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INDIVIDUALS WITH FETAL ALCOHOL SPECTRUM DISORDER (FASD):
PREDICTIVE FACTORS FOR SUCCESSFUL OCCUPATIONAL PERFORMANCE

by

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ABSTRACT

INDIVIDUALS WITH FETAL ALCOHOL SPECTRUM DISORDER (FASD):
PREDICTIVE FACTORS FOR SUCCESSFUL OCCUPATIONAL PERFORMANCE

By Mary Culshaw, MSc, BScOT

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University

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As awareness and diagnoses of FASD grow in Canada, there is increased need to support these individuals across their lifespan. One study suggested the prevalence of FASD may be as high as 10 per 1000 births (May & Gossage, 2001). The impact to society is growing as well, since this population requires support across their lifespan due to cognitive and sometimes physical impairments. It was estimated that the annual cost to Canadians was \$53 billion (in 2007 dollar value) to support individuals aged 0-53 years (Stade et al., 2009). There is mounting evidence identifying the cognitive and

physical impairments that these individuals have, particularly in children. Studies have also described the adaptive functioning of children with FASD, and their ability to cope in daily life. There is little information on youth and adults regarding their daily lives, and the factors that contribute to success in daily life.

The purpose of this study was to identify predictive factors that contribute to success in occupational performance in youth and adults with FASD. Using the Canadian Model of Occupational Performance and Engagement (CMOP-E), the study explored variables reflecting the person, environment, and activity that promoted engagement and participation. The study also investigated the value of using self-report or performance-based assessment with the FASD youth and adult population. Due to memory, cognitive, and executive functioning deficits, the individual with FASD may not be able to accurately self-report.

Results from the study suggest an individual's living situation, involvement with foster care, and family involvement play a role in successful occupational performance. Formal assessments of cognitive, academic and memory abilities did not appear to play a role in the individual's school completion and daily life. Interestingly, the characteristics of this FASD sample depicted a group of youth and adults, who, in general, lived with family, had completed some schooling at the grade 10-12 level, had limited employment, were not involved with the judicial system, and were just as likely to be Caucasian as Aboriginal. The concept of occupational performance proved complex, and future study on the factors contributing to occupational performance would benefit from additional variables related to environment and activity than were available in the current data set.

Chapter 1: Introduction

Awareness of Fetal Alcohol Spectrum Disorder (FASD) in North America is increasing. With this comes growing identification of children and adults whose functioning is affected by prenatal exposure to alcohol. Research has ascertained cognitive functioning is consistently compromised in children, adolescents, and adults with FASD (Murthy, Kudlur, George & Mathew, 2009). Sensory processing, the ability to appropriately react to sensation from the environment, is impaired as well (Abele-Webster, Magill-Evans & Pei, 2012). It is also known that individuals with FASD have great difficulty in adaptive functioning and participating effectively in daily activities (Whaley, O'Connor & Gunderson, 2001). Little is known of the factors that predict outcomes in daily functioning in the FASD population.

Exploring daily functioning of individuals with FASD through the lens of occupational performance can give a more complete picture of the many factors that can impact an individual's functioning. This is essential in order to provide efficient and effective support throughout the lifespan. Occupational performance considers not just the person, but also the environment and occupation, which contribute to successful participation in daily life (McColl, Law, Stewart, Doubt, Pollock & Krupa, 2003). In this dissertation, the use of the term "individual" includes the wide age range within the youth and adult since the study sample included youth and adults. This also allows for

differences in classification of adults, which can be by age of majority and can vary by political and geographical boundaries.

In addition to determining the factors contributing to successful occupational performance, it is important to determine if the variables of interest appropriately and accurately reflect the individual's functioning. Accurately measuring function and abilities in individuals with FASD may be a challenge due to their cognitive deficits. Many assessments used in the diagnosis of FASD include self-report. The accuracy of self-report is dependent on several cognitive processes, and is affected by the wording, format, and content of the questions (Schwarz, 1999). Self-report has been found to be inaccurate in typical populations as well as people with cognitive impairments, highlighting the need for multiple methods of assessment (Baxter & Norman, 2011; Ross & Oliver, 2003). Examining the accuracy of self-report in this population is crucial in order to validate assessment and research findings.

Scope and Societal Implications of FASD

The effect on the fetus by a mother's consumption of alcohol has been known for many years. In the 1700s, children of alcoholic women were described as weak, feeble, and distempered (Calhoun & Warren, 2007). In North America, the first articles describing Fetal Alcohol Syndrome (FAS) were published in the early 1970s (Jones & Smith, 1973; Jones, Smith, Ulleland & Streissguth, 1973). Publication of the characteristics and diagnosis of FAS continued throughout the 1970s and 1980s (Institute of Medicine, 1996; Jones & Smith, 1973). Those publications described a new syndrome that contained moderate to severe cognitive disabilities, higher than average infant mortality, microcephaly, with physical changes including facial irregularities and

small stature (Armstrong, 1995). Armstrong (1995) emphasized the societal and moral aspect in the development of the diagnosis, as the articles focused on alcoholic women. One early view was if the woman was an alcoholic then the child would naturally have FAS and FAS features on a child proved a woman's alcoholism. Research in the 1970s into FAS was "hidden" within larger studies due to the lack of recognition of the syndrome and belief that prenatal exposure to alcohol could cause such problems (Warren & Hewitt, 2009).

In 1996, the additions of Alcohol Related Neurodevelopmental Delay (ARND) and Fetal Alcohol Effects (FAE) into the nomenclature demonstrated the advancement of the field and the need to accurately diagnose a child who did not meet the criteria for FAS (Institute of Medicine, 1996). Diagnosis was further defined when Astley and Clarren (2000) introduced the 4-Digit Diagnostic Code in an effort to provide accurate and consistent diagnosis. This diagnostic process used Likert scale scores on growth, facial features, alcohol exposure, and neurodevelopmental delay to determine a four digit code for the individual, which was then translated into a descriptive term. Using this process, Canadian guidelines were recommended in 2005, which have been adopted by multidisciplinary clinics throughout Canada (Chudley, et al., 2005). This process has allowed for more refined, systematic, and reliable diagnosis, including the breadth of the effects. The term FAS now only includes severely affected individuals, while FASD includes the scope of all individuals affected.

Incidence of FAS does not appear to have changed over the last decades, despite the increased knowledge of FAS and public awareness campaigns. Most of the literature cites rates of FAS ranging from 3-9 per 100 live births, although rates up to 18

participants per 100 live births have been noted (Burd & Moffatt, 1994; Center for Disease Control, 2012; May et al., 2014; Popova, Stade, Bekmuradov, Lange & Rehm, 2011). Most investigators accept that these rates may be an under representation of true rates and do not include all individuals with diagnoses under the umbrella term of Fetal Alcohol Spectrum Disorder (FASD) (Calhoun & Warren, 2007). Some Aboriginal populations in North America have been shown to have higher rates of incidence of FAS; however, the data and methods of these studies remain questionable (Burd & Moffatt, 1994). Some authors query the incidence and severity of FASD in aboriginal populations, as these individuals may be more likely to be identified due to involvement with government services (Burd & Moffatt, 2011). The difficulty in obtaining accurate incidence rates has been linked to inconsistent reporting and diagnostic procedures. The Government of Canada, with the adoption of the 4-Digit Diagnostic Code, is expecting an improvement in the validity and reliability of the diagnosis leading to more accurate statistics (Government of Canada, 2007). Based on current birth statistics information and a prevalence rate of 1% of the population, it can be estimated at least 3700 infants were affected by maternal alcohol consumption in Canada in 2014 (Statistics Canada, 2014; Popova, Lange, Bekmuradov, Mihic & Rehm, 2011). Since this is a life-long disability, the implication for society grows each year.

During a systematic review of Canadian cost analysis studies, the monetary implications of FASD were found to be considerable (Popova, Stade, et al., 2011). On an individual level, annual costs were estimated to be \$21,642 (95% CI, \$19,842; \$24,041) (Stade et al., 2009). Total annual costs for FASD in Alberta in 2007 dollars ranged between \$48 million (low incidence rate) to \$143 million (high incidence rate).

The authors state that FASD is a serious public health problem and current cost estimates under estimate the true costs of FASD. Nationally, the annual cost to Canada, in 2007 dollars, for individuals aged 0-53 years was estimated to be \$5.3 billion (95% CI, \$4.12 billion; \$6.4 billion) (Stade et al., 2009).

Societal costs such as involvement with child welfare, criminal justice, special education, mental health services, and specific medical services for physical abnormalities can also be significant and are not included in many cost estimations. For example, Popova and colleagues (Popova, Stade, et al., 2011) reported that 60% of persons with FAS/FAE had been involved with the criminal justice system and approximately 50% of the children in the child welfare system in Alberta have FASD. One study revealed a startling 90% of adults with FASD had mental health and/or medical issues (Spohr & Steinhausen, 2008). These costs are absorbed by the different public welfare systems, contributing to inaccuracies in cost estimation without acknowledging the pressures put on these social services.

Adults with FASD continue to use different public welfare systems throughout their lives at a higher rate than typical individuals. Recognizing the limitations of the few cohort and longitudinal studies conducted (low sample numbers and different diagnostic/inclusion criteria) some statistics have been reported: 90% of individuals with FASD have secondary mental health problems, only 29.5% of these individuals live independently, only 13.5% obtained vocational training or were able to earn a living while 80% required assistance with daily living skills (Spohr & Steinhausen, 2008). With support these individuals can have increased independence and success with their daily lives (McFarlane, 2011). These individuals require ongoing and consistent supports

that are individualized. Unfortunately, many individuals do not receive accurate and timely diagnosis. By the time they are adults, this can lead to involvement with the criminal justice system, breakdown of informal and familial support, and poor socio-economic outcome. Proper assessment and support of adults requires a comprehensive team to address legal, housing, employment, and parenting issues (McFarlane, 2011).

Significance of Need

To promote independence for individuals with FASD, thus lessening the financial cost to society, effective intervention and support need to be implemented and maintained. Understanding the trajectory towards independence for FASD can allow support to be tailored for the individual. The measurement of adaptive function has been used in the literature to identify an individual's ability to participate in activities of daily living and their level of independence. Adaptive functioning refers to those skills that allow one to live safely from day to day including conceptual, social, and practical life skills (Reynolds, Zupanick & Dombeck, 2014). The challenges in applying existing understanding of adaptive functioning to adults with FASD are several. While articles have described the adaptive functioning of children and youth with FASD, little information is available on adults with FASD. Further, investigators have recognized that intelligence and memory individually are contributing factors to adaptive functioning but have not investigated other cognitive functions that are also impacted in FASD such as learning and communication (Whaley, et al., 2001). The existing research is limited to those activities included on the adaptive functioning questionnaires. As well, research has not explored the impact of the environment on successful adaptive

functioning. Studying the cognitive and physical factors of the individual as well the environment, along with the activity demands would give a more complete picture of the level of independence in individuals with FASD. The Canadian Model of Occupational Performance and Engagement (CMOP-E) is used in the current study to accomplish this. The CMOP-E incorporates the environment, person, and activity to describe occupational performance, and emphasizes that the interaction between the three is essential to successful engagement in daily living (Townsend, 2002).

Identifying optimal predictors of independent living may be a challenge. Assessment of adaptive functioning in adults is typically accomplished through the use of self-report questionnaires. Accurate self-report can be difficult for individuals with intellectual disabilities (Balboni, Coscarelli, Giunti & Schalock, 2013). There are multiple cognitive processes required for an individual to answer a question and complete a questionnaire such as memory, language comprehension, insight in personal behaviors, and problem solving (Fleming, Kennedy, Fisher, Gill, Gullo & Shum, 2009; Schwarz & Oyserman, 2001). In addition to these, the accuracy of self-report in a typical person can be influenced by the type of question, the format of the questionnaire, and the topic (Schwarz, 1999). In order to address the question of independence in daily in individuals with FASD, it first needs to be determined if current assessment techniques of adaptive behavior are accurate with this population.

Adaptive Functioning and FASD. One definition of adaptive functioning is “how well a person handles common demands in life and how independent they are compared to others of a similar age and background” (Community Living British Columbia, n.d.). The American Association on Mental Retardation defines adaptive

functioning as those conceptual, social, and practical skills that are learned in order to function in daily life (Schalock & Luckasson, 2004). Both definitions highlight the expression of the skills is the focus rather than simply the acquisition. A person may be able to learn a skill (acquisition) but also needs to use the skill in everyday life (expression). The measurement of this concept is frequently done through assessments of adaptive behavior, such as the assessment chosen in this study the Adaptive Behavior Assessment Scales (ABAS-II). Adaptive behavior is seen as those behaviors that allow a person to engage in constructive activities (Liss et al., 2001). For the purposes of clarity, the term adaptive functioning will be used in this dissertation as this term is more closely related to occupational performance. Although researchers have found an inverse relation between adaptive living abilities and cognitive abilities in certain populations (Njarvik, Matson & Cherry, 1999), it is the individual's adaptive functioning, not cognitive level, that determines success in daily living (Liss et al., 2001). Social interaction, communication skills, and cognition combine to play a role in adaptive functioning. Liss et al. (2001) highlight the importance of determining the development of adaptive functioning as a way of identifying the nature of the underlying deficits. Understanding how inadequate adaptive functioning development serves as a barrier to daily life allows intervention to be targeted to address the deficits.

Research shows a pattern of poor adaptive functioning skills across the age span for individuals with FASD (Whaley et al., 2001; Jirikowic, Olson & Kartin, 2008; Streissguth, 1993). A longitudinal study of 90 adults with FAS, followed for 20 years, demonstrated significantly lower rates of success in employment, education, and independent living (Spohr & Steinhausen, 2007). In the sample, 80% required

assistance with activities of daily living while 60% left schooling early or had breaks in their education. Petrenko, Tahir, Mahoney & Chin (2014) in their study, recognized the importance of other factors (family support, stable and nurturing home environment, and ongoing support services) that can mitigate secondary issues such as involvement with the justice system, drug and alcohol abuse, and poor school outcomes in this population.

Research has also found that deficits in adaptive functioning in individuals with FASD increase with age, starting in childhood. Whaley et al. (2001) examined adaptive functioning in 33 children with FAS and 33 matched controls, aged six years, finding that 21.5% of the FAS sample scored within average range. As the age increased, the FAS group displayed a more significant decline in socialization skills. The authors suggest that the FAS sample was young and the trend towards poorer adaptive functioning with increase in age may be an important factor to consider. These difficulties in functioning were not significantly related to intelligence or home placements. Other factors may be involved.

Similar to socialization, social communication, and behavior issues (including disruptive and uncooperative behavior) have been linked to decreased adaptive functioning in children. Using the Scales of Independent Behavior-Revised (SIB-R), Jirikowic et al. (2008) found that 48% of a group of children with FASD scored at least one standard deviation below the mean, and were functioning at an age level significantly younger than the typically developing group. A limitation to this study was the use of a single measurement of functioning, in this case the SIB-R. To explore all aspects of daily functioning, it is worthwhile to consider exploring the problem through

the lens of occupational performance. Occupational performance describes the interaction between the person, environment, and activity; it is not limited to specific activities.

Theoretical Framework: Canadian Model of Occupational Performance and Engagement

Theories are recognized to be significant in the research process (Portney & Watkins, 2009). The use of a theory allows researchers to make predictions on the outcomes of their study and to guide the development of hypotheses. Occupation is comprised of daily activities that fall within self-care, productivity, and leisure while occupational performance is the person's ability to engage in purposeful, daily activities (McCull et al, 2003). The Canadian Model of Occupational Performance and Engagement (CMOP-E) explains the complex concept of occupational performance (Townsend, 2002). This model is the best fit for the study of daily functioning success in individuals with FASD. See Figure 1 for visual depiction of the model.

The CMOP-E places the person at the core of the model (Townsend & Polatajko, 2007). This is the central, yellow section in the diagram. Spirituality, at the core of the person, reflects personal core beliefs; not just religious beliefs but how the person believes in himself. The CMOP-E identifies three performance components: affective (feeling), cognitive (thinking), and physical (doing). The environment, the outside green portion, surrounds the person and includes not only the physical environment but also the institutional, cultural, and social environments. Occupational performance (productivity, self-care, leisure) is the link between the environment and the person.

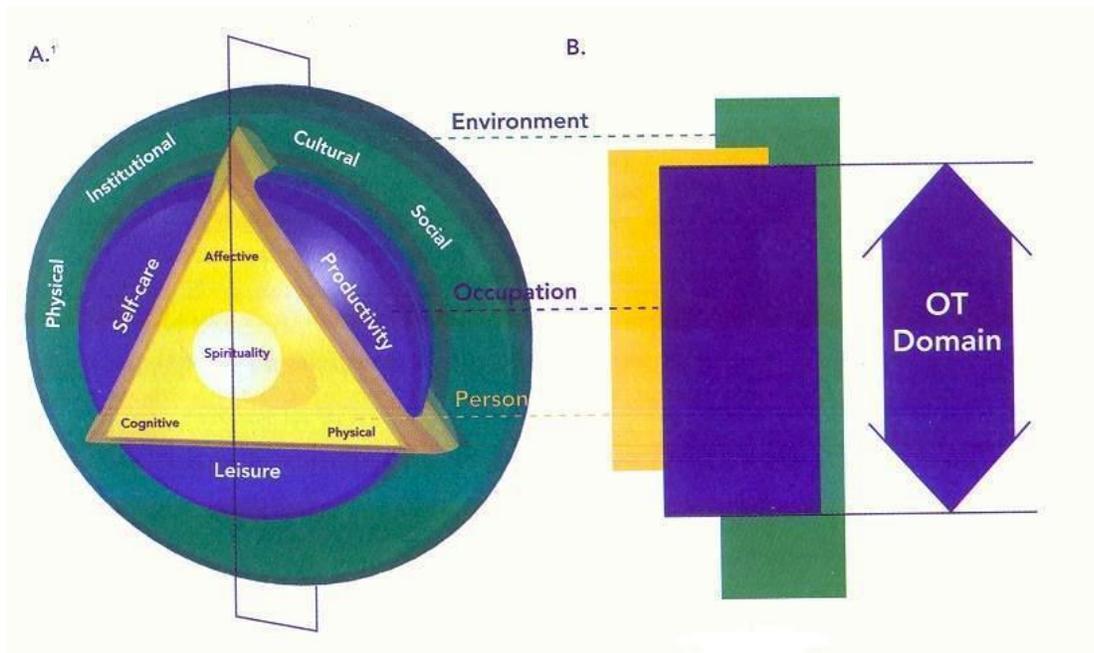


Figure 1. The Canadian Model of Occupational Performance and Engagement (p.23, Townsend & Polatajko, 2007). Used with permission from the Canadian Association of Occupational Therapists.

The person interacts with the environment through activities of daily living.

Occupational therapy focuses on the person's occupational performance, that is, their interactions with the environment, while respecting the personal factors that may impact occupational performance. The occupation therapy domain is indicated on right side of the model as seen in Figure 1, corresponding to the blue occupational performance section on the model.

This model recognizes that personal factors are fluid and will have a different impact on different environments. For example, a person's cognitive abilities may have little impact on one lifting task, while thinking of a new way to lift may be advantageous in another task. As mentioned earlier, the affective or feeling component is significant.

This component also incorporates a person's mental health and gives understanding to their internal motivation.

According to the CMOP-E, it is the person-occupation-environment fit that contributes to success (Townsend & Polatajko, 2007). It is the lack of fit that leads to decreased participation. While personal components may lead to poor fit, it may also be the occupation itself and the environment, or a combination of all components. For example, it is determined that a person fails to bathe every day, indicating a lack of independence in daily living. However, in examining the environment more closely, it is determined that the person's hot water heater is broken, and he does not have the money to fix it. Here, the environment (shower), occupation (daily bathing), and person (lack of money to fix water heater) combined to lead to a poor fit. Once the elements contributing to the lack of fit are identified, then appropriate steps can be taken to remedy the situation. Is it useful to teach the person how to fix the heater or is it better to find funding to get the heater fixed? Engagement includes the individual's motivation and personal interest in an activity, rather than completing an activity because of necessity.

On a more macro level, researching the components of occupational performance allows for knowledgeable decisions to be made for policy making and program planning. Specifically, understanding the underlying factors contributing to occupational performance in adults with FASD can lead to a more complete picture of the person-occupation-environment fit for this population. Policy and program planning can then be tailored to address the primary factors leading to failure in daily living tasks, thus allowing more efficient and effective support of these individuals. The CMOP-E

provides the framework to guide research into the daily living of adults with FASD.

Using the person, environment, and occupation, the CMOP-E offers the opportunity to explore the relationships between the components that combine in these factors.

Occupational Performance and Adaptive Functioning. Examining adaptive functioning, the individual's ability to participate in activities of daily living does not include examining the purpose or meaning of the activity. Occupational performance and the CMOP-E take a larger view on success in daily living by including the impact of the environment and engagement in meaningful activities (Townsend, 2002). Within the CMOP-E, it is recognized there are many activities, tasks, and skills required for a person to be successful in daily life and that these may change from day to day as well. Adaptive functioning identifies personal factors such as communication and social skills and, depending on the assessment tool, how these impact specific occupational performance skills such as self-care. Bathing is included in typical assessment of adaptive functioning as an activity of self-care, but not the environment in which the bathing is done (Harrison & Oakland, 2002). In the bathing example above, the person would have been identified as having decreased self-care skills and poor adaptive functioning for bathing. However, the problem was not in the *person's ability* to bath, but instead it was with the larger environment and resources available to the person. Using adaptive functioning alone as a framework one can learn if a person can do the task, but not if whether he wants to, and not the barriers to success. Consideration of the person-occupation-environment fit is required to make evident a more complete picture of performance (Townsend, 2002).

Examined through the lens of the CMOP-E, the routinely used definition of adaptive functioning, and the approach to researching this concept, begins to be too simplistic to explain a person's ability to participate in activities. Adaptive functioning in the literature is frequently defined by the assessment used in the study (Liss et al., 2001; Mattson, Dempsey & Fodstad, 2009; Whaley et al., 2001). Social skills, communication, and self-care are common areas assessed in examining adaptive functioning as they are domains in the Vineland Adaptive Behavior Scales and other assessments (Jirikowic et al., 2008; Whaley et al., 2001). However, they represent only components of the bigger picture. More information regarding the multifaceted interaction between environmental, family, and personal factors is needed to fully understand how a person can participate in occupations (Law, 1991; Strong, Rigby, Stewart, Law, Letts & Cooper, 1999). These concepts are at the core of occupational performance theories.

Occupational Performance and Activities of Daily Living. Activities of daily living (ADL) typically refer to self-care tasks that a person engages in throughout the day (Edwards, 1990); self-care is one component of occupational performance as defined in the CMOP-E. Basic ADLs includes personal activities such as bathing, dressing, and eating while Instrumental ADLs include those activities that allow a person to live in a community such as transportation, banking, and shopping (Edwards, 1990). Formal activities of daily living are those that include rules and specified roles for the people participating, such as a soccer game. Informal activities are typically initiated by the person with no planning or rules, such as hanging out with friends.

The difference between occupational performance and activities of daily living is that occupational performance includes those activities that are meaningful and purposeful. Daily activities may or may not be meaningful for an individual. Participation in activities through occupational performance allows the person to engage in and provide meaning to their life (Law, 1991). Participation includes formal and informal activities (Law, 1991).

Occupational Performance and the Importance of Environmental Factors.

The environment, which includes physical, social, cultural, and institutional factors, impacts occupational performance. Environmental concepts are crucial in the understanding of occupational performance and are considered in the CMOP-E as well as other models of occupational performance. Authors accept that the environment can change during a day for a person, both socially and physically, which will impact their ability to participate (McColl et al., 2003). The CMOP-E highlights the importance of the social aspect of environment (Townsend, 2002). Culture and societal influences within environment are emphasized, since they can bias a person towards interaction in an environment and bring significant barriers to participation. Kielhofner (2008) highlighted that culture gives a lens on how a person perceives the environment and defines how we interact with it. For example, a person who does not feel as though they belong in a situation or environment culturally will choose to avoid it, decreasing their participation in daily life.

Different environments hold different behavioral expectations, or environmental press, as unwritten rules that a person must be aware of in order to participate (Kielhofner, 2008). For example, a coffee shop may have comfortable chairs and tables

facilitating conversation with friends. A library may have areas with couches and low tables, but in contrast, here the expectation is for engagement in quiet activities, such as reading and similar activities done individually. Participation within each environment includes understanding unwritten rules; cues from the physical environment (e.g. comfortable chairs) are not enough for appropriate participation.

Within the social factors are those that relate to family. They comprise the family's socioeconomic status and psychosocial support from family members and can impact participation in daily activities (Law, 2002; Townsend, 2002). Participation in leisure activities is frequently impacted by finances. The person and family may be unable to cover the costs for a sport, such as the cost of equipment and travel. Familial expectations and psychosocial support can sway a person's participation. Law (2002) emphasized that having familial psychosocial support promotes engagement in meaningful activity. When a person is encouraged and supported, then he is more likely to continue with an activity or choose to enter into a new activity. The popular media frequently report stories of how the support of the parents allowed an athlete to advance to an international level (CBC Radio Canada, 2014). The CMOP-E recognizes that to enable a person to achieve a goal and occupation, the family unit is crucial (Townsend, 2002). Families need to be supported in the enabling process for a person, so they can do so in a respectful and thoughtful manner (Townsend, 2002).

Occupational Performance and the Importance of the Person. The CMOP-E factors for the person are physical, including motor movement, communication, cognition, and affective factors, such as thoughts and feelings (Townsend, 2002). The use of motor and memory skills enhances a person's performance and promotes

engagement in occupations (Baum & Law, 1997). Occupational performance considers not only the cognitive abilities of the person, but also how they use those abilities to participate effectively. For instance, a person with poor memory for names may use problem solving skills to overcome the deficit by adding new people to the contact list in their cell phone, with a picture. Further, routine assessment of components such as cognition can determine if the person has poor memory, but do not address the impact of this deficit on the person's functioning in daily life, or the compensatory skills the individual has developed to address the issue.

The psycho-social aspect of the person, which includes the ability to make conscious choices or decisions on whether to participate in an activity, is dependent on a person's values, feelings of personal capacity/effectiveness and interests. The person may be competent to participate in an activity, but if he does not feel he has the skills or the interest then he may choose not to participate. A person needs to believe they have the self-efficacy to participate, which comes from their life experiences, current situation, and emotional state.

Roles and habits overlay the person factors to allow an individual to organize their daily life and effectively participate in different daily occupations (Kielhofner, 2008). Roles can be explicit, but are typically implicit, which can be a barrier to people. Using the example of the library, a reader's role includes being quiet at all times, respectful of other's space and caring for the books. The CMOP-E views routines and habits to be important within occupational performance (Townsend, 2002). Driving a car is initially very cognitively demanding, but once mastered the act becomes a habit and allows the person to concentrate on the external environment and possible safety issues. People

may need to change their routines and habits in order to continue to participate in occupations (Townsend, 2002). For instance, buying groceries at a different store may require that a person change their routine of going only to the familiar isles to find the things on their list; they may now need to browse the store to identify new locations for their items. If a person does not have the flexibility or learning ability to change then they risk losing that occupation or becoming ineffectual in the occupation.

The CMOP-E is a framework through which to explore occupational performance in individuals with FASD. Successful occupational performance is based on the interaction between environment, occupation, and person. The focus of this study is to examine the relationship between these factors as they relate to FASD and successful occupational performance. To date, no study has explored which factors or groups of factors most contribute to successful occupational performance in individuals with FASD. Occupational performance, the engagement in meaningful and purposeful activities that allow participation in daily life, is difficult to operationalize. Identifying and defining daily activities or factors that may be meaningful or purposeful to an individual also poses challenges. This study included those variables that appeared to most closely relate to the term “occupational performance”.

In examining occupational performance in this study it was necessary to carefully consider the secondary data source. Some of the data tools included in this study used self-report by the subjects. As noted earlier, individuals with FASD are known to have cognitive limitations including memory and executive functioning (EF) (Pei, Job, Kully-Martens & Rasmussen, 2011; Rasmussen, 2005). In the literature on FASD, authors have suggested that memory and EF play a role in success in daily living (Chudley et

al., 2007). This may also affect an individual's capacity to accurately self-report on previous events, personal abilities, and aspects of their behavior. Based on this concern it was necessary to determine the relationship between self-report questionnaires and performance-based assessment of daily skills. Examining these two data sources relative to memory and EF provided further information relative to the individual's ability to complete the assessments.

Research Questions, Hypotheses, and Significance

Aim One: Comparing Self-Report and Performance Based Assessment of Functioning. Research has shown that typically functioning individuals have difficulty accurately assessing their own performance or characteristics (Baxter & Norman, 2011; Stone, Broderick, Schwarz & Schwarz, 2008). Self-report inaccuracies in reporting behavior and aspects of daily functioning can be further increased due to the nature of the question, formatting of the assessment as well as biases (Schwarz & Oyserman, 2001). Over the decades research has identified response biases against the content and format of questionnaires which decrease the response accuracy (McGrath, Mitchell, Kim & Hough, 2010). Examples of these natural biases are: inconsistent response (random or careless responses), responses to the extremes or middle, and responses giving a positive or negative impression. McGrath et al. (2010) speculate that the area of response accuracy may be the most researched area in applied psychological measurement. Even though response accuracy has been greatly studied over the decades, it remains an issue regardless of the population being measured.

Self-report has been researched on specific populations with cognitive impairments. Some studies indicate individuals with cognitive disabilities have difficulty

accurately judging their performance/functioning (Breuk, Clauser, Stams, Slot & Doreleijers, 2007; Edwards, 1990; Söderström, Pettersson & Nilsson, 2014). Study participants also had greater variability and inconsistencies in their report than independent observers. Research on youth with brain injuries and subsequent cognitive impairment showed some correlation with independent observers in the identification of depressive and anxiety symptoms, but low to negative correlation on behavior traits (Viguier, Dellatolas, Gasquet, Martin & Choquet, 2001). There remains some disagreement among studies on the extent of correlation between self-report of individuals with cognitive impairments and independent observers (Balboni et al., 2013).

Individuals with FASD have well documented difficulties with cognition (Pei, et al., 2011; Rasmussen, 2005). Children with FASD demonstrate poor encoding in memory tasks, leading to poor recall (Pei et al., 2011). Research has clearly demonstrated individuals with FASD have poor executive functioning (Mattson, et al., 2009; Pei et al., 2011; Rasmussen, 2005). Executive functioning uses primary cognitive processes together for an individual to accurately perform task (Stuss, 2011; Miyake, Friedman, Emerson, Witzki, Howerter & Wager, 2000). This would include using estimation and inferences to answer a question, or respond to a question about. No studies have reported on the accuracy of self-report in individuals with FASD. This knowledge is crucial to any research and assessment into this population, to determine the most useful method of assessment.

This project explored the uncertainty regarding adequacy of self-report in individuals with FASD before examining the bigger issues relative to how available data related to or predicted? occupational performance. Data was available from both self-

report and performance based tools. The ABAS-II is a self-report, norm-referenced instrument that measures areas of adaptive functioning (Harrison & Oakland, 2002). The defined areas include: Conceptual, Practical, Community Use, Home Living, Self-Care, Functional Academics, Social, Community, Leisure, Health and Safety, Self-Direction, and Work. It is described as being an inclusive measure of a person's ability to function in daily life. This was compared against the Independent Living Scales (ILS), which is an individually administered test of daily living skills (Loeb, 1996). It is divided into five subscales: Memory/Orientation, Managing Money, Managing Home and Transportation, Health and Safety, and Social Adjustment. Within a one-to-one testing environment, an individual completes a variety of tasks and answers questions on situations that occur in daily life. The first aim of the study was to examine differences in findings from each tool, and pending findings, consider whether to include both or a single assessment in looking at occupational performance in the second aim. Schwarz & Oyserman, (2001) argue self-report can be flawed in individuals with no disability. With the addition of cognitive impairments, the likelihood of inaccurately answering a self-report questionnaire can increase (Schmidt, et al., 2010). Schmidt et al. (2010) recommend a combination of caregiver and self report to gain a more accurate representation of the individual's functioning. There is little literature comparing self-report and performance, and examining it here seemed essential. These assessment results were also examined relative to executive functioning, memory, and cognition (Figure 2). Stronger correlations would be linked with higher capability because aspects of these higher level functions influence adaptive function. Table 1 delineates specific aim 1, research questions, and hypotheses.

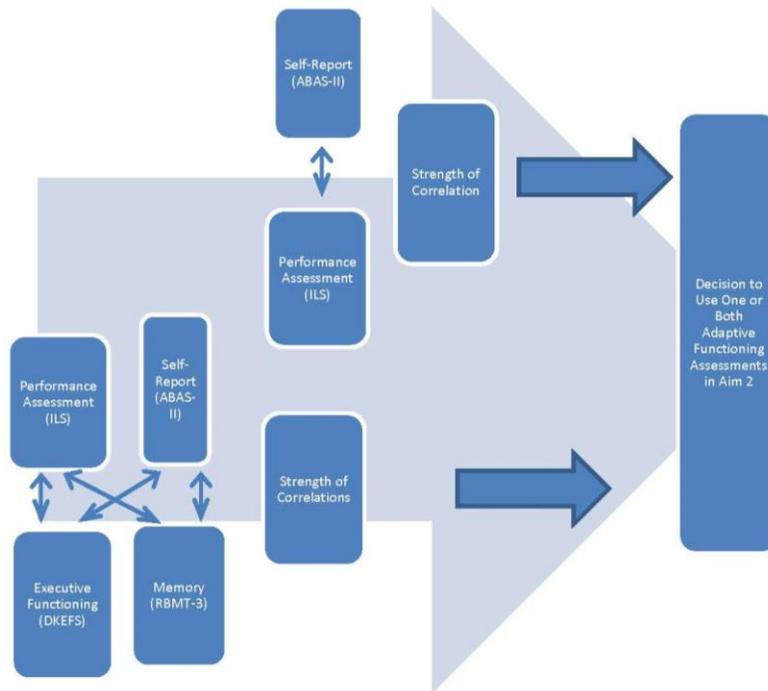


Figure 2. Analyses for Aim One.

Table 1

Aim One with Research Questions and Hypotheses

Aim	Research Questions	Hypotheses
1. To examine the relationship between performance based assessment of functioning, self-report assessment of adaptive functioning, and aspects of executive functioning in adults with FASD	1) What is the relationship between scores for adults with FASD on the Adaptive Behavior Assessment System Second Edition (ABAS-II) and the Independent Living Scales (ILS)?	H1 The full scale standard score on the ILS will have a positive correlation with the General Adaptive Composite (GAC) score on the ABAS-II.
	2) What is the relationship between executive functioning, memory, the General Adaptive Composite (GAC) score on the ABAS-II, and the full-scale standard score on the ILS?	H2 Executive functioning, shown through Delis-Kaplan Executive Functioning System (DKEFS) sub tests, will be positively related to GAC scores on the ABAS-II, and the full-scale standard score on the ILS. H3 Memory, shown by the Full Scale Score on the RBMT-3, will be positively related to GAC scores on the ABAS-II, and the full scale score on the ILS.

Aim Two: Predicting Occupational Performance in Individuals with FASD.

Much of the literature has focused on confirming the cognitive/neurological components that are impacted by FASD. Children and adults with FASD have characteristic deficits in language, cognition, learning, attention, sensory processing, and memory (Davis, Desrocher & Moore, 2010). Individuals with FASD have poorer quality of life than non-affected adults, they rely more on social systems for support (e.g., housing and income) and have greater involvement with the legal system (Lupton, Burd & Harwood, 2004; Spohr & Steinhausen, 2008). There is no literature exploring the predictive factors regarding person components that lead to the lack of success in occupational performance.

Successful occupational performance is based on the interaction between an individual, the environment, and purposeful activity (Townsend, 2002). To better understand a person's success or failure in occupational performance, it is crucial to consider the interactions of factors that comprise the person, environment, and activity. This study included variables that linked to the person and activity. The key factors in the CMOP-E that are part of the person include the physical, socio-cultural, psycho-emotional and cognitive/neurological (McColl et al., 2003). These factors were partially represented in the current study, by memory, learning abilities, executive functioning, socio-economic history and mental health issues. The individual's socio-cultural variables that were included to reflect social environment were: involvement in foster care, and current living situation.

Examining successful participation in daily life (occupational performance) is somewhat more complex, focusing on single activities or groups of activities and

determining the relationship between person, environmental factors and activity. Adaptive functioning is defined by the occupational performance areas evaluated, typically assessing communication, social skills, and self-care. Because the ABAS-II and ILS may give some insight into the individual's ability to complete specific activities and tasks, the two assessments are categorized in this study under the occupational performance factor.

Using an occupational performance approach, these variables listed in Figure 3 explore the person factors that contribute to successful participation in daily life.

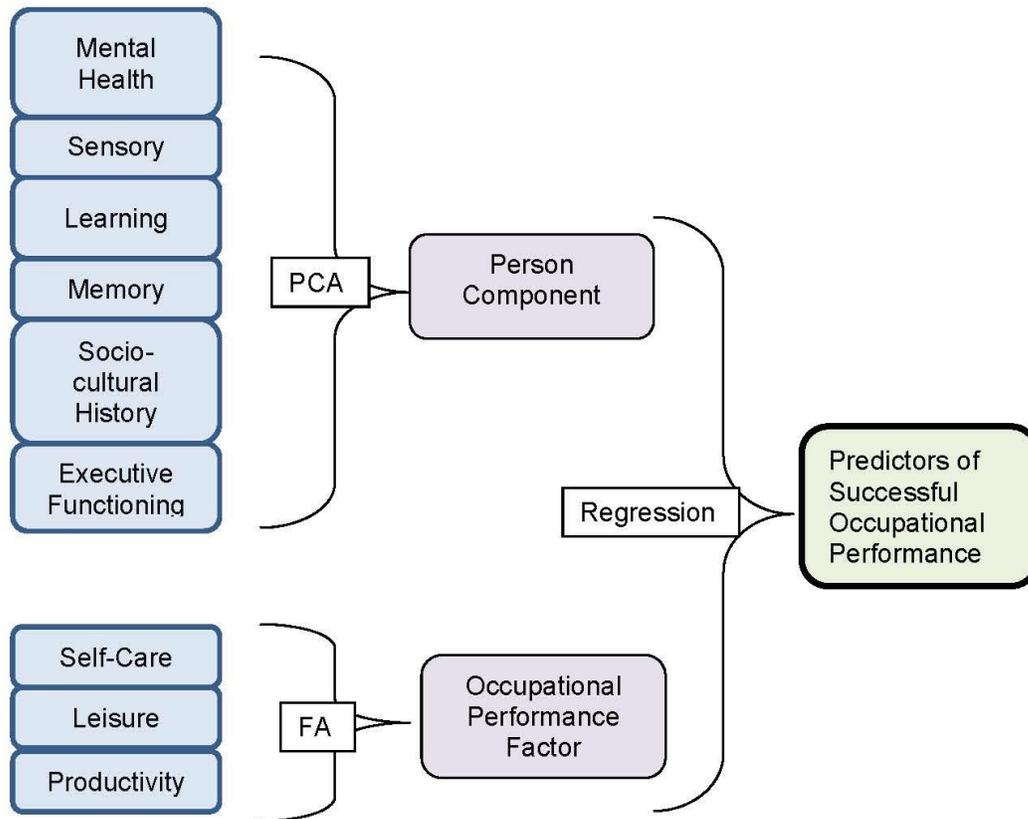


Figure 3. The Analysis for Aim Two.

Table 2 includes research questions and hypotheses for aim 2.

Table 2

Aim Two with Research Questions and Hypotheses

Aim	Proposed Research Questions	Hypotheses
2. Investigate the role of the socio-cultural environment, executive functioning, memory, learning, and mental health on occupational performance characteristics in adults with FASD.	3) What is the relationship between socio-cultural history, executive functioning, memory, learning, and mental health; which are factors of occupational performance in adults with FASD?	H4 Greater impairment in executive functioning, memory, learning, and mental health, with poorer socio-cultural history will be related to lower occupational performance as measured in the areas of adaptive function, self-care, leisure, and productivity
	4) Which combination of the following variables is the most predictive of occupational performance in adults with FASD: socio-cultural environment, executive functioning, memory, learning, or mental health factors?	H5 Socio-cultural history, executive functioning, sensory processing, memory, and learning factors related to communication will be the most predictive of occupational performance in adults with FASD.

Summary

Using a lens of occupational performance to research the barriers to successful daily living in adults with FASD allows for a better understanding of the issue. Comparing single components of functioning, such as intelligence scores, to adaptive functioning scores, do not take into consideration the complexities of daily activities. Based on the CMOP-E, the person is comprised of more than cognitive, physical or emotional components but a complex and fluid interaction between the components. In addition to this interaction is the person’s continual interface with the environment, which is comprised of physical, social, cultural, and institutional components. Any or all of these components may impact the person’s ability to successfully participate in daily living activities. The CMOP-E is one model that explains these multiple interactions

through “goodness of fit”. If the person-occupation-environment fit is good then the person can be successful. Use of the CMOP-E guided the study to be inclusive of environmental factors and more comprehensive of the personal factors that impact participation in adults with FASD. Examining the relationships between the factors can identify significant interactions, which is much more useful than individual factors that are compared in the research on adaptive functioning.

Chapter 2: Literature Review

While both breadth and depth of knowledge on FASD continues to grow, less is understood regarding how individuals affected by the disorder struggle with daily activities (Burd, Cotsonas-Hassler, Martsolf & Kerbeshian, 2003). Awareness of the physical impact of fetal alcohol exposure is not new. In a reprint of an 1899 article, Sullivan identified that drinking during pregnancy created a “toxic influence” on the growing embryo (Sullivan, 2011). In spite of this early understanding, long term effects on daily functioning and participation continue to require investigation.

Adults with FASD have greater difficulty maintaining employment, increased mental health issues, increased involvement with the judicial system and require formal and informal supports to function day to day (Famy, Streissguth & Unis, 1998; Wheeler, Kenney & Temple, 2013). These secondary disabilities are due to the initial or primary deficits in cognition, memory, executive function, sensory processing, social skills, and learning ability (Popova et al., 2011; Chudley, et al., 2007). Combined, the primary and secondary disabilities greatly affect an individual’s ability to participate fully in society. The impact to society continues to increase as individuals with FASD mature through life, and alcohol- exposed infants continue to be born (Klug & Burd, 2003). As such, FASD is recognized as a serious public health problem with significant monetary costs (Popova, Stade, et al., 2011).

Though it is known that adults with FASD have difficulty living independently and maintaining employment, there is limited research isolating the factors that contribute to successful daily living in this population (Spohr & Steinhausen, 2008). This chapter describes background information on the disorder and societal implications to the problem. The theoretical approach to be used in the study is introduced. Finally, the literature illustrating the deficits in daily living and adaptive functioning as it relates to FASD is explored.

Fetal Alcohol Spectrum Disorder

Compared to some diagnoses, the umbrella term of FASD, as we know it, is relatively young. Early articles published in the 1970s identified Fetal Alcohol Syndrome (FAS), the most severe form of the disorder that includes growth and facial anomalies (Jones, 2003). Since then there has been much work put into identifying the impairments associated with FASD and increasing the awareness of the general public as well as medical personnel. To assist in understanding the implications of FASD on society and the significance of the problem, it is useful to review the evolution of the diagnosis, prevalence, and costs to society.

History of FASD. Aristotle was one of the first people to document the negative impact of prenatal exposure to alcohol (Calhoun & Warren, 2007). He labelled the children of women who were alcoholics as “morose and languid”. Through the 1700s, reports depicted children born to alcoholic mothers as weak, silly, and distempered with increasing concern about the impact to society (Calhoun & Warren, 2007; Warren & Hewitt, 2009). Authors suggest that this heightened awareness correlated with the increased availability of cheap gin, or the “London Gin Epidemic” (Warren & Hewitt,

2009). Sullivan (2011) described a pattern of increased rate of mortality and epilepsy in children of imprisoned, alcoholic women in 1899. In the years that followed the Temperance movement gained momentum, promoting abstinence and a more religious lifestyle, which cast a moral slant on research (Sanders, 2009). Research on prenatal alcohol exposure was biased towards providing evidence supporting abstinence, to the detriment of quality research (Sanders, 2009).

It was not until 1973 that the term Fetal Alcohol Syndrome (FAS) was proposed in the United States, which outlined a pattern of physical malformations that were linked with prenatal alcohol exposure (Jones, 2003). Those initial papers spawned targeted research confirming the relationship between prenatal exposure and birth defects (Thomas, Warren & Hewitt, 2010). Inclusion of animal studies were crucial to persuade the medical and research communities that alcohol was a teratogen, and not due to mothers “defiant lifestyles”, smoking or drug exposure (Thomas et al., 2010). The establishment of the National Institute on Alcohol Abuse and Alcoholism (NIAAA) in the United States in 1974, and its research mandate to understand alcoholism and its impact, provided a platform to guide and fund research into FAS (National Institute on Alcohol Abuse and Alcoholism, 2014). Since then research has explored the impact of prenatal alcohol exposure on cognition, motor skills, and adaptive and social functioning (Burd et al., 2003). Guidelines for diagnosis have been developed, including the 4-Digit Diagnostic Code (Astley & Clarren, 2000). The Canadian recommended guidelines are adapted from these (Chudley, et al., 2007). Despite the research and effort that has been devoted to increasing our understanding and awareness of FASD, women continue to drink during pregnancy. This behavior has created a significant problem for

society in regards to the economic costs as well as the pressures on health, education and social services (Popova, Stade, et al., 2011)

Impact to Society. Costs to society can be considered in the use of resources within social systems (e.g. health, education), loss of productivity for the individual, as well as the financial burden. Inconsistencies in FASD prevalence statistics have hindered accurate costing estimates in the literature leading researchers to believe current estimates to be under reporting the true cost (Popova, Lange, Burd & Rehm, 2014).

The prevalence of FASD in recent Canadian literature was cited at 1% of the population (Popova, Lange, et al., 2011). This means, according to Statistics Canada 2011 census, 334,767 individuals in Canada are affected with FASD and at least 3,776 infants will be born each year with FASD (Statistics Canada, 2014). Prevalence of FAS, the most severe of prenatal alcohol exposures, has been estimated to range from 0.10 per 100 births to 9.8 per 1000 births (May & Gossage, 2001). When individuals less significantly affected by prenatal exposure are included, a conservative rate of prevalence for FASD was suggested to be 10 per 1000 births (May & Gossage, 2001).

Individuals with FASD have higher usage of government services throughout their lives compared with non-affected individuals (Popova, Lange, et al., 2011; Popova, Stade, et al., 2011; Spohr & Steinhausen, 2008). This includes additional educational supports during their schooling, increased use of social services including foster care, increased involvement with the judicial system, use of social housing, use of government supported income programs and mental health supports (Popova, Lange, et al., 2011; Popova, et al., 2014; Spohr & Steinhausen, 2008). Individuals with FASD

are known to have higher incidences of mental health issues, and increased use of mental health supports (Pei, Denys, Hughes & Rasmussen, 2011).

Adults with FASD are reported to have decreased employment that may be due to lack of education and inability to work (Spohr & Steinhausen, 2008). Over a lifetime this is a significant burden to society. In the corrections systems, it has been estimated near 3,700 of 37,234 adults in custody on any given day in Canada would have FASD, or 9.8% of the population (Popova, Lange, et al, 2011).

One recent estimate on cost of FASD per individual per year in Canada was \$21,642 (95% CI, \$19,842; \$24,041) (Stade et al., 2009). Reported incidence rates have varied in the literature and are typically based on FAS, not the full spectrum of FASD diagnoses, making cost estimates difficult. Typically reported incidence in Canada is a range from 3 to 9 participants of FAS per 1000 live births (Popova, Stade, et al., 2011). At a provincial level, the annual cost estimates to society for Alberta, Canada, ranged from \$48 million (low incidence rate) to \$143 million (9 per 1000 incidence rate) (Popova, Stade, et al., 2011). At a population level, the estimated annual cost in 2007 in Canada for people aged 0-53 was \$5.3 billion (95% CI: \$4.12 billion–\$6.4 billion) (Stade, et al., 2009). Popova, Stade, et al. (2011) confirmed rising costs from 2002-2005 in their review of the literature and it would be practical to assume this continues as the population of Canada continues to grow. It is estimated that adults with FASD would also live a typical lifespan, and thus require support across many decades (Popova, Lange, et al., 2011). These numbers highlight the substantial monetary impact FASD has on society.

With the knowledge of the societal costs, it is important to provide the most effective and efficient support to this population to enable them to participate in daily life to the best of their abilities, thus lessening the impact on society. To do this, the underlying factors that contribute to successful daily life participation need to be explored. The theoretical framework of occupational performance frames daily life participation as reliant on the interaction between person, environment, and occupation; this framework forms the foundation for the current study.

Understanding FASD through Occupational Performance

The Canadian Model of Occupational Performance and Engagement (CMOP-E) is proposed for use in this study (Townsend, 2002). This model defines occupation as those purposeful activities an individual engages in throughout the day (Townsend, 2002). Within occupational performance there is the ability of the individual to change in response to internal and external demands (McColl, et al., 2003). The interplay between the individual, environment, and the occupation is key for successful occupational performance (McColl, et al., 2003).

Development of the model began with the Canadian Association of Occupational Therapists in an effort to guide occupational therapists in their practice (Townsend 2002). Over several versions, the concepts and beliefs held within the model were refined. The CMOP-E offers a visual representation of occupation and provides three core constructs around which therapists can conduct their practice: the person, occupation, and environment (Figure 1) (McColl, et al, 2003). These constructs, the person, occupation, and environment are further described below.

The Person. The CMOP-E depicts the person to be central to occupational performance. Components that are included within the person construct are: spirituality, affect, physical, and cognitive (Townsend, 2002).

Spirituality refers to a person's belief system and their values (Townsend, 2002). It contains those intrinsic values which guide and shape a person's choices and actions. Involvement with religion is not required for this, but rather a personal belief system.

Affect relates to emotions and emotional regulation (Townsend, 2002; Stamm, Cieza, Machold, Smolen & Stucki, 2006). How much a person engages in an occupation is shaped by the emotional state they are in when they approach the occupation. Emotions are, in turn, guided by memories of similar situations.

Physical refers to strength, motor coordination, endurance, and balance (Townsend, 2002). Within the context of occupation, how the person uses the factor is also important. For example, an individual may be strong, but does not have the cognitive processes to organize boxes within a room so his/her strength is not the advantage that it was first considered.

Cognitive refers to brain processes and include memory, problem solving, learning, and language (Townsend, 2002). These four components combine to allow a person to engage in occupation. For example, in approaching an occupation the person thinks of the consequences if he does or does not complete the occupation. If this occupation is important to him then perhaps he remembers a previous engagement, and finally decides to engage in the occupation where he uses his cognition and motor skills to complete the required activities within the occupation.

Within occupational performance models, the person is considered a salient being with the ability to make choices, initiate actions on those choices, and reflect or learn from those choices (McColl, et al., 2003). People operate within societal and personally defined roles, such as mother, worker, and friend. These roles also impact the way an individual approaches an occupation (Kielhofner, 2008). For example, the importance of cleaning a house would be perceived differently for a woman whose primary role is that of a mother compared to a single woman.

Environment. In the CMOP-E occupation is seen as the bridge between the person and the environment, whereby the person uses occupation to interact with the environment (McColl, et al., 2003). There is increased emphasis on the role of the environment within the CMOP-E; using this model allows this study to explore aspects of the person's life. Importantly, the current research on FASD has explored aspects of the individual's functioning and compared these to specific activities of daily life, but has not specifically addressed the role of environment.

In the CMOP-E, environment is comprised of physical, institutional, cultural, and social constructs (Townsend, 2002). These constructs are intertwined and separate, variable with time and location. Environments are those contexts or situations that are outside of the person and either support or are barriers to successful occupational performance (Law, 1991). Law (1991) challenged readers to view occupation within the context of the person's daily environment. Taking this view, problems in occupational performance can be seen as the result of a poor fit with the environment, rather than exclusively related to the person's abilities. Based on this poor fit, the intervention focuses on changes to the environment as an alternative approach for facilitating

occupational performance. This view of occupation is an appropriate match for individuals with FASD, as it is well known the physical and cognitive deficits, person factors, remain across the lifespan and can impact all aspects of their daily lives (Chudley, et al., 2007). Changing or adapting the environment may be a more realistic approach to improving occupational performance rather than attempting to improve the FASD individual's cognitive processes, for example.

The *Physical* environment is the most easily understood; it is those objects that surround us and the geographical locations we live, work, and play within (Law, 1991). Individuals with FASD may experience a myriad of physical environments, some of which will be a better fit in supporting occupational performance. *Institutional* environment refers to those systems, services, and policies in which we operate (Law, 1991; Stamm, et al., 2006). This may be governmental and/or educational systems or even the economic climate, which impact occupation. The institutional environment falls short for adults with FASD; access to services and supports are known to be limited for adults with FASD, compared with children (Chudley, et al., 2007).

Cultural environment denotes the person's ethnic background, including the cultural expectations, biases, and roles. The degree of cultural environment impacts on occupational performance differs with the occupation, physical environment, and person. Previous studies have linked higher incidences of FASD in the aboriginal population who have different cultural and societal norms (Burd & Moffat, 2011).

The *Social* environment consists of societal norms and practices (Stamm, et al., 2006). This may or may not be closely tied with the cultural environment. Societal norms contain attitudes and expectations. For example, attitudes towards disability and

the contribution of persons with disabilities are societal. DeJ (2011) argues that the society shifts its view of an individual with FASD, with the child portrayed as a victim, but the adult with FASD as a failure. Society does not expect children to be responsible for their actions, though adults are expected to be (DeJ, 2011). Inappropriate behaviors and cognitive limitations are accepted in children, however children are expected to outgrow these limitations and when they do not society can judge them as failures. Properly supporting adults with FASD is crucial from a societal perspective and inclusion.

Occupation. It is the engagement in occupation that brings purpose and meaning to life; engagement in occupation affects health and well-being (Townsend, 2002). Importantly, occupation is specific to the person, allowing for the nuances, characteristics, and values of the person. Participation in the activity should not be confused with independence in the activity. People with physical impairments can direct caregivers to give specific support, allowing them to overcome the physical limitations. In contrast, a caregiver may direct an individual with cognitive impairments to complete each step of an activity. Both individuals are participating, though it is unknown if it is to the best of their abilities.

Self-care occupations include those activities required to maintain health and hygiene. Typical activities include toileting, bathing, and dressing. Individuals with FASD may have learnt the self-care activity, but their performance may vary over time (Paintner, Williams & Burd, 2012). The teen or adult with FASD may need consistent reminders to complete activities such as brushing their teeth or hair, and be easily distracted prior or during the activity so they do not complete it. Individuals with FASD

may know how to do the components of a regular activity but cannot organize, remember or plan for the activity.

Productivity occupations are those activities such as paid employment, school or volunteering (Townsend, 2002). People move among these activities during the course of their life. In the younger years, there is increased emphasis is school while paid employment is considered a primary occupation during the middle years. The person's abilities as well as the environment determine the productive occupations that would be appropriate. Adults with FASD frequently fail to find the successful match between their unique abilities and the environment (Spohr & Steinhausen, 2008).

Leisure occupations are those activities which primarily provide enjoyment to the person rather than being productive or for self-care (Townsend, 2002). Examples of this are knitting, playing cards, socializing with friends or playing electronic games. Personal abilities and interests guide participation in these occupations.

FASD, Exploring Outcomes Through Occupational Performance

There has been much research into FASD, focusing on the cognitive, social, and physical signs of the disorder (Calhoun & Warren, 2007). The literature has described difficulties with daily living, and the need for increased formal and informal support across the lifespan (Jirikowic, et al., 2008; Spohr & Steinhausen, 2008). Research has not identified the combination of factors that contribute to successful daily living but has focused on comparing specific factors such intelligence and executive functioning (Jirikowic, et al., 2008). Using the framework of the CMOP-E, possible factors that could impact successful occupational performance in the FASD adult population are described.

The Person. The spiritual component of the person in children and adults with FASD is not well understood. Spirituality is the “very essence of who we are as human beings” (Townsend & Polatajko, 2007, p.68). In occupational performance, spirituality is linked to our motivation and our sense of our place in the world (Townsend & Polatajko, 2007). Spirituality is related to personal meaning and a person’s uniqueness and is not identified with one definition (Townsend, 2002). Within the CMOP-E, spirituality guides a person’s choices and participation in activities. Shultz (2005), in a limited study of 12 adults, explored the difference in spirituality between childhood and adult onset disabilities. Those with childhood onset disabilities perceived spirituality differently. These adults with disabilities highlighted a connection for purpose and meaning in life as well as connecting to others and the world through actions. This suggests spirituality develops in childhood and continues throughout life.

The impact of foster care and exposure to abuse and trauma on self-worth, spirituality and meaning in this population is not fully understood. Hyter, Henry, Atchison, Sloan, Black-Pond & Shangraw (2003) indicated that children exposed to trauma and prenatal alcohol had difficulty taking others’ perspectives, experienced dissociation, and had difficulty differentiating between their feelings and sensations. Yancey (1998) discussed the relation of out of home care for adolescents in general and the impact this can have on self-image. Yancy (1998) suggested self-image and the perception the adolescents have of the world is defined not by organic causes, but the environments to which they are exposed. Children with FASD who have been raised in abusive and/or neglectful families demonstrate poor self-esteem and feelings of worthlessness while removal from the home can cause further problems in these areas

(Victor, Wozniak & Chang, 2008). With this information, it would be worthwhile to consider the implications of trauma, abuse, and the foster system on self-worth and self-image in the FASD population as they relate to spirituality.

Affect of the person, or the emotional state and regulation of the person has been studied within the areas of mental health, ADHD, and sensory processing. Individuals with FASD frequently have mental health issues, with estimates of up to 90% of the population (Pei et al., 2011). Common issues included depression, mood, anxiety disorders, ADHD, and conduct disorder (Pei et al., 2011). Grant, Huggins, Connor & Streissguth (2005), in a study of 11 women with FASD, suggested that mental health issues had a negative role in the quality of life in this population.

Included in the affective component of the individual is sensory processing, the brain's ability to receive, process, and act appropriately on sensation from the environment. This has been shown to be significantly impaired in individuals with FASD (Abele-Webster, et al., 2012; Jirikowic et al., 2008). Focusing on sensory modulation and using the Sensory Profile, Abele-Webster and colleagues (Abele-Webster, et al., 2012) found that 26 children with FASD demonstrated over responsivity to sensory stimuli and specific difficulty processing auditory stimuli. These investigators suggested that the cause of the over arousal was delayed habituation, an interpretation brought forward in previous studies. In the same study, behaviours associated with poor sensory processing did not overlap with ADHD related behaviours, suggesting distinct brain functions. Previous studies had not explored if these were separate, though it has been reported that up to 61% of children and youth with FASD have an ADHD diagnoses (Spohr & Steinhausen, 2008).

Related studies have found poor sensory processing in children with FASD associated with social, thought, and attention problems (Franklin, Deitz, Jirikowic & Astley, 2008). More specifically, children with FASD were found to have difficulty filtering auditory sensation, have tactile sensitivity, and be under responsive or sensory seeking (Franklin, Deitz, Jirikowic & Astley, 2004). Sensory processing has noted to be interconnected with occupational performance, with sensory dysfunction impacting an individual's ability to perform daily activities (Bundy, Lane & Murray, 2002). Franklin et al (2008) also found moderate correlation between sensory processing problems and adaptive functioning in children with FASD; however the study did not compare other factors in a model for adaptive functioning. None-the-less, it is logical to project that individual's with FASD will have problems in occupational performance based on poor sensory processing.

The *physical* component of the person has limited representation in the literature, relative to the motor coordination abilities of children and adults with FASD; no literature was found linking motor ability with success in daily activities. Connor, Sampson, Bookstein, Barr & Streissguth (2006) found decreased fine motor coordination in adults with FASD using assessments of motor sequencing and accuracy, and static balance (balancing in one place). There was moderate correlation between motor performance and IQ; however, there was no significant difference in motor performance between adults with FAS and FAE. Connor, et al. (2006) recommended assessment of motor skills in order to more appropriately place individuals in employment, training programs or treatment options. In contrast to the findings of Conner, Jirikowic, et al. (2008) found a mean standard score of 49.1 ± 14.0 on the Bruininks-Oseretsky Test of Motor

Proficiency (BOTMP) in a group of 25 children with FASD; not statistically different from the control group. The focus on children in the studies suggest further research may be beneficial, specifically with in the adult population.

Cognitive deficits, in particular executive functioning, are well established in individuals with FASD (Rasmussen & Bisanz, 2009). Rasmussen & Bisanz (2009) identified problems with verbal reasoning, problem solving, concept formation, deductive reasoning, and letter fluency in children with FASD ages 8yrs 4mo to 16ys 2mo. Further, relative strengths were found in category fluency, impulsivity, and visual spatial reasoning. The study did not explore how the identified deficits affected the children in daily life. Similarly, Pei, et al (2011b) demonstrated students with FASD (n=35, age 6-12 years) had difficulty recalling information, which they linked to difficulties initially encoding the information. In visual spatial tasks, the children with FASD had decreased organization and difficulty perceiving a complex object as a whole figure (Pei, et al., 2011).

Poor EF has been consistently identified in adults with FASD, but not consistently defined by the severity of the diagnosis (Rasmussen, 2005). Using results from a longitudinal study (N= 419) and a second study on adults with FAS (N=45), the level of deficit in executive functioning was not related to the individual's intelligence quotient (IQ) unless the individual had severe intellectual disability (Connor, et al., 2006). The subjects with FAS in the second study (evidence of facial distortions, growth deficiency, and central nervous system impairment with significant prenatal alcohol exposure) had a mean overall IQ score of 83.9, while subjects with FAE (significant alcohol exposure with central nervous system impairment but without any physical evidence) had a mean

overall IQ score of 87.1. Connor, et al. (2000), found the direct effects of prenatal alcohol exposure on EF were related to maintaining complex attention, shifting tasks, performing visuospatial tasks, and using working memory accurately despite distractions. Interestingly, these investigators took this information a step further, suggesting that these deficits would lead to difficulties maintaining important information in a distracting environment and shifting strategies in situations where rules were vague. Drawing from these findings, job situations in which an individual is required to shift tasks frequently or operate without concrete rules would be problematic for people with FASD. Social relationships would also be problematic, as an individual with FASD would not be able to interpret the finer nuances of the complicated interactions and adjust their strategy appropriately (Connor, et al., 2000).

Children aged 7-14, with heavy prenatal alcohol exposure and Attention Deficit Hyperactivity Disorder (ADHD) (N=22) require more trials to achieve a learning objective, relative to children with ADHD alone (N=22) and controls (N=22) (Crocker, Vaurio, Riley & Mattson, 2009). Investigators indicated that short term recall of the information was more problematic in the group of children who had been exposed to alcohol and carried a diagnosis of ADHD compared with controls. While interesting, and addressing aspects of EF, this study has been criticized because the children were learning new words within a defined environment, and asked to recall possibly non-relevant information.

Adolescents with FASD have been identified as having specific learning problems in reading and lower IQ scores (although still within "Borderline" range) compared to a control group of children without FASD (Howell, Lynch, Platzman, Smith

& Coles, 2006). Adolescents with physical dysmorphia attributed to alcohol exposure (N=46), features typically associated with FAS, had significantly more difficulties in math compared with the control group (N=56), a special education group (N=79), and an alcohol exposed with no dysmorphic features (N=83). All adolescents with alcohol exposure had low grades. Twice as many adolescents in the group with dysmorphia attended specialized education programs than in the control and alcohol exposed without dysmorphic features groups. This may suggest those adolescents with dysmorphia have increased academic and learning issues.

Thus, many aspects of EF appear compromised in individuals with FASD. These cognitive impairments impact many aspects of daily functioning for this population. Difficulties in learning can necessitate many trials in order to learn a new action or concept. Memory problems can be seen in their attempts at recall of events and actions. Problems in executive functioning are apparent in difficulties to change their thought process for a problem or see alternative solutions. These difficulties can combine to make engagement in occupational performance a challenge.

Environment. As mentioned earlier, the impact of environment on occupational performance in FASD has not been explored; however the impact of environment and family have been (Streissguth, 1997). Spohr & Steinhausen (2008) listed living in a supportive and caring environment for more than 70% of one's life as having a mitigating effect on FASD. Recognizing that thousands of individuals with FASD are or have been in the foster care system, this is significant from a societal perspective. The authors of the article stated 70.5% of adults with FASD lived in dependent or supervised

situations but did not define the type of living situations (for example, family versus group home).

From the *Institutional* environment perspective, it is known that adults with disabilities, including FASD, have decreased access to services compared with children (McFarlane, 2011). Adults are expected to access different services independently, such as supportive housing and income support. The ability to access services, from completing forms to arranging appointments, can be challenging for the adult with FASD due to their cognitive limitations. This can be even more of a challenge in rural areas, where services may be limited and spread across a large geographical area (McFarlane, 2011). Barriers to accessing the institutional environment may be limiting a person's occupational performance and is an area that is worthwhile to explore further in the FASD population.

The *Societal* environment can greatly shape a person's reaction to the world around them. Law (1991) argues that society views an individual on how far from perceived normal they are, rather than accepting a new normal. This viewpoint serves to isolate the individual and produces rejection within the society (Law, 1991). The FASD symptoms of the child continue into adulthood, yet the societal expectation changes for adults with FASD; in adulthood they are expected to take responsibility for themselves and have insight into their actions (Dej, 2011). In Dej's (2011) opinion this change leads to a shift in perception from a child as a victim of FASD to an adult who is now labelled as deviant. This change in society's expectations on the individual will impact how the individual is able to access services, and their involvement with the criminal system (Dej, 2011). The arguments from Law and Dej open the possibility on

the negative impact of the societal environment on the individual with FASD. This negative impact may be limiting occupational performance in the individual with FASD.

Occupational justice is the right to participate in an occupation regardless of race, ethnicity, age, or ability. For example, the limiting of occupational performance by outside forces would be occupational injustice (Nillson & Townsend, 2014). The concept of occupational justice can be appreciated throughout this study; however, this study is limiting its focus to the underlying factors to occupational performance. Results may highlight factors that are related to occupational justice, and will be further explored at that time.

Occupation. Spohr & Steinhausen (2008) indicate that up to 80% of individuals may require support for self-care activities and 70% may be unemployed. Of the subjects in their study, only 13.5% obtained vocational training or were able to earn a living when followed longitudinally

Looking at engagement in occupation from the caregiver perspective, Clark and colleagues found that most adults with FASD did not have access to support services such as an in-home aide to teach and monitor home and community based skills, instead relying on families (Clark et al., 2008). Further, adults with FASD had limited integration into social/recreational activities and productivity. Very few of the subjects were perceived to be integrated into education, employment or volunteering. The investigators concluded that the needs of the individual with FASD had to be addressed for appropriate integration into different activities, and while living with a caregiver (usually family) was a common factor to success, families could not maintain the required support across different environments (Clark, et al., 2008). These investigators

suggested the use of paid support for integration into community activities and further research into integration of adults with FASD into common activities.

There are many possibilities for barriers to successful occupational performance for individuals with FASD. Previous studies into FASD limit current understanding of the extent of occupational performance concerns because they focus on adaptive functioning. According to the definition by the American Association on Mental Retardation, adaptive functioning focuses on whether an individual can complete daily activities, generally self-care activities such as bathing and eating and not only that they have acquired the ability to do so (Schalock & Luckasson, 2004). There is some evidence that individuals with FASD have difficulty with self-care, leisure, and productivity though no study has focused on the factors that contribute to successful occupational performance. This study explored which factors within the *Person* and *Occupation* had the greatest impact on occupational performance.

Self-Report and FASD

There are a variety of possible factors to explore relative to occupational performance and adults with FASD. However before this can be undertaken, consideration must be given to the current methods of obtaining data. Many commonly used adult assessments of adaptive functioning use self-report questionnaires. The cognitive limitations faced by individuals with FASD were explained earlier and included memory deficits as well as poor executive functioning. Such deficits may make self-reporting erroneous for this population. Interestingly, there is no evidence questioning the validity of this method of assessment for the FASD population.

Studies have shown that people with cognitive disabilities have more error in self-report than typically functioning people. In a meta-analysis of 31 studies on the reporting of depressive symptoms in students with learning disabilities, Nelson & Harwood (2011) found parents and teachers scored higher symptomology than the student. They suggested reliance on one source of assessment is a problem in this population and recommended gathering information from multiple sources (Nelson & Harwood, 2011).

In consideration of whether individuals with cognitive impairments could self-report accurately, investigators have found that the individuals generally rated their quality of life higher than caregivers, though there was moderate to high correlation between the ratings. Interestingly, Schmidt, et al (2010) noted that there was higher correlation between respondents using a disability appropriate measurement instrument which modified the test language so the individuals with cognitive disabilities could self-report. These authors suggest using both self-report and proxy-report for a more accurate result, recognizing the need for further research into self-reports and people with intellectual disabilities.

Young adults with TBI reported similar, positive perceptions of school performance, somatic and psychological problems compared to a control group (i.e. 58.9% of adolescents with TBI, 59.1% control group thought they were good students), though clinician report identified school problems and delay in over 70% of the adolescents with TBI (Viguier, et al., 2001). The investigators found that adolescents with TBI more accurately self-reported depressive symptoms than cognitive or behavioral difficulties (Viguier, et al., 2001). One limitation of the study was that the

clinicians and adolescents with TBI used different questionnaires, which makes response comparison and determining patterns an issue.

Importantly, self-report within typical respondents (those with no disability) is known to be flawed (Schwarz & Oyserman, 2001). There are many components within the questions and the questionnaires themselves that influence responses (Schwarz & Oyserman, 2001). Poor recall of events and skewed perception of past events is common and to counteract this, an individual will use various cognitive processes such as inference and estimation (Schwarz & Oyserman, 2001). If a person does not have the flexibility in their thinking to do this, such as those with FASD, then there is increased risk of incorrect recall.

Schwarz and Oyserman (2001) identified the following cognitive processes required for a person to accurately respond to questions: understanding the question, recalling relevant behavior, inferring and estimating the response, recording the response within the provided format, and reviewing the response. Once the respondent *comprehends the question*, he needs to use the same definitions and parameters on words and phrases as the author. For example, “sporty, red car” could mean a two seat luxury sports car in bright red or it could be expanded to a small sport utility vehicle with a dark red color. *Recall* is known to be erroneous, influenced by the type and frequency of activity (Sonnenberg, Riediger, Wrzus & Wagner, 2012; Stone et al., 2008). Regular activities such as work or sleep may be more reliably reported than irregular activities such as shopping for dresses. Symptoms that vary from day to day, such as pain, have been shown to have higher reported intensity with a longer reporting period (Stone et al., 2008). The pain experienced today is reported to be less than experienced a month

ago. *Inference and estimation* in the response are strategies to compensate for poor recall and understanding (Schwarz & Oyserman, 2001). For example, the question may give categories on the amount of alcohol consumed in a week and the individual, considering societal norms/cultural context and the purpose of the questionnaire, may estimate a lower quantity than actually consumed. *Recording the response* is the individual's ability to use the method required in the questionnaire such as a rating scale, open ended answer, multiple or dichotomous choice (Schwarz & Oyserman, 2001; Sonnenberg et al., 2012). If the answer options are vague or not matching the individual's response then he is more likely to respond inaccurately. With all the opportunities for a typical person to respond inaccurately to assessment questions, it is understandable that people with cognitive impairments could have increased response inaccuracies. *Editing or Reviewing the Response* is the individual changing their answer to fit their perception of what should be correct, such as response bias. This is when an individual consistently answers inaccurately to an indicator which leads to systematic error (McGrath, et al., 2010).

Other examples of reporting biases are: Inconsistent – the respondent varies responses in an unsystematic way, or randomly; Acquiescence – respondent uses the most positive response to the question; Extreme responder – chooses responses at either end of a scale; and Neutral responder – chooses responses in the middle of the scale (McGrath, et al., 2010). Respondents may choose answers that they feel the assessor wants, or answers that make them “look better” but is not true to their situation and behavior. People with FASD are known to have reading, memory and cognitive issues (Howell et al., 2006) and may become overwhelmed with the amount and type of

questions. One or more of the biases described may influence responses to a questionnaire.

An additional concept brought forward by Groot (2000) that may impact self-report is adaptation to illness/disability. An individual with a chronic illness or disability adapts to their situation and accepts his/her stable level of functioning as normal. Groot also suggests that when an individual has lived with a chronic condition his point of reference may change and instead of comparing his function to the normal population, he compares with others who have the same condition (Groot, 2000). This may be a consideration for individuals with FASD. The person with FASD typically has stable functioning, and may not recognize that their functioning is different from the typical population. If asked about his quality of life, an individual with FASD may say it is good, even though he is homeless, unemployed with mental health problems. Because his life has always been that way, he may not have a point of comparison. If he were placed into supportive housing, treated for his mental health problems, and had found enjoyable, meaningful activities in which to engage during the day, then both his reference point and view his previous quality of life may change considerably.

Thus, based on noted impairments in cognitive functioning, along with potential self-response bias and adaptation to illness/disability, self-report by individuals with FASD may be unreliable, impacting conclusion validity. These individuals may not have the cognitive processes necessary to accurately recall and answer questionnaires, or the self-reflection needed to accurately assess their own adaptive function. Literature in this area has shown self-report to be questionable in other populations with cognitive impairments, and authors have recommended gathering information from multiple

sources rather than relying on the individual in question. No study has specifically addressed whether an individual with FASD is accurate in their self-report. To inform practice and policy, it is important to investigate the appropriateness of self-report in this population.

Summary

Current knowledge about occupational performance for individuals with FASD is limited. While an examination of occupational performance from the lens of the person-environment-occupation fit is important, this investigation begins by first examining the validity of self-report on measures of occupational performance. Before available data can be used, it needs to be determined if the information is an accurate reflection of the individual's abilities. The second focus of this study is to examine person and occupation factors as defined within the theoretical base of the CMOP-E, and determine their contributions to successful occupational performance. The following Aims and Research Questions guided this work:

Aim One. To examine the relationship between performance based assessment of adaptive functioning, self-report assessment of adaptive functioning, and aspects of executive functioning in adults with FASD.

Question 1. What is the relationship between scores for adults with FASD on the Adaptive Behavior Assessment System Second Edition (ABAS-II) and the Independent Living Scales (ILS)?

Question 2. What is the relationship between executive functioning, memory, the General Adaptive Composite (GAC) score on the ABAS-II and the full scale standard score on the ILS?

Aim Two. Investigate the role of the socio-cultural environment, executive functioning, sensory processing, memory, and learning on occupational performance characteristics in adults with FASD.

Question 3. What is the relationship between socio-cultural environment, executive functioning, sensory processing, memory, learning, and mental health; and occupational performance in adults with FASD?

Question 4. Which combination of the following variables is the most predictive of occupational performance in adults with FASD: socio-cultural environment, executive functioning, sensory processing, memory, learning, or mental health factors?

Chapter 3: Methodology

The aims of the study were: 1) to examine the relationship between performance based assessment of adaptive functioning, self-report assessment of adaptive functioning, and aspects of executive functioning in adults with FASD; and 2) investigate the role of the socio-cultural environment, executive functioning, sensory processing, memory, and learning on occupational performance characteristics in adults with FASD. This chapter describes the research design, instruments, and variables and finally, the statistical analysis. Within the research design section, advantages and limitations of the design, and sample choices are explained as well as information on the collection of data.

Research Design

The overall objective of this study was to gain a better understanding of adults with FASD and their occupational performance. This study was a non-experimental, exploratory research design, to investigate the relationship between variables and groups of variables (Portney & Watkins, 2009). The study data was cross sectional obtained retrospectively from one point in time from an existing database (Portney & Watkins, 2009).

Cross sectional approaches have been used with different topics to identify correlations and outcome predictors (de Winter, Bastiaanse, Hilgenkamp, Evenhuis &

Echteld, 2012; Hulley, Cummings, Browner, Grady & Newman, 2007). A cross sectional approach can be advantageous relative to a longitudinal study as it is more efficient and thus less costly; testing is not compromised by history or testing effects (Portney & Watkins, 2009).

Portney & Watkins (2009) highlight that correlational studies can be used in developing models used in decision making and to understand factors that impact success of interventions. Correlational studies have been used in occupational therapy literature successfully (Case-Smith & Powell, 2008). While correlational studies can be limited in their ability to predict relationships, this type of design can be influential in supporting a predictive research question (Polit & Beck, 2012). This study also included a predictive component through regression analysis, in determining the contributing factors to successful occupational performance. Predictive designs are intended to develop models that can be used for clinical decisions and further research (Portney & Watkins, 2009). Prediction studies are recognized to be essential in exploring models of health and function (Portney & Watkins, 2009).

Retrospective studies can be advantageous in less cost and time consumed since the data is already collected (Hulley et al., 2001). A significant advantage is the ability to examine populations or issues that ethically would preclude a controlled trial, such as deliberately exposing people to smoking (Mann, 2003). These types of studies can examine populations with low occurrence that otherwise would require additional time to recruit suitable number of subjects in a prospective design (Mann, 2003). One shortcoming of retrospective studies is missing data. This became problematic in the

current investigation, necessitating a change in components of the proposed research questions. Proposed and revised aims and research question are presented below.

Research Questions

Aim One. To examine the relationship between performance-based assessment of functioning, self-report assessment of adaptive functioning, and aspects of executive functioning in adults with FASD (Figure 2).

Question 1. What is the relationship between scores for adults with FASD on the Adaptive Behavior Assessment System Second Edition (ABAS-II) and the Independent Living Scales (ILS)?

H1 The full scale standard score on the ILS will have a positive correlation with the General Adaptive Composite (GAC) score on the ABAS-II.

Question 2. What is the relationship between executive functioning, memory, and the General Adaptive Composite (GAC) score on the ABAS-II and the full scale standard score on the ILS?

H2 Executive functioning, shown through Delis-Kaplan Executive Functioning System (DKEFS) sub tests, will be positively related to GAC scores on the ABAS-II, and the full scale score on the ILS.

H3 Memory, shown by the Full Scale Score on the RBMT-3, will be positively related to GAC scores on the ABAS-II, and the full scale score on the ILS.

Aim Two. *Proposed aim:* Investigate the role of the socio-cultural environment, executive functioning, sensory processing, memory, learning, and mental health on occupational performance characteristics in adults with FASD.

Revised aim: Investigate the role of the socio-cultural environment, executive functioning, memory, learning, and mental health on occupational performance characteristics in adults with FASD (Figure 3).

Question 3. What is the relationship between socio-cultural environment, executive functioning, memory, learning, and mental health; which are factors of occupational performance in adults with FASD?

H4 Greater impairment in executive functioning, memory, learning, and mental health with poorer socio-cultural environment will be related to lower occupational performance as measured in the areas of adaptive function, self-care, leisure, and productivity.

Question 4. Which combination of the following variables is the most predictive of occupational performance in adults with FASD: socio-cultural environment, executive functioning, memory, learning, or mental health factors?

H5 Executive functioning, memory, learning, and mental health factors will be the most predictive of occupational performance in adults with FASD.

Data Source

Data was taken from an existing database comprising the assessment results of individuals aged 14-56 years with the diagnosis of FASD in Central Alberta, Canada. The varied ages in the individuals limits the possible impact of a cohort effect. The information in the database has been collected over the last four years and by the end of 2014, when this study was conducted, included data from 128 subjects.

Subjects

The information gathered on individuals with FASD comes from the adult assessment clinics: The Central FASD Adult Assessment Clinic (Central), and Prairie North Central Adult FASD Assessment Clinic (North) in Red Deer, Alberta, Canada. These clinics use the Canadian guidelines for the assessment of FASD (Chudley, et al., 2005). The guidelines utilize a four digit diagnostic code that allots a score to each of the areas of growth, facial features, brain dysfunction, and alcohol exposure risk. The four digits are matched with the appropriate code, giving the individual a diagnosis along the spectrum (Chudley et al., 2005). This allows for reliable diagnosis of the disorder that is consistent with current literature. The use of these clinics allows for increased reliability in the assessment and diagnostic process as the same clinicians are employed for both clinics and have been since the inception of the Central clinic four years ago and the North clinic in 2012.

Inclusion criteria for the study:

- Diagnosis of FASD using the 4-Digit Diagnostic Code
- Over the age of 16. The assessment tools used in the diagnostic process provide more complete data for this age and older.

Exclusion criteria:

- Individual did not meet diagnostic criteria for FASD using the 4-Digit Diagnostic Code

Sample Size

Literature using the same topic or in the same field with similar methodologies and statistical analysis was considered. Alpha levels that are typically accepted in the

behavioral sciences are .05 and .01 (Murphy, Myors & Wolach, 2009). Using an alpha level of .05, anticipated effect size of 0.15, desired statistical power of 0.85 and estimating five predictors in the final multiple regression analyses the minimal sample size needed is 102 subjects (Soper, 2014).

The available database comprised the results of individuals aged 14-56 years assessed for the diagnosis of FASD in Central Alberta. Inclusion criteria stated for the youth to be over 16 years; however the decreased number of participants, which affected the statistical analyses, and slight variation on the sample characteristics between inclusion or exclusion prompted the addition of those 16 years and younger. The information in the database was collected between 2010-2014; at the end of 2014 there were 128 eligible individual subjects. The aim of the study was to use all 128 individuals in the sample size, which would have allowed for attrition without compromising the power of the analysis. Attrition may occur due to missing data and the process of data cleaning.

Variables and Measures

Aim One: Comparison of Self-Report to Performance Based Assessment of Functioning and Aspects of Executive Functioning. Self-report is used in the adult population to gather data on personal attributes such as adaptive functioning and mental health. The usefulness of self-report from individuals with FASD, a population known to have memory, learning, and executive functioning impairment, has not been examined. Correlating self-report with performance based assessment can indicate whether the data can be used in further analysis in this study and for clinic decision making. Significant negative correlation between the two tests, as well as significant

negative correlation between the tests and the cognitive factors of executive functioning and memory led to consideration of eliminating the test(s) from inclusion in Aim Two. Since higher scores indicate higher functioning for both tests, a positive correlation can suggest the tests are related and it does not make a difference which test is used.

This study used the Adaptive Behavior Assessment System, Second Edition (ABAS-II), the Independent Living Scale (ILS), and descriptive data that capture occupational performance characteristics of the sample. The nature of occupational performance, the individual, and environment cannot be captured within one measurement instrument or descriptive variable, such as employment status. The use of multiple data sources gives a more complete picture of the occupational performance of individuals in the sample.

Measures. Throughout the study, the assessment instruments used were developed based on data from the United States unless otherwise specified. These assessments are considered to be valid for use in Canada as the demographics of the United States are considered to be similar to Canada (United North America, 2013).

The ABAS-II is a measurement of function of daily adaptive skills (Harrison & Oakland, 2003). Adaptive skills are defined in the ABAS-II manual as those functional or practical, everyday skills necessary for daily living (Harrison & Oakland, 2003). The ABAS-II measures domain and specific adaptive skills as defined by the Statistical Manual of Mental Disorders – Fourth Edition – Text Revision (DSM-IV-TR). The skill areas in the ABAS II are: Communication, Community Use, Functional Academics, Home/School Life, Health and Safety, Leisure, and Self-care. These different functional areas are captured with three skill domain scores (Conceptual, Social, and Practical)

and the overall General Adaptive Composite (GAC) score (Table 3). This study included the GAC score. The Adult form is used for ages 16-89 and the questionnaire can be self-report or report by third persons.

Table 3

Measurement domains and scales of the ABAS-II in Assessment of Adaptive Functioning

Skill Areas	Domains
Communication	Conceptual
Community Use	Social
Functional Academics	Practical
Home/School	
Health and Safety	
Leisure & self-care	

To develop the normative values, a standardization sample of 990 individuals was obtained that was representative of the United States (US) demographic data collected in the 2000 census (Harrison & Oakland, 2003). Results are given as standardized scores, with a mean of 100 and standard deviation of 10. Note that correlations to establish validity between the ABAS-II and other adaptive functioning questionnaires were only completed on the child and parent/caregiver forms. This may be a limiting factor to the ABAS-II. The authors state the domains and skills areas are based on the American Association of Intellectual and Developmental Disabilities, and have a strong theoretical base. See Table 4 for further psychometric information.

The Independent Living Scales (ILS) assesses an individual's competency in completing instrumental activities of daily living (Loeb, 2001). It uses tasks that are relevant to daily living, such as paying bills and finding a phone number. The ILS is divided into five scales: Memory-Orientation, Managing Money, Managing Home and

Table 4

Reliability and Validity of the ABAS-II

Property	Statistic	Value
Reliability		
	Corrected r	
Internal Consistency		.88-.99
Test-Retest		.91-.99
Inter-Rater ^a		.78-.93
Cross-Form Consistency ^b		.88-.95
Validity		
	Coefficient alpha	
Between skill areas and GAC		.60-.99 ^c
Between ABAS-II and Wechsler Adult Intelligence Scale - 3		.11-.72 ^d

- a. Comparison between different third person raters
- b. Consistency between the self-report form and third person form
- c. .60 value for leisure correlated with work
- d. .11 value for work correlated with performance, intelligence, based on 34 observations

Transportation, Health and Safety, and Social Adjustment. Separate scale scores can be calculated as well as a full scale standard score. It is promoted to be a more objective and reliable measure of daily living than self-report questionnaires (Pearson Canada Assessment Inc., 2014).

Standardization was limited, completed on a sample of 590 individuals aged 65 and older, and based on the 1993 US census data. Four hundred individuals who lived independently comprised the sample to determine the final standardization scoring. A second validation sample of 248 individuals was collected that included individuals with known brain disorders, including mental retardation and traumatic brain injury.

Standard scores are obtained with a mean of 100 and a standard deviation of 15; however, the literature discusses dividing into three categories that indicate the level of support an individual will require (20-39 scores indicate full time supervision; 40-49 scores indicate moderate supervision; and 50 + scores indicate minimal supervision).

Despite of the limitations, the ILS is the only assessment tool that includes performance based tasks which has normative values. See Table 5 for further information on reliability and validity.

Table 5

Reliability and Validity of the Independent Living Scales

Property	Statistic	Value
Reliability		
	r	
Internal Consistency		Full Scale .88
Inter rater		Full Scale .99
Test Retest		Subscales .80 and above
Validity		
Unable to obtain validity information at this time		

Executive functioning within the CMOP-E framework is considered a Person component, and includes those cognitive processes that allow an individual to integrate basic cognitive functions such as memory and perception to make decisions on and act appropriately with their environment through goal oriented behavior (Rasmussen, 2005). Research includes in this term: planning, organization of behavior, self-regulation, cognitive flexibility, response inhibition and sequencing behaviors. The study compares EF to scores from the ABAS-II and ILS to determine the level and direction of correlation between the two tests.

Delis-Kaplan Executive Function System (DKEFS) (Delis, Kaplan & Kramer, 2001). The Delis-Kaplan Executive Function System was designed to measure higher level cognitive functions, executive functioning, for clinical and research application. Some of the components measured include: initiation of problem-solving behavior,

concept-formation skills, flexibility of thinking, transference of concepts into action, abstract expression of conceptual relationships and flexibility of behavioral responses (Delis, Kaplan & Kramer, 2001). The System consists of nine tests that can be administered individually or in combination. The study uses results from the following tests as separate variables: letter fluency, category fluency, category switchers, accuracy, number sequencing, letter sequencing and N-L switching. These subtests are the most routinely administered to subjects within the assessment process. A sample of 1,750 individuals ranging in age from 8 to 89, based on US 2000 census data, comprised the standardization study. People of English descent comprised the largest ethnic group for both countries, though Canadian demographics demonstrated greater ethnic diversity particularly in native representation (United North America, 2013). This may impact the validity of the instruments used in the study, and the ethnic mix of the sample was monitored for this. The study examined memory from the Rivermead Behavioral Memory Assessment in relation to scores from the ABAS-II and ILS.

Rivermead Behavioral Memory Assessment, 3rd Edition (Wilson, et al., 2010). The Rivermead Behavioral Memory Assessment (RBMT-3) is a predictive instrument for everyday memory problems in individuals with acquired, non-progressive brain injury for individuals aged 16 – 89 (Wilson, et al. 2008). It is comprised of 14 subtests that measure verbal, visual, and kinesthetic memory: First & Second Names – Delayed Recall, Belongings – Delayed Recall, Appointments – Delayed Recall, Picture Recognition – Delayed Recognition, Story – Immediate Recall, Story – Delayed Recall, Face Recognition – Delayed Recognition, Route – Immediate Recall, Route – Delayed

Recall , Messages – Immediate Recall, Messages – Delayed Recall , Orientation & date, Novel Task – Immediate Recall, and Novel Task – Delayed Recall. There are two versions, allowing for repeat testing.

Psychometrics. A sample of 333 individuals aged 16 – 89 were recruited, which were representative of demographics from the 2001 United Kingdom census.

Demographics are similar between Canada and the United Kingdom on ethnicity of the population, though the overall population of the United Kingdom is substantially larger than Canada (Index Mundi, 2014; United North America, 2013). Subtest results are shown as standard scores with a mean of 10 and standard deviation of 3. An overall score can be calculated; the General Memory Index (GMI) that has a mean of 100 and standard deviation of 15 is used in this study.

Aim Two: Occupational Performance and Individuals with FASD. Individuals with FASD are known to have a wide array of deficits in cognitive performance, motor, social interaction, and physical impairments (Olson, Morse & Huffine, 1998). The inclusion of “Spectrum Disorder” in the diagnosis highlights the range of impairment that individuals can demonstrate. Accurately determining predictors of function is challenging due to this variability. Researchers have suggested that adaptive functioning is not dependent on one variable, but may be a result of a combination of variables (Connor, et al., 2000). This study will be the first to examine the impact of multiple predictors on occupational performance using the CMOP-E framework of occupational performance. See Table 6 for an outline of the dependent variables reflecting occupational performance. Within this study, the lack of participation in the

Table 6

Dependent Variables Reflecting Occupational Performance

Occupational Performance Component	Dependent Variable	Description	Level
Self-Care	Adaptive Functioning	Adaptive Behavior Assessment System, Second Edition (ABAS-II)- standard score	Continuous
		Independent Living Scales (ILS)- standard score	Continuous
	Living situation	Independent no support, Independent with support from family, Independent with support from worker, Supervised-Family/Roommate/Group Home	Categorical
	Current family involved	Yes, None, Unknown	Categorical
	Subject has children	Yes, None, Unknown	Categorical
	Children's living situation	Live with subject, live with other family, combination, in government care	Categorical
Productivity			
	Employment	Full/ Part-time, Casual, Volunteer, None	Categorical
	Financial support	Alberta Income Support for the Handicapped (AISH), Government Income Support, Family, None	Categorical
	Involvement with Justice	Present, Past, Both, None	Categorical
	Incarceration	Present, Past, Both, None	Categorical
Leisure			
	Activities in the community	Yes, None, Unknown	Categorical
	Scheduled activities	Yes, None, Unknown	Categorical
	Physical activities	Yes, None, Unknown	Categorical
	Activities in the home	electronic games, TV, reading, hobby, social media, physical activity	Categorical

different variables, such as employment, will be indicative of poor occupational performance. Described below are seven possible predictors of function which have been established in the literature as areas of deficit in individuals with FASD (Connor et al., 2000; Olson et al, 1998; Rasmussen, 2005). Under the CMOP-E, these would be

considered under the Person and within the Cognitive, Affective, and Physical components. The formal assessment tools measuring the predictors are described, along with descriptive data. See Table 7 for an outline of the independent variables reflecting the person components.

Table 7

Independent Variables Reflecting Person Components

Person Component	Independent Variable	Measurement	Level
Spirituality	Socio-cultural History	Foster Care Involvement, Adoption	Categorical
Affective	Mental Health	Mental Health Issues, Addictions, Medications, Diagnoses	Categorical
Cognitive	Executive Function	Delis-Kaplan Executive Function System- factor score	Continuous
	Memory	Rivermead Behavioral Memory Test, Third Edition – factor score	Continuous
	Academic Skills	Woodcock Johnson Test of Achievements, Third Edition – standard score	Continuous
		Grade Completion, Attended Specialized Programming	Categorical

Occupational Performance. In addition to the ILS and the ABAS-II that focus on adaptive functioning and daily life, there are specific variables that are characteristic of occupational performance and may allow identification of successful occupational performance. These variables identify the individual’s level of independence in different areas, self-care, productivity indicators as well as involvement with leisure activities. See Table 6 for a list of variables. No study has specifically evaluated these variables as to their relationship with occupational performance in relation to FASD. These variables were entered in a principle component analysis to determine which ones were

most highly correlated, so not all the variables were used in the final analysis. The following variables were chosen for inclusion into analysis to represent aspects of occupational performance: *Living Situation, Finances, Current Employment, Judicial Concerns, Incarceration, Number of Jobs and Family Involved*. This choice was primarily guided by the variables available for analysis from the dataset but also influenced by information from the literature on occupational performance as well as discussion with committee members.

Person Components. Within the many possible variables that can impact the Person Component, the following were included in the statistical analyses. These variables were available within the database, having been collected within the assessment process.

Mental Health. *Descriptive Data Indicating Mental Health and Addiction Issues.* The available descriptive data was gathered during one or more interviews between the social worker and the client, as well as during the assessment sessions with the psychologist and occupational therapist. This data is part of the diagnostic process and is also used in forming the recommendations given by the assessment team. It gives additional evidence relative to the individual's current functioning and patterns of past functioning. See Table 7 for the description of the data that is included.

Learning. *Woodcock Johnson Tests of Achievements, 3rd Edition.* The Woodcock Johnson Tests of Achievement, 3rd Edition (WJ III) measure an individual's learning abilities through 12 tests on the standard battery (Mather & Woodcock, 2001). These tests include reading, math, oral language, spelling, and phonological awareness. The study used the following tests: Academic Skills, Academic Application,

Letter-Word Identification, Passage Completion, Calculation, Applied Problem Solving, Spelling, and Writing Sample. *Psychometrics* The standardization sample, based on United States 2000 census projections, included 8,818 individuals, of which 1,843 of these were adults. Results are shown as standard scores with a mean of 100 and standard deviation of 15.

Descriptive Statistics Supporting Academic Achievement. The data collected was part of the assessment process and obtained through interviews with the social worker and other team members. See Table 8 for the description of the data.

Table 8

List of Descriptive Data, Gathered During the Assessment Process, Supporting Academic Achievement

Occupational Person Component	Variable	Variable Levels
Cognitive	Education level achieved	gr. K-5 gr. 6-9 gr. 10-12 High School Diploma Post-Secondary
	Attended specialized education programs	yes none unknown

Socio-cultural Environment. This study used descriptive, categorical data collected during the assessment process on the subject’s involvement with social services, if any, and placement history and its impact on subsequent functioning in adult life. The categorical variable used was *Foster Care Involvement*.

Statistical Analysis

Analysis is divided into two sections, to address the separate aims and research questions. The first analysis focused on the degree of correlation between two measures to identify the nature of the relationship between self-report and performance-based measures of daily functioning for individuals with FASD. The second analysis began by performing Principle Component Analysis (PCA) and Factor Analysis (FA), and following up with a multiple regression to identify the best predictors of occupational performance for individuals with FASD.

Descriptive Statistics. Descriptive statistics are computed for all independent and dependent variables. See Tables 4 and 5 for specific variables. For each variable the following is computed: mean, standard deviation, frequency, proportion, minimum/maximum values, kurtosis and skewness. These results are displayed as graphs or numerically.

Missing Values. While there are methods for addressing missing values, minimizing the issue through the study design is preferable (Hulley et al., 2007). Designing the database to flag missing values on entry, checks on data entry by other team members and assigned protocols for data collection can all lessen the possibility of missing values (Hulley et al., 2007). Missing observations were coded during data cleaning and excluded from the analyses. During analyses, SPSS displaced the number of missing participants to valid participants (IBM Corp., 2011). Within this study, missing data were addressed through listwise deletion, regardless of the cause of the missing data. This possibility has been accounted for in the collection of data by having more subjects than required. If the number of participants deleted would

compromise the overall sample size then an imputation was run through SPSS. This replaces the missing values with substituted values and produces a new file with the adjusted values.

Data Cleaning. This includes two types of checks. The first is identifying outliers, those values that lie outside the normal range, and wild codes, codes that are not possible (Polit & Beck, 2012). Secondly is a consistency check, which evaluates the data within the case, such as a male coded as a male not female. These can be addressed through SPSS data cleaning as well as by human review (IBM Corp., 2011).

Covariates. Within this study, intelligence quotient is considered a covariate as the literature identifies this to have a significant impact on functioning when it is very low (Connor, et al., 2000). Age and sex are also considered covariates. While the literature has not recognized these as affecting adaptive functioning, they have not been specifically studied.

Wechsler Adult Intelligence Scale – Fourth Edition. The Wechsler Adult Intelligence Scale, Fourth Edition (WAIS-IV) is a measurement of intelligence (Wechsler, 2008). It is comprised of four indices: Verbal Comprehension, Perceptual Reasoning, Working Memory and Processing Speed, and a Full Scale, or composite score, which represents general intellectual ability. This study uses the composite score. Each index contains two or three subtests and a supplemental subtest. For example, Verbal comprehension includes similarities, vocabulary and information subtests. Results are shown in standard scores with a mean of 100 and standard deviation of 15. *Psychometrics* The Canadian standardization was an extension of the US standardization (Wechsler, 2008). The normative sample of 688 individuals aged

16-90 years was representative of the Canadian population, based on the 2006 census information gathered by the Government of Canada (Wechsler, 2008).

Aim One: Comparing of Self-Report to Performance Based Assessment of Functioning, and Aspects of Executive Functioning. The focus of the first analysis was to determine the degree of correlation, if any, between the Adaptive Behavior Assessment System, GAC Second Edition (ABAS-II) and the Independent Living Scales (ILS). Secondly, the analyses would determine the strength of the relationship between scores for memory and executive functioning and the ILS and ABAS-II Scales. See Table 9 for specific research questions, hypotheses and analyses.

One issue in determining the type of statistical analysis is if the sample meets the conditions for parametric or non-parametric tests. The primary assumption in parametric tests is that the population in question has normal distribution (Portney & Watkins, 2009). Secondary is that the variance within the sample is homogenous or roughly equal (Portney & Watkins, 2009). The literature highlights the variability in the symptoms and effects of FASD on individuals due to the inconsistencies in prenatal exposure to alcohol (Davis et al., 2010). This suggests a population that may not have a normal distribution in functioning. Since the data used is a sample of convenience, there is great possibility that the variance may not be homogenous. With this information in mind, the use of non-parametric tests may be more valid for this study.

Non-parametric tests can be considered similar to parametric tests as both include a hypothesis and statistical ratio (Portney & Watkins, 2009). Parametric tests, however, generally assume the population in question is normal and there is homogeneity of variance. There are parametric tests that can be performed without the

Table 9

Aim One Research Questions, Hypotheses and Statistical Analysis

Research Questions	Hypotheses	Planned Statistical Analysis	Conducted Statistical Analysis
1) What is the relationship between scores for adults with FASD on the Adaptive Behavior Assessment System Second Edition (ABAS-II) and the Independent Living Scales (ILS)?	H1 The full scale standard score on the ILS will have a positive correlation with the General Adaptive Composite (GAC) score on the ABAS-II.	Spearman Rank Correlation Coefficient	Kendall's Tau Correlation Coefficient
2) What is the relationship between executive functioning, memory, the General Adaptive Composite (GAC) score on the ABAS-II and the full scale standard score on the ILS?	H2 Executive functioning, shown through Delis-Kaplan Executive Functioning System (DKEFS) sub tests, will be positively related to I GAC scores on the ABAS-II, and the full scale score on the ILS. H3 Memory, shown by the Full Scale Score on the RBMT-3, will be positively related to GAC scores on the ABAS-II, and the full scale score on the ILS.	Principal Component Analysis (PCA) on the DKEFS to reduce variables into a factor, then Spearman Rank Correlations PCA on the RBMT-3 to reduce variables into a factor, then Spearman Rank Correlations	PCA on the DKEFS, Kendall's Tau Correlation Coefficient PCA on the RBMT-3 to reduce variables, then Kendall's Tau Correlation Coefficient

assumption of homogenous and heterogeneous variance. Non-parametric tests allow the population to have a non-normal distribution, which may be occurring in this study.

Correlation. The Spearman rank correlation coefficient, similar to Pearson product-moment correlation coefficient but a non-parametric test, determines the strength of the correlation between two variables and a measure of the explained variance (Field, 2005). In Spearman rank correlation coefficient the subsequent value, Spearman's rho, ρ or r_s (representing non-parametric measure), with a one-tailed

probability, indicates if there is a significant correlation (positive or negative) between the two independent groups of scores and the strength of the correlation. This is a preferable method of calculating correlation.

The Wilcoxin Signed Rank Test can determine the level of correlation between two related samples (Field, 2005). This test is indicated when the differences are non-normally distributed. In this study, it was unknown if the differences are normally distributed. The Signed Rank Test can provide a safer alternative when calculating correlation on differences that may not be normally distributed.

The Kendall's Tau results were displayed as these were more conservative and likely to be representative of the strength of the correlation. Kendall's Tau was chosen during the analyses because of its more conservative calculation of correlation, particularly on populations that are potentially non-normal distribution.

Principal Component Analysis. Principal Component Analysis (PCA) is used to collapse or reduce the number of variables measuring a common construct into a single standardized factor; it is primarily a method for data reduction (Wold, Esbensen & Geladi, 1987). In PCA analysis, variables that are most closely related are grouped into factors (components) that account for most of the variance within a scale or construct. This lessens the overall number of variables included in subsequent analyses, reduces degrees of freedom used, and therefore the required sample size. One or more components can therefore explain the variance associated with many variables in the data; the first component explains the largest variance and each subsequent component a smaller amount.

To determine how many of the components to use for either PCA, there are a number of rules that can be implemented (Portney & Watkins, 2009). The Percentage of Accumulative Variance rule is chosen for this study. Application of this rule means that the components reflecting the highest amount of variance by percentage would be included. The investigator decides which components contribute the most to the variance. A limitation is the personal choice of the investigator.

The combination of categorical and numerical data produces a possible issue as PCA is typically used with numerical data. Component PCA (CATPCA), or nonlinear principle component analysis, allows for the grouping of both types of data (Kaplan, 2004; Rijal, Brewster & Bergh, 2014). It retains the same purpose to reduce different types of variables into non-related components. CATPCA is useful to address data with nonlinear relationships, to limit multivariate linearity, and to analyze numerical, ordinal, and nominal data (Linting & van der Kooij, 2012). This type of analysis will give eigenvalues, component loadings, principle components, sums of squared component loadings per variable over components, and component scores for each case in the data set (Linting & van der Kooij, 2012). Within this study, the categorical data is nominal in nature, where the categories can be counted but not ranked. Through SPSS, the results are displayed visually in graphs (Kaplan, 2004). This method of PCA has been used successfully in other studies with mixed data types (Rijal et al., 2014).

The utility of PCA was beneficial in this study to reduce the overall number of variables. It was completed on the DKEFS subtests and RBMT-3 subtests prior to calculating correlation. PCA was also used with the descriptive, categorical variables, listed under the Person components, to reduce the number of variables in the

regression analysis; including Academic Skills, Mental Health and Socio-Cultural History (see Table 7 and 8). The final product of the PCA contained a reduced number of variables, represented in factors. In the first aim, PCA reduced the DKEFS and RBMT-3 subtests into one or two factors, which were then used in the comparison calculations. This addressed H2 and H3.

Aim Two: Predicting Occupational Performance in Individuals with FASD.

To determine which variables contribute to a model of successful occupational performance, the many variables that are included under the Individual (e.g. cognition, memory, academic performance) in the CMOP-E, needed to be reduced. This was proposed to be done through PCA to determine the primary variables that explain the variance in the data. Since the literature does not give direction to guide reduction a priori, the variables are reduced within the domains and then the domains reduced relative to each other. Though both PCA and Factor Analysis (FA) are primarily data reduction tools, PCA is better used for variables that are known to be correlated. The literature recognizes cognitive issues to be characteristics of an individual with FASD (Connor, et al., 2006; Elgen, Bruaroy & Laegried, 2007). Therefore, with these areas previously identified with FASD, PCA was more appropriate to use in the analysis.

Factor Analysis. The many descriptive variables included within occupational performance needed to be reduced. Factor Analysis (FA) seeks to find an explanatory value for observed variance among many variables that is all related to some common construct (Wikipedia Contributors, 2014). The literature suggests these variables listed under Self-care, Leisure, and Productivity are conceptually related to occupational performance, although that claim has not been formally tested in the published

literature on the FASD population. While the literature does not guide the decision on order of data analysis a priori, these were analyzed within the variable groupings and then against each other. Conducting a FA would determine if they contribute towards the observed variation in occupational performance for individuals with FASD. It was estimated that one or two factors would emerge from the FA that explain occupational performance in FASD.

As with the PCA analysis, the FA analysis becomes more problematic with the inclusion of different types of data. Bécue-Bertaut & Pagès (2008) describe the process to equalize the difference in the distances between units or equaling the weighting between unit so that FA can be applied. Within this study, these calculations were completed through SPSS.

Linear Regression. In this study, linear regression is undertaken to better understand the factors which contribute to successful occupational performance, see Table 10 for specific research questions, hypotheses, and statistical analyses for Aim Two. This analysis allows a more complete picture of the interactions at play and the relationship the variables have between each other and with the dependent variable (Cohen, 1988). The measures for occupational performance would be factors determined from variables in Self-care, Leisure, and Productivity and the full scale, standardized scores from the ABAS-II and/or the ILS, see Table 10. The results of Aim 1 would determine if the ABAS-II or ILS, or both would be used in Aim 2. To answer H4 and H5, the *Person* components (Mental Health, Learning, and Socio-cultural History) were used in regression analysis against the occupational performance factor for predictive value.

Table 10

Aim Two Research Questions, Hypotheses, and Statistical Analysis

Research Question	Hypothesis	Statistical Analysis
3) What is the relationship between socio-cultural environment, executive functioning, memory, learning, and mental health; which are factors of occupational performance in adults with FASD?	H4 Greater impairment in executive functioning, sensory processing, memory, learning, and mental health, with poorer socio-cultural environment will be related to lower occupational performance as measured in the areas of adaptive function, self-care, leisure, and productivity	Principal Component Analysis to reduce categorical variables in mental health, learning and socio-cultural environment, and standardized scores in the RBMT-3, and DKEFS. Factor Analysis to reduce variables related with occupational performance including categorical variables for self-care, leisure and productivity and standardized scores for the subtests on either the ILS or ABAS-II or both Linear Regression to determine contributors to occupational performance using results from the PCA and FA

In a standard, or simultaneous, multiple regression analysis all independent variables (IVs) are entered at once to give a picture of the predictive value of each IV towards the outcome. While this can give information regarding whether an IV individually or uniquely contributes towards the outcome, it does not recognize the importance of the combined or full interaction of IVs. To this end a sequential progression was used in this study, in which the researcher specified the order of entry of IVs into the equation (Portney & Watkins, 2009). This considers an IV's unique and overlapping contribution to the model.

Example of the regression equations:

$$DV_{\text{adapt}} = \text{constant} + \text{Factor}_{\text{Executive Func.}} + \text{Factor}_{\text{Memory}} + \text{Var}_{\text{communication}} + \text{Var}_{\text{academic skills}} + \text{Var}_{\text{mental health}} + \text{Var}_{\text{socio-cultural}} + \text{Var}_{\text{sensory processing}} + \text{Var}_{\text{socio-economic}} + \text{error}$$

$$DV_{\text{self-care}} = \text{constant} + \text{Factor}_{\text{Executive Func.}} + \text{Factor}_{\text{Memory}} + \text{Var}_{\text{communication}} + \text{Var}_{\text{academic skills}} + \text{Var}_{\text{mental health}} + \text{Var}_{\text{socio-cultural}} + \text{Var}_{\text{sensory processing}} + \text{Var}_{\text{socio-economic}} + \text{error}$$

$$DV_{\text{leisure}} = \text{constant} + \text{Factor}_{\text{Executive Func.}} + \text{Factor}_{\text{Memory}} + \text{Var}_{\text{communication}} + \text{Var}_{\text{academic skills}} + \text{Var}_{\text{mental health}} + \text{Var}_{\text{socio-cultural}} + \text{Var}_{\text{sensory processing}} + \text{Var}_{\text{socio-economic}} + \text{error}$$

$$DV_{\text{productivity}} = \text{constant} + \text{Factor}_{\text{Executive Func.}} + \text{Factor}_{\text{Memory}} + \text{Var}_{\text{communication}} + \text{Var}_{\text{academic skills}} + \text{Var}_{\text{mental health}} + \text{Var}_{\text{socio-cultural}} + \text{Var}_{\text{sensory processing}} + \text{Var}_{\text{socio-economic}} + \text{error}$$

The degree of correlation between the IV and occupational performance, the dependent variable (DV) or outcome, and information from the literature contribute to the order of entry. Using the Spearman Rank Correlation Coefficient (rho) between each IV and the DV can determine the amount the individual IV correlates with the DV. By conducting this analysis first, IVs that have little correlation can be excluded from the multiple regression analysis and increase the power of the analysis (Aberson, 2010). For this analysis, rho was set at $p < 0.30$ to retain a variable.

Regression Diagnostics. Multi-collinearity is addressed through SPSS and displayed through the “tolerance” and variance inflation factor (VIF). A VIF of 10 or more, or a “tolerance” of less than .10 will warrant further investigation into the variables (UCLA: Statistical Consulting Group, 2014).

Finally, the Pratt Index was proposed to determine the proportion of variance accounted for by the variable or component in the analysis. The Pratt Index can determine the relative importance of predictors in that the sum of the Index will add to

one.http://luxor.acadiu.ca/library/ASAC/v27/content/authors/z/Zumbo_Bruno/VARIABLE_IMPORTANCE_IN_LOGISTIC_REGRESSION.pdf

Protection of Human Subjects

Data has been and is continuing to be collected as individuals are assessed through the clinics. Within the clinics, an administrative assistant is assigned to maintain the database. Permission to use the data was granted by the FASD Central Network Steering Committee, which governs the clinics, in the spring of 2013.

Ethical review was completed through the Community Research Board of Alberta in May, 2015. This governmental body reviews all health related research that is not affiliated with a university, college, or other recognized organizations in Alberta. This board meets once a month to review proposals that are submitted electronically. Prior to this, ethics approval was completed by the Institutional Review Board of Virginia Commonwealth University, since the data collected is part of a dissertation for completion of a doctoral degree. This review was also submitted online. The reviews were classified as exempt, as the data is de-identified.

Chapter 4: Results

The analyses presented in this chapter were adjusted to accommodate the challenges addressing the missing data. The following figure (Figure 4) gives the visual depiction of the variables.

Sample Characteristics

A total of 144 participants were included in the Central Alberta FASD Network database (Appendix A). Since the primary role of this clinic is to determine a FASD diagnoses, not all of the 144 participants met the criteria for a FASD diagnosis. This created a reduced sample of 84 participants that were actually diagnosed with FASD. This reduced sample is the basis for the analyses in this study. Appendix A details characteristics between the full and reduced samples. Overall the two samples are similar in their demographic composition.

There were large amounts of missing data among this sample due to inconsistencies in the assessment method of the clinic. If the participant came with pre-existing assessment information then only the missing formal assessments required for a diagnosis were completed by the in-house psychologist. As a result the analyses are variably based on sample sizes ranging from 20-50 participants, depending on the analysis. Due to the small sample size and missing data, not all proposed variables were included in the analyses for Research Question 4, see Figure 4.

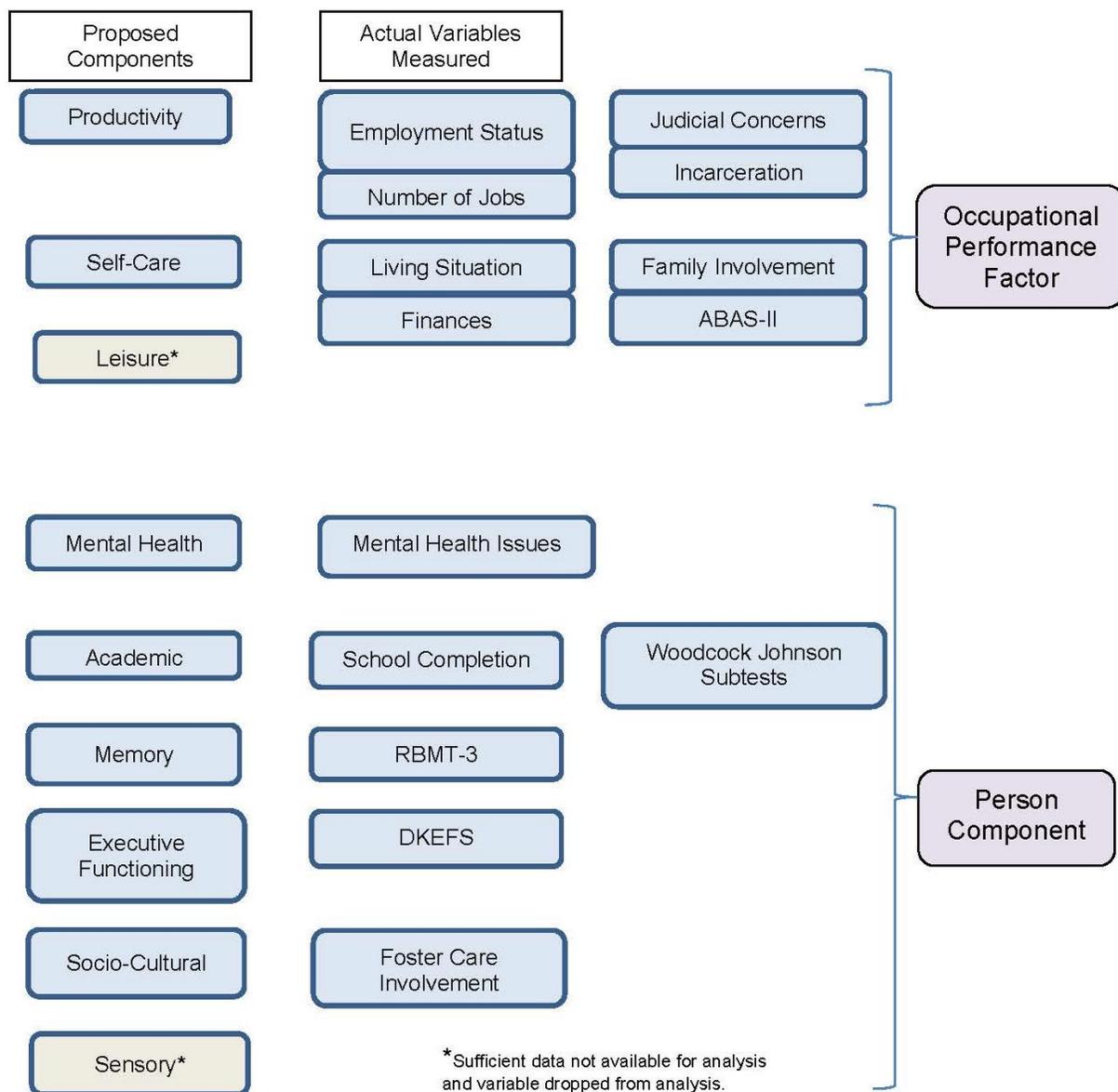


Figure 4. Variables and Correlations Pertaining to Occupational Performance and the Person

Demographics for the analysis (reduced) sample (n=84) are presented in Table 11; demographics for the full sample are included in Appendix A. The two samples did not differ in any meaningful way. As such, the focus here is on the analysis sample.

Table 11

Analysis Sample Demographics

Demographic	Category	Mean \pm SD	
Age		23 \pm 9 years	
IQ		70.60 \pm 11.37	
		Frequency	Percent of sample (n)
Gender Distribution	Male	40	47.6
	Female	44	52.4
Ethnicity	Caucasian	46	54.8
	Aboriginal	37	44
	Other	1	1.2
Schooling Completed	Post secondary	1	1.2
	High school diploma*	6	7.1
	Grades 10-12*	31	36.9
	Grades 6-9	30	35.7
	Unknown	1	1.2
Living situation	With Parents	27	32.1
	With Extended Family	14	16.7
	With Partner	13	15.5
	Living Alone	12	14.3
	Group Home	11	13.1
	With Roommate	3	3.6
	Independent with Supervision	2	2.4
	Homeless	2	2.4
Diagnosis	Static Encephalopathy/Sentinal Physical Findings - Alcohol Exposure	9	10.7
	Static Encephalopathy - Alcohol Exposure	1	1.2
	Unknown		
	Static Encephalopathy - Alcohol Exposed	60	71.4
	Partial FAS - Alcohol Exposed	7	8.3
	FAS- Alcohol Exposure Unknown	1	1.2
	FAS - Alcohol Exposed	6	7.1

Relative to age, the range for the sample was 13-54 years. This author intended to discard participants under the age of 17; however due to the limited number of participants the entire sample and little distinction on demographic variables when youth were included or excluded, the entire age range was included in the analyses.

Appendix B outlines the similarities between including or excluding youth 16 years and younger. There were slightly more women than men in both samples. The reduced sample had a mean IQ score in the range of Borderline intelligence, within two standard deviations from the norm. The primary ethnic background of the participants was Caucasian and Aboriginal.

The analysis sample had the following highest ranked FASD diagnoses: Static Encephalopathy - Alcohol Exposed (N=60), Static Encephalopathy/Sentinal Physical Findings - Alcohol Exposure (N=9) and Partial FAS- Alcohol Exposure (N=7).

School Completion breakdown indicated that the majority of participants completed some schooling between grades 10-12, followed closely by participants completing grades 6-9.

Relative to living situation, the majority of the participants (64.3%) lived with people who were significant in their lives. Through Kendall's Tau correlation, as age increased in the sample, so did the variability in their housing arrangements. Many of the participants in the reduced sample had between 0 and 4 jobs in their work history (n=65, 77.4%), although the majority of participants were unemployed (70.2%).

Research Question 1: Relationship Between the ABAS-II and ILS

Original hypothesis and proposed and revised analysis for research question 1 are shown in Table 12. As seen, the statistical analysis was adjusted to accommodate the reduced sample size. Analysis was completed using Kendall's Tau, chosen as it is a more conservative non-parametric test (Howell, 1997). Non-parametric correlation is considered a better choice when there is a possibility that the population distribution will be non-normal, or if there is a small sample size. In this study, both of these statements

Table 12

Hypothesis H1, Statistical Analysis and Variables

Hypothesis	Proposed Statistical Analysis	Completed Statistical Analysis	Variables
H1 The full scale standard score on the ILS will have a positive correlation with the General Adaptive Composite (GAC) score on the ABAS-II.	Spearman Rank Correlation Coefficient	Kendall's Tau	ABAS- GAC (total score) and ILS Total

are true. The hypothesis that there would be a positive relationship between the ABAS-II and the ILS was not supported. Limiting to participants who completed their own form (n=74), there was no statistical significance with $r_T = .208$, $p = .316$.

Research Question 2: Relationship Between Executive Function and Memory, and ABAS-II and ILS

The revised statistical analysis with research questions and hypotheses are shown in Table 13, and visually depicted in Figure 5.

Table 13

Hypotheses H2 and H3, Statistical Analysis and Variables

Hypotheses	Proposed Statistical Analysis	Completed Statistical Analysis	Variables
H2 Executive functioning, shown through Delis-Kaplan Executive Functioning System (DKEFS) sub tests, will be positively related to GAC scores on the ABAS-II, and the full scale score on the ILS.	Principal Component Analysis (PCA) on the DKEFS to reduce variables into a factor, then Spearman Rank Correlations	PCA then Kendall's Tau	DKEF subtests (Letter Fluency, Category Fluency, Category Switching, Accuracy, Number Sequence, Letter Sequence, NL Switch), ABAS- GAC (total score) and ILS Total
H3 Memory, shown by the Full Scale Score on the RBMT-3, will be positively related to GAC scores on the ABAS-II, and the full scale score on the ILS.	Spearman Rank Correlations	Kendall's Tau	RBMT-3 Full, ABAS GAC, ILS Total

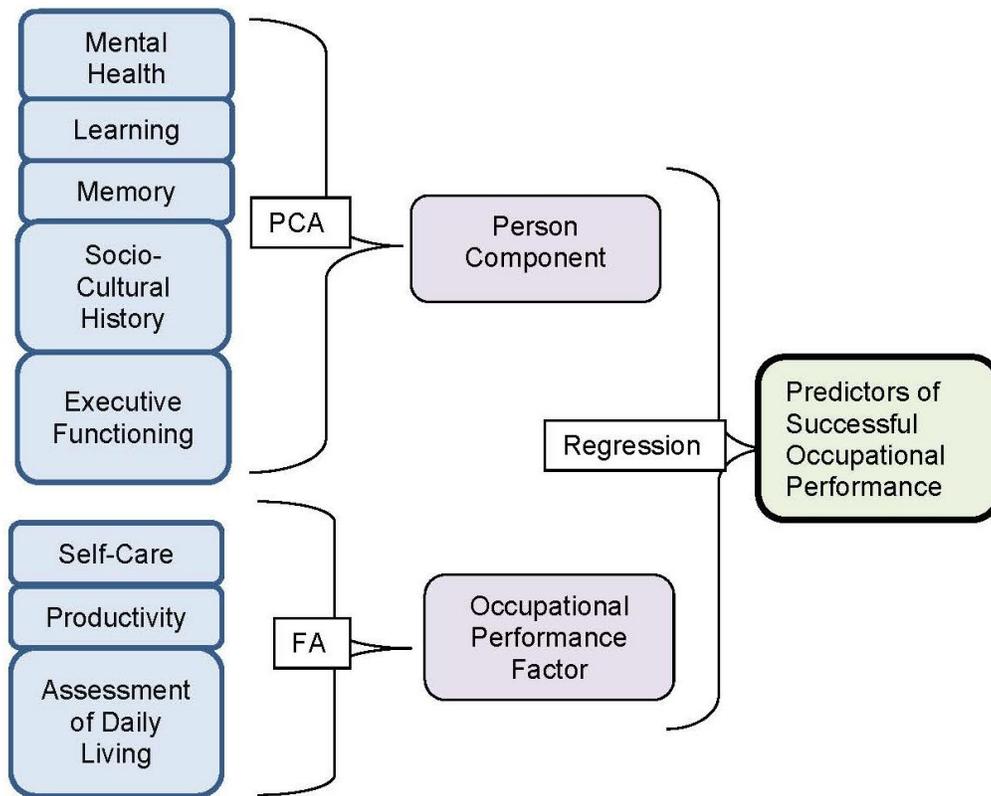


Figure 5. Variable Types Contained in Analyses for Aim One, Research Question 2

The DKEFS includes seven subtests that do not combine to a total score. As this is was a primary analysis, a PCA was conducted to reduce the seven subtests into one factor that would be more suitable for correlational calculations. The DKEFS subtests reduced to a model with a low Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) value of .67, suggesting that the sample was questionable for PCA, and the result should be considered non-robust. Typically, a $KMO > .8$ is considered very good while results in the .6 range are considered mediocre (Dziuban & Shirkey, 1974). However, the resulting model accounted for 48.6% of the variance and included the following subtests: Category Fluency, Category Switching, Number Sequence, Letter Sequence, Number-Letter Switching and Letter Fluency. There was no statistical

correlation between the ABAS-II and the DKEFS model at $r_T = .071$, $p = .504$, or between the ILS and DKEFS model at $r_T = .048$, $p = .762$. Hypothesis H2 was rejected. Hypothesis H3 was similarly not supported. There was no statistical correlation between the ABAS-II and the RBMT-3 at $r_T = .068$, $p = .592$. Statistical analysis showed no statistical correlation between the ILS and RBMT-3 $r_T = .248$, $p = .148$.

Research Question 3: Relationship Existence Between the ABAS-II and ILS, Evaluating the Accuracy of Self-Report Against Performance Assessment

The specific hypothesis and proposed analysis for research question 3 are presented in Table 14. The completed hypothesis H4 determined if a relationship existed between occupational performance and higher impairment in variables within the Person component. This hypothesis was not supported in the analyses.

Occupational Performance

Those variables identified to belong within the occupational performance factor were initially reordered to have categories within all the variables range of high functioning to low. This allowed for ranking of the variables from most functional to least and put data in the format necessary for PCA analysis.

On review of the dataset, variables were allocated to those components that were most reasonable. This was particularly true of the Occupation component; here a variety of variables were included that were seen to reflect occupation. One aspect of Productivity for many is to have a job, so Employment Status, and Number of Jobs were included as reflections of productivity. Productivity is placed at risk when individuals

Table 14

Hypothesis H4, Statistical Analyses and Variables

Hypothesis	Proposed Statistical Analysis	Completed Statistical Analysis	Variables
<p>H4 Greater impairment in executive functioning, memory, learning, and mental health with poorer socio-cultural environment will be related to lower occupational performance as measured in the areas of adaptive function, self-care, leisure, and productivity</p>	<p>Occupational Performance Factor - Factor Analysis(FA) to reduce variables related with occupational performance including categorical variables for self-care, leisure and productivity and standardized scores for the subtests on either the ILS or ABAS-II or both</p>	<p>PCA, Bivariate Correlation and cross tabulation</p>	<p>Occupational Performance variables - Financial Situation, Number of Jobs, Judicial Involvement, Incarceration, Current Employment status, Living Situation, Current Family Involvement,</p>
	<p>Person Factor - Principal Component Analysis (PCA) to reduce categorical variables in mental health, learning, and socio-cultural environment, and standardized scores in the RBMT-3, and DKEFS.</p>	<p>PCA, Bivariate Correlation and cross tabulation</p>	<p>Person variables - Mental Health concerns (Y/N), Grade Completed, Foster care exposure, RBMT-3, DKEFS, WJ subtests (Academic Skill, Academic Application, Calculation, Letter-Word ID, Passage Composition, Applied Problem, Spelling, Sample (writing))</p>
	<p>Linear Regression to determine contributors to occupational performance</p>	<p>Linear Regression, cross tabulation</p>	<p>Occupational Performance PCA factor (comprised of Living Situation, Finances, Current Employment, Judicial Concerns, and Incarceration), Person PCA factor (comprised of DKEF subtests and RBMT)</p>

find themselves linked with the justice system; as such Judicial Involvement and Incarceration were also included under this component. Independence in Self-care for adults can reflect their ability to manage their own finances and accommodations, so Finances and Living Situation were also included in Occupation. Family Involvement was also considered within Self-care since family support may be seen as increasing long term independence. The ABAS-II and the ILS represent basic ADLs such as bathing and feeding, and is routinely included within Occupation. The two variables that related to having children and caring for children were dropped as it was not feasible to

rank the values associated with these variables as high to low functioning, making them inappropriate for inclusion in the FA. Prior to factor analysis, correlations using Kendall's Tau were completed on the variables to determine if there were relationships, see Table 15. Statistically significant relationships were found between the variables of the ABAS-II and Judicial Involvement and Incarceration while the ILS did not correlate with any occupational performance variables. Family Involvement correlated with Finances and Living Situation, while Finances correlated with Employment Status. Judicial Involvement correlated with Incarceration and Number of Jobs.

Table 15

Correlations Between Variables Belonging to the Occupational Performance Factor

	Family Involved	Judicial Involvement	Incarceration	Finances	Living Situation	Number of Jobs	Current Employment Status
ABAS GAC	.075	-.279	-.283	-.025	-.050	-.129	-.068
Family Involved	1.000	.020	-.130	.300**	.298**	-.120	0.000
Judicial Involvement	.020	1.000	.443**	-.056	.008	.222 [^]	-.118
Incarceration	-.130	.443**	1.000	-.119	-.003	.160	-.209
Finances	.300**	-.056	-.119	1.000	-.149	-.031	.460**
Living Situation	.298**	.008	-.003	-.149	1.000	.019	-.053
ILS Full Score	-.155	-.124	-.077	-.205	-.018	.042	-.148
Number of Jobs	-.120	.222 [^]	.160	-.031	.019	1.000	-.118
Employment Status	0.000	-.118	-.209	.460**	-.053	-.118	1.000

*Correlation significant at the 0.05 level (2-tailed)

** Correlation significant at the 0.01 level (2-tailed).

Initial factor analysis resulted in three components; however the KMO was very low at .381. Forcing the variables into one factor, All Variables, produced the same KMO, and explained only 25% of the model variance (Table 16). Extracting the variable

Table 16

Factor Matrices for Occupational Performance Factor

	Factor		
	1	2	3
	All Variables	Variables, without Jobs	Living, Finance, Employment and Justice
Living Situation	0.367	-0.403	-0.476
Finances	-0.835	0.856	0.81
Family Involved	0.303		extracted
Current Employment	-0.745	0.758	0.774
Number of Jobs		extracted	extracted
Judicial Concerns	0.368	-0.344	-0.37
Incarceration	0.328	-0.307	-0.328

Number of Jobs, (Factor 2, Variables Without Jobs), did not improve the same KMO, although explained variance rose slightly to 29%. Number of Jobs was extracted as the amount it contributed to the model was so small it was not shown as a value. The final factor, Factor 3 Living, Finance, Employment and Justice, extracted Family Involvement variable, resulting in a KMO of .52 and explaining 34% of the variance. Unfortunately, even this model is considered to be questionable with poor interpretability.

From the analyses in H1 and H2, the ABAS-II was selected to be included in the occupational performance model as it had previously correlated with other variables while the ILS had not. Initial rotated component factor analysis matrix identified two factors that explained 58.1% of the model's variance and had a KMO of 0.560 (Table 17). The grouping of components is similar to previous correlations, with the ABAS-II

Table 17

Rotated Component Matrix for Occupational Performance Factor

	Factor	
	1 Lifestyle Variables	2 Justice and ABAS-II
Living Situation	-0.5	
Finances	0.876	
Current Employment	0.829	
Judicial Concerns		0.68
Incarceration		0.79
ABAS_GAC		-0.767

Rotation Method: Varimax with Kaiser Normalization.

linking with Judicial Concerns and Incarceration while the lifestyle variables including Living Situation and Current Employment loaded with Finances.

Forcing variables into one factor for Occupational Performance and refining the variables resulted in a final KMO of .560 but the explained variance dropped to 32.7%. The variables of Judicial Concerns and Incarceration were recoded into dichotomous variables to improve the fit of the model and KMO, which was .615 and gave an explained variance of 36.0% (Table 18).

Table 18

Component Matrix for Occupational Performance Factor with ABAS-II

	Occupational Performance Factor
Living Situation	0.417
Finances	-0.587
Current Employment	-0.554
ABAS GAC	-0.546
Judicial Recode	0.668
Incarceration Recode	0.768

Person Component. The Person Component was initially comprised of categorical and continuous variables (Table 19). Correlation analysis using Kendall's Tau revealed a significant relationship between executive functioning, memory, and academic skills. Grade

Table 19

Correlations Between Variables Identified with the Person Factor

	DKEF PCA	RBMT Full	Grade Completed	Mental Health Concerns
DKEF PCA	1.000	.238	.104	.023
RBMT Full	.238	1.000	.050	-.126
Grade Completed	.104	.050	1.000	.100
Mental Health Concerns	.023	-.126	.100	1.000
WJ Academic Skill	.372**	.224	.045	.045
WJ Academic Application	.303**	.309*	-.082	-.034
WJ Letter Word ID	.409**	.265*	.077	.054
WJ Passage Comp	.337**	.289*	-.078	.067
WJ Calculation	.420**	.259*	.100	.033
WJ Applied Problem	.218*	.373**	-.062	-.156
WJ Spelling	.272**	.244*	-.025	-.019
WJ Writing Sample	.292**	.171	-.032	.054

* Correlation significant at 0.01 level (2-tailed)

** Correlation significant at the 0.05 level (2-tailed)

Completion was not significantly correlated with executive functioning, behavioral memory or academic skills. Mental Health Concerns were not significantly correlated with executive functioning, behavioral memory or academic skills (Table 20).

Initial PCA with varimax rotation determined four components with KMO of .679 and explained variance of 67% for three of the components (Table 20). While the formal assessments measuring executive function, memory, and learning loaded into the first two components, they did not link with *Grade Completion*. *Foster Care* and *Grade Completion* were negatively linked into one component, as were *Mental Health*

Table 20

Component Matrix for Person Factor

	Initial Person Component			
	1	2	3	4
Grade Completed			0.927	
Mental Health Concerns				0.867
Foster Care			-0.466	0.57
WJ Academic Skill	0.967			
WJ Academic Application		0.874		
WJ Letter Word ID	0.924			
WJ Passage Comp	0.861			
WJ Calculation	0.78			
WJ Applied Problem		0.912		
WJ Spelling	0.896			
DKEF PCA	0.633	0.373		
RBMT Full	0.363	0.518		

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

Concerns and Foster Care. A decision to use subtests was made in order to observe any correlations that may be lost through variable reduction. Due to the low power of a model because of low sample size, a correlation between variables may not be evident. Forcing the variables into two components, see Reduced Component in Table 20, the categorical and descriptive variables of grade completed and mental health concerns did not load into the model. The final model for the Person Component contains only variables ascertained from formal testing and involving assessment of cognitive skills. See Table 21. The KMO was highest at .763 and explained variance of 50%.

Completing regression between the Person and Occupational Performance factors (hypothesis H4) produced a very small linear relationship. There were no statistically significant differences between group means between the Person and Occupational Performance factors, as determined by one-way ANOVA ($F(1,26) = .216$,

Table 21

Component Matrices for Person Factor, Reduced

	Reduced Component		Person Component
	1	2	
Grade Completed			extracted
Mental Health Concerns			extracted
Foster Care	-0.336		
WJ Academic Skill	0.954		0.93
WJ Academic Application		0.88	0.395
WJ Letter Word ID	0.924		0.936
WJ Passage Comp	0.854		0.868
WJ Calculation	0.8		0.782
WJ Applied Problem		0.892	0.451
WJ Spelling	0.874		0.819
DKEF PCA	0.688	0.342	0.763
RBMT Full	0.4	0.487	0.539

Extraction Method: Principal Component Analysis. Rotation Method:
Varimax with Kaiser Normalization, 3 iterations

$p = .646$). In the process of developing the models, some significant relationships may have been lost between variables identified as occupational performance and those as person. The lack of explanatory power of the models also leads to consideration that the analyses may not be accurate.

To counter these possibilities, the variables identified under occupational performance were correlated against one another individually using Kendall's Tau, as well as specific variables under the person factor, and cross tabulated. Examination of *Financial Support* showed those who were self-funded (not receiving financial support through the state or informal means) were most likely to live with a partner or extended family (61.6%) and those who were financially supported by parents were most likely to live with them (71.4%). Those receiving income support were more likely to live alone (47.1%) while those receiving Assured Income for the Severely Handicapped (AISH)

were more likely to live in a group home (41.7%). The majority of participants had involvement with the foster care system (60.7%). Those who had not been involved with the foster care system tended to live with their parents (48.5%) or extended family (21.2%) while those who had been involved with the foster system were more varied in their living situations (21.6% with parents, 17.6% in group home, 17.6% with partner and 15.7% live alone). See Appendix B. Only 36.9% of the sample had involvement with the judicial system, with only seven out of 84 individuals incarcerated.

The sample had a high number of participants with mental health concerns (84.5%) and of those with concerns, 63.4% had involvement with the foster system. However, there was no statistically significant relationship between involvement with the judicial system and mental health concerns ($r_T = .097, p = .347$). There was a statistically significant relationship between actual incarceration and mental health concerns ($r_T = .237, p = .028$).

Examining the relationships between *Mental Health Concerns, Grade Completion, Foster Care, Living Situation, Judicial Involvement, and Age* for the 84 participants using Kendall's Tau resulted in only two relationships of statistical significance. *Age* and *Mental Health Concerns* had a positive correlation such that as the participants increased in age they were more likely to have mental health concerns ($r_T = .323, p < .0005$). *Age* was negatively correlated with living situation ($r_T = -.348, p = .000$); as participants aged they were less likely to live with parents and family members. *Diagnosis* did not correlate with grade completion ($r_T = -.310, p = .757$).

Chapter 5: Discussion

This is the first study to examine the factors thought to contribute to successful occupational performance in individuals with FASD. Using a sample of 84 participants who received a diagnosis under the FASD umbrella, principle component analysis, regression, and correlational analyses were completed on the many variables identified under occupational performance and the person factor. The statistical approach to this study rigorously controlled for missing data through removing participants with large amounts of missing data, and using the mean of the data points for an individual missing data point. Both controls altered the total number of participants included in each analysis.

Performance and Self-Report of Daily Living Skills

In completion of Aim 1 of this study, the relationship between self-report and performance-based daily living assessments was examined. It had been hypothesized that these two approaches to assessment of daily living skills would be correlated. However, the analysis failed to support the hypothesis; there was no clear relationship between the ABAS-II and the ILS. Further, the absence of a relationship was found whether the participant completed the ABAS-II themselves or another individual completed the ABAS-II on their behalf, within the reduced sample. In this sample there was a small subset of individuals (n=4) for whom the ABAS-II was completed by proxy.

Kendall's Tau Correlation Coefficient was done to examine differences between this group and the main analysis group, and none were found. This may have been due to the uneven distribution of participants in the two groups. Alternatively, the finding that it did not matter if the participant or a proxy completed the ABAS-II suggests that there is an inherent difference between the content and/or composition of the ABAS-II and the ILS that impacted the lack of correlation; it cannot be attributed to personal attributes of the individual completing the instrument. Only those participants who completed the form independently were included in the further analyses. Interestingly, individual subtests which appear similar between the two assessments, such as the social subtest on the ILS with the social component on the ABAS-II, also did not correlate.

These findings lead to the possibility that the ABAS-II and the ILS may not be measuring the same aspects of daily living skills. Of note is the age of the ILS, published by Loeb in 2001, and the possibility that some of the items on the assessment are not compatible with today's lifestyle (Loeb, 2001). The instrument measures aspects of daily life, such as looking a phone number up in a phone book, that are not part of everyday life and culture currently. The ABAS-II may not be affected as much by the passage of time, as the tasks included are not as affected by technology such as bathing.

Adaptive behavior is characterized as those conceptual, social, and practical skills that are learned in order to function in daily life, as put forward by the American Association on Mental Retardation (Schalock & Luckasson, 2004), and upon which the ABAS-II is based upon (Aricak & Oakland, 2010). This definition emphasizes the expression of the skills rather than simply the acquisition. A person may be able to

learn a skill (acquisition) but also needs to use the skill in everyday life (expression). More specifically, practical skills are meant to include activities of daily living; however, Schalock & Luckasson (2004) report that formal assessments are unable to capture all areas of adaptive behavior and unlikely to accurately represent the total breadth of an individual's functioning. This allows for the possibility that the ABAS-II measures different aspects of adaptive behavior than does the ILS, and it may underlie the failure to find a relationship between these tools in this investigation.

On closer inspection, the ILS was developed to measure the cognitive abilities required for independent living and the likelihood of successful independent living through completion of daily living tasks (Revheim & Medalia, 2004). The ILS is meant to classify an individual's level of functioning to assist in discharge planning. A high score indicates that a high level of independence can be expected. For instance, Revheim & Medalia (2004) found that living status was successfully predicted by the ILS scores in individuals with schizophrenia. Results from the study described in this document suggest that the ILS may be measuring different skills that make up daily functioning and may not relate with the model of occupational performance. In this study it was speculated that accurate recall and written comprehension were two of many cognitive processes that might impact self-report in the ABAS-II and ILS; however, the lack of correlation suggests otherwise. This suggests the two assessments are not affected by cognitive processes of the individual. The ABAS-II was also found to have limited relationships with other key variables, leading to questions on its usefulness in predicting daily functioning. At this time, in a clinical

setting, it may be better to use both assessments to gain a broader understanding of the person's abilities rather than choose one over the other.

In examining daily living skills, the relationship between executive functioning and GAC scores on the ABAS-II, and the full scale score on the ILS was expected to be positive (hypothesis H2). Poor executive functioning and memory are well identified characteristics of FASD (Rasmussen, 2005; Mattson et al., 2010). Previous studies have postulated that individuals with FASD should have difficulties with daily living due to their executive functioning deficits (Connor et al., 2000), although other investigators failed to find adaptive behavior deficits related to the diagnosis of FASD (Whaley et al., 2001). It was expected that the ILS would correlate with executive functioning and memory, as this tool is purported to measure the cognitive abilities required for independent living. Analysis did not support this relationship or a relationship between the ABAS-II and executive functioning and memory. These results suggest that there may be factors other than executive function and memory impacting adaptive functioning in individuals with FASD. This multi-factor possibility for successful daily living supports the theoretical framework utilized in this study, occupational performance and the successful engagement of an individual in purposeful and meaningful activities is dependent on many aspects of the person, environment, and occupation.

Occupational Performance and Daily Living Skills

In this study the occupational performance model was created from variables expected to be available in the database. Creation of a robust statistical model was limited by small sample size and the limited occupational performance data collected, which restricts the explanatory power. Seven variables were identified as representing

aspects of occupational performance: *Living Situation, Finances, Current Employment, Judicial Concerns, Incarceration, Number of Jobs and Family Involved*. Factor analysis using these variables resulted in the Occupational Performance factor which was comprised of two components, the lifestyle variables (*Living Situation, Finances, and Current Employment*), and the *ABAS-II, Justice and Incarceration*, that explained the majority of the variance in the model. Results indicate that financial independence and employment are important areas to explore with these individuals during assessment, as poorer employment history was related to decreased financial independence and less optimal living situation. Not unexpectedly, successful occupational performance, as measured here, could not be categorized by one outcome, adding additional support for the likely multifaceted nature of this population and the importance of exploring this area through measures of occupational performance that incorporate the environment, activity and person.

The final statistical model for Occupational Performance included the variables of *Living Situation, Finances, Current Employment, Judicial Concerns and Incarceration* to reflect occupational performance. The absence of leisure and self-care variables, which were not captured in the database, means the statistical model did not speak to the broad spectrum of occupational performance. The ABAS-II has a section on self-care, so could be included within the self-care component; however the lack of correlation by the ABAS-II with other variables suggests that it would not load into the factor. The factor analysis and correlations from this study point to family involvement as a factor to avoiding involvement with the judicial system. Family involvement correlated positively with grade completion, and negatively with involvement with the judicial system and jail.

In the factor analysis, family involvement did not load with formal assessments of memory, learning and executive functioning. This is similar to other literature which stresses that ongoing family involvement is necessary for this population. Michaud & Temple (2013) interviewed mothers of children with FASD. These mothers indicated that their children would need family support well into adulthood to participate in daily activities, and would struggle to live on their own; mothers commented that they would be caring for their children until the mother died. Examining the issues somewhat differently, Fast and Conry (2004) stressed that multiple factors contribute to criminal behavior in individuals with FASD. These factors included a poor home environment, vulnerability to making poor decisions, alcohol and/or drug abuse, exposure to criminal behavior through family members, and involvement with the foster care system (Burd, Fast, Conry & Williams, 2010; Fast & Conry, 2004). Thus, Fast and Conry also support the link between family involvement and criminal behavior.

Interestingly, individual correlations between the ABAS-II and occupational performance variables indicated a significant, negative relationship with judicial concerns and incarceration; with higher scores on the ABAS-II, the participant was more likely to have had involvement with the justice system. While on the surface this appears counter-intuitive, it is possible that as the individual is more independent with adaptive behavior and daily life, he may have less supervision leading to more opportunities for illicit behaviors. This is a question to be explored in future research.

The Relationship Between the Person Factors and Success in Daily Life

Creation of the model incorporating variables that make up the person was also limited by the number of participants. Several anticipated variables for the person factor

could not be included in the model due to missing data. Viable variables examined relative to person included mental health issues, school completion, academic skills, foster care involvement, and executive functioning. Somewhat surprisingly, results indicated that cognitive and academic functioning was not related to school completion. This suggests that something else, or a combination of factors, have a substantial impact on school completion. Involvement in the foster care system may be one factor, as the results loaded it negatively with school completion. Living with family and family involvement may also contribute to school completion. Victor, et al. (2008) had indicated that a stable home environment, the level of verbal interaction in the home, and the familial expectations regarding education, all contributed to school completion. It would be valuable for further research to explore in detail the link between family support, foster care, and school completion. In the broader picture, examining such factors as the length of time in the foster system, number of placements and adoption may also provide greater insight into school success than academic abilities for this population. Consistent with this suggestion, Pears, Kim, Fisher & Yoerger (2013) found decreased engagement in school by children in foster care, leading to poorer academic outcomes.

A stable home environment has been linked with school success (Victor, et al., 2008) and may also be a key factor with the FASD population. Looking more closely at living situation, those participants who lived with family were more likely to be self-funded for finances and have jobs. Family involvement correlated with living situation and, as noted earlier with finances, implying that family support may be a key factor in successful living for these individuals. Participants who had been involved with the foster system had a wider range of living situations, from living with foster parents to

being homeless, while the majority of non-foster care participants lived with parents or their partner. Mental health concerns were very prevalent in the sample (84.5%) but did not appear to influence the living situation of participants. Interestingly, of those who had mental health concerns, the majority had been involved with the foster system (63.4%). This is comparable to previous research that indicated ongoing psychosocial issues with people who had been in foster care (Dregan & Guildford, 2012). Intelligence did not correlate with participants living or financial situations though executive functioning did correlate, indicating there can be multiple factors that influence these variables.

In sum, these findings speak to the multifarious factors that impact the daily lives and long term outcomes for individuals with FASD. While there are studies linking mental health issues, foster care involvement and family support to success in daily living, there is little information on 'dosage' relative to foster care, type of mental health concern, type of involvement or support for the FASD population (Dregan & Gulliford, 2012; Pears, et al., 2013). Further research is needed to better understand the details of the participant's mental health issues, foster care involvement, diagnoses, severity and impact of these variables on engagement in occupational performance.

Interpretation of the Findings in Relation to the CMOP-E

Successful engagement in purposeful and meaningful activities is at the heart of occupational performance (Law, 1991), and occupational performance and engagement are conceptualized as the dynamic interaction of person, environment, and occupation (Polatajko et al., 2007).

In this study, the concept of occupational performance was proposed to be illustrated by variables in self-care, productivity, and leisure; however, final analysis was limited and the final model is somewhat different (Figure 6).

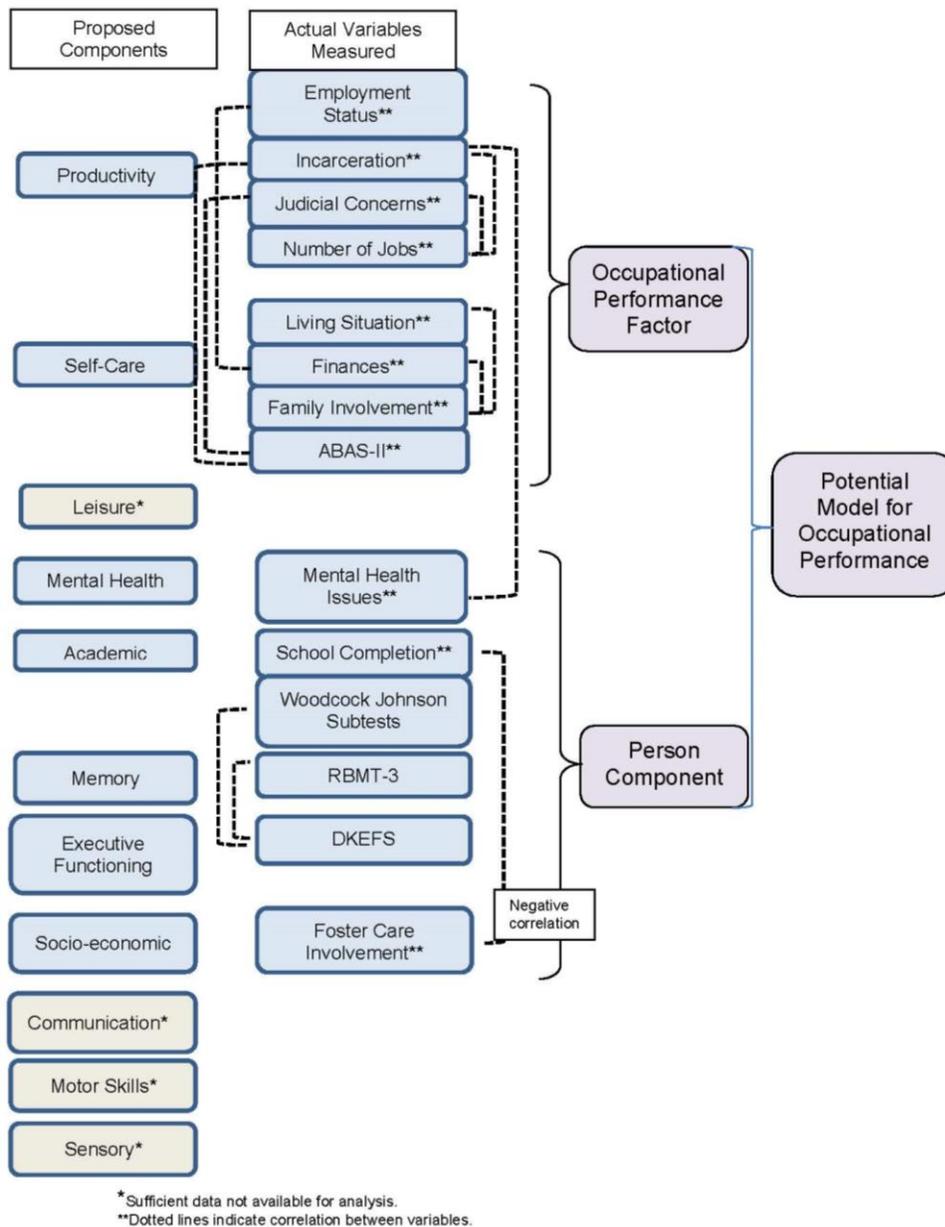


Figure 6. Variables and Correlations Pertaining to Occupational Performance and the Person

The model shows the proposed variables and the variables that were included in final analysis. Also included in the model and indicated by dotted lines, are the correlations that were found between variables.

This study queried person variables potentially predictive of successful outcomes in occupational performance: formal assessments of cognitive abilities as well as information on schooling, mental health, and social variables comprised these variables. While the statistical models suggest some relationships between variables reflecting occupational performance and the person component, they were not sufficiently robust to pinpoint the predictive factors to successful occupational performance.

The lack of explanatory power of the occupational performance statistical models speaks to the intricacy of the underlying concept and the need for a robust dataset. Living situation, finances, employment, and judicial concerns consider only fragments of the purposeful and potentially meaningful activities that are in our daily lives. Further exploration in this area should include variables tapping more deeply into leisure and self-care information; this will enable a more comprehensive model of occupational performance for this population. The ABAS-II and ILS provide some information on self-care; however considering self-care embedded within occupational performance offers a broader picture. Having the ability to do an activity does not mean a person is consistent and functional in the activity. For example, an individual may be able to set the table for a meal, but if the environment does not allow regular opportunities to use this skill, setting the table may not become a functional activity.

Living with parents, partners or extended family, and family involvement, have a positive impact on finances and employment. Surprisingly, they were not related to

judicial concerns. However, only a small subset of the current sample had judicial concerns, suggesting that factors not considered in this study, i.e. aspects of the environment (physical and cultural) and other aspects of the person, may mitigate risk factors that lead to judicial concerns.

The person component as defined by the CMOP-E contains many more aspects of human functioning than were feasible to examine in this study. None-the-less, this study included both formal assessment and descriptive data on function. Interestingly, variables obtained through formal assessments of executive functioning, memory, and academic skills related to each other but did not relate to descriptive variables, such as grade completion. This calls into question the actual meaningfulness of these standardized scores and suggests that important aspects of the person to consider for this population were not identified. It was those variables which capture the participant's current life situation, such as family involvement, history with the foster system, mental health issues, and living situation, that showed the greatest relevance to occupational performance. Delving further into these variables would give a more complete picture of what the real predictors are of occupational performance.

Guided by the CMOP-E and the concept of occupational performance, variables in this study were categorized into areas of potential influence. Analyzing the data through the lens of occupational performance allowed for reflection on the possible factors that could impact daily life. The CMOP-E provides a useful guide for this type of research because the scope and breadth of the model allows the researcher to include variables not typical in predicting success of daily living. However, the CMOP-E also

falls somewhat short, for the same reason. It does not offer the researcher specifics on measurement variables.

Further Findings

This study allowed one of the first examinations of data collected on multiple aspects of occupational performance of individuals with FASD. While the following conclusions do not fall within Aim One or Two, they do offer some insight into the youth and adult FASD population. This information can assist in program development and question some current thinking on individuals with FASD.

In characterizing the full group of participants, it became clear that there was similarity in the number of participants diagnosed with FASD between Caucasian and Aboriginal ethnic backgrounds, suggesting relatively equal prevalence of the FASD spectrum of diagnoses across these two populations within this sample. Published studies remain divided on whether the native or aboriginal population is over represented in FASD prevalence or there are errors in measurement of the prevalence of FASD (Burd & Moffatt, 2011). Burd & Moffatt (2011) highlighted the preponderance of articles focusing on high prevalence levels in the aboriginal populations. However, there is limited epidemiological data across other ethnic groups, which biases interpretation and limits comparison among ethnic groups.

The data obtain for this study are interesting, as the catchment area for the clinics includes nine native reservations, with some of the largest aboriginal populations in Alberta (Health Co-Management Secretariat, 2010). In the full sample, the similar number of Caucasian and Aboriginal individuals referred to the clinic points to this not being viewed as a “native issue”, as popular media may suggest. Further, a recent

study indicated that the highest reported estimates for women drinking in child bearing years were found with Caucasian, college educated, employed women (Centers for Disease Control and Prevention, 2012). This implies that ethnicity either does not play a role in the underlying etiology of FASD, or that the role of ethnicity is not as profound as once thought. Until more data that include a variety of ethnic backgrounds are collected it is unwise to conclude the aboriginal population has a higher prevalence of FASD. Instead, these diagnostic outcomes suggest that there may be more equality in the prevalence rates of FASD in Alberta between Caucasian and Aboriginal people

In this study, approximately two thirds of the sample had not been involved with the judicial system, and only seven individuals out of 84 had been incarcerated, even though the sample group had multiple risk factors. Previous studies estimated that youth with FASD are 19 times more likely to be incarcerated in a year than those without FASD based on prison statistics (Popova et al., 2012); however there is little information available exploring the prevalence of criminal behavior within the FASD population.

The surprising results of this study suggest there are also mitigating influences that prevent involvement in the justice system, and it cannot be assumed that having a diagnosis of FASD inevitably results in involvement with the justice system. This finding is potentially very important and worth further exploration. From a program development perspective, implementing appropriate supports and specific intervention may lower the incidence of criminal behavior. For families, this knowledge can bring hope that their loved one can stay out of jail.

Defining the mitigating factors is key since the risk factors of this sample are similar to those designed in previous research (Zara & Farrington, 2010). These risk factors include low education levels, poor financial independence, childhood history of family/home disruption and low levels of productivity. In Zara & Farrington's sample, the participants did not have the cognition to reason through potentially harmful situations or poor social situation; this can increase the likelihood of engaging in criminal behavior. Fast & Conry (2004) reported on similar cognitive limitations, characteristics, and life situations that increase the risk of illicit behavior and involvement with the judicial system. The participants in this study demonstrated decreased intelligence, with a large variance in intelligence scores. This does not appear to be related to their involvement with the judicial system. Authors have reported family support and a stable home environment to be risk mitigating factors but have not defined the qualities of those variables (Spohr & Streissguth, 2008). The results from this study indicate living with parents, partners or extended families was associated with less involvement with the judicial system, a positive outcome. What is unknown is why this may have a positive impact. This suggests further research would be beneficial. The next step is to compare these situations to living alone, with a roommate or a formal living arrangement and to get more detail on these.

Limitations

Cross sectional designs are limited by a potential cohort effect, where the subject's generation or time period in which they are living is a variable (Portney & Watkins, 2009). However, using cross-sectional data allows a snapshot in time, which can be useful in understanding many factors that contribute to a single outcome. To

counteract the potential cohort effect, it is important to gather subjects from across the age span, which was accomplished in the current study.

A pre-existing data set was chosen due to time and financial constraints. Disadvantages of retrospective studies include the likelihood of missing data. In addition, retrospective studies include data generally collected for a different purpose, limiting the potential analyses. While significant amounts of missing data occurred in the study, the available data provided an opportunity to explore variables from a different perspective. A revision of planned analysis was required as a result of data loss, and the cross tabulation and correlations guided identification of specific relationships that may have been missed with a more complex statistical approach. The correlations and descriptive statistics also brought to the forefront interesting characteristics of the sample that would have been missed, such as the limited number of participants who were involved with the criminal system.

An additional limitation is presented in the model that steered this investigation. The CMOP-E was designed as a guide for occupational therapy practice (Townsend, 2002). It provides one explanation of the constituents of occupation; however there are investigators that question the classification of the categories and its usefulness (Hammell, 2009). The CMOP-E does not attempt to identify the importance of constructs relative to each other. This limits its potential as a source for guiding the analysis and interpretation. The possible vagueness in the environmental categories allows for errors when assigning variables to a category for classification. Further, current arguments challenge that productivity does not encompass the wide variety of possible activities (Hammell, 2009). In this study, the broadness of the model did not

appear to be a hindrance. Use of this model appears to have assisted the study in that the model does not define what variables or components can be included and this author was able to include a variety of different types of variables along with multiple analyses.

Conclusion

This is the first study to consider the factors that contribute to successful occupational performance in individuals with FASD. The use of the CMOP-E provided a well-established framework for examining those variables that may be part of occupational performance or characteristics of the person. The challenge of the CMOP-E is, in part, how to operationalize the different components – Person, Occupation and Environment. Variables relating to Person and Occupation could be found; however Environment was more elusive. Further research is recommended on how Environment can be incorporated into studies such as this.

Further study is recommended to determine if self-report, performance based assessment, or both are required to acquire a more complete picture of a person's functioning. The lack of correlation between the performance and report-based assessments of daily function calls into question the purpose of these instruments in the assessment process and the information that they can provide. In addition, this study showed some of the possible factors that contribute to occupational performance, but also illustrated the need to include a spectrum of variables in future studies that describe functioning levels in self-care, leisure and productivity in order to determine predictors of occupational performance success.

One factor that was highlighted within the study was the importance of family support to an individual with FASD for their living situation, employment, and financial status. A second factor to surface was the ongoing negative effects of a participant's inclusion in the foster care system, which appears to relate to their mental health, and living situation. Both findings are consistent with existing literature. Future study is recommended to more completely explore the impact these two factors have on individuals with FASD.

The failure to find simple relationships between measured and descriptive variables may mean that there are multiple factors within a person that are involved in successful engagement in occupational performance. It is proposed that these contributions go beyond intelligence, memory, and executive functioning. This study also indicated that limiting "occupational performance" to variables focused on productivity is insufficient to fully understand this construct.

While previous studies have focused on the impact that cognitive deficits have on daily life, this study was able to show that independence and functioning in daily life is more than cognitive skill. Daily functioning is dependent on more than academic skills, memory, executive functioning, or intelligence.

Finally, the sample characteristics of this study indicated that prevalence rates of FASD were similar for Aboriginals and Caucasians. These findings require serious consideration. Previous research had indicated a higher prevalence rate in the Aboriginal population, something not found here. Another characteristic of the sample in this study was the low incarceration rate and involvement with the judicial system, suggesting the potential of mediating factors that can be further explored. It may be

useful to explore this from the perspective of occupational performance; one that includes the person and environment components.

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Glossary

Activities of Daily Living Those activities that an individual participates in regular and typically daily nature.

Adaptive Functioning An individual's ability to participate in activities of daily living and their level of independence.

Affect relates to emotions and emotional regulation.

Fetal Alcohol Spectrum Disorder An umbrella term for a group of diagnoses describing an individual's condition that is affected by pre-natal alcohol exposure.

Leisure Those activities an individual engages for pleasure and enjoyment. Examples of these activities are hobbies, reading and visiting with friends.

Occupational Performance The engagement by an individual in purposeful and meaningful activities

Productivity Those activities an individual engages in that contribute to society, whether paid or unpaid. Examples of these activities are volunteering and going to school.

Self-Care Those activities that assist an individual to maintain health and wellness. Examples of these activities are bathing, dressing and feeding.

Spirituality A person's belief system and their values (Townsend, 2002). It contains those intrinsic values which guide and shape a person's choices and actions.

Appendix A

Sample Characteristics Between the Full and Reduced Samples

Table A1

Participant Age

	N	Minimum	Maximum	Mean	Std. Deviation
Full Sample	145	13	54	24.20	9.212
Reduced Sample	84	13	54	23.26	8.99

Table A2

Sample Characteristics

Characteristic		Full Sample		Reduced Sample	
		Frequency	Percent	Frequency	Percent
Gender	Male	69	47.6	40	47.6
	Female	76	52.4	44	52.4
Ethnicity	Caucasian	71	49.0	46	54.8
	Aboriginal	73	50.3	37	44.0
	Other	1	0.7	1	1.2
Mental Health Concerns	No	19	13.1	11	13.1
	Yes	122	84.1	71	84.5
	Unknown	4	2.8	2	2.4
Foster Care	No	56	38.6	33	39.2
	Yes	88	60.7	51	60.7
	Unknown	1	0.01	0	.0
Family Involved	No	20	13.8	11	13.1
	Yes	125	86.2	73	86.9
Incarcerated	No	117	80.7	70	83.3
	Yes	20	13.8	7	8.3
	Unknown	8	5.5	7	8.3
Judicial Concerns	No	23	15.9	11	13.1
	Yes	38	26.2	20	23.8
	Unknown	84	57.9	53	63.1
Grade Completed	Unknown	18	12.4	15	17.9
	Post Secondary	1	.7	1	1.2
	High School Diploma	11	7.6	6	7.1
	Gr. 10 - Gr. 12	62	42.8	31	36.9
	Gr. 6-9	49	33.8	30	35.7
	K-Gr. 5	4	2.8	1	1.2

Table A3

Reduced Sample Diagnoses

Diagnosis	Frequency	Percent
Static Encephalopathy/Sentinal Physical Findings - Alcohol Exposure	9	10.7
Static Encephalopathy - Alcohol Exposure Unknown	1	1.2
Static Encephalopathy - Alcohol Exposed	60	71.4
Partial FAS - Alcohol Exposed	7	8.3
FAS- Alcohol Exposure Unknown	1	1.2
FAS - Alcohol Exposed	6	7.1
Total	84	100.0

Table A4

Reduced Sample Cognitive Characteristics

Assessment	N	Minimum	Maximum	Mean	Std. Deviation
IQ Full Standard Score	48	42	100	70.6	11.4
RBMT Full Standard Score	42	58	100	75.4	10.8
DKEF Accuracy	39	0	13	4.9	4.4
DKEF Category Fluency	47	1	13	7.0	3.0
DKEF Category Switching	47	1	14	7.5	3.1
DKEF Letter Fluency	47	1	14	7.4	3.0
DKEF Letter Sequence	47	1	12	6.0	3.2
DKEF NL Switch	47	1	11	5.5	3.5
DKEF Number Sequence	47	1	14	5.9	3.6
WJ Academic Application	42	31	91	73.5	13.6
WJ Academic Skill	47	22	95	73.6	17.9
WJ Applied Problem Solving	43	45	94	77.4	11.1
WJ Calculation	47	19	94	63.7	15.2
WJ Letter Word ID	47	23	101	82.3	16.6
WJ Passage Composition	46	39	95	80.0	12.1
WJ Writing Sample	42	38	96	80.0	12.1
WJ Spelling	47	37	108	81.8	17.0

Appendix B

Cross Tabulation of Foster Care, Financial Status and Living Situation

Living Situation	Foster Care			Finances					
	No	Yes	Total	Self-funded	Family support	No formal support	Income support	AISH	Total
Living Alone	4 12.1%	8 15.7%	12 14.3%	1 7.7%	0 0.0%	0 0.0%	8 47.1%	3 25.0%	12 14.3%
Independent with Supervision	0 0.0%	2 3.9%	2 2.4%	0 0.0%	0 0.0%	0 0.0%	1 5.9%	1 8.3%	2 2.4%
With Roommate	0 0.0%	3 5.9%	3 3.6%	0 0.0%	0 0.0%	0 0.0%	2 11.8%	1 8.3%	3 3.6%
With Extended Family	7 21.2%	7 13.7%	14 16.7%	4 30.8%	5 17.9%	4 28.6%	0 0.0%	1 8.3%	14 16.7%
With Partner	4 12.1%	9 17.6%	13 15.5%	4 30.8%	3 10.7%	4 28.6%	1 5.9%	1 8.3%	13 15.5%
With Parents	16 48.5%	11 21.6%	27 32.1%	1 7.7%	20 71.4%	3 21.4%	3 17.6%	0 0.0%	27 32.1%
Group Home	2 6.1%	9 17.6%	11 13.1%	2 15.4%	0 0.0%	2 14.3%	2 11.8%	5 41.7%	11 13.1%
Homeless	0 0.0%	2 3.9%	2 2.4%	1 7.7%	0 0.0%	1 7.1%	0 0.0%	0 0.0%	2 2.4%
	33 100.0%	51 100.0%	84 100.0%	13 100%	28 100.0%	14 100.0%	17 100.0%	12 100.0%	84 100.0%

VITA

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