter-rater agreement was within 0.88 of a score point. These findings are encouraging toward evaluating the remaining 28 items as being interpreted in a similar way by two raters.

Limitations

The criterion-referenced approach to establishing a performance standard and setting cut scores for the STEPSS used empirical evidence and a convention of norm-referenced tests for one standard deviation below the mean being a delineation point. The qualitative descriptions in tests like the WPPSI-III and the WISC-IV at a threshold point of 1.0 to 1.5 standard deviations below the mean is a separation of cognitive performance described as *low average* verses *borderline* (Wechsler, 2002). This study could have benefited from a panel of experts to judge both *adequate* and *at-risk* cognitive performance given the obtained sample for the present study.

This research was constrained by having a predominately urban, Caucasian sample. Consequently, caution needs to be exercised in drawing conclusions on reliability and validity until all the variables that effect establishing a performance standard for 4:0- to 5:11-year olds are well understood. Setting a cut score requires consideration for: a) how inclusionary the present sample is (or should be) of mild and moderate intellectual and learning disabilities; b) how the cut score would be adjusted for a more representative sample based on ethnicity; c) how the cut score would be adjusted for a more representative sample based on geographical distribution; and d) the impact of a more representative sample based on parent's demographics like education level, marital status (one parent verses two-parent families), and socioeconomic status of the immediate family.

Setting an initial full scale cut score for STEPSS at 113 classified 14.77% of the obtained sample of preschoolers as *at-risk*. This serves an initial objective of suggesting that the STEPSS would have an incremental effect over the prevalence of memory, verbal ability, and attention deficits in the general population of children (5.0 – 8.0%). However, it must also be considered that the obtained sample for the present study (Caucasian preschoolers from urban areas) may present a bias toward a ceiling effect. Therefore, there may be a need to revise the cut score or establish additional cut scores once the STEPSS is standardized on important ethnic groups. For example, Aboriginal preschoolers living on a reserve in Northern Saskatchewan may be disproportionately influenced by parental demographics (level of primary caregiver's education, mother's marital status, socioeconomic status of the immediate family, among others) and this may reflect a need for a revised cut score for more accurate interpretation of the STEPSS.

Ultimately, the intent of the STEPSS is to have a general screen standardized on a nationally representative sample of preschoolers for the Canadian population. The research findings, at this stage of instrument development, do not allow for the generalizability of results beyond the characteristics of the obtained sample for the present study.

The decision to construct a brief screening instrument for a preschool population (as opposed to a population of 6:0- to 9:11-year olds) has limitations in terms of accessible groups to complete the validation process of the STEPSS. Identifying appropriate clinical groups, cognitively *at-risk* due to their disease and/or treatment effecting CNS functioning, is an important aspect toward an examination of predictive validity. However, clinical groups, like pediatric cancer survivors, in a target group of 4:0- to 5:11-year olds are a relatively small group in any given treatment centre. These children need to have the right types of cancer (e.g., brain tumours) that effect the CNS and also need to be into the maintenance phase of their treatment (off of chemotherapy and craniospinal irradiation) to be stable enough to assess their cognitive status. Accessing a suitable number of pediatric cancer survivors for completing the validation of the STEPSS will require a multi-centre approach.

Another limitation of the proposed STEPSS is that it is not as objective a measure as it may need to be. In particular, the 7-item attention component focuses exclusively on the weaknesses of the 4:0- to 5:11-year old preschooler and excludes items that rate possible strengths of the child. Since the STEPSS will be evaluated on the extent to which it is predictive of diagnostic outcomes on tests like the WPPSI-III, it is important to consider the overall purpose of assessment tests. Struiksma (2008) indicates that the

purpose of assessment includes: a) identification of a learning profile; b) identification of both strengths and weaknesses; c) determination of a learning disability; d) investigation of other factors that may affect performance (anxiety, depression); and e) a determination of appropriate intervention programming.

An additional limitation of the STEPSS has to do with drawing any final conclusions about inter-rater agreement. The small samples for both parent and parent/teacher inter-rater agreement (n = 10 and n = 9 respectively) can only be considered an encouraging preliminary trend at this stage of instrument development. The stability of inter-rater agreement would be greatly improved if the number of pairs of raters were increased to ≥ 30. The very small number of pairs of parents (n = 4) that agreed to rate their 4:0- to 4:11-year old cannot be considered adequate empirical evidence. Interestingly, one of the four pairs of parents rating 4-year olds lacked consistency with a 1.22 score point difference which is considered poor. The father rated this 4-year old male consistently lower than the mother on nine of the 17 items and on six items by ≥ 2 score points. The consistency of the father's lower rating makes this discrepancy difficult to explain, given that both parents reported their relationship with their child as one of *equal caregivers.* This finding may indicate that 4-year olds are not as predictable a group to rate as 5-year olds. Consequently, a larger sample of pairs of parents of 4-year olds needs to be examined to demonstrate adequate reliability evidence for the STEPSS.

Finally, the research design parameters for the present study have to be considered a limitation to evaluating the validity of the STEPSS. The present study intentionally stopped short of two validation processes: 1) utilizing an expert panel to judge and

provide a substantive review of the recommended performance standard; and 2) an examination of predictive (concurrent) validity utilizing accessible populations of one or more of the clinical groups (pediatric cancer survivors, preterms, those diagnosed with ARND, and those classified with various learning disabilities). Consequently, the revised 28-item STEPSS lacks the following validity evidence: 1) establishing a threshold point (performance standard) for distinct group membership based on clinical diagnosis; and 2) examining the predictive validity of the STEPSS on a standardized cognitive battery that would include several established cognitive tests and appropriate subtests related to memory, verbal ability, and attention. These validation procedures are beyond the scope of the current study, but are considered necessary steps in developing a final version of the STEPSS.

Future Research

The priority for future research is to complete the development and validation process of the STEPSS. The development of a final version of the STEPSS would benefit from the following processes: a) a second pilot test with a sample more ethnically and geographically representative of the general population of 4:0- to 5:11-year olds; b) a re-examination of cut scores and corresponding estimates of decision consistency for important ethnic groups; c) a focus group with parents of *at-risk* preschoolers (pediatric cancer survivors, preterm low birth weight, those diagnosed with ARND, and those diagnosed with learning disabilities) to review the face validity of the STEPSS (item clarity, instructions, scoring system, and interpretation); and d) an examination of the predictive validity of the STEPSS (concurrent testing with a standardized cognitive battery) with two or more clinical groups.

A second pilot testing would increase the sample size and may improve the reliability and validity of the 28-item STEPSS. Increasing the sample size to meet or vexceed the convention of ten subjects to one variable (see Garson, 2008) may alleviate some of the concern with a leptokurtic (scrunched up) distribution obtained in the present study. Popham (1978) argues that when scores start to scrunch up, correlational approaches may yield spurious results. Additionally, the factor analysis for the 28 items based on an obtained sample of 151 reported only one of the 28 variables with a communality ≥ .6. MacCallum, Widamen, Preacher, and Hong (1999) argue that adequate communalities should be ≥ .6 or the mean level of communality should be ≥ .7 for interpreting adequate reliability.

A second pilot study would also provide an opportunity to improve on the psychometric properties of the STEPSS for inter-rater agreement. A future study would benefit from more direct recruitment techniques targeting both parents and parent/teacher ratings of the same preschooler. Future opportunities to collaborate with children's mental health centres and pediatric treatment centres suggest help with access to and the recruitment of families of *at-risk* preschoolers not possible with the present study. Obtaining a larger sample and improving the range of variation on inter-rater agreement among both the parent and parent/teacher pairs would lead to improved confidence in the reliability of the STEPSS.

A larger and more representative sample of 4:0- to 5:11-year olds needs to be obtained to improve the validity of the STEPSS as a general screen for a target population inclusive of all preschoolers. The psychometric properties of the STEPSS need to be re-examined given better representation in two areas: 1) ethnic groups, particularly

Aboriginal preschoolers (both First Nations and Métis); and 2) a larger group of rural preschoolers. For a practical application of the STEPSS, to support parents untrained in assessment, it requires the development of a technical and interpretive manual that would include: a) cultural considerations for rating the STEPSS with Aboriginal preschoolers; and b) a simple scoring system along with a straightforward interpretation of *at-risk* relative to the cut scores.

A practical format for the STEPSS would include focus group sessions with parents and possibly playschool and kindergarten teachers. Potential users of the STEPSS need to provide their opinion and perspective on issues like completeness of instructions, clarity of items, ease of using the scoring system, how to interpret the raw score rating relative to the cut scores. This type of validation process would also provide input on unanticipated questions that could be addressed in a do-it-yourself administration and scoring manual. Consensus on judgments from a representative group of parents would provide would add an important aspect of validity to the development of the STEPSS.

Conclusions

Completing the development of the STEPSS constitutes an important prerequisite stage toward earlier detection of cognitive impairment and/or delay in preschoolers. The STEPSS represents a new tool to support parents in making a referral decision toward more comprehensive assessment and tailoring of intervention strategies. Involving parents earlier and much more directly in the monitoring of preschoolers will improve the *at-risk* child's chances for a positive school experience. An early return or prompt start to school is considered an important process for children recovering from chronic or acute health conditions (DuHamel et al., 1999). The ability of the *at-risk* child to be in the

school environment also increases the exposure to socialization opportunities and support systems considered crucial for proper adjustment into adolescence and adulthood.

The development of the STEPSS is important for three reasons: 1) it fills a gap in the types of screening instruments available for monitoring cognitive functioning in a preschool population; 2) it is unique in that it is intended to be administered, scored, and interpreted by non-professionals in assessment; and 3) it has the potential to alleviate the current delay in depending upon the school system to identify, monitor, and document low cognitive functioning. Additionally, the continued development of cognitive screening instruments for all ages of children and youth (6:0- to 9:11-years and 10:0- to 15:11-years) is an important research stream toward improving school outcomes. In support of this, Nelson et al. (2006) indicate that an optimal method of screening children for speech and language delay (verbal working memory) has not yet been established.

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Appendix 1

Content Expert Rating Form

Cognitive Domain: Memory

We are looking for the best developmentally sensitive markers that are representative of typical cognitive performance in a preschool-age population.

Definition:
The extent to which children 4-years to 5-years, 11 months display the ability to temporarily store and perform a set of cognitive operations on information that requires the management of the limited capacity of short-term memory. For the older end of the target group this may include memory span which is defined as the ability to attend to and immediately recall temporally ordered elements in the correct order after a single presentation. However, for the most part, observable memory deficits will be based on the preschoolers' ability to recall basic personal information and procedural items (i.e., what to do in situations) that they would have been repeatedly exposed to.

1. Knows first, middle and last name.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

2. Tells their age when asked.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

3. Remembers how to point to their eyes, nose, mouth, and ears.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

4. Can repeat a sentence with 3 words (e.g., Kitty ran away)

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

5. Can repeat three numbers (in the same order) when requested.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

6. Finds a specific book on request.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

7. Names objects that make sounds.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

8. Tells the days of the week in order.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

9. Remembers their sibling's name(s).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

10. Tells their age when asked.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

11. Remembers how to point to their chin, thumbs, knees, neck, and fingernails.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

12. Can repeat a sentence with 5 words.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

13. Remembers what to do when his/her hands are dirty.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

14. Remembers what to do when they want to go into a dark room.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

15. Remembers what to do when they are sleepy.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

16. Remembers what to do when they are thirsty.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

17. Remembers how to be polite (says please and thank you) when asking for something.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

18. Greets familiar adults without reminder.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

19. Remembers which faucet is hot and which is cold.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

20. Takes part in reading familiar books by 'filling in' words.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

21. Follows rules in a group game led by an older child.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

22. Tells which objects go together.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

23. Remembers their house address.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

24. Remembers the name of the city/town they live in.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

25. Remembers how to point to their chest, heels, ankles, and jaw.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

26. Can repeat 4 numbers (in the same order as presented) when requested.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

27. Can repeat a sentence with 7 words.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

28. Remembers how to tie their shoe laces.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

29. Remembers what to wear to go outside if it is raining.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

30. Tells colour of named objects.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

31. Names time of day associated with familiar activities.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

32. Recalls three objects seen in a picture.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

33. Apologizes without reminder 75% of the time.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

34. Repeats familiar rhymes.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

35. Tries to read familiar books from memory.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

36. Can count from 1 to 12

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

37. Remembers not to interrupt others when they are speaking 75% of the time.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

38. Remembers how to begin conversations appropriately.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

39. Remembers to politely ask for help.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

40. Can remember events (e.g., going to McDonalds) from the previous week.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

41. Remembers their playschool teacher's name.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

42. Tells the other children's names in their playschool/kindergarten class.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

43. Tells month and day of birthday.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

44. Remembers their parent's real (first) names.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

45. Tells his/her telephone number when asked.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

46. Remembers how to point to their shoulders, elbows, hips, wrists, and waist.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

47. Remembers how to turn the TV on and off.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

48. Can repeat 5 numbers (in the same order presented) when requested.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

49. Can repeat a sentence with 9 words.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

50. Remembers what to do if they see a house on fire.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

51. Attempts to read by looking at pictures.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

52. Sings at least 5 lines of a familiar song.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

53. Retells a story (from a picture book) with reasonable accuracy.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

54. Explains the rules of a game or activity to others.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

55. Remembers left and right hands on self.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

56. Can remember the order of activities in a common event (e.g., ordering food at McDonalds, paying for food, eating food).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

57. Remembers an emergency phone number (e.g., 911).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

59. Can count from 1 to 20.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

60. Tells what is missing when one object is removed from a group of three.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

61. Remembers how to politely answer the telephone.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

62. Remembers the time of day for their favourite TV program.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

63. Retells 5 main facts from a story heard several times.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

64. Tells familiar story without pictures for cues.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

65. Recites the letters of the alphabet in order.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

Now that you have rated the items, how well does the assessment material sample the memory domain or observable behaviours representative of cognitive performance of preschoolers ages 4- to 5-years?

Are there items that you would recommend including in the screening instrument (i.e., having an excellent fit) that have been omitted from this item bank?

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Content Expert Rating Form

Cognitive Domain: Attention (Executive Functioning)

Definition:

The extent to which children 4 years to 5 years, 11 months display observable, day-to-day behaviours associated with the ability to sustain focus and alertness over time, shift attention as required (regulate activity level – hyperactivity), and have appropriate response inhibition (control impulsivity). This also includes behaviours associated with executive functions (higher-order cognitive abilities that assist with self-regulation) such as action planning, reasoning (understanding rules), and problem-solving. Implicit in attention is demonstrating an ability to organize, prioritize, and begin and complete tasks (Fine & Kotkin, 2003). In other words, "behaviour of a person that modifies the probability of subsequent behaviour so as to alter the probability of a later consequence" (Barkley, 1998).

1. Works with an adult by doing an activity for 5 minutes.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

2. Attends to music or stories for 5 to 10 minutes.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

3. Engages in make-believe play, imitating an adult for 5 to 10 minutes.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

4. Is restless when travelling in a car.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

5. Is overly active.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

6. Leaves his/her seat during meals.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

7. Touches everything when shopping.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

8. Throws temper tantrums.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

9. Screams for no good reason.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

10. Makes loud noises when playing.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

11. Climbs on things.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

12. Acts silly.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

13. Easily distracted by extraneous stimuli (e.g., typical household noises).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

14. Doesn't listen to what is said.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

15. Sorts toys (e.g., pegs, blocks) by colour.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

16. Can build a train of 8 to 10 blocks.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

17. Can build a tower of 6 to 8 blocks.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

18. Can put together a 4 part nesting toy.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

19. Can complete a 3 piece form board (e.g., large scale puzzle).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

20. Can play simple group games such as 'Ring Around the Rosy'.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

21. Begins to play cooperatively with other children with adult supervision.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

22. Gets satisfaction from doing things with others.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

23. Turns several pages in a book at once.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

24. Is interested in 'read-to-me' books.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

25. Cannot wait to take his/her turn.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

26. Shows off when visitors are present.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

27. Interrupts people who are speaking.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

28. Talks back to adults.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

29. Can put together two parts of a shape to make a whole.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

30. Can use blocks to build simple enclosures (e.g., animal pens or yards).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

31. Can arrange objects into categories.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

32. Can match (or continue) a sequence or pattern of blocks or beads.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

33. Can complete a large scale five or six piece puzzle.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

34. Can build a 'T' with 10 blocks.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

35. Finds the most direct route on a map (e.g., point 'A' to point 'B' maze).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

36. Can build steps with 12 blocks.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

37. Can do an activity (e.g., play with toys, watch TV) for at least 20 minutes.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

38. Has a shorter attention span than you would expect.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

39. Has difficulty staying alert and paying attention.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

40. Often forgetful of daily events.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

41. Cannot read a book one page at a time (has to turn several pages at once).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

42. Hurries through tasks.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

43. Is unable to wait for events (e.g., rewards, birthdays, etc.).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

44. Begins to take turns with some assistance.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

45. Works in a small group for 5 to 10 minutes.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

46. Performs simple errands for others.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

47. Engages in socially acceptable behaviour in public.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

48. Shows off when visitors are present.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

49. Disrupts work of other children in playschool/kindergarten.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

50. Seeks attention while doing tasks in playschool/kindergarten.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

51. Needs too much supervision, whether at home or in playschool.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

52. Acts without thinking.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

53. Talks too loud (doesn't use inside voice).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

54. Calls out in class, without being asked.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

55. Can match symbols (e.g., letters and numbers).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

56. Can build a pyramid with 10 to 12 blocks.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

57. Takes some time to think about things before starting a task.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

58. Uses blocks to build complex enclosures such as houses, barns, or garages.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

59. Can pick out small differences in a group of similar objects.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

60. Gives up easily when starting something new.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

61. Has trouble concentrating.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

62. Can remain at a 10 to 12 minute task until it is completed.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

63. Can work alone at a chore for 20 to 30 minutes.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

64. Doesn't listen to what is said, even when spoken to directly.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

65. Is slow to return to an activity once interrupted.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

66. Often loses or misplaces things.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

67. Doesn't do her/his work in playschool/kindergarten.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

68. Often stares blankly or daydreams.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

69. Has difficulty organizing tasks or activities.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

70. Often fails to follow instructions or fails to finish chores.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

71. Makes careless mistakes.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

72. Is constantly looking around.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

73. Often fidgets with hands or feet or squirms in seat.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

74. Is restless during movies.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

75. Has difficulty attending to a classroom activity or discussion.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

76. Loses temper easily.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

77. Can plan and build using simple tools (e.g., inclined plane, level, pulley).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

78. Can arrange objects in sequence of width and length.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

79. Can do simple connect-the-dot puzzles.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

80. Can do 'Simon Says' types of activities.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

81. Can stack objects (blocks) based on imitating a model.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

82. States goals for himself/herself and carries out activity.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

83. Has problems with explaining things.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

84. Can concentrate to pick out small differences between similar pictures.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

85. Avoids, hesitates, or has difficulty with tasks needing sustained attention.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

86. Likes to finish what he/she starts.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

87. Pushes to be independent like an adult.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

88. Must have immediate rewards, long-term rewards don't work.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

89. Blurts out answers before questions have been completed (I know, I know …).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

90. Has difficulty remaining quiet according to classroom rules.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

91. Talks excessively.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit', item may be representative of _____ domain.

Now that you have rated the items, how well does the assessment material sample the attention domain and/or observable behaviours representative of cognitive performance of preschoolers ages 4- to 5-years?

Are there items that you would recommend including in the screening instrument (i.e., having an excellent fit) that have been omitted from this item bank?

_____
_____
_____
_____
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_____

Content Expert Rating Form

Cognitive Domain: Language (Verbal Ability)

Definition:

The extent to which children 4 years to 5-years, 11 months display observable, day-to-day behaviours associated with a "socially shared code or conventional system for representing concepts through the use of arbitrary symbols and rule-governed combinations of these symbols" (Owens, 1988, p. 4). Implicit in this broad characterization of language is that there are three major, but not necessarily equal components (i.e., form, content, and use), of language that further characterize cognitive functioning in this broad domain by indicating either a receptive or expressive function. The form component (e.g., voice quality, intonation, and rate of speech) relates to behaviours associated with subcomponents that connect sounds or symbols with meaning (i.e., syntax, morphology, and phonology) (Owens, 1992). The content (semantics) component relates to behaviours associated with "aspects of language concerned with the rules governing the meaning or content of words or grammatical units" (Owens, 1992, p. 528). The use (pragmatic) component relates to behaviours associated with "aspects of language concerned with language use within a communication context" (Owens, 1992, p. 530).

1. Cooperates with parental requests 50% of the time.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

2. Can bring or take an object to/from another room when asked.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

3. Makes a choice when asked.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

4. Shows understanding of feelings by verbalizing love, mad, sad, etc.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

5. Without being asked, imitates adult speech.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

6. Controls voice volume 90% of the time (e.g., understands inside voice).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

7. Understands commands using two related actions (e.g., run fast, talk quietly).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

8. Can identify 7 body parts when asked.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

9. Can think of solutions to problems before acting (e.g., put it under the _____).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

10. Can match words spoken with movements (e.g., arm go baby).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

11. Grammar begins to reveal past and present tense.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

12. Statements begin to reveal correct order to express intended meaning.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

13. Can carry out a series of two related commands.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

14. Responds to commands using 'on', 'under', 'up', 'down'.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

15. Distinguishes between one and many.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

16. Understands taking turns.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

17. Can bring more than one object (e.g., blocks) when asked using plural form.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

18. Points to picture of common object described by its use.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

19. Can point to an object that 'is not' (e.g., which is not a ball?).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

20. Has a vocabulary of at least 200 - 300 words.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

21. Names objects that make sounds (e.g., bee – buzz).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

22. Repeats sentences of 4 words.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

23. Names familiar environmental sounds (e.g., door bell).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

24. Asks questions, 'What's this (that)?

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

25. Holds up fingers to tell age.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

26. Answers 'who' question with name.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

27. Combines noun and verb in two word phrase (e.g., daddy go).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

28. Uses word for bathroom need.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

29. Combines two words to express possession (e.g., daddy car).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

30. Refers to self by own name in speech.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

31. Uses some class names (toys, animal, food).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

32. Talks when playing alone.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

33. Can answer the telephone and talk to a familiar person.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

34. Cooperates with adult requests 75% of the time.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

35. Comprehends and answers questions.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

36. Understands another person's perspective.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

37. Sings to music.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

38. Greets familiar adults without reminder.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

39. Tells if an object is big or little.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

40. Points to 10 body parts when asked.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

41. Tells if an object is heavy or light.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

42. Describes two events or characters from familiar story or TV program.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

43. Can tell which two objects are the same (e.g., two bunnies in an array of animals).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

44. Can count up to 10 objects in imitation.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

45. Names objects as same and different.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

46. Names three colors when asked.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

47. Names three shapes: square, triangle, and circle.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

48. Carries out a series of two unrelated commands.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

49. Answers simple 'how' questions.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

50. Tells how common objects are used.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

51. Tells two events in correct order of occurrence.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

52. Can carry out a series of three simple directions.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

53. Understands the concept of one.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

54. Understands the concept of more.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

55. Understands three common prepositions (e.g., on, in, under, between).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

56. Understands compound sentences.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

57. Can repeat two or three nonsense syllables.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

58. Knows synonyms for simple words (e.g., another word for big).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

59. Produces multiple word utterances in response to picture book.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

60. Uses the correct word order to ask questions (e.g., can I, does he).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

61. Tells full name when asked.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

62. Uses regular past tense forms (e.g., jumped).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

63. Can express future events with 'going to', 'have to', and 'want to'.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

64. Uses some common irregular plurals (e.g., men, feet).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

65. Begins to use function words (e.g., in, by, to, the).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

66. Can produce about 60% of consonants correctly.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

67. Has a spoken vocabulary of 500 – 1000 words.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

68. Uses language comfortably in everyday situations to fit their own needs.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

69. Knows when to speak quietly or loudly depending upon the situation.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

70. Can change speaking patterns (i.e., speed up, slow down) to accommodate listeners.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

71. Asks for assistance (e.g., with bathroom, getting a drink).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

72. Contributes to adult conversation.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

73. Repeats rhymes or songs.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

74. Asks permission to use objects belonging to others 75% of the time.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

75. Tells whether object is heavy or light (less than 1 kg. difference).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

76. Names eight colors when asked.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

77. Carries out a series of 3 directions.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

78. Can find 'top' and 'bottom' of objects when asked.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

79. Can point out absurdities in pictures.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

80. Names an object that does not belong in particular class (e.g., one that's not an animal).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

81. Repeats familiar rhymes.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

82. Names two kinds of coins (e.g., penny, nickel, dime).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

83. Tells the color of named objects.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

84. Knows the difference between 'long' and 'short'.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

85. Tells whether two words rhyme or not.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

86. Understands use of passive sentence (girl was hit by a boy).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

87. Uses compound sentences (e.g., I hit the ball and it went on the road).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

88. Has a spoken vocabulary of 1,000 to 1,500 words.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

89. Uses 'could' and 'would' in speech.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

90. Uses contractions, 'can't', 'don't', 'won't'.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

91. Uses words, 'sister', 'brother', grandmother', 'grandfather'.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

92. Has mastered 90% of consonant speech sounds.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

93. States feelings about self: mad, happy, love, etc.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

94. Explains rules of game or activity to others.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

95. Joins in conversation at mealtime.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

96. States goals for herself or himself and carries out activity.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

97. Uses appropriate table manners.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

98. Begins conversations appropriately.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

99. Compliments others when appropriate.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

100. Describes location or movement by using 'through', 'away', 'over', 'from', and 'toward'.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

101. Answers 'why' questions with an explanation.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

102. Can tell a 3 – 5 part sequence story.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

103. Can tell the opposite of common words (e.g., short, little, close).

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

104. Names left and right on self.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

105. Names position of objects: first, second, third.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

106. Sight reads 10 printed words.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

107. Can point to 'least', 'most', 'few'.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

108. Can point to 'some', 'many', 'several'.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

109. Uses 'yesterday' and 'tomorrow' meaningfully.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

110. Asks meaning of new or unfamiliar words.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

111. Can tell when people are kidding them.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

112. Tells simple jokes and make truth distortions.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

113. Has developed a sense of humour.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

114. Tells of his/her daily experiences.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

115. Uses pronouns (e.g., he, she, them) consistently and correctly.

① ② ③ ④
No Fit Excellent Fit

If 'No Fit", item may be representative of _____ domain.

Now that you have rated the items, how well does the assessment material sample the language domain and/or observable behaviours representative of cognitive performance of preschoolers ages 4- to 5-years?

Are there items that you would recommend as 'having an excellent fit' that have been omitted from this item bank?

Appendix 2

UNIVERSITY OF SASKATCHEWAN
Parent Consent – Rating Form

Dear Parent,

You are invited to participate in a study entitled *Screening Cognitive Functioning in Preschool Children with Varying Health Conditions*. Please read this form carefully, and feel free to contact us with any questions you may have.

I am a graduate student at the University of Saskatchewan working on my Ph.D. in educational psychology. This study is designed to examine a typical range of thinking ability, reading skill, remembering, and attention to events for preschool children ages 4:0- to 5:11-years. I expect the results of this study to benefit at-risk groups of preschoolers (e.g., those diagnosed with various acute and chronic health conditions) that in many cases leads to poor school performance or poor social functioning. The results of this study are intended to provide a means for the early detection and intervention of impairments in at-risk preschool children to improve the chances for a positive school experience.

The purpose of the study is to develop a parent and teacher (i.e., kindergarten and play school) rating scale, based on observable ability in the areas of memory, attention, and language. The intent is to gain more information about typical (or average) preschool children so that at-risk preschool children can be compared to these norms to determine if they are falling behind.

The rating scale form you are asked to complete will not require any identifying information about the child other than age and gender. You are asked to consider recent and present observations about your child and then rate them on the 52 items in the questionnaire (not including the personal questions). This should take approximately 20-25 minutes to complete. There is no deception intended in collecting the data for this study. There are no significant risks anticipated for your child by participating in this study. The data collected will be used to facilitate the completion of the researcher's Ph.D. dissertation and results will only be reported as combined data to produce typical or average performance across the age groups. Due to the importance of this research for at-risk children, please be advised that the results of this study may be published and/or presented at conferences.

Your participation in rating your preschooler is entirely voluntary. You are free to withdraw from the process at any time and/or decline to respond to any particular question included on the rating scale.

There are two participation options listed below. As the preschooler's parent or guardian you will make the decision as to whether your child's teacher should also be permitted to rate your preschooler using the same rating scale. Please indicate your preference by marking an 'X' in the corresponding box:

☐ I agree to rate my child, but I do not agree with having the teacher conduct the same rating.

☐ I agree to rate my child and I also agree to having the teacher conduct the same rating.

If you agree to the option where you permit the teacher to rate your child, we need to know both their names to coordinate this with the teacher. *Please be advised that once the coded data (i.e., the two rating forms) are linked, the identifying information will be destroyed.*

_____
Child's Name (please print)

_____
Teacher's Name (please print)

_____
School

For whichever option you choose, please use the stamped, addressed envelope to mail all documents to my attention at the University of Saskatchewan. If you choose to permit the teacher to rate your child, please mail the forms back to me and I will contact the teacher about rating your child.

If you have any questions about the study, now, or at a later date, feel free to contact the researchers as listed below. This study has been approved on ethical grounds by the University of Saskatchewan Behavioural Research Ethics Board on April 12, 2005. Any questions regarding your rights as a participant may be directed to that committee through the Office of Research Services (966-2084). To find out the results of this study, you may contact the student researcher (Randy Duncan, at 966-2874), or the supervisor, Dr. Ivan Kelly (966-7715). The research data collected for this study will be securely stored in the office of Dr. Kelly for a period of not less than five years. These researchers are located in the Department of Educational Psychology & Special Education, College of Education, 28 Campus Drive, University of Saskatchewan, S7N 0X1.

Your signature indicates that you have read and understood the information provided above, that you willingly allow your child to participate, that you have received a copy of this form for your records, and that you may withdraw from the study at any time, for any reason, without penalty or consequences of any sort.

_

_____ _____
(Parent or Guardian's Signature) (Date)

_____ _____
(Signature of Researcher) (Date)

Department of Educational Psychology & Special Education
College of Education, University of Saskatchewan
28 Campus Drive, Saskatoon, SK, S7N 0X1

January 19, 2007

Dear Director,

Pursuant to our telephone discussion of January 19th, I have enclosed 40 packages for distribution to parents of preschool children ages 4:0- to 5:11-years. The package attached to this letter is a copy for you records of what is sent out to parents.

Whereas we are trying to obtain a large sample of parents of 'normally' or 'typically' functioning preschoolers, the instrument will ultimately be used for monitoring at-risk children with chronic health conditions. The result will be a brief screening instrument to be used by non-professionals in assessment, primarily parents. The final instrument will be shorter than this piloted version and have only 8 to 10 items for each domain of attention, memory, and language. The intention is that parents and/or kindergarten or playschool teachers use this screening instrument to monitor cognitive abilities as often as once a month if necessary. The overall result should be earlier interventions for children falling behind according to cut-off scores based on the normative sample.

We also want good variation in the normative sample. The only children that we would want to exclude are those with severe intellectual and learning disabilities. Parents with children having mild to moderate intellectual and learning disabilities are welcome to contribute to the normative sample.

We appreciate any effort on your part to promote the study with the parents at your facility. Whereas we would like to have the questionnaires completed and returned as soon as possible (within 2 weeks is preferable), we will certainly accept and include questionnaires received up to the end of February.

We intend on providing a summary of our findings on this project in spring 2007 to all the kindergartens, preschool programs, and daycares that assisted with the distribution of packages to parents.

Thank you for your interest and assistance with this research.

Sincerely,

_____

C. Randy Duncan, BA, MEd, PhD Candidate
Phone: (306) 966-7653 E-mail: randy.duncan@usask.ca

Department of Educational Psychology & Special Education
College of Education, University of Saskatchewan
28 Campus Drive, Saskatoon, SK, S7N 0X1

October 18, 2006

Dear Director,

You are invited to participate in a study entitled *Screening Cognitive Functioning in Preschool Children with Varying Health Conditions*. The purpose of the study is to develop a parent and teacher (kindergarten and playschool) screening instrument to rate observable cognitive abilities in preschool children ages 4:0- to 5:11-years.

I am a graduate student at the University of Saskatchewan working on my Ph.D. in educational psychology. This study will examine a typical range of thinking ability, language skill, remembering, and attention to events for preschool children ages 4:0- to 5:11-years. I expect the results of this study to benefit at-risk preschool groups (those diagnosed with various acute and chronic health conditions) that in many cases have led to poor school performance or poor social functioning. The results of this study may provide a means for the early detection and intervention of impairments in at-risk preschool children to improve their chances for a positive school experience. Please refer to the attached summary proposal of this study for more detailed information.

Data collection will involve kindergarten teachers and instructors in any structured playschool programs. The intent is to recruit a large sample of (n = 800) parents and teachers across several school divisions. The primary expectation for teachers will be to assist with the distribution of packages (i.e., screening instrument, consent form, debriefing form) to the parent(s) of preschoolers in kindergarten classes. The packages will be self-explanatory for the completion and return of the questionnaires. The package includes a stamped, self-addressed envelope so that the teacher need not participate in a collection procedure. The involvement of the teacher can stop at this point.

However, if there is any interest, a teacher could participate further by agreeing to assess a couple or even just one of their students. This requires that the respective parent(s) have completed a questionnaire and approved the teacher to also conduct a rating of their child. This process will be coordinated through me to ensure accurate coding of forms to conduct the inter-rater reliability analysis.

For any questions concerning the study, now, or at a later date, feel free to contact the researcher or the supervisor at the numbers provided below. This study has been approved on ethical grounds by the University of Saskatchewan Behavioural Sciences Research Ethics Board on April 27, 2005 (see attached letter of approval and ethics application). Any questions regarding your rights as a participant may be addressed to that committee through the Office of Research Services (966-2084). To find out the results of the study, you may contact the primary researcher (Randy Duncan, at 966-8259 or e-mail at randy.duncan@usask.ca), or the researcher's supervisor, Dr. Ivan Kelly (966-7715). Inquiries by mail can be directed to the Department of Educational Psychology & Special Education, College of Education, 28 Campus Drive, University of Saskatchewan, S7N 0X1.

Thank you for your time and attention to this request. I look forward to hearing from you at your earliest convenience.

Respectfully,

_____
C. Randy Duncan, BA, MEd, PhD Candidate

Department of Educational Psychology & Special Education
College of Education, University of Saskatchewan
28 Campus Drive, Saskatoon, SK, S7N 0X1
Phone: 966-8259, E-mail: randy.duncan@usask.ca

September 27, 2006

Dear Principal,

The purpose of this letter is to request approval to conduct research in your school. I have obtained the requisite approval for the study from Dr. Scott Tunison, the Coordinator, Research and Measurement (see attachment).

The study is titled *Screening Cognitive Functioning in Preschool-Age Children with Varying Health Conditions* and is a study about developing a brief cognitive screening instrument for assessing at-risk preschool children ages 4:0- to 5:11-years. I expect the results of this study to benefit at-risk groups of preschoolers (e.g., those diagnosed with various acute and chronic health conditions) that in many cases leads to poor school performance or poor social functioning. The results of this study are intended to provide a means for the early detection and intervention of impairments in at-risk preschool children to improve the chances for a positive school experience. The resulting instrument will fill a gap in assessment tools as there is currently no brief cognitive screening instrument available for use by parents and kindergarten teachers.

The study would require the involvement of the kindergarten teacher(s) in two ways: 1) initially their assistance with the distribution of the packages of materials (i.e., the rating form, parent consent form, return envelopes) to the parent(s); and 2) if kindergarten teachers wish to participate, carry out a rating of several of their students using the cognitive screening instrument (see attachment). The rating of any students by the respective teacher would only be carried out if the parent(s) provides their consent. In this regard, the packages distributed to the parent(s) will have a stamped, self-addressed return envelope included so that I can provide the coordination of any subsequent teacher assessments. The assessment of the kindergarten students is a rating of the frequency with which the children perform typical memory, attention, and language functions that relate to cognitive ability.

In addition to a copy of the Cognitive Ability Rating Scale, please find a copy of the parent consent form, the teacher consent form, and a brief introduction which provides more background on the study. Finally, I have attached an approval form along with a stamped, self-addressed envelope to assist with the reply process.

Thank you for your interest in this study. Along with my supervisor, Dr. Ivan Kelly (966-7715), we look forward to being able to work with you on this timely and relevant project.

Respectfully,

_____

C. Randy Duncan, BA, MEd, PhD Candidate
C. Randy Duncan
Department of educational Psychology & Special Education
College of Education
University of Saskatchewan
28 Campus Drive
Saskatoon, SK, S7N 0X

Re: Screening Cognitive Functioning in Preschool-Age Children with Varying Health Conditions

I have reviewed your request to conduct research and have decided to:

☐ **Approve** your study in _____ school.

The following conditions will apply:

_____
_____
_____
_____
_____
_____

☐ **Not approve** your study in _____ school.

If approved, please provide the name(s) of the kindergarten teacher(s) to be contacted:

1) _____
(Please print)
best contacted by:
a) Phone at _____

b) E-mail at _____

2) _____
(Please print)
best contacted by:
a) Phone at _____

b) E-mail at _____

_____ _____
(Name – please print) (Date)

_____
(Signature)

Department of Educational Psychology & Special Education
College of Education, University of Saskatchewan
28 Campus Drive, Saskatoon, SK, S7N 0X1

November 14, 2006

Dear Preschool Teacher,

Pursuant to our e-mail correspondence, I have enclosed 26 packages for distribution to parents of preschool children in your class. The package attached to this letter is a copy for you records of exactly what is sent out to parents.

Whereas we are trying to obtain a large sample of parents of 'normally' or 'typically' functioning preschoolers, the instrument will ultimately be used for monitoring at-risk children with acute and chronic health conditions. The result will be a brief screening instrument to be used by non-professionals in assessment such as parents. The final instrument will be somewhat shorter than this piloted version and have only 8 to 10 items for each domain of attention, memory, and language. The intention is that parents and/or kindergarten or playschool teachers use this screening instrument to monitor cognitive abilities as often as once a month if necessary. The overall result should be earlier interventions for children falling behind according to cut-off scores based on the normative sample.

We also want good variation in the normative sample. The only children that we would want to exclude are those with severe intellectual and learning disabilities. Parents with children having mild to moderate intellectual and learning disabilities are welcome to contribute to the normative sample.

We appreciate any effort on your part to promote the study with the parents at your institution. We intend on providing a summary of our findings on this project in spring 2007 to all the kindergartens, preschool programs, and daycares that assisted with the distribution of packages to parents.

Thank you for your interest and assistance with this research.

Sincerely,

_____

C. Randy Duncan, BA, MEd, PhD Candidate
Phone: (306) 966-8259
E-mail: randy.duncan@usask.ca

UNIVERSITY OF SASKATCHEWAN
Teacher Consent – Cognitive Ability Rating Form

Dear Teacher,

You are invited to participate in a study entitled *Screening Cognitive Functioning in Preschool Children with Varying Health Conditions*. Please read this form carefully, and feel free to contact us with any questions you may have.

I am a graduate student at the University of Saskatchewan working on my Ph.D. in educational psychology. This study is designed to examine a typical range of thinking ability, language skill, remembering, and attention to events for preschool children ages 4:0- to 5:11-years. I expect the results of this study to benefit at-risk groups of preschoolers (e.g., those diagnosed with various acute and chronic health conditions) that in many cases leads to poor school performance or poor social functioning. The results of this study are intended to provide a means for the early detection and intervention of impairments in at-risk preschool children to improve the chances for a positive school experience.

The purpose of the study is to develop a parent and teacher (i.e., kindergarten and playschool) rating scale, based on observable ability in the areas of memory, attention, and language. The intent is to gain more information about typical (or average) preschool children so that at-risk preschool children can be compared to these norms to determine if they are falling behind.

The rating scale form you are asked to complete will not require any identifying information about the child other than age and gender. You are asked to consider recent and present observations about your student and then rate them on the 52 items in the questionnaire (not including the personal information items). This should take approximately 20-25 minutes to complete. There is no deception intended in collecting the data for this study. There are no significant risks anticipated for the child by participating in this study. The data collected will be used to facilitate the completion of the researcher's Ph.D. dissertation and will only be reported as combined data to produce typical or average performance across the age groups. Due to the importance of this research for at-risk children, please be advised that the results of this study may be published and/or presented at conferences.

Your participation in rating any of your students is entirely voluntary. You are free to withdraw from the process at any time and/or decline to respond to any question included on the rating scale.

There are two levels of participation should you agree to participate in the study. The first level of participation is agreeing to assist with the distribution of the parent packages (i.e., parent consent forms and rating forms) to the parent(s) and/or guardian(s) of students in your class. The second level of participation would be you agreeing to conduct ratings for one or more or your students where prior consent has been received from the respective parent(s).

Please identify your preference by marking an 'X' in the corresponding box:

☐ I agree to assist with the distribution of the rating form packages, but do not agree to rate any of the students in my class.

☐ I agree to assist with the distribution of the rating form packages and I agree to rate one or more students where permission has been received from the parent(s).

☐ I am not interested in participating in the study at either of these levels.

For whichever option you choose, please use the enclosed stamped, self-addressed envelope to mail all the documents to my attention at the University of Saskatchewan. Even if you choose to not participate, I would appreciate getting the materials back so that I know who is willing to participate and will not bother you with a follow-up contact. The list of approved students will be forwarded to you as soon as it becomes available. To facilitate efficient communication, it would be helpful if you could provide both your e-mail address and a fax number:

E-mail: _____

Fax: _____

If you have any questions about the study, now, or at a later date, feel free to contact the researchers as listed below. This study has been approved on ethical grounds by the University of Saskatchewan Behavioural Research Ethics Board on April 12, 2005. Any questions regarding your rights as a participant may be directed to that committee through the Office of Research Services (966-2084). To find out the results of this study, you may contact the student researcher (Randy Duncan, at 966-2874), or the supervisor, Dr. Ivan Kelly (966-7715). The research data collected for this study will be securely stored in the office of Dr. Kelly for a period of not less than five years. Both of these researchers are located in the Department of Educational Psychology & Special Education, College of Education, 28 Campus Drive, University of Saskatchewan, S7N 0X1.

Your signature indicates that you have read and understood the information provided above, that you have received a copy of this form for your records, and that you may withdraw from the study at any time, for any reason, without penalty or consequences of any sort.

_____
(Name – please print)

_____ _____
(Teacher's Signature) (Date)

_____ _____
(Signature of Researcher) (Date)

UNIVERSITY OF SASKATCHEWAN
Student Identification Form

Dear Teacher,

If you agree to rate one or more of your students, we need to know their name(s) and the school to coordinate this. Where you have agreed to rate more than one student please ensure that this identification form is attached (preferably stapled) to the corresponding questionnaire. Please be advised that after we have linked the two forms for conducting the inter-rater reliability analysis, the identifying information will be destroyed.

_____
Child's Name (please print)

_____
Teacher's Name (please print)

_____
School

Please use the stamped, addressed envelope to mail all documents to my attention at the University of Saskatchewan.

If you have any questions about this phase of the study feel free to contact the researchers as listed below:

Randy Duncan, at 966-7653 or by e-mail at randy.duncan@usask.ca
or
Dr. Ivan Kelly (Faculty Supervisor), at 966-7715

University of Saskatchewan
Department of Educational Psychology & Special Education
College of Education
28 Campus Drive
Saskatoon, Saskatchewan
S7N 0X1

June 28, 2005

Dear Dr. ,

Thank you for agreeing to participate in a study entitled *Screening Cognitive Functioning in Preschool Children with Varying Health Conditions*. Should you have any questions throughout this validation process please feel free to contact me at (306) 966-2874 or by e-mail at crd401@mail.usask.ca . In addition you should feel free to contact either of my co-supervisors, Dr. Vicki Schwean (966-5246 or by e-mail at vicki.schwean@usask.ca) or Dr. Don Saklofske (966-7727 or by e-mail at don.saklofske@usask.ca).

The purpose of the study is to develop a first-level screening instrument for use by non-specialists (i.e., parents and playschool and kindergarten teachers) for rating at-risk preschool children on observable behaviours that are representative of cognitive performance. This brief rating scale will be based on the most developmentally sensitive markers that relate to easily observed behaviours in children ages 4:0 to 5:11- years. The intent is to identify the best items (markers) upon which to rate the frequency of performance of preschoolers in the three cognitive domains of memory, attention, and verbal functioning.

The conceptual framework for the study is contemporary information-processing, therefore, we are looking for items that will be similar for all ages within the 4:0- to 5:11-year age-range, but that will vary on the frequency of observed behaviour. For example, if a verbal functioning item was 'Can repeat a sentence of five words', parents in the pilot testing may rate typical performance across this age group as follows: a) a 4:0-year old as 1-Never or 2-Occasionally; b) a 4:11-year old as 4-Usually; and c) a 5:11-year old as 5-Consistently. Therefore, when you consider how representative the various items are within a specific domain we are also asking you to consider if the item would be useful in obtaining a range of responses for this age-group based on frequency of typical behaviour.

Your task is to judge the degree of fit between the items on the attached inventory and the domain characteristics (i.e., operational definition) to which the items are referenced. Using a four-point Likert-type rating scale anchored by endpoints of 0 (No Fit) to 4 (Excellent Fit), consider how well you think the item reflects the domain characteristics it was written to measure. If you select the response option of '0 (No Fit)', you are asked to consider if the item may have a fit with either of the other two domains of interest. Please keep in mind that this additional consideration when a '0 (No Fit)' response is selected, while potentially helpful to the process, is an optional exercise for judges. We would also encourage you to make any constructive comments on individual items (e.g.,

the use of 'words' is preferable to 'syllables' in an item stem for clarity with parents) in the margins of the form next to particular items.

Once you have judged the items on the attached rating form, you will notice space provided at the end for additional comments. The intent here is for you to make any recommendations you feel are appropriate for items that may have been omitted in compiling the item inventory that may improve the content validity of the instrument. It would also be beneficial if you could forward any comments you may have relative to the process in general.

The information you provide will contribute to reducing this item bank down to the 16-20 items that best represent each of the three domains. Given the four-point rating scale, we anticipate that suitable items will require a median score of 2.75 or higher in order to meet the criteria of item relevance. The resulting 48-60 items will then be incorporated into a draft screening instrument that will be reviewed by focus groups of parents and kindergarten/playschool teachers and then piloted to 800-1,200 parents and teachers.

Results from this project will be used for my dissertation, scientific publications, and presentations to professionals at national and international conferences. All responses obtained from you will remain confidential. Responses on any materials associated with the study will be identified by a code number and not by name. Data from this study will be kept in a secure location for at least five years. Your participation in this study is completely voluntary, and you may withdraw from the study at any time.

It would be appreciated if you could complete this judging process within two weeks of receiving this package. If you anticipate any significant delays, please contact me directly to provide for an extension to avoid being subjected to any unnecessary follow-up reminders.

Thank you for your time and interest in this study.

Sincerely,

_____

C. Randy Duncan, B.A., M. Ed.
Doctoral Candidate
Measurement and Evaluation
Department of Educational Psychology & Special Education
University of Saskatchewan

Appendix 3

Memory Judges' Ratings Summary

			Judges						
Item:	**1**	**2**	**4**	**5**	**6**	**7**	**8**	**Mdn:**	**R_k:**
1	3	4	4	4	4	4	2	4	3
***2**	**3**	**3**	**3**	**4**	**4**	**4**	**2**	**3**	**3**
3	2	3	2	3	2	4	1	2	4
***4**	**2**	**4**	**4**	**1**	**3**	**4**	**4**	**4**	**4**
***5**	**2**	**4**	**4**	**2**	**4**	**4**	**4**	**4**	**3**
6	nr	2	1	4	3	2	3	2.5	4
7	2	3	1	3	3	3	2	3	3
8	2	4	2	4	4	4	4	4	3
9	2	4	3	2	4	2	2	2	3
10	3	nr	2	4	3	4	2	3	3
11	4	3	2	4	3	4	1	3	4
***12**	**2**	**4**	**4**	**1**	**4**	**4**	**4**	**4**	**4**
13	2	2	1	4	2	2	2	2	4
14	2	3	1	nr	2	2	2	2	3
15	2	4	1	2	2	2	1	2	4
16	2	4	1	3	2	2	1	2	4
17	3	1	1	3	3	2	1	2	3
18	2	3	1	3	3	1	1	2	3
19	3	1	2	3	3	4	3	3	4
20	3	2	2	4	3	4	1	3	4
21	4	1	1	4	3	4	3	3	4
22	2	3	2	2	3	1	1	2	3
***23**	**3**	**4**	**3**	**4**	**3**	**4**	**3**	**3**	**2**
***24**	**3**	**4**	**3**	**4**	**4**	**4**	**3**	**4**	**2**
25	4	3	2	nr	3	4	1	3	4
***26**	**2**	**4**	**4**	**1**	**4**	**4**	**4**	**4**	**4**
27	2	4	4	1	3	4	2	3	4
28	4	1	2	3	3	1	3	3	4
29	2	3	1	4	2	1	1	2	4
30	2	4	1	4	4	1	2	2	4
31	2	3	1	3	4	3	3	3	4
***32**	**2**	**4**	**3**	**4**	**4**	**4**	**4**	**4**	**3**
33	2	1	1	3	2	1	1	1	3
***34**	**2**	**4**	**3**	**4**	**4**	**3**	**4**	**4**	**3**
35	2	2	3	4	3	3	1	3	4
36	2	2	4	3	4	4	4	4	3
37	4	1	1	3	2	1	nr	1.5	4
38	3	1	1	3	3	1	1	1	3
39	4	1	1	3	3	1	1	1	4
***40**	**2**	**4**	**3**	**4**	**4**	**4**	**4**	**4**	**3**
41	2	4	2	4	4	2	3	3	3
***42**	**4**	**4**	**2**	**4**	**4**	**3**	**4**	**4**	**3**
43	2	4	3	4	4	4	2	4	3
44	2	2	2	4	3	4	2	2	3
***45**	**4**	**2**	**3**	**4**	**4**	**4**	**4**	**4**	**3**

46	4	3	1	nr	3	4	1	3	4
47	2	4	2	3	3	2	3	3	3
***48**	**4**	**4**	**4**	**1**	**4**	**4**	**4**	**4**	**4**
***49**	**3**	**4**	**4**	**1**	**4**	**4**	**4**	**4**	**4**
50	3	2	1	2	3	2	2	2	3
51	2	2	1	1	1	2	1	1	2
***52**	**4**	**3**	**4**	**3**	**4**	**4**	**4**	**4**	**2**
***53**	**3**	**2**	**4**	**4**	**4**	**4**	**4**	**4**	**3**
54	3	3	2	4	4	2	3	3	3
55	3	4	1	2	3	2	3	3	4
56	3	3	1	4	4	2	2	3	4
***57**	**3**	**2**	**4**	**4**	**4**	**3**	**4**	**4**	**3**
59	3	2	4	1	4	4	2	3	4
***60**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**1**
61	2	1	1	3	3	1	2	2	3
***62**	**4**	**2**	**3**	**4**	**4**	**4**	**4**	**4**	**3**
***63**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**1**
***64**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**1**
65	2	3	4	1	4	4	2	3	4

Verbal Ability Judges' Ratings Summary

					Judges	Ratings				
Item:	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**9**	**Mdn:**	**R_k:**
1	2	2	1	1	4	2	2	2	2	4
2	2	3	4	3	4	2	2	4	3	3
3	3	3	4	2	4	2	3	2	3	3
4	3	4	4	3	3	2	3	2	3	3
5	4	1	2	2	2	2	2	2	2	4
6	1	3	2	2	2	nr	4	2	2	4
***7**	**3**	**4**	**4**	**3**	**3**	**3**	**4**	**4**	**3.5**	**2**
8	4	3	3	3	2	2	1	2	2.5	4
9	1	2	nr	2	1	2	3	1	2	3
10	2	4	nr	2	4	2	1	2	2	4
11	4	3	4	2	4	3	4	4	4	3
12	4	2	4	2	1	4	3	4	3.5	4
13	2	3	4	3	4	2	3	3	3	3
***14**	**4**	**4**	**4**	**3**	**4**	**nr**	**4**	**2**	**4**	**3**
15	4	4	4	2	3	1	3	2	3	4
16	4	3	2	2	1	1	2	1	2	4
17	4	4	4	2	3	3	2	4	3.5	3
18	4	4	4	3	4	2	2	2	3.5	3
19	4	4	3	2	2	2	4	4	3.5	3
20	4	3	2	3	4	3	2	2	3	3
21	4	4	3	2	2	2	2	2	2	3
22	2	4	4	2	3	3	2	2	3	3
23	2	4	4	2	2	1	2	2	2	4
***24**	**4**	**4**	**3**	**3**	**3**	**4**	**3**	**4**	**3.5**	**2**
25	4	3	1	2	1	1	1	2	1.5	4
26	4	3	3	2	3	3	2	2	3	3
27	2	3	3	3	4	nr	2	3	3	3
28	4	2	3	2	3	1	2	3	2	4
29	4	3	3	3	3	nr	2	2	3	3
30	4	2	nr	2	2	nr	3	2	2	3
31	4	4	4	2	3	nr	4	3	3.5	3
32	3	2	1	2	2	1	4	1	2	4
***33**	**3**	**4**	**4**	**2**	**4**	**4**	**4**	**1**	**4**	**4**
34	1	2	1	1	nr	1	3	3	1.5	3
***35**	**4**	**4**	**4**	**3**	**4**	**4**	**4**	**4**	**4**	**2**
36	1	1	1	1	1	2	4	1	1	2
37	2	2	3	1	1	1	1	4	**1.5**	4
38	4	4	1	1	1	1	2	2	1.5	4
***39**	**4**	**3**	**3**	**2**	**4**	**3**	**3**	**3**	**3**	**3**
40	4	3	4	3	2	1	1	2	2.5	4
41	3	3	3	2	2	1	3	2	3	4
42	2	3	3	2	3	3	4	4	3	3
43	3	1	3	2	4	2	3	2	2.5	4
44	2	2	nr	2	1	1	4	2	2	4
45	nr	2	3	2	2	2	3	3	2.5	3
46	3	3	3	2	2	2	3	2	2.5	3

47	4	3	3	2	2	2	2	2	2	3
48	2	3	3	3	3	2	3	3	3	3
***49**	**4**	**4**	**3**	**2**	**3**	**4**	**4**	**4**	**4**	**3**
50	3	4	3	3	3	3	4	4	3	3
51	2	3	3	2	3	3	3	4	3	3
52	2	3	3	3	3	1	4	4	3	4
53	4	1	1	2	2	1	3	2	2	4
54	4	3	3	2	3	1	3	2	3	4
***55**	**4**	**4**	**3**	**3**	**3**	**4**	**4**	**2**	**3.5**	**3**
56	**2**	**4**	**3**	**2**	**4**	**4**	**3**	**3**	**3**	**3**
57	2	2	3	1	4	2	2	1	2	4
58	3	4	3	2	3	3	4	2	3	3
59	4	4	3	2	3	2	4	3	3	3
***60**	**4**	**4**	**3**	**2**	**3**	**3**	**3**	**4**	**3**	**3**
61	3	2	1	2	2	2	2	2	2	3
62	4	3	4	3	4	2	3	2	3	3
***63**	**4**	**3**	**4**	**2**	**4**	**3**	**3**	**4**	**3.5**	**3**
64	4	4	4	2	2	2	4	4	4	3
65	nr	3	2	2	4	4	3	3	3	3
66	1	3	1	2	4	1	3	1	1.5	4
67	3	3	1	3	4	nr	3	2	3	4
68	nr	2	nr	2	4	4	4	1	3	4
69	1	3	3	2	3	4	4	1	3	4
70	1	3	3	2	3	3	4	1	3	4
71	2	3	3	3	4	2	3	1	3	4
72	nr	4	3	2	4	2	2	1	2	4
73	2	3	3	2	4	2	2	2	2	3
74	3	2	nr	1	2	2	2	2	2	3
75	1	3	nr	2	1	1	3	2	2	3
76	3	3	4	2	1	2	2	2	2	4
77	2	3	3	3	4	2	4	2	3	3
78	3	3	3	2	4	3	3	2	3	3
79	4	1	3	1	1	1	1	1	1	4
***80**	**4**	**4**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**
81	3	3	3	2	3	3	2	2	3	2
82	2	3	1	1	1	2	2	2	2	3
83	3	4	3	2	2	2	3	2	2.5	3
84	3	3	3	2	2	2	3	2	3	3
85	4	3	4	2	4	3	4	2	3.5	3
***86**	**4**	**4**	**4**	**3**	**3**	**3**	**2**	**4**	**3.5**	**3**
87	4	3	4	2	2	3	2	4	3	3
88	4	3	nr	3	4	2	4	2	3	3
89	3	3	3	2	3	nr	2	4	3	3
***90**	**4**	**2**	**3**	**3**	**4**	**nr**	**3**	**4**	**3**	**3**
***91**	**4**	**3**	**3**	**2**	**4**	**3**	**3**	**4**	**3**	**3**
92	1	4	1	2	4	1	3	1	1.5	4
93	3	3	4	3	4	1	3	1	3	4
94	2	4	4	3	3	3	4	2	3	3
95	2	4	3	2	4	2	3	1	2.5	4
96	2	2	nr	2	2	2	3	2	2	2

97	1	1	1	1	1	1	1	1	1	1
98	2	3	3	1	4	2	3	1	2.5	4
99	2	2	1	1	2	1	2	2	2	2
100	**4**	**2**	**4**	**3**	**4**	**3**	**2**	**4**	3.5	3
***101**	**4**	**3**	**4**	**3**	**4**	**4**	**3**	**3**	**3.5**	**2**
***102**	**4**	**3**	**4**	**3**	**3**	**4**	**3**	**3**	**3**	**2**
***103**	**4**	**4**	**4**	**2**	**4**	**3**	**3**	**3**	**3.5**	**3**
104	3	3	2	2	1	2	3	2	**2**	3
105	4	3	3	2	2	2	2	2	**2**	3
106	3	2	3	1	1	1	3	nr	**2**	3
107	4	3	3	2	3	2	2	2	**2.5**	3
108	4	4	3	2	3	2	2	2	**2.5**	3
***109**	**4**	**3**	**3**	**3**	**4**	**3**	**3**	**2**	**3**	**3**
***110**	**3**	**2**	**3**	**3**	**4**	**3**	**3**	**3**	**3**	**3**
111	1	3	1	2	4	1	2	4	**2**	4
112	2	3	1	2	3	1	2	3	**2**	3
113	2	3	1	2	1	1	3	2	**2**	3
114	3	3	2	3	4	3	4	2	**3**	3
***115**	**4**	**3**	**4**	**3**	**4**	**3**	**3**	**4**	**3.5**	**2**

Attention Judges' Rating Summary

	Ratings									
	1	**2**	**3**	**5**	**6**	**7**	**8**	**9**		
Item:									**Mdn:**	**R_k:**
1	2	2	4	2	3	4	2	4	2.5	3
***2**	**3**	**4**	**3**	**2**	**3**	**4**	**3**	**4**	**3**	**3**
***3**	**3**	**2**	**3**	**3**	**3**	**4**	**3**	**4**	**3**	**3**
4	2	2	2	1	nr	4	1	1	2	4
5	1	2	1	1	3	nr	1	3	1	3
6	3	nr	3	1	4	nr	2	3	3	4
7	3	2	2	2	3	2	1	3	2	3
8	1	1	3	3	3	1	2	3	2	3
9	1	1	1	2	2	1	2	2	1.5	2
10	1	2	1	3	3	2	2	1	2	3
11	1	2	1	3	3	1	2	1	1.5	3
12	1	1	1	1	2	1	1	1	1	2
***13**	**4**	**4**	**3**	**2**	**3**	**4**	**4**	**4**	**4**	**3**
***14**	**3**	**4**	**3**	**3**	**3**	**4**	**2**	**3**	**3**	**3**
15	3	1	3	3	4	4	3	2	3	4
16	2	1	3	3	4	4	3	3	3	4
17	2	1	4	2	3	4	3	3	3	4
18	4	1	2	4	3	4	3	3	3	4
19	2	1	3	2	2	4	3	3	2.5	4
20	1	1	4	4	4	4	3	nr	4	4
21	4	1	3	3	2	2	3	2	2.5	4
22	1	1	2	3	2	2	1	1	1.5	3
23	1	1	2	3	nr	3	1	3	2	3
24	2	1	3	3	4	3	2	1	2.5	4
25	4	2	3	3	3	2	2	4	3	3
26	1	2	1	3	3	1	1	1	1	3
27	3	2	4	3	2	3	2	4	3	3
28	1	1	1	1	2	2	1	1	1	2
29	3	1	3	2	4	4	3	3	3	4
***30**	**4**	**1**	**3**	**3**	**3**	**4**	**3**	**3**	**3**	**4**
31	4	1	3	2	2	4	3	4	3	4
32	3	1	3	3	2	4	3	nr	3	4
33	3	1	3	3	2	4	3	4	3	4
34	3	1	2	nr	2	1	3	2	2	3
35	nr	1	1	4	1	3	2	4	2	4
36	3	1	1	nr	2	3	2	2	2	3
***37**	**4**	**4**	**3**	**3**	**2**	**4**	**4**	**2**	**3.5**	**3**
***38**	**4**	**4**	**3**	**nr**	**3**	**4**	**3**	**4**	**4**	**2**
39	**4**	**4**	**3**	**nr**	**3**	**4**	**3**	**4**	**4**	**2**
40	1	4	1	4	2	2	1	1	1.5	4
41	2	2	1	4	2	4	1	1	2	4
42	2	3	4	nr	3	3	1	1	3	4
***43**	**4**	**3**	**3**	**3**	**3**	**3**	**2**	**4**	**3**	**3**
44	4	2	2	3	3	3	2	1	2.5	4
45	2	2	3	4	3	4	3	1	3	4

46	nr	1	2	3	2	4	2	1	2	4
47	3	2	3	3	3	2	2	1	2.5	3
48	1	1	1	3	2	2	1	1	1	3
49	4	1	2	3	3	2	1	1	2	4
50	1	1	2	3	2	2	1	1	1.5	3
51	4	2	1	3	2	3	1	1	2	4
52	4	2	3	2	3	4	2	4	3	3
53	2	2	3	3	2	1	2	1	2	3
54	4	2	3	3	nr	3	2	3	3	3
55	2	1	3	4	2	1	3	1	2	4
56	3	1	2	4	2	4	3	3	3	4
***57**	**4**	**3**	**4**	**3**	**1**	**4**	**3**	**4**	**3.5**	**4**
58	3	1	2	4	2	4	2	3	2.5	4
59	3	2	2	3	1	3	3	1	2.5	3
60	4	3	3	1	2	1	3	3	3	4
***61**	**4**	**4**	**3**	**nr**	**1**	**3**	**3**	**4**	**3**	**4**
***62**	**4**	**4**	**4**	**4**	**1**	**4**	**3**	**4**	**4**	**4**
63	1	3	2	3	1	3	4	3	3	4
64	3	4	4	1	2	2	3	4	3	4
65	1	3	nr	3	2	3	3	2	3	4
66	1	4	2	2	2	3	1	4	2	4
67	4	1	2	3	3	4	1	2	2.5	4
68	4	2	1	1	1	3	2	1	1.5	4
***69**	**4**	**4**	**3**	**3**	**2**	**4**	**3**	**4**	**3.5**	**3**
***70**	**4**	**4**	**4**	**3**	**2**	**4**	**3**	**4**	**4**	**3**
***71**	**4**	**4**	**4**	**1**	**3**	**3**	**3**	**4**	**3.5**	**4**
72	3	3	2	1	2	3	3	4	3	4
73	2	2	4	2	1	3	2	3	2	4
74	2	2	2	3	1	3	2	2	2	3
75	4	4	2	1	2	4	3	4	3.5	4
76	1	1	1	3	2	2	2	1	1.5	3
77	2	2	1	4	3	3	3	4	3	4
78	2	1	2	3	1	4	2	4	2	4
79	nr	1	3	4	1	3	3	2	3	4
***80**	**3**	**3**	**4**	**4**	**2**	**4**	**3**	**nr**	**3**	**3**
81	4	1	2	4	2	4	3	3	3	4
82	3	2	2	3	1	4	4	2	2.5	4
83	1	1	1	3	2	3	1	1	1	3
84	3	3	3	3	1	4	3	1	3	4
***85**	**4**	**4**	**2**	**nr**	**3**	**4**	**3**	**4**	**4**	**3**
86	4	3	3	2	1	3	3	1	3	4
87	1	1	1	2	1	2	2	1	1	2
88	4	2	3	3	1	3	3	1	3	4
89	4	2	4	3	2	3	3	3	3	3
90	4	2	2	4	2	2	2	3	2	3
91	4	2	3	3	2	3	2	1	2.5	4

Where the draft questionnaire items were adapted from:

	Questionnaire Number
Portage Guide to Early Education:	
Answers telephone, calls for adult or talks to a familiar person.	31
Repeats rhymes, songs, or dances for others.	17,21
Explains rules of game or activity to others.	57
Plans and builds using simple tools (inclined planes, fulcrum, lever, pulley).	51
Plays 'dress-up' in adult clothes.	48
Acts out parts of story, playing part or using puppets.	48
Names big and little objects.	33
Describes two events or characters from familiar story or TV program.	26
Recalls four objects seen in a picture.	16
Names time of day associated with activities. (TV program?)	25
Repeats familiar rhymes.	17
Tells what is missing when one object is removed from a group of three.	24
Retells five main facts from story heard several times.	26
Sings five lines of a song.	21
Answers question "what's … doing?" for common activities.	32
Carries out a series of two related commands.	28
Asks question, "What's this (that)?".	30
Uses some class names (toy, animal, food).	37
Will attend for five minutes while a story is read.	47
Expresses future occurrences with 'going to', 'have to', 'want to'.	36
Tells two events in order of occurrence.	35
Uses contractions can't, don't, won't.	39
Uses words sister, brother, grandmother, grandfather.	40
Tells familiar story without pictures for cues.	27
Names picture that does not belong in particular class (one that's not an animal).	37
Tells address.	13
Tells phone number.	20
Tells daily experiences.	18,19
Puts together and tells 3-5 part sequence story.	42
Uses yesterday and tomorrow meaningfully.	44
Asks meaning of new or unfamiliar words.	45
Attends to music or stories 5 – 10 minutes.	47
Greets familiar adults without reminder.	31
Matches objects with picture of same object.	24
Places objects, in, on and under upon request.	29

BASC:

Parent:	
Has trouble concentrating.	55,54
Is easily distracted.	49
Cannot wait to take turn.	53
Gives up easily.	52,56, 61
Listens attentively.	50,58
Teacher:	
Is easily distracted from classwork.	49
Makes careless errors.	59
Has a short attention span.	55,61

Children's Memory Scale:

Numbers Subtest;	
The examinee is asked to repeat digit sequences of graduated length.	14
Word Lists Subtest;	
The examinee is asked to learn a list of words presented in four trials.	11,12
Family Pictures Subtest;	
The examinee is asked to identify which family members were in the picture, where they were, and what they were doing.	22,16
Stories Subtest;	
The examinee is asked to listen to two stories read by you. Immediately after hearing each story, ask the examinee to retell it from memory.	26,27

Bayley Scales of Infant Development (2nd Edition):

Classifies objects from a stimulus booklet.	37
Relates temporal sequence of events.	18
Identifies three incomplete pictures from a stimulus booklet.	24
Discriminates sizes in a stimulus booklet.	33
Remembers a sequence.	11,12, 15

The Bzoch-League Receptive-Expressive Emergent Language Scale (2nd Edition) for the Measurement of Language Skills in Infancy:

Regularly can now basically relate experiences from the recent past (what happened while he or she was out or separated from parent).	18
Demonstrates an understanding of several prepositions (such as in, on top of, on, under, in front, behind, etc.).	34
Now can carry out up to three or more verbal commands given in one long utterance.	28,32

Asks questions and shows interest in explanations of ‘why’ things are and ‘how’ things function.	41,45
Uses several verb forms correctly in speech or relating what is going on in action pictures (like throwing, swinging, talking, etc.).	35,36

Appendix 5

The University of Saskatchewan

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S7N 0X1

Cognitive Ability Rating Scale

A Brief Screening Form

For

The Measurement of Memory, Attention and Language in Preschool Children

(Ages 4- to 5-Years)

Dear Parent or Teacher,

Please complete all the questions in each section as this will assist in providing a more reliable and valid interpretation of the results for the child. For Sections C, D and E please fill in the circle that best corresponds to your rating of the child on that item.

Please complete all the items before scoring the sections of the questionnaire. When you are satisfied that you have completed the form to the best of your ability you can then go back and transfer the number corresponding to the filled in circle for each question to the column under 'Rating' as per the example:

① Not at All	② Rarely	③ Sometimes	④ Usually	⑤ Consistently

Rating:

My child watches Dora the Explorer on TV. ① ② ● ④ ⑤ ➪ __3___

A. Child's Information:

1. Child's Gender:

O Male O Female

2. Child's Age:

O 3 years to 3 years, 6 months
O 3 years, 7 months to 4 years
O 4 years to 4 years, 6 months
O 4 years, 7 months to 5 years
O 5 years to 5 years, 6 months
O 5 years, 7 months to 6 years

3. Child's involvement in a pre-school program:

O not attending any structured pre-school program
O attending or has completed a play school program
O attending or has completed kindergarten

4. Child's ethnic status:

O Aboriginal (First Nations)
O Aboriginal (Mètis)
O Caucasian
O Asian
O Other, please specify _____

5. What best describes the child's place of residence?

O Urban with a population > 30,000
O Urban with a population < 30,000
O Rural
O Northern

B. Rater's Information:

6. Gender:

O Male O Female

7. My relationship to the child is:

- O Parent as a primary caregiver
- O Parent as an equal caregiver
- O Parent unable to be an equal caregiver (reduced role)
- O Primary caregiver other than a parent (e.g., guardian, grandparent)
- O Play school teacher
- O Kindergarten teacher

8. Please identify the highest level of education you have attained:

- O Grade 11 or less
- O High School graduate
- O Post-secondary courses, but have not completed a degree, diploma, or certificate
- O Technical Institute, Regional College, Business School graduate, etc.
- O University graduate

9. If you are a parent of the child, please identify your parental status:

- O Single parent
- O Two parent family

C. Memory Factor:

Please rate the child's ability to do the following memory tasks on the basis of the frequency with which you can observe (or have observed) them doing the activity. Please think of the child's performance along a range of ability with endpoints of 1 (Not at All) to 5 (Consistently). Please complete all items before writing the number under 'Rating' and adding the scores.

① Not at All	② Rarely	③ Sometimes	④ Usually	⑤ Consistently

Rating:

10. Tells their correct age when asked. ① ② ③ ④ ⑤ ⇨ _____

11. Can repeat a sentence with 3 Words (e.g., kitty ran away) ① ② ③ ④ ⑤ ⇨ _____

① Not at All	② Rarely	③ Sometimes	④ Usually	⑤ Consistently

Rating:

12. Can repeat a sentence of 5 words. ① ② ③ ④ ⑤ ⇨ _____
13. Knows their house address. ① ② ③ ④ ⑤ ⇨ _____
14. Knows the name of the city/town they live in (or closest to). ① ② ③ ④ ⑤ ⇨ _____
15. Can repeat 4 numbers (in the same order as presented) when asked. ① ② ③ ④ ⑤ ⇨ _____
16. Recalls 3 objects seen in a picture. ① ② ③ ④ ⑤ ⇨ _____
17. Repeats familiar rhymes. ① ② ③ ④ ⑤ ⇨ _____
18. Can remember events (e.g., going to McDonalds) from the previous week. ① ② ③ ④ ⑤ ⇨ _____
19. Knows other children's names in their daycare, playschool, or kindergarten class. ① ② ③ ④ ⑤ ⇨ _____
20. Tells his/her phone number when asked. ① ② ③ ④ ⑤ ⇨ _____
21. Sings at least 5 lines of a familiar song. ① ② ③ ④ ⑤ ⇨ _____
22. Retells a story (from a picture book) with reasonable accuracy. ① ② ③ ④ ⑤ ⇨ _____
23. Remembers an emergency phone number (e.g., 911). ① ② ③ ④ ⑤ ⇨ _____
24. Tells what is missing when one object is removed from a group of three. ① ② ③ ④ ⑤ ⇨ _____

① Not at All	② Rarely	③ Sometimes	④ Usually	⑤ Consistently

Rating:

25. Remembers the time of day for their favourite TV show. ① ② ③ ④ ⑤ ⇨ _____

26. Retells 5 main facts from a story heard several times. ① ② ③ ④ ⑤ ⇨ _____

27. Tells familiar story without pictures for cues. ① ② ③ ④ ⑤ ⇨ _____

Total Score Memory Factor

Please transfer the total score for the Memory Factor to the last page of this booklet into the 'Raw Score' column of the summary table.

D. Language Factor:

Please rate the child's ability to do the following language tasks on the basis of the frequency with which you can observe (or have observed) them doing the activity. Please think of the child's performance along a range of ability with endpoints of 1 (Not at All) to 5 (Consistently). Please complete all items before writing the number under 'Rating' and adding the scores.

① Not at All	② Rarely	③ Sometimes	④ Usually	⑤ Consistently

Rating:

28. Follows commands related to actions (e.g., run fast, talk quietly). ① ② ③ ④ ⑤ ⇨ _____

29. Responds to commands using 'on', 'under', 'up', 'down'. ① ② ③ ④ ⑤ ⇨ _____

30. Asks questions, What's this (that)? ① ② ③ ④ ⑤ ⇨ _____

① Not at All	② Rarely	③ Sometimes	④ Usually	⑤ Consistently

Rating:

31. Can answer the telephone and talk to a familiar person. ① ② ③ ④ ⑤ ⇨ _____

32. Answers simple 2-step questions (e.g., How do you turn on the TV?). ① ② ③ ④ ⑤ ⇨ _____

33. Tells if an object is big or little. ① ② ③ ④ ⑤ ⇨ _____

34. Understands three common prepositions (e.g., on, in, under, between). ① ② ③ ④ ⑤ ⇨ _____

35. Uses the correct order to ask questions (e.g., can I, does he). ① ② ③ ④ ⑤ ⇨ _____

36. Can express future events with 'going to', 'have to', and 'want to'. ① ② ③ ④ ⑤ ⇨ _____

37. Names an object that does not belong in a particular class (e.g., one that's not an animal). ① ② ③ ④ ⑤ ⇨ _____

38. Understands the use of passive sentence (e.g., girl was hit by a boy). ① ② ③ ④ ⑤ ⇨ _____

39. Uses contractions like, 'can't', 'don't', 'won't' correctly. ① ② ③ ④ ⑤ ⇨ _____

40. Uses relationship words such as 'sister', 'brother', 'grandmother'. ① ② ③ ④ ⑤ ⇨ _____

41. Answers 'why' questions with an explanation. ① ② ③ ④ ⑤ ⇨ _____

42. Can tell a 3-5 part story in the correct order. ① ② ③ ④ ⑤ ⇨ _____

43. Can tell the opposite of common words (e.g., short - tall, close - far). ① ② ③ ④ ⑤ ⇨ _____

① Not at All	② Rarely	③ Sometimes	④ Usually	⑤ Consistently

Rating:

44. Uses words like 'yesterday' and 'tomorrow' meaningfully. ① ② ③ ④ ⑤ ⇨ _____

45. Asks the meaning of new or unfamiliar words. ① ② ③ ④ ⑤ ⇨ _____

46. Uses pronouns (e.g., he, she, them) consistently and correctly. ① ② ③ ④ ⑤ ⇨ _____

Total Score Language Factor

Please transfer the total score for the Language Factor to the last page of this booklet into the 'Raw Score' column of the summary table.

E. Attention Factor:

Please rate the child's ability to do the following attention tasks on the basis of the frequency with which you can observe (or have observed) them doing the activity. Please think of the child's performance along a range of ability with endpoints of 1 (Not at All) to 5 (Consistently). Please complete all items before writing the number under 'Rating' and adding the scores.

① Not at All	② Rarely	③ Sometimes	④ Usually	⑤ Consistently

Rating:

47. Attends to music or stories for at least 5 minutes. ① ② ③ ④ ⑤ ⇨ _____

48. Engages in make-believe play for 10 minutes. ① ② ③ ④ ⑤ ⇨ _____

49. Easily distracted from tasks by typical household noises. ① ② ③ ④ ⑤ ⇨ _____

① Not at All	② Rarely	③ Sometimes	④ Usually	⑤ Consistently

	Rating:
50. Doesn't listen to what is said.	① ② ③ ④ ⑤ ⇨ _____
51. Can use blocks to build simple structures (e.g., enclosures like animal pens or yards).	① ② ③ ④ ⑤ ⇨ _____
52. Can do an activity (e.g., play with toys, watch TV) for at least 15 minutes.	① ② ③ ④ ⑤ ⇨ _____
53. Has trouble waiting for events (e.g., rewards, birthdays, etc.).	① ② ③ ④ ⑤ ⇨ _____
54. Takes some time to think about things before starting a task.	① ② ③ ④ ⑤ ⇨ _____
55. Has trouble concentrating.	① ② ③ ④ ⑤ ⇨ _____
56. Can remain at a 10 to 12 minute task until it is completed.	① ② ③ ④ ⑤ ⇨ _____
57. Has difficulty organizing tasks or activities.	① ② ③ ④ ⑤ ⇨ _____
58. Often fails to follow instructions or fails to finish chores.	① ② ③ ④ ⑤ ⇨ _____
59. Makes careless mistakes.	① ② ③ ④ ⑤ ⇨ _____
60. Can do "Simon Says' types of activities.	① ② ③ ④ ⑤ ⇨ _____
61. Avoids or has difficulty with tasks needing longer periods of attention.	① ② ③ ④ ⑤ ⇨ _____

Total Score Attention Factor

Please transfer the total score for the Attention Factor to the last page of this booklet into the 'Raw Score' column of the summary table.

F. Observations and General Comments:

Do you consider these ratings of the child's performance to be typical of their abilities in:

Memory:	O	Yes	O	No
Language:	O	Yes	O	No
Attention:	O	Yes	O	No

If No, for any of these three areas of cognitive ability, please provide a reason (e.g., was not as alert or active as usual, was upset about something, was not feeling well, etc.) in the space provided below:

Thank you for participating in this study!

G. Scoring:

Shaded portion for administrative use only!

Summary Table: ↓

Factor:	**Raw Score**	3-Years Cut-off Score	4-Years Cut-off Score	5-Years Cut-off Score	Classification
Memory 18 Items (Max. Score 90)					
Language 19 Items (Max. Score 95)					
Attention 15 Items (Max. Score 75)					
Total 52 Items (Max. Score 260)					

↑