Achievement Motivation and Intervention Impacts in Adolescents with Fetal Alcohol Spectrum Disorder

by

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Abstract

This dissertation consists of three separate papers that contribute to an increased understanding of achievement motivation and discuss how it can guide interventions for adolescents with Fetal Alcohol Spectrum Disorder (FASD). The first paper is a concept review of important topics in this dissertation, namely achievement motivation, FASD, and interventions. Two achievement motivation theories were applied in this dissertation (i.e. Mindset Theory and Self-Determination Theory), and these theories are discussed in detail. I also describe considerations for achievement motivation in developmental disability populations, specific motivation research related to adolescents with FASD, and the importance of intervention research. I unravel the relationships between achievement motivation, FASD, and interventions, and call for researchers to consider the impact of participant characteristics on intervention outcomes.

In the second paper, I primarily explore Mindset Theory (MT) in adolescents with FASD. The second paper is a descriptive study in which I measured and described types and levels of mindsets in adolescents with FASD and their caregivers. As part of a self-regulation (SR) intervention study, I collected information on the mindsets about SR for 24 adolescents (aged 11-17) with diagnosed FASD, as well as their caregiver's mindset about SR for their child. I incorporated Self-Determination Theory (SDT) into this study by measuring psychological needs (i.e. competence, autonomy, and relatedness) and interest/enjoyment in the intervention. This study was divided into two stages. In the first stage, I found that the majority of adolescents with FASD and their caregivers had a predominantly growth mindset for SR. There was no significant correlation between adolescent's SR mindsets and competence, autonomy, relatedness or interest/enjoyment. There was a significant correlation between the three psychological needs and interest/enjoyment, which adds support to SDT. In the second stage, I conducted a qualitative analysis of interviews with seven adolescent participants and five caregivers to uncover influences on mindsets. Six themes were found: *observation of change,*

strategy development and use, support and resources, making meaning of the diagnosis, *increased understanding of SR*, and *hope and positivity*. These findings are discussed in the context of how we can use an increased understanding of SR mindsets, as well as the variables that contribute to a SR mindset, to guide practitioners and researchers in considering the beliefs that participants hold when they are participating in intervention programs. Future avenues for research are identified.

In the third paper, I explore the influence of the level of mindset and psychological need satisfaction on an intervention outcome (i.e. inhibition). A sample of 23 adolescents with FASD participated in a SR intervention program, and I conducted pre- and post-testing of SR mindsets, psychological need satisfaction, interest/enjoyment, and three inhibition measures. Verbal inhibition was found to significantly change in a pre- post- comparison, and psychological need satisfaction was found to predict improvements in verbal inhibition. In addition, adolescents reported experiencing a sense of competence, autonomy, relatedness, and interest/enjoyment in the SR intervention, and I found a significant increase in sense of competence from the beginning of the intervention to the end. Lastly, the level of SR mindset significantly changed towards a more growth mindset orientation when adolescents who had completed the intervention were compared with a waitlist control group. The importance of considering MT and SDT in intervention development, implementation, and research is discussed.

Preface

This thesis is an original work by Aamena Kapasi. This thesis is part of a larger research project which received research ethics approval from the University of Alberta Research Ethics Board, Project Name “Self-Regulation in Adolescents with FASD: The Efficacy of a Targeted Intervention”, Pro00064830, September 8, 2016.

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Chapter 1. Introduction

Fetal Alcohol Spectrum Disorder (FASD) is a neurodevelopmental disorder caused by in utero alcohol exposure. Research in FASD is fairly recent, with the disorder only being formally recognized in the 1970s (Jones and Smith, 1973). Jones and Smith (1973) coined the term *fetal alcohol syndrome* to describe a pattern of growth deficiencies, facial abnormalities, and behavioural and cognitive deficits observed in children born to mothers with alcoholism. Since that time, the research field of FASD has evolved from a primary focus on the impacts of prenatal alcohol exposure on physical and cognitive development, to the functional difficulties associated with FASD, and, of late, to interventions to support individuals with FASD and their families. Recent Canadian prevalence estimates for children with FASD are approximately 2%-3% (Popova, Lange, Chudley, Reynolds, & Rehm, 2018). FASD is a costly disorder; an estimate of the economic burden in Canada in 2013 was 1.8 billion dollars (Popova, Lange, Burd, & Rehm, 2016). Individuals with FASD can experience a range of physical, cognitive, and behavioural disabilities that impact their daily functioning, and, as such, there are many different manifestations of the disorder. Each individual with FASD has unique strengths and difficulties. Differential impacts of prenatal alcohol exposure are due to numerous factors, some of which are maternal nutrition (Helfrich, Saini, Kling, & Smith, 2018), maternal parity and age, amount of alcohol consumed during pregnancy, and socioeconomic status (May et al., 2017). There are over 400 comorbid diagnoses that may accompany a diagnosis of FASD, with the most common being abnormalities in the peripheral nervous system and special senses, conduct disorder, receptive language disorder, expressive language disorder, and chronic otitis media (Popova et al., 2016).

Given the range of difficulties individuals with FASD experience, research in interventions to support individuals with FASD and their families is crucial. Demand has increased from practitioners, families, and individuals with FASD themselves for the development of evidence-based interventions to promote skill development and assuage common challenges for individuals with FASD. Given the known benefits of early interventions, researchers have tended to focus on studying interventions for elementary-aged children with FASD, and literature on interventions for adolescents and adults with FASD is scarce (Pei, Flannigan, Walls, & Rasmussen, 2016). Adolescence is a key period of time when brain maturation is rapidly occurring, which can make adolescents particularly vulnerable to both positive and negative influences (Arain et al., 2013; Dayan, Bernard, Olliac, Mailhes, & Kermarrec, 2010). Consequently, interventions can have an optimal impact during this developmental time to foster success in the transition to adulthood. Interventions that target

specific skill deficits common in children with FASD have found some success (e.g. Kable, Taddeo, Strickland, & Coles, 2016; Kerns, Macoun, MacSween, Pei, & Hutchinson, 2017; Nash et al., 2015), which supports the assertion that children with FASD can improve their skills.

Over the past few decades, there has been an increased emphasis on evidence-based practice, which is the integration of research evidence, clinical expertise, and patient characteristics and preferences into the clinical decision-making process (Lilienfeld, Ritschel, Lynn, Cautin, & Latzman, 2013; Spring, 2007). Although there are increasing numbers of promising interventions for individuals with FASD, many intervention programs have varying results, and not every participant will experience positive intervention outcomes. In order to aid practitioners in the clinical decision-making process regarding treatment approaches, researchers need to explore how patient characteristics interact with intervention effects. Aptitude *x* Treatment Interaction (ATI) is a research paradigm that is concerned with the match between a participant's characteristics (or aptitude) and the intervention they receive. ATI-based researchers acknowledge the relationships between individuals and intervention outcomes, and they seek to shed light on the processes that make interventions differentially effective (Caspi & Bell, 2004). One possible aptitude that may be impacting the effectiveness of interventions is achievement motivation.

Achievement motivation is a psychological construct regarding the thoughts, beliefs, and emotions that influence goal-directed behaviour (Schunk, Pintrich, & Meece, 2008). If participants are differently motivated to learn new information and improve an ability, it is possible that the impact of an intervention will differ between participants. In order to understand the effectiveness of interventions for children and adolescents with FASD, I sought to learn how individuals with FASD are motivated. To date, no research has assessed motivation directly in adolescents with FASD, which is problematic because motivation is an internal construct that does not necessarily show behaviourally, and therefore cannot be accurately inferred.

I drew on two contemporary social-cognitive achievement motivational theories, Mindset Theory (MT) and Self-Determination Theory (SDT). Mindset theorists posit that individuals differ in the degree to which they implicitly believe their abilities are able to change (Dweck, 2006). Those with a fixed mindset believe that their abilities are set and unchangeable. Alternatively, individuals with a growth mindset believe their abilities are malleable, and that they can improve with practice and effort (Dweck, 2006). Self-Determination theorists place a focus on the social conditions that facilitate or hinder human flourishing (Ryan & Deci, 2017). Self-determination theorists suggest that individuals are more motivated when three psychological needs are fulfilled through interactions with the environment. These three needs are competence (i.e.

feeling effective), autonomy (i.e. feeling in control), and relatedness (i.e. experiencing satisfying relationships) (Ryan & Deci, 2017). Converging two social-cognitive theories allowed for a broader conceptualization of achievement motivation, as these theories provide insight into both the environmental conditions that facilitate motivation (i.e. competence, autonomy, relatedness), and an internal belief system about abilities (i.e. mindset). Achievement motivation theories have not yet been applied to interventions with individuals with FASD. In this dissertation, I aimed to provide professionals working with adolescents with FASD with important information and considerations for delivering effective interventions to this high-needs population.

Current Dissertation and Research Questions

This dissertation consists of three papers related to the topic of achievement motivation among adolescents with FASD. In order to understand the unique achievement motivation profiles of adolescents with FASD, it is important to consider the broader literature on motivation in cognitive disability populations and the relationship between motivation and interventions; therefore, the first paper is a concept review of the topics of achievement motivation, FASD, and interventions. The goal of Paper 1 was to determine what can be learned from the literature about achievement motivation in individuals with developmental disabilities, how this information pertains to FASD, and how the information may impact intervention effectiveness. Building on the literature-informed conceptualization of MT and SDT in adolescents with FASD from Paper 1, in Paper 2 I describe how SDT and MT relate and impact adolescents with FASD and their caregivers in the context of a self-regulation (SR) intervention. The goal of Paper 2 was to collect quantitative and qualitative data to answer the questions: 1) what are the levels of fixed and growth SR mindsets of adolescents with FASD and their caregivers? 2) is there an association between mindsets, psychological needs, and interest/enjoyment? And 3) what are the influences that caregivers and adolescents with FASD describe on their SR mindset? Lastly, based on the idea that participant characteristics interact with treatment outcomes, Paper 3 was designed to incorporate the theoretical background from Paper 1, and the foundational understanding gathered from Paper 2, to investigate the relationships between mindsets and psychological needs in a SR intervention with adolescents with FASD. The goal of Paper 3 was to collect quantitative data to answer the questions: 1) Do total mindsets and psychological need satisfaction predict outcomes of inhibition? 2a) Did the adolescent participants describe the intervention as interesting/enjoyable, and meeting the needs of competence, autonomy, and relatedness at the end of the intervention, and 2b) does this change from the beginning of the intervention to the end? and 3) Did participating in the intervention change the total SR mindset of the participants and their caregivers?

Across all three papers, the ultimate goal of this dissertation was to gather information about achievement motivation, as described by MT and SDT, in adolescents with FASD, and to understand how the information can be informative in designing effective interventions. The overarching premise is that there is not yet an adequate understanding of why interventions differ in their effectiveness, and as a result, intervention researchers continually struggle to find or develop effective interventions, especially for diverse populations, such as FASD. This gap in understanding undermines our ability to reliably provide interventions that produce positive outcomes for individuals with FASD. My underlying hypothesis for this dissertation is that there are psycho-social variables, such as mindset, competence, autonomy, and relatedness, that impact treatment effectiveness that need to be considered when designing and delivering clinical interventions, and when supporting individuals with FASD. This information is valuable to clinicians, educators, families, and researchers who have the potential to make meaningful impacts on the lives of those affected by FASD.

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Chapter 2. Concept Review: Achievement Motivation in Individuals with FASD

A large majority of research in the field of achievement motivation has been conducted with typically developing populations, and there is a need for more research exploring achievement motivation for individuals with disabilities, specifically developmental disabilities. Individuals with developmental disabilities often have different life experiences and social histories than those of typically developing individuals, which consequently may lead to differences in achievement motivation. In particular, individuals with Fetal Alcohol Spectrum Disorder (FASD) often experience cognitive, behaviour, and physical difficulties as a result of the disorder that are likely to impact their levels of motivation in achievement settings.

The purpose of this paper is to review and integrate the concepts of achievement motivation, FASD, and interventions. In this concept review paper, I review achievement motivation, and I place a focus on two social-cognitive theories of achievement motivation, namely Mindset Theory (MT) and Self-Determination Theory (SDT). In particular, I focus on how these theories have been applied to children and how these theories inform motivation for children with various developmental disabilities. Next, I describe FASD, and I present specific concerns for adolescents with FASD, including difficulty with self-regulation. I then review the current research available in motivation for individuals with FASD. I discuss interventions with individuals with FASD, and the relationship between motivation and interventions. Lastly, I describe the importance of examining these concepts together as a possible way to better understand and support individuals with FASD.

Achievement Motivation

Achievement motivation can be defined as “the process whereby goal-directed activity is instigated and sustained” (Schunk et al., 2008, pg.4). Breaking down this definition into its parts allows for a greater understanding of achievement motivation: first, it is goal-oriented in that individuals are aware of something they are trying to achieve or avoid. Achievement motivation is action-based and requires physical and/or mental activity. Second, the activity is started and maintained, which can sometimes last over very long periods of time, and it is eventually terminated. Third, motivation is a process that cannot be directly observed, but instead, it is inferred from actions and verbalizations. Many processes come into play to help people initiate action and sustain motivation, including personal beliefs, influences of others, and environmental factors. Social-cognitive theories emphasize the specific environmental, cognitive, and affective components of motivation, and seek to identify specific psychological processes that interact with situational cues to shape people’s actions (Heckhausen & Dweck,

1998; Schunk et al., 2008). Two prominent social-cognitive theories of achievement motivation are MT and SDT.

Mindset Theory (MT)

MT shares history with other prominent perspectives including Achievement Goal Theory. Achievement goal theorists posit that achievement situations are interpreted differently to different people; some people see achievement situations as a test of their ability, called a performance goal orientation, yet others see them as learning opportunities, called a mastery goal orientation (Elliot & Dweck, 1988). Dweck and colleagues posited that goal orientation is a function of different theories of intelligence (Dweck & Leggett, 1988). Theories of Intelligence is distinct from actual ability and intelligence; it is the belief about the nature of intelligence. Dweck and colleagues named this theory *Theories of Intelligence* (TOI) because it grew out of children's perceptions of their intelligence in school settings, however, this theory can be applied to any aspect of the self, not just intelligence. Therefore, TOI is now commonly referred to as MT. A person's mindset creates a world view for interpreting and evaluating the self which impacts a person's beliefs about themselves and others (Schunk et al., 2008).

Research has been conducted which supports the concept that students' beliefs about the nature of their intelligence predict their achievement goals (Dweck & Leggett, 1988). Students who have a performance goal orientation are more likely to have an entity TOI; that is, they believe that intelligence is not under one's control. An entity TOI commonly exhibits itself as believing abilities are stable and unchanging (Dweck, 1998). An entity TOI is also known as a fixed mindset. Individuals with a fixed mindset believe that a person has a set amount of potential for a certain task.

In contrast, those who have mastery goals typically have an incremental TOI; that is, they believe that intelligence is malleable, it can be cultivated and developed, and it can increase with effort and experience (Dweck, 1998). An incremental TOI is also called a growth mindset. Although all people differ in talent, aptitude, interest, or personality, a person with a growth mindset tends to believe that people can change and grow. It is important to note that there is a continuum between fixed and growth beliefs; individuals can be in the middle or have elements of both. These beliefs are also domain specific; for example, someone could have a fixed mindset about their intelligence, but a growth mindset of athletics (Dweck, 2006). TOI will be referred to for the remainder of the paper as MT, and the terms growth and fixed will be used.

Having a growth mindset has been shown to have positive effects, including predicting an increase in grades (Blackwell, Trzesniewski, & Dweck, 2007), influencing positive parenting

(Moorman & Pomerantz, 2010), tempering the impact of socio-economic status on academic achievement (Claro, Paunesku, & Dweck, 2016), and reducing academic stereotype threat in minority populations (Good, Aronson, & Inzlicht, 2003). Conversely, individuals with a fixed mindset are generally more vulnerable to helplessness when they fail because they do not believe their abilities can improve (Dweck, 2006). In a study of reaction to failure, students were asked to respond to academic failure scenarios, and those with a fixed mindset displayed more negative affect, and fewer constructive strategies than those with a growth mindset (Zhao & Dweck, 1994). Individuals with a fixed mindset are also primarily outcomes-focused and may reject opportunities to learn, which was exemplified in study using EEG technology. In this study, individuals were given a task and then feedback while brain waveforms were recorded (Mangels, Butterfield, Lamb, Good, & Dweck, 2006). The brain waveforms revealed that those with a fixed mindset appeared to show interest only in feedback that reflected their ability: they paid attention when they were told whether they were right or wrong but did not appear to pay attention when offered strategies for improvement (Mangels et al., 2006).

Having a fixed mindset extends to many domains. For example, in a study looking at individuals who were shy, those with a fixed mindset were noted to be more fearful of taking social risks, worried about making mistakes, and more concerned about being judged than those with a growth mindset (Beer, 2002). Applying mindsets to mental health, anxiety mindsets were found to moderate the association between stressful life events, psychological distress, and maladaptive coping strategies, which suggests that having a growth mindset specific to anxiety may promote mental health resilience (Schroder et al., 2017).

Younger children generally hold growth mindsets, and as children age, they tend to start to develop more fixed mindsets (Dweck, 1999). These changes may be due to an increase in social comparison, identity development, increasing levels of self-evaluation, and environmental structures, such as grades. Additionally, teachers' instructional practices have been found to play a role in mindset development as early as grades one and two. The more teachers reported emphasizing performance-oriented instructional practices in the classroom, the more students endorsed a fixed mindset (Park, Gunderson, Tsukayama, Levine, & Beilock, 2016).

Researchers have found that people do have the capacity for lifelong learning and brain development. An interaction of nature and nurture exists, where a complex interplay of factors including genetics, experiences, and effort all influence outcomes (Dweck, 2006). Education about the ability of the brain to learn and change is a key focus of mindset intervention research that aims to help people develop growth mindsets. In this dissertation, I will examine mindsets because I am interested in understanding the beliefs that influence motivation. Sternberg (2005)

noted that the major factor that determines whether people achieve expertise is not prior ability, but rather purposeful engagement, which is facilitated by a growth mindset and forestalled by a fixed one.

Self-Determination Theory (SDT)

SDT is a theory of intrinsic motivation that is founded on the notion that motivation is internal to the individual, and when the surrounding environment provides basic psychological needs, motivation will flourish (Ryan & Deci, 2000). Self-determination is the process of utilizing one's will, or the capacity to choose how to satisfy needs (Deci, 1980). In order to be self-determined, a person must decide how to act in their environment. It is suggested that the process of self-determination is intrinsically motivating. Intrinsic motivation is based on the satisfaction of behaving for its own enjoyment, and intrinsic motivation is satisfied when individuals act willingly. SDT presents three basic innate psychological needs that underlie behaviour. The three psychological needs proposed in self-determination theory are: 1) competence, 2) autonomy, and 3) relatedness. These needs are thought to energize the developmental process; they are essential elements that foster growth and well-being (Ryan & Deci, 2000). The three psychological needs are discussed below.

The need for autonomy is based on the idea that humans have a basic need to be the origin of action and experience their behaviour as volitional (Deci & Ryan, 1991). People require a sense of control in their interactions with the environment. When people act in accordance with their nature, they experience their actions as unconflicted and true to themselves (Ryan & Deci, 2000). Autonomy support for children includes allowing children an appropriate amount of freedom to determine their own behaviour. To foster a sense of autonomy, adults should minimize the use of external rewards, and instead give children options and choices to pursue their own interests (Furrer, Skinner, & Pitzer, 2014).

The need for competence is a need for mastery. In order to flourish, individuals need to feel efficient and capable. They desire to feel competent in their interactions with the environment, in their interactions with others, and in tasks and activities (Ryan & Deci, 2000). Competence is fostered in children when they experience optimal structure; when expectations are high and communicated clearly, teaching strategies are appropriate for the child's level, when adults respond consistently, predictably, and contingently, and when adults show they have confidence in the child (Furrer et al., 2014).

Relatedness is a need for a sense of belonging and connectedness to others (Ryan, 1998), and is a psychological need that supports the fulfillment of the other needs. Relatedness refers to the quality of interpersonal relationships children have with the adults in their lives, and

it includes both involvement and warmth (Furrer et al., 2014; Skinner & Belmont, 1993). When social relationships support the basic needs of competence and autonomy, problems such as helplessness are less likely to occur (Ryan, 1998). In this dissertation, I will examine the psychological needs proposed by SDT because I am interested in understanding the environmental factors that facilitate, or impede, intrinsic motivation.

Cognitive Evaluation Theory (CET) is a sub-theory in SDT that describes the processes through which social environments influence intrinsic motivation (Ryan & Deci, 2017). Intrinsic motivation leads people to seek out and master challenges, which satisfies the need to be competent and autonomous, and ultimately self-determined (Ryan & Deci, 2000). Intrinsically motivated activities are those that people choose freely and engage in for their own sake. On the other side of the self-determination continuum is extrinsic motivation, which describes when people are behaving as a means to an end (Ryan & Deci, 2000). Intrinsically motivated students have demonstrated higher task persistence, confidence, and a greater desire towards attending class and staying in school. (Hardre & Revee, 2003; Robbins et al., 2004; Simons, Dewitte, & Lens, 2004). CET is concerned with the social and environmental factors that facilitate intrinsic motivation. Deci and Ryan (1987) summarized research on some factors that support or curtail self-determination and intrinsic motivation. Controlling rewards, threats and deadlines, evaluation, and surveillance all undermine intrinsic motivation. Positive features that support intrinsic motivation include the amount of choice given and positive feedback of competence.

The vast majority of research in achievement motivation has been conducted with typically developing populations, and little is known about achievement motivation in children with developmental disabilities. In order to best serve all children, it is important to understand how achievement motivation may present differently in children with developmental disabilities.

Motivation in Populations with Developmental Disabilities

Approximately one in six children have a developmental disability (Boyle et al., 2011), such as Attention Deficit Hyperactivity Disorder (ADHD), Intellectual Disabilities, Autism Spectrum Disorder (ASD), Learning Disabilities (LD), and FASD. Due to pre-existing difficulties that are coupled with different environmental experiences, children with developmental disabilities may require uniquely targeted approaches to facilitate goal achievement. There is a dearth of research applying achievement motivation theories to special populations, and so it is unclear whether existing motivation findings and interventions generalize to children with developmental disabilities.

One area that is affected in many children with developmental disabilities is difficulty with executive functioning. Executive functions (EF) are higher-order cognitive processes that

support goal-directed behaviours (Khoury, Milligan, & Girardi, 2015). EF include working memory, cognitive flexibility, planning, problem-solving, and inhibitory control. EF subserve successful self-regulation (Hofmann, Schmeichel, & Baddeley, 2012), and can be disrupted in children with disabilities, including ADHD (Willcutt, Doyle, Nigg, Faraone, & Pennington, 2005), intellectual disabilities (Alloway, 2010), ASD (Gilotty, Kenworthy, Sirian, Black, & Wagner, 2002), learning disorders (Singer & Bashir, 1999; Toll, Van der Ven, Kroesbergen, & Van Luit, 2011), emotional disorders (Emerson, Mollet, & Harrison, 2005), and FASD (Rasmussen & Bisanz, 2009). Given that the presented definition of achievement motivation is "the process whereby goal-directed activity is instigated and sustained" (Schunk et al., 2008, pg.4), and that EF are cognitive processes that support goal-directed behaviours, it is no wonder that children with disabilities who experience deficits in EF struggle in goal achievement. When EF are weaker, it is difficult to instigate and sustain motivation, therefore requiring these children to work a lot harder to achieve the same outcomes as their typically developing peers. It is crucial that we increase our understanding of achievement motivation in children with developmental disabilities to best support their goal achievement. To do this, we need to consider the key areas described in motivational theories where children with developmental disabilities may differ from typically developing children. These considerations include expectations and perceived competence, achievement goals and mindsets, and intrinsic motivation.

Expectancy and Competence

Expectations of success or failure may be a key difference when comparing children with disabilities to typically developing children. Has the child had positive experiences of success? Often students with developmental disabilities have experienced a history of repeated failures (Grolnick & Ryan, 1990; Licht, 1983). Patterns of repeated failure may foster a belief that one's ability is low, which impacts sense of competence, and supports the notion that failure is inevitable. When expectations and sense of competence are low, it is unlikely that children will be able to maintain a growth mindset for the task or be intrinsically motivated by the task. When students do not expect to do well because they believe that they are incompetent, they may develop patterns of helplessness. For example, compared to typically developing peers, students with LD have been found to have lower levels of self-esteem, persistence, and expectations of future academic success (Gans, Kenny & Ghany, 2003; Nunez et al., 2005; Stone & May, 2002). In one study, children with LD displayed deficits in all three areas of helplessness assessed: motivational deficits (i.e. low effort), cognitive deficits (i.e. expectations of hopelessness), and depressed affect (Sideridis, 2003). Students with LD have also rated themselves as less competent than IQ matched controls (Grolnick & Ryan, 1990).

This low sense of competence may be fostered by parents' and teachers' responses to children with disabilities. Despite the good intentions of parents and teachers, by praising success on easy tasks or providing sympathetic assistance, children may infer they have low abilities, and that they are being helped because, otherwise, they would fail (Woodcock & Vialle, 2010; 2011). One study found that pre-service teachers felt more sympathy towards boys with a specific learning disability in hypothetical scenarios and held lower expectations for their educational success (Woodcock & Vialle, 2016). Pre-service teachers also had more positive feedback and lower levels of frustration when students with LDs displayed low levels of effort compared to students without LD who also displayed low levels of effort. These responses were likely provided because the teachers desired to be kind (Woodcock & Vialle, 2016). However, by showing more sympathy and positive feedback for students with specific learning disabilities who expend low levels of effort, they may be unintentionally communicating the belief that these students are not capable of higher achievement, and that they do not hold high expectations for them (Woodcock & Vialle, 2016). Parents, teachers, coaches, and other key adults in children's lives can promote a sense of competence and foster an expectation of success by holding children to high (yet realistic) expectations, encouraging them to exert effort, finding and building on their strengths, framing challenges and failure as learning opportunities, and communicating a belief that they can succeed (Dweck, 2006).

Achievement Goals and Mindsets

In early attempts to understand and define cognitive and behavioural differences, researchers and professionals largely focused on the deficits and negative trajectories of individuals with developmental disabilities (McDonald & Raymaker, 2013). Disabilities have been traditionally thought of as stable and unchangeable, and, due to this messaging, many people with developmental disabilities likely developed a fixed mindset. Indeed, it was found that children with intellectual disabilities were more likely to hold a fixed mindset compared to children without intellectual disabilities (Koestner, Aube, Ruttner, & Breed, 1995).

A growth mindset is a protective factor against developing a sense of helplessness (Dweck, 2006), and the positive effects of believing abilities are malleable can extend to students with intellectual disabilities (Koestner et al., 1995). In one study, children with an intellectual disability were more likely to prefer challenging activities and report high levels of interest and enjoyment when a puzzle activity was described to tap into improvable rather than fixed abilities (Koestner et al., 1995). These findings suggest that, despite the higher levels of fixed mindsets in children with intellectual disabilities, if a task is introduced in a way that

highlights growth and self-improvement, they may pursue the challenge and demonstrate interest and enjoyment.

When investigating teacher's mindsets regarding children with learning challenges, teachers with a fixed mindset were more likely to use comfort and kinder strategies (e.g. giving less homework) to children with low math abilities. Students who received this comfort-oriented feedback reported lower motivation and lower expectations for their own performance (Rattan, Good, & Dweck, 2012). This is congruent with the aforementioned research on competence, and it highlights how different teaching approaches for children with developmental disabilities are influencing children's motivation at school in unintentionally negative ways. Having a teacher with a growth mindset may be a protective factor for children with disabilities, as researchers have found that teachers' mindsets remain consistent in scenarios that included different disabilities (Gutshall, 2013).

Intrinsic Motivation

In a meta-analysis investigating intrinsic motivation in high school and college students, Taylor et al. (2014) found that intrinsic motivation had a moderately strong, positive relationship with school achievement, suggesting the importance of intrinsic motivation for academic success. However, as a consequence of experiencing many academic failures, children with LD often show less initiation and value for school, and less interest and desire to learn (Ryan, Connell, & Deci, 1985). Intrinsic motivation for learning may be low in children with developmental disabilities, therefore external rewards are commonly used to motivate these children in the classroom, which can undermine the development of intrinsic motivation (Lynch, 2010; Ryan & Deci, 2017).

Children with developmental disabilities, specifically those with ASD, often exhibit mild to severe disruptive behaviour to avoid or escape challenging or uninteresting academic tasks (Ochs, Kremer-Sadlik, Solomon, & Sirota, 2001). By specifically incorporating motivational components into academic tasks, a study demonstrated faster completion rates, decreased disruptive behaviour, and improved interest in children with ASD (Koegel, Singh, & Koegel, 2010). Motivational components in this study included embedding incentives into the task to provide a natural reward, offering choices about materials and setting, and interspersing easy tasks with target tasks. These motivational variables decreased or eliminated disruptive behaviours without ever having to address the behaviours directly (Koegel et al., 2010). This research provides support for SDT with children with ASD, as the study incorporated natural rewards, fostered a sense of competence by delivering easy tasks, and a sense of autonomy by offering choices.

In another study investigating motivation in children with ASD, researchers incorporated the psychological need of autonomy by using choice to create a more intrinsically motivating task. They found that motivation in children with ASD was not enhanced or undermined by a performance-based extrinsic reward, however, children showed a clear preference for activities that offered choice (Lynch, 2010). Similarly, adolescent students with high-functioning ASD who perceived their teachers as being more autonomy-supportive reported greater autonomous motivation for doing schoolwork and higher perceived academic competence (Shea, Millea, & Diehl, 2013).

Murray and Greenberg (2006) investigated social relationships in children with disabilities including LD, emotional and behavioural disorders, and mild intellectual disability. In this study, social relationships with parents, teachers, peers, as well as school bonds, were found to be related to the emotional, behavioural, and social adjustment of students with disabilities. Having supportive relationships with teachers, feeling connected with school, and feeling safe in school were associated with indicators of social, emotional, and school-related adjustment. For example, students who felt supported and attached to teachers were also found to be less likely to experience anxiety. Alternatively, alienation or rejection in relationships contributed to emotional and behavioural problems (Murray & Greenberg, 2006). This is consistent with other research that has found that youth with LD and intellectual disabilities had a poorer attachment to school, and the delinquency problems of these same students were attributed to poor school bonds (Fink, 1990). Students who feel a sense of belonging to school are more likely to become academically engaged in school (Battistich, Soloman, Watson, & Schaps, 1997; Goodenow, 1993).

Children with developmental disabilities are often not considered in the formation or application of achievement motivation theories, yet children with developmental disabilities are individuals who regularly experience challenges to success. Experiences of failure, in particular, are detrimental to children's achievement motivation because they undermine children's sense of competency and expectation for success. Experiences of failure contribute to fixed mindsets in that individuals may interpret the failures as evidence that their abilities as pre-set and stable. Experiences of failure also add to differences in the way teachers and other professionals interact with the children, including shielding children from experiencing failure and using more extrinsic motivators to encourage learning. Unfortunately, these behaviours, while well-intentioned, ultimately can diminish intrinsic motivation. With new knowledge of brain plasticity, innovative technology, and more intervention research, it is now known that individuals with developmental disabilities are capable of progress. It is imperative that individuals with

developmental disabilities be given opportunities to feel autonomous, competent, and capable of growth in order to promote positive outcomes for this population and to avoid the development of learned helplessness. This message needs to be communicated to families and children with developmental disabilities to promote a growth mindset and foster intrinsic motivation. One population, in particular, that may benefit from a belief in growth and environments that foster self-determination are individuals with FASD.

Fetal Alcohol Spectrum Disorder

FASD is a neurodevelopmental disorder that occurs as a result of prenatal alcohol exposure. FASD presents as a complex array of physical, emotional, and cognitive disabilities, and is the leading known preventable cause of developmental delays in Canadian children (Centre for Addiction and Mental Health, 2020; Koren, Nulman, Chudley, & Loock, 2003). Current prevalence estimates of FASD are approximately 1.1%-5.0% of children (May et al., 2018), and associated lifetime costs have been estimated to be more than one million Canadian dollars in some cases (Popova, Stade, Bekmuradov, Lange, & Rehm, 2011). Studies attempting to find prevalence rates of FASD are thought to result in underestimates of the actual rates due to the difficulty of diagnosis and lack of knowledge about FASD (Chasnoff, Wells, & King, 2015). One common area of deficit for individuals with FASD is EF, which impedes the ability to self-regulate. Self-regulation is the ability to manage thoughts, behaviours, and emotions (Soh et al., 2015; Willingham, 2011). Difficulty with self-regulation impacts the ability to cope with environmental stressors and learn new information effectively. As individuals with FASD enter adolescence and expectations for independence increase, it is important that self-regulation and EF are targeted and promoted in order to foster healthy outcomes in this population.

FASD in Adolescents

Adolescence is a vulnerable time for additional risks that are particularly prevalent in individuals with FASD. Common adverse outcomes noted in the FASD population include disruptive school experiences, trouble with the law, inappropriate sexual behaviours, and drug and alcohol use (Streissguth et al., 2004). In a seminal study on adverse outcomes, Streissguth et al. (2004) found that 53% of adolescents with FASD had been suspended from school, 29% had been expelled, and 25% had dropped out. In regard to legal trouble, 67% of adolescents had been charged, arrested and/or convicted, and 29% of adolescents reported drug and alcohol problems. Adolescents with FASD (11 to 15 years old) were found to have the highest overall cost when in care with the Canadian Child Welfare System (Popova, Lange, Burd, & Rehm, 2014). Difficulty with self-regulation among adolescents with FASD is thought to be an underlying factor that leads to these negative outcomes. For example, caregivers of alcohol-

affected adolescents viewed their children as having significantly more difficulty controlling their emotions and behaviour in social situations compared to a normative sample (Mariasine, Pei, Poth, Henneveld, & Rasmussen, 2014). Given the many challenges adolescents with FASD face, it is possible that at this developmental point, adolescents with FASD may have an entrenched fixed mindset and may not be experiencing intrinsic motivation. Thus, important motivation beliefs may also come alongside self-regulation deficits.

Despite the many struggles they face, adolescents with FASD have been found to perceive themselves as academically and socially successful, which is largely influenced by support from caregivers (Duquette, Stodel, Fullarton, & Hagglund, 2007). In one study, adolescents with FASD described wanting to be challenged and engaged in the classroom and pass their courses and graduate. Socially, adolescents described having friends, interacting with peers, and having positive relationships with teachers (Duquette et al., 2007). These results suggest that some individuals with FASD retain a sense of competence and relatedness into adolescence, which are main components to intrinsic motivation. Learning how some adolescents with FASD were able to maintain these perspectives will be crucial to understanding how to support psychological need satisfaction for all adolescents with FASD.

Motivation in FASD Populations

Due to the range of physical, emotional, and cognitive disabilities that occur as a result of prenatal alcohol exposure, initial research in FASD was largely problems-focused, with little consideration for the potential of the individual (see CanFASD, 2017). This likely has had an impact on the motivation of both individuals with FASD and their caregivers. Similar to children with other developmental disabilities, children with FASD have often experienced a history of repeated failures, both academically and behaviourally. In fact, individuals with FASD commonly have co-morbid diagnoses, which can include intellectual disabilities, conduct disorder, receptive and expressive language deficits, ADHD (Popova et al., 2016; Weyrauch, Schwartz, Hart, Klug, & Burd, 2017), and ASD (Stevens, Nash, Koren, & Rovet, 2013). Therefore, while it is important to consider the uniqueness of the FASD population, motivation research conducted with other disability populations, as described above, is likely relevant to children with FASD.

There is a lack of research in achievement motivation specific for individuals with FASD. One study that provided motivational information in individuals with FASD was a pilot study by Adnams, Rossouw, Perold, Kodituwakku, and Kalberg, reported in Riley et al. (2003). This study explored using Cognitive Control Therapy (CCT) with five children with FASD. Therapists reported improvements in the children's self-efficacy, motivation, cooperation, self-confidence, and emotionality; however, it is unknown how these constructs were measured (Riley et al.,

2003). In another study by Adnams et al. (2007), the researchers assessed teacher-reported self-efficacy of children with FASD using the Children's Perceived Self-Efficacy Scale at the time of diagnosis. There was a significant negative correlation between behaviour problems and reported self-efficacy at the time of diagnosis, suggesting that children with behaviour difficulties at school did not feel efficacious at school.

Other researchers have looked at motivation in caregivers raising children with FASD (Petrenko, Pandolfino, & Roddenbery, 2016), and teachers working with children with FASD (Atkinson, 2012, 2017; Frohlich, 2017). Attribution theory, which is an achievement motivation theory, has been applied to research with caregivers and teachers who work with children with FASD. Attribution theory is a cognitive model of motivation based on the assumption that people are motivated to understand and master the environment and themselves. At the heart of attribution theory lies the causal ascriptions, which are the perceived causes of an event (i.e. the reason for success or failure). These casual ascriptions include different variables such as ability, effort, task difficulty, or luck, as well as affiliations including physical characteristics, personality, health, mood, etc. The perceived causes share three common properties, called causal dimensions: locus, stability, and controllability (Wiener, 1985). In a thesis by Atkinson (2012), pre-service teachers reported their belief of the underlying cause of problems for students with FASD, and these causes were coded into four categories: biological, environmental, lack of education, and complex. Atkinson (2012) looked at these four categories based on the three causal dimensions of attribution theory. In general, pre-service teachers did not see the child with FASD as having control of the challenges they face, but they differed in the extent of which they see those challenges as being stable or externally controllable. Teachers who reported higher personal control attributions and lower stability attributions reported feeling more efficacious (Atkinson, 2012). Atkinson continued to investigate attributions and self-efficacy in teachers for a dissertation study and she found that, after an attribution retraining intervention, many pre-service teachers reported their perceptions and attitudes about students with FASD had shifted (Atkinson, 2017). In a thesis by Frohlich (2017) studying the attributions teachers make for challenging classroom behaviour of children with FASD, it was found that the attributions were related to both the responsibility they assigned to the child with FASD and the emotions they felt towards that child. This has important implications as teachers may be able to be taught to make uncontrollable and unstable attributions for the disruptive classroom behaviour, which may reduce the amount of anger they feel, and increase the amount of hope they feel for the child with FASD (Frohlich, 2017).

In an investigation of attributions of caregivers of children with FASD, researchers found two attribution patterns that distinguished caregivers: those who attributed child misbehaviour to neurodevelopmental disabilities, and those who attributed misbehaviour to willful disobedience (Petrenko et al., 2016). Caregivers who had greater knowledge of FASD, and caregivers who were unrelated to the child (e.g. foster or adoptive parents) were more likely to view their children's misbehaviour as relating to a neurodevelopmental disability. Those caregivers who attributed misbehaviour to a neurodevelopmental disability were more likely to use their knowledge of the disability to perform antecedent strategies for preventing misbehaviour. Moreover, these caregivers were generally more successful and less frustrated in managing misbehaviour compared to caregivers that primarily used punishment strategies (Petrenko et al., 2016).

Other intervention research has used the principles of attribution theory without directly labeling it as such. Individuals caring for children with FASD are often trained to focus on the controllability dimension of attribution theory, changing their perception of behaviour from controllable to uncontrollable. For example, one intervention approach that has been commonly used in interventions for parents and teachers of children with FASD is to redefine behaviour as a neurodevelopmental disability, rather than willful disobedience (Bertrand, 2009). This shift in controllability of the behaviour has resulted in reported changes in perceived classroom behaviour and decreases in parental stress (Bertrand, 2009; Clark et al., 2014). Equipped with knowledge of neurodevelopmental disabilities, caregivers and teachers can develop more realistic expectations for children with FASD, which may reduce the number of failure experiences these children face. In addition, stronger parent-child relationships can be developed if caregivers are less frustrated and stressed, and if they experience more success managing behaviours. Interventions can help to create supportive environments that promote positive outcomes in children with FASD.

Intervention Research

By purposely intervening, researchers and practitioners seek to influence change and to understand if and how intentional actions produce a change in participants. The overall aim of intervention research is to generate evidence to support the appropriateness and effectiveness of interventions in producing beneficial outcomes. This information is then used to inform professional practice and policy (Sidani, 2015). According to an evidence-based practice approach, clinical practice should be based on the best available research evidence that informs practitioners as to whether or not an intervention has been demonstrated to work (Lilienfeld et al., 2013). The clinical decision-making process is informed by research evidence, client

characteristics and preferences, and clinical expertise (Lilienfeld, Ritschel, Lynn, Cautin, & Latzman, 2013; Spring, 2007). The identification of evidence-based interventions is intended to narrow the research-to-practice gap by helping practitioners evaluate interventions for use with their clients (Kratochwill & Stoiber, 2002).

Intervention Research with Children and Adolescents with FASD

Interventions for individuals with FASD can look very different. Some interventions are considered "targeted" and can be described as programs that focus on a specific skill. Some examples of evidence-based targeted interventions include Caribbean Quest (Kerns, Macoun, MacSween, Pei, & Hutchison, 2017) for EF, the Alert Program® (Williams & Shellenberger, 1996) for self-regulation, GoFar (Coles et al, 2015) for attention, behaviour, and adaptive functioning, MILE (Kable et al. 2007) for math, rehearsal training (Loomes et al. 2008) for working memory, and language and literacy training (Adnams et al., 2007). Other interventions are "integrated", and these programs provide guidance and support to individuals with FASD, as well as their families and the professionals in their lives. Integrated interventions often aim to shift environmental supports and expectations in order to promote well-being in the life of the individual with FASD. Although intervention research for individuals with FASD is still in its infancy, the research thus far demonstrates the potential of children with FASD to learn and grow.

Motivation in Intervention Research

It is understood that interventions do not work for every participant, therefore intervention researchers examine potential mediating and moderating variables to reveal why interventions may work differently for different participants. Motivational variables may be important mediating or moderating variables to consider when attempting to optimize the success of interventions. For example, interventions can be developed to encourage autonomy, competence, relatedness, and growth beliefs in children with FASD, which may impact outcomes. As recommended by Glasgow et al. (2003), researchers should attend to the range of conditions, settings, intervention features, and participants of which the results of a study apply.

The concept of participant characteristics interacting with the effectiveness of intervention is not novel. Aptitude *x* Treatment Interaction (ATI) research is a research paradigm that emphasizes exploring how intervention outcomes depend on the match between participant's aptitude and the treatment they receive (Yeh, 2012). An aptitude is any personal characteristic that can have an impact on achieving treatment goals. An ATI is when a treatment is differently effective for individuals who differ on certain attributes, for example, motivation (Chronbach & Snow, 1977). The goal of ATI is to find interactions between treatments and

aptitudes to create an environment in which the treatment matches the aptitude, resulting in optimal benefits (Caspi & Bell, 2004). Ultimately, ATI research enhances the ability to create more customized treatment environments.

In school settings, researchers have shown that targeting student's thoughts and beliefs about intelligence have had notable positive effects on educational achievement that can last months or even years (Yeager & Walton, 2011). Intervention programs are another achievement setting where adolescents are learning new information and skills. Does having a growth mindset and/or psychological need satisfaction improve intervention outcomes for adolescents with FASD?

Conclusion

Achievement motivation is a multidimensional construct that encompasses social-cognitive processes to move towards or avoid an outcome or action. Simultaneously implementing multiple achievement motivation variables allows for a more comprehensive understanding of motivation. For example, combining MT and SDT makes it possible to explore motivation through different cognitive, social, and environmental lenses. Increasing our understanding of achievement motivation will optimize supports and intervention initiatives to help children with developmental disabilities, including those with FASD, pursue and achieve goals, whether they are academic, behavioural, or emotional. Understanding motivation in children with FASD will improve the effectiveness of motivational strategies used with this population and prevent ill-informed practices that may undermine the success of those with FASD.

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Chapter 3. Describing Achievement Motivation in Adolescents with FASD

Fetal Alcohol Spectrum Disorder (FASD) is a neurodevelopmental disorder that can result from in utero alcohol exposure. Individuals with FASD are a heterogeneous group of people who may experience difficulties in multiple areas of functioning including affect regulation (Pei, Denys, Hughes, & Rasmussen, 2011), learning (Rasmussen & Bisanz, 2011), memory (Pei, Job, Kully-Martens, & Rasmussen, 2011), language (Wyper & Rasmussen, 2011), attention (Kooistra, Crawford, Gibbard, Kaplan, & Fan, 2011), cognitive flexibility, and inhibition (Rasmussen & Bisanz, 2009). These difficulties persist across the lifespan and impact the functioning of individuals with FASD in their homes, schools, and communities. Given the complexity of their challenges, individuals with FASD and their families often seek help from professionals to work towards treatment and learning goals that will help assuage these difficulties. In order to best support and treat individuals with FASD, it is important to consider how these individuals are motivated to achieve goals. Thus, I turn to the achievement motivation literature for guidance, even though it is rarely applied to FASD specifically.

Achievement motivation is a specific type of motivation found in contexts where an individual is striving to achieve a goal (Niederkofler, Herrmann, Seiler, & Gerlach, 2015). Little research has been conducted on achievement motivation in individuals with FASD, yet researchers have demonstrated that other individuals with developmental disabilities often struggle to optimally set and achieve goals, and they are more prone to developing learned helplessness (Sideridis, 2003). The purpose of this research study was to increase understanding of the levels of motivation and the factors influencing motivation in adolescents with FASD and their caregivers. I begin by providing a critical overview of two achievement motivation theories in typically developing adolescents before discussing adolescents with FASD and reviewing the existing research in motivation with FASD populations. I specifically highlight the dearth of research that currently exists on achievement motivation and adolescents with FASD. Results from this research study will contribute to our current understanding of achievement motivation, specifically mindsets, in adolescents with FASD and their caregivers.

Background

Achievement Motivation and Adolescence

Achievement motivation can be described as a set of interrelated thoughts, beliefs, and emotions that influence goal-directed behaviour (Schunk, Pintrich, & Meece, 2008; Wentzel, 1999). There are several theories that explain different variables associated with achievement motivation through an array of cognitive, social, and emotional components. Two social-cognitive theories important to consider when investigating achievement motivation are Mindset

Theory (MT) and Self-Determination Theory (SDT). Integrating these two theories allows for a deeper conceptualization of motivation in individuals with FASD, as together they provide an understanding of both the environmental conditions that facilitate motivation (i.e. competence, autonomy, and relatedness), as well as the psychological conditions (i.e. beliefs about ability to change). Indeed, Yeager and colleagues (2019) recently found that it was the combined importance of belief change (i.e. mindset) and school environment (i.e. peer norms) that influenced sustained benefits of a mindset intervention.

Given that adolescence is a precarious time for changes in achievement beliefs and behaviours, it is crucial that researchers work to understand achievement motivation during this developmental period (Ryan & Patrick, 2001). For some, adolescence is a time of increased self-reflection and identity exploration. Alternatively, for others, adolescence is a time of decreased self-esteem and a downward achievement trend. As academic demands increase, some adolescents begin to doubt their abilities in school, question the value of doing their schoolwork, and decrease their academic efforts (Robins & Trzesniewski, 2005; Ryan & Patrick 2001). Examining the period of adolescence through the lenses of MT and SDT may help to uncover some of the underlying factors which are contributing to these observed changes in adolescents, before turning our attention to FASD specifically.

Mindset Theory. Mindsets describe core assumptions about the malleability of personal qualities (Dweck & Leggett, 1988). A person is said to have a fixed mindset if they believe that their abilities are unchangeable. On the other hand, a person is said to have a growth mindset if they believe that their abilities are able to change (Dweck, 2006). Mindsets are domain specific; for example, a person could have a growth mindset about their math ability, but a fixed mindset about their singing ability (Dweck, 2006). The mindset an individual implicitly holds influences their belief about their talent and ability to change and develop.

Adolescence is a time in development that includes a high level of self-focus and fear of embarrassment, and adolescents with a fixed mindset may reduce their academic efforts in an attempt to protect their egos (Dweck, 2006). On the other hand, adolescents with a growth mindset are better equipped to learn from the difficulties and setbacks they are sure to face in high school because they believe they can improve from them. Those adolescents with a growth mindset are more likely to increase effort in school, engage in novel situations, and overcome challenges, all of which contribute to positive outcomes. Indeed, mindsets have been shown to impact academic outcomes as well as social interactions in adolescents. In one study, seventh-grade students who were mentored to view intelligence as malleable earned significantly higher math and reading scores than those in the control condition (Good, Aronson, & Inzlicht, 2003).

Mindsets also have been shown to influence resilience following peer victimization and conflicts during adolescence (Yeager & Dweck, 2012). Adolescence is an influential time when a growth mindset can help motivate students to continue to invest in their goals. This is even more true for individuals with developmental disabilities, such as FASD, who face additional struggles at home and school, which has implications for their levels of motivation.

MT was initially developed out of research in school settings, and therefore intelligence has been the primary ability that mindset researchers use to understand beliefs about change. Other abilities or constructs have also been researched in relation to mindset theory, for example, social behaviour (Valentiner, Jencius, Jarek, Gier-Lonsway, & McGrath, 2013), anxiety (Schroder et al., 2017), and serious gaming (Lee, Heeter, Magerko, & Medler, 2012).

Self-Determination Theory. Self-determination was described by Field, Martin, Miller, Ward, and Wehmeyer (1998) as “an understanding of one’s strengths and limitations together with a belief in oneself as capable and effective” (p. 115). A core component of being self-determined is being intrinsically motivated. Intrinsic motivation describes the innate desire to pursue interesting tasks “for their own sake”. Intrinsic motivation incorporates enjoyment and interest (Reeve, 1989). Being intrinsically motivated fosters task persistence, confidence, and satisfaction (Cerasoli & Ford, 2014). Self-determination theorists propose that for a person to be intrinsically motivated and function at an optimal level, the three psychological needs of competence, autonomy, and relatedness must be supported (Ryan & Deci, 2017). These needs nurture well-being and healthy psychological growth. Feeling autonomous refers to having a sense of choice, initiative, and control over one’s own activities. Feeling competent corresponds to having a sense of mastery, and relatedness refers to feelings of closeness and connectedness to others.

Fostering self-determination and intrinsic motivation is important in adolescents as they grapple with a period of immense growth and development. Veronneau, Koestner, and Abela (2005) found that during early adolescence in typically developing adolescents, the satisfaction of all three basic psychological needs was associated with well-being, as measured by questionnaires on positive affect, negative affect, and depressive symptoms. This is particularly important because rates of depression and negative mood states increase twofold to threefold during adolescence (Mash & Wolfe, 2017). Fostering autonomy, competence, and relatedness may be one way to increase positive affect and decrease negative affect during this turbulent life stage. Researchers have found that when adolescents with developmental disabilities (i.e. intellectual disability and learning disabilities) are self-determined, they are more likely to achieve positive adult outcomes, including being employed at a higher rate and earning more

per hour, living independently, and receiving more job benefits than those students with disabilities who are not found to be self-determined (Wehmeyer & Schwartz, 2003).

FASD and Adolescence

Individuals with FASD commonly experience a range of physical, behavioural, and cognitive disabilities. Current prevalence estimates of FASD among children and adolescents are approximately 7.7 per 1000 globally (Lange et al., 2017). FASD has been associated with wide-spread neurocognitive impairment. One area that has been identified as a core deficit for individuals with FASD is executive functions (EF), which are higher-order cognitive processes that help facilitate goal-directed behaviours (Khoury, Milligan, & Girardi, 2015). EF subserve successful self-regulation (SR), which is impactful to daily functioning as SR allows individuals to stay calm, focused, and attentive (Hofmann, Schmeichel, & Baddeley, 2012).

Adolescence is a time of heightened susceptibility to adversity, which is particularly prevalent in individuals with FASD. Common adverse outcomes noted in the FASD population during adolescence include behaviours associated with low levels of regulation, such as disruptive school experiences, trouble with the law, risky sexual behaviours, and drug and alcohol use (Streissguth et al., 2004). In a study investigating the cost of children with FASD in the Canadian Child Welfare System, adolescents with FASD (11 to 15 years old) were found to have the highest overall cost when in care (Popova, Lange, Burd, & Rehm, 2014).

Despite difficulties, adolescents with FASD can perceive themselves as academically and socially successful, largely influenced by support from caregivers (Duquette, Stodel, Fullarton, & Hagglund, 2007). One study that sampled eight adolescents with FASD aged 15-20 years old, and 16 parents, all residing in Canada or the USA, described the high school experiences of individuals with FASD. The adolescents with FASD in this study reported that they wanted to be challenged and engaged in the classroom, pass their courses, and graduate. They also described having friends, interacting with peers, and some adolescents reported positive relationships with teachers (Duquette et al., 2007). These findings suggest that some adolescents with FASD have a high sense of competence and relatedness, both of which foster self-determination and intrinsic motivation.

FASD and Motivation

In an effort to define and identify FASD, early FASD researchers largely focused on the deficits and adverse outcomes of individuals with FASD. Similar to children with other disabilities, children with FASD often have experienced many academic and behaviour challenges beginning early in childhood. Facing these challenges without appropriate supports leads many children with FASD to experience repeated failures and potentially develop a fixed

mindset. As the field has evolved with new research in interventions and supports, it is now known that individuals with FASD have the potential to improve their abilities and experience success (Pei, Flannigan, Walls, & Rasmussen, 2016). A change in messaging has lagged behind the research, however, and it is possible that many individuals with FASD still believe their abilities are unchangeable.

One of the only studies to provide motivational information for individuals with FASD was a pilot study by Adnams, Rossouw, Perold, Kodituwakku, and Kalberg, presented in Riley et al. (2003). This study used Cognitive Control Therapy (CCT) with a sample of five children with FASD. Qualitative improvements in the children's self-efficacy, motivation, cooperation, self-confidence, and emotionality were noted by the therapists in the study, however, it is not clear how these constructs were assessed (Riley et al., 2003). In another study by Adnams et al. (2007), the researchers used the Children's Perceived Self Efficacy Scale at the time of FASD diagnosis to assess teacher-reported student self-efficacy. The results suggested that those with behaviour difficulties at school did not feel efficacious at school. Other researchers have looked at achievement motivation variables in caregivers raising children with FASD (Petrenko, Pandolfino, & Roddenbery, 2016), and teachers working with children with FASD (Atkinson, 2012). No researchers to date have investigated the mindsets that caregivers of children with FASD hold for their child (i.e. did the caregivers believe that their child's abilities could change?). Furthermore, no studies have assessed motivation for children and adolescents with FASD by asking the children and adolescents with FASD directly. This is problematic because motivation is an internal construct that does not always show behaviourally, and therefore cannot necessarily be accurately inferred. There is a gap in the literature in understanding motivation from the perspective of the individual with FASD themselves.

This study is the first to measure and describe the achievement motivation theories of MT and SDT with a sample of adolescents with FASD. Given that this study has been conducted in the context of a SR intervention, the mindset that will be measured is SR mindset. In this study, I use multiple methods to explore and examine achievement motivation. First, I use quantitative methods in the form of self-report questionnaires to measure mindsets in regard to the belief of whether SR can change or not for the adolescent with FASD. I also examine the relationship between the level of mindset and psychological needs, as well as interest/enjoyment, in the intervention. Next, I use a qualitative approach using interviews to gain depth in understanding the nature of mindsets in an FASD population, including the factors that have influenced the development of belief of malleability.

Research Questions and Hypotheses

The purpose of this research study is to increase our understanding of how the achievement motivation theories of MT and SDT relate and impact adolescents with FASD and their caregivers. This study is a descriptive study that aims to measure and describe mindsets and psychological needs in a sample of adolescents with FASD in the context of a SR intervention. Research in achievement motivation in adolescents with FASD can facilitate opportunities to help these adolescents remain motivated and engaged in programs and interventions to ultimately support healthy trajectories.

This study was conducted in two stages. The first stage used quantitative methods to describe the level of SR mindsets and psychological needs for adolescents with FASD and their caregivers using the whole study group sample. SR mindsets are the participant's mindset regarding their self-regulation. SR mindsets were chosen because the participants were participating in a SR intervention study (as opposed to traditional mindset theory which typically focuses on beliefs about intelligence in school settings). Two specific research questions were analyzed in stage one of this study.

Research Question One

The first research question was: what are the levels of fixed and growth SR mindsets of adolescents with FASD and their caregivers? I hypothesized that the majority of adolescents would have a more fixed SR mindset than a growth mindset, which is based on literature that suggests mindsets become more fixed during adolescence (Dweck, 1999), and takes into consideration the low expectations of success that this population may have. I explored caregiver's mindsets for their adolescent (i.e. the belief in the malleability of their child's SR ability) to incorporate possible influences of parenting. I hypothesized that the majority of caregivers would have a more growth mindset than fixed given the fact that they are enrolling their child in an intervention with the hope that they will see improvements in their child's SR.

Research Question Two

The second research question was: is there an association between mindsets, psychological needs, and interest/enjoyment? I hypothesized that there will be positive associations between level of growth mindsets, psychological needs, and interest/ enjoyment in the context of an SR intervention. I based this hypothesis on the notion that individuals require need fulfillment in order to be intrinsically motivated, which includes feelings of interest/enjoyment (Ryan & Deci, 2017). Previous research has demonstrated the relationship between a growth mindset and intrinsic motivation (Haimovitz, Wormington, & Corpus, 2011), so I predicted that there will be a relationship between growth mindset and interest/enjoyment.

Research Question Three

In the second stage of this study, I used qualitative methods with a small subgroup of the sample to further explore the roots and influences of the participants' mindsets. A third research question comprises stage 2 and was posed and answered using content analysis: 3) what are the influences that caregivers and adolescents with FASD describe on their SR mindset? No a priori hypothesis was made due to the exploratory nature of the research question.

Stage 1

Methods

The data for this project were embedded in a larger research study investigating a SR intervention on adolescents with FASD. For the purposes of context, I describe the intervention procedure here: The intervention was an adapted version of the Alert Program® (Williams and Shellenberger, 1996), and was comprised of 12 sessions administered one-on-one in which the participants learned regulation strategies. During the intervention, participants learned to identify their regulation level on a scale of high, just right, and low, and then used sensory strategies to help them be in the "just right" level. The strategies stemmed from five categories, namely mouth, move, touch, look, and listen. Strategies included activities such as deep breathing, walking, squeezing a stress ball, dimming lights, or listening to music. Participants were encouraged to find different strategies that worked for them within all five categories. These strategies were then practiced and integrated into the participant's daily lives.

Procedure. This study took place in hospital settings in Edmonton, Alberta, and in Vancouver, British Colombia. Ethics approval from the University of Alberta and the University of British Columbia were obtained. Participants were recruited through the Glenrose Hospital FASD Clinic, Sunnyhill Health Centre, and advertising through other community partners. Caregivers of adolescents with FASD contacted the investigators for more information about the study, and to book their appointment for an initial testing session. There was a rolling recruitment of participants, and participants began the study at their convenience. Adolescents and their caregivers were asked to complete questionnaires prior to beginning the intervention, including the mindset questionnaire. Adolescent participants were also asked to complete cognitive testing before starting the intervention. A $5.00 gift card was given to participants as a thank-you for completing the testing session. Data for Stage 1 were also collected from the participants at the beginning of the fourth intervention session using the Intrinsic Motivation Questionnaire. Data were collected between January 2016 and November 2018.

Participants. Eligible participants were adolescents between the ages of 11-17 who had a diagnosis of FASD. Exclusion criteria included those with a known genetic disorder, significant

motor/sensory impairments, or other severe neurodevelopmental disorders (e.g. Autism Spectrum Disorder). A total sample of 27 participants participated in this study, however, three participants did not complete all the questionnaires during the testing session, therefore 24 participants are included in the analyses for this stage of the study. Participants had a mean age of 13.17 years (range 11-17 years), and 11 males and 13 females participated. The average IQ of participants was 93.39 (SD = 13.33, range = 66-121).

Measures. Two measures were used, one for each of the theories being explored: the Mindset Questionnaire for MT, and the Intrinsic Motivation Inventory (IMI) for SDT.

Mindset Questionnaire. This measure was adapted by our research team to measure the caregiver's and adolescent's mindset regarding SR. Mindsets can be determined to be either incremental (growth), meaning the respondent believes SR can change, or entity (fixed), meaning the respondent believes SR cannot change (Dweck, 1999). Two versions of the questionnaire were made, one with wording for the participant asking about their beliefs, and one with wording for the caregiver, inquiring about their beliefs about their child's abilities. The questionnaire is comprised of eight statements, which are rated on a Likert scale of 1-6, from strongly agree to strongly disagree. The original mindset questionnaire on which we based the adaptation displayed good internal consistency (α=0.82-0.97), and test-retest reliability (α=0.80-0.82) (Dweck, Chiu, & Hong, 1995a,b). The original scale has good construct validity with scores predicting theoretically meaningful relationships for a range of variables, and good discriminate validity against possibly confounding variables including social desirability, intellectual abilities, or self-preservation concerns (Dweck et al., 1995a,b). The Mindset Questionnaires were completed at the testing session prior to beginning the intervention. The Mindset Questionnaire adapted for adolescents was completed by adolescent participants, and the Mindset Questionnaire adapted for caregivers was completed by caregivers. A sum of the four fixed mindset targeted statements and a sum of the four growth mindset targeted statements were found. The lower score was recorded as the dominant mindset. A total mindset score was calculated by reverse scoring the fixed mindset items and then summing all the items to obtain a total mindset score. The total mindset score corresponds to the level of growth mindset that the individual holds, and a lower score indicates a more growth mindset than a fixed mindset.

Cronbach's alpha was calculated for the growth and fixed mindset scales for both adolescents and caregivers. See Table 3.1.

Table 3.1. Reliability Statistics for Mindset Questionnaire.

	Cronbach's Alpha for Growth Mindsets	Cronbach's Alpha for Fixed Mindsets	Cronbach's Alpha for Total Mindsets
Adolescents	.80	.56	.75
Caregivers	.76	.87	.86

Intrinsic Motivation Inventory (IMI). This self-report measure is a multidimensional measurement tool to assess the participants' subjective experiences related to an activity (Jenkins-Guarnieri, Vaughan, & Wright, 2015; McAuley, Duncan, & Tammen, 1987). It assesses participants' perceived competence, perceived choice and autonomy, sense of relatedness, and interest/enjoyment. This measure was adapted for this study. It consists of 31 items, and uses a Likert rating scale of 1-7, from *not true at all* to *very true*. The original items in the measure have been shown to be factor analytically coherent and stable across a variety of tasks, conditions, and settings. In order to be included when the scale was developed, items had to have a factor loading of at least 0.6 on the subscale, and no cross-loadings above 0.4. This measure was given to adolescent participants at the beginning of the fourth intervention session. This time point was selected to give participants three sessions to become familiar with the intervention and interventionist. All four subscales on the IMI were individually summed. These four scales were treated as separate indicators of SDT, specifically three psychological needs (i.e. competence, autonomy, relatedness) and an outcome related to intrinsic motivation (i.e. interest/enjoyment).

Table 3.2. Reliability Statistics for Intrinsic Motivation Inventory

	Cronbach's Alpha
Interest/enjoyment	.92
Choice/Autonomy	.81
Relatedness	.65
Competence	.87

Planned Analyses

All data were entered into SPSS Version 24. Descriptive statistics and frequency statistics were conducted to describe demographic variables and data of interest in this study. Pearson correlations were conducted in SPSS. All assumptions for Pearson correlations were checked and met.

Results

Question 1: What are the levels of fixed and growth SR mindsets of adolescents with FASD and their caregivers?

Sixteen (67%) adolescents with FASD reported that they had a growth SR mindset, seven (29%) reported having a fixed mindset, and one (4%) reported equal values for growth and fixed mindset. It is worth noting that all but one of the participants who reported a fixed SR mindset were in the younger age group (11-13 years old) (see Figure 3.1). Percentages of growth and fixed SR mindset were similar for both male and female participants.

The mean growth SR mindset score for adolescent participants was 10.04 (*SD* = 4.22, range = 4-21). The mean fixed SR mindset score was 13.50 (*SD* = 4.04, range = 7-20). As a reminder, a lower score indicates a more growth mindset than fixed mindset, and the lowest possible score was 4 and the highest possible score was 24 for each scale.

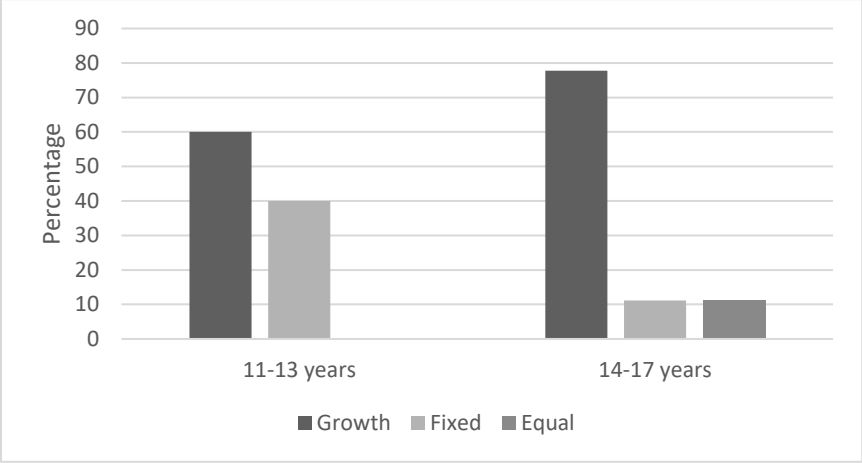

Figure 3.1. Mindsets by age group

Twenty (83%) caregivers reported having a growth SR mindset, and four (17%) reported having a fixed mindset. The mean growth SR mindset score for caregivers was 11.83 (*SD* = 2.94, range = 4-17), and the mean fixed mindset score for caregivers was 18.08 (*SD* = 3.50, range = 11-24).

A small majority (58%) of caregivers and their children reported having the same SR mindset for the adolescent with FASD (i.e. either both growth or fixed). Caregivers' and adolescents' SR mindsets were not significantly correlated (r (22) = .09, $p > 0.05$). Of the 58% caregiver-adolescent dyads that had the same mindset, all but one (93%) were a growth mindset pair.

Question 2: Is there a relationship between mindset and psychological needs?

I ran Pearson correlations between participant's total mindset score and each subscale

of the IMI. Correlations between mindset and autonomy, competence, relatedness, and interest/enjoyment were conducted (see table 3.3). No significant correlations were found between the total level of mindset and the Intrinsic Motivation Inventory subscales (*p*s > 0.05). Significant moderate to strong correlations were found between the four scales of the IMI (*p*s < 0.05).

Table 3.3. Correlation Matrix between Mindsets and IMI

	Interest/ Enjoyment	Choice/ autonomy	Relatedness	Competence
Interest/Enjoyment				
Choice/autonomy	.86**			
Relatedness	.47*	.48*		
Competence	.71**	.67**	.50*	
Total Adolescent Mindset	.22	.10	.26	.32

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

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

Discussion

The aim of stage 1 was to measure variables associated with the level of achievement motivation in adolescents with FASD based on two theories of achievement motivation: MT and SDT. In this stage of the study, I investigated the level of SR mindsets of adolescents with FASD and their caregiver's mindsets for their children's SR abilities. I also investigated the relationship between mindsets, psychological needs, and intrinsic motivation in a SR intervention. This study is the first to apply MT and SDT to adolescents with FASD, and these results increase understanding of achievement motivation in the FASD population.

The majority of individuals who participated in this study reported having a growth SR mindset. Adolescents had a mean growth mindset score of 10.04 on a scale of four to twenty-four with four being the most possible growth mindset score. This suggests that the adolescents were, on average, reporting a fairly strong growth mindset. Out of the 24 adolescents who completed the questionnaire at the testing session prior to beginning the intervention, 67% reported a growth mindset. These results were not hypothesized; however, it is promising that the majority of adolescents with FASD, who chose to be part of an intervention study, believe their SR can improve. Of note is that, although overall younger participants were more likely to have a growth mindset rather than a fixed mindset, the number of younger adolescents who reported a fixed

mindset. This is contrary to what is expected, given that individuals are thought to develop a more fixed mindset as they age (Dweck, 1999). In this sample of adolescents with FASD, it may be that older adolescents have more experience or knowledge about SR and therefore are more likely to have a growth mindset. Considering that early adolescence, in particular, is a sensitive period of development when self-doubt increases (Robins & Trzesniewski, 2005), this information has the potential to inform intervention design. Instead of first jumping into teaching skills and strategies to adolescents with FASD, interventionists may first want to discuss with the participant the idea that the adolescent has the ability to change and develop new skills. Encouraging the participant to first believe that they can improve their skills may increase motivation in the intervention.

Out of 24 caregivers who completed the questionnaire at the initial testing session, 83% reported a growth mindset for their child's SR ability. This result is consistent with my hypothesis. This is a positive finding as previous literature has demonstrated that a growth mindset is related to positive involvement from parents; specifically, it corresponds with less performance-oriented, controlling, and negative interactions. Parents with a growth mindset are also more likely to respond constructively to helplessness compared to those with a fixed mindset (Moorman & Pomerantz, 2010). The growth mindset majority may be explained by the fact that these caregivers were enrolling their children in a SR intervention study that is designed to improve SR. Presumably, caregivers would be less likely to enroll their child in an intervention program if they did not believe it could help change their child's abilities.

It is also interesting that a small majority of caregivers and their children matched in the type of mindset they held. Although it seems logical that children would hold the same mindset that their parents have in regard to their abilities, researchers have demonstrated that it is a parent's *failure* mindset, not intelligence mindset, that predicts children's intelligence mindsets (Haimovitz & Dweck, 2016). A failure mindset is thought to be more visible to children than an intelligence mindset, and therefore more influential. Parents can view failure as either enhancing or debilitating, and this view predicts parenting practices and, in turn, children's intelligence mindsets (Haimovitz & Dweck, 2016). It is unclear if this research relates to SR mindsets as well, but it speaks to the visibility of a parent's mindset as being more influential on children's mindset than the belief itself. Parents may report having a type of mindset (i.e. fixed or growth), but it is their behaviours that influence the mindset of their children. This may be a reason why only 58% of caregivers and their children had the same mindset. It is not clear from this research study if the parent's reported beliefs about the malleability of their child's SR corresponded to their actions and messaging about SR.

There were no significant correlations between the initial mindset score and the subscales on the IMI (i.e. competence, autonomy, relatedness, and interest/enjoyment). All correlations were weak, suggesting that there is not a strong relationship in this study between level of mindset and perceived interest/enjoyment, autonomy, competence, or relatedness. Although I hypothesized that there would be a relationship between mindsets and psychological needs because the two theories are conceptually similar, this was not substantiated in this study. Those who believed their SR could change were not more likely to report having higher levels of psychological needs met in the intervention, or interest/enjoyment. This may be, in part, due to the importance of the interventionist's role in fostering a sense of interest/enjoyment, competence, autonomy, and relatedness during the intervention, which is separate from the adolescent's implicit belief about the ability to change. Interest/enjoyment positively correlated with all three psychological needs; therefore, the findings indicate that SDT is upheld.

Stage 2

Methods

Procedure. Follow-up interviews were conducted after the SR intervention was completed. All families who had participated in the SR intervention study were contacted via e-mail or phone call. They were informed that only the caregiver, only the adolescent, or both caregivers and adolescents were welcome to participate in the follow-up interview. Those who said they would like to participate were emailed information letters and consent and assent forms to read, and an interview time was scheduled. All participants were given the option for in-person interviews, phone interviews, or video-calling interviews. One caregiver and adolescent did an in-person interview which took place at the Glenrose Hospital. All other interviews were conducted via video-calling. Consent and assent were reviewed and obtained at the beginning of the interview, and then the caregivers and adolescents participated in semi-structured interviews with the researcher, which took approximately one hour each. Four of the interviews with the adolescents were conducted with their caregiver present in the interview. Caregivers did not participate in these interviews with the adolescents, but they did help ensure comprehension of questions by repeating questions and, at times, slightly rephrasing the questions to their child, when needed. The researcher ensured that the questions were not re-worded in a way that changed the intention of the question. The researcher also clarified the question when required.

Participants. Five caregivers and seven adolescents from the same families (two caregivers had enrolled two adolescent participants) agreed to participate in a follow-up

interview. At the time of the interview, adolescents ranged in age from 13 to 17 years of age (ages 13, 13, 14, 14, 15, 15, 17). Three of the adolescent participants were male, and four were female. All caregivers were female. One caregiver-adolescent duo had not completed the Mindset Questionnaire at baseline, but they had completed it after the intervention. Of the other four caregivers and six adolescent participants, all caregivers in this subsample reported a growth mindset before the intervention began. Three of the adolescents reported a growth mindset, two reported a fixed mindset, and one reported equal values of growth and fixed.

Measures. Two different interview protocols were created, one for the caregivers and one for the adolescents. First, three questions were designed based on knowledge of the mindset literature to inquire about the development of implicit beliefs about the changeability of SR, and to probe at reasons why an individual may have a fixed or growth mindset. These three questions were then reviewed by my doctoral advisory committee and the suggestion was made to create separate interview questions to ask to caregivers and adolescents with FASD. The caregivers were asked three questions that were similar to the three questions initially proposed, but re-worded to be clear that I was asking what they thought about their child's SR mindset and to contextualize the questions to the Mindset Questionnaire they had completed. Questions were changed in the interview protocol for the adolescents in order to make the questions more concrete in nature, and questions were added specifically asking about the intervention and changes in SR. The adolescents were asked eight questions. Questions were reviewed by my supervisory committee and approved. The interview included questions about what might make the interviewee believe that SR is changeable or not, and where that messaging may have come from. For the adolescents, it also included questions about what they learned from the intervention and how that may have influenced their thinking about how SR can change. See appendix for the interview protocols.

Analysis. Qualitative content analysis was used to analyze the interview data. Qualitative content analysis involves classifying data into categories or themes (Breakwell, 2012). This content analysis was conducted based on the stages outlined by Breakwell (2012). First, all interviews were transcribed. The transcriptions were then reviewed, and the meaningful content was highlighted, and then was combined into one document. This cleaned data was then entered into NVivo software, a program used for the organization and coding of qualitative data, to assist with exploring dominant themes and categories. A classification system was developed from a review of all the data. Initially, 11 categories were created based on the interview data, however, upon review, the 11 categories had significant overlap in underlying concepts. Consequently, these 11 categories were re-analyzed and collapsed into six

categories. Inter-rater reliability was implemented at this point. An independent researcher reviewed the coded responses independently to ensure reliability. The two researchers met to review the coding together and discussed any discrepancies, differences of opinion, or codes that lacked clarity until an agreement on categorization was achieved.

Results

Question 3: What are the influences that caregivers and adolescents with FASD describe on their SR mindset?

Six themes emerged from the interview data regarding the mindsets of caregivers and adolescents. Two of the themes pertained to the ability of SR to change and develop: *observation of change,* and *strategy development and use.* The other four themes were related to influences on a growth mindset: *support and resources, making meaning of the diagnosis*, *increased understanding of SR*, and *hope and positivity*.

Observation of change. Participants described observing change in SR ability as an indicator that SR can change. For example, one participant said, “When I got mad at my sister for just doing something that wasn’t pretty nice to me, what I did was, instead of starting yelling at her and pushing her around, I just said, okay, then I left what I was doing with her, and then I just went for a walk just to cool myself down.” Participants talked about how they believe that SR can change because they have personally noticed a change, specifically an improvement, in the ability of adolescents with FASD to self-regulate. Caregivers and adolescents discussed observing a greater sense of control over emotional responses, and how using SR strategies helped participants keep calm and focused, suggesting qualitative support for the intervention.

Strategy development and use. Participants reported that learning about, developing, and using SR strategies were a key component to improving SR. Important strategies identified by participants included deep breathing, positive self-talk, walking, reading, exercising, squeezing a stress ball, and listening to music. One caregiver described her experience of learning about strategy use: “I think I always kind of looked at [a child having a tantrum] that we had to somehow react a certain way, and the change depended on how we reacted; not how he reacted. And that did work in certain situations, but this really went into strategies - concrete strategies that they could utilize - deep breathing, music, those kinda of things. For me, this program opened my eyes to concrete strategies they could learn.” Implementing strategies in situations allowed participants to change their regulation levels and have more control in their daily lives. One participant gave an example of a strategy that works for him by saying, “I would say when I don’t feel too active and I’m not really paying attention, what I’ll do is usually get up and stretch and walk around for a little bit, and I’ll just come back and get back to work.”

Support and Resources. Participants described the importance of having supports and resources in place to facilitate change in the regulation abilities of adolescents with FASD. This included personal and professional supports and a variety of resources that provided information and guidance. One caregiver described the importance of supports and resources by saying, “I think if you’re able to put the resources and supports together, in combination, and make a commitment to continuing to explore new ways to approach things, it’s a very different type of dynamic.” Participants emphasized the need to have appropriate supports and resources available in order to help adolescents with FASD work through difficult situations.

Making meaning of the diagnosis. Participants described some of the negative messaging they have heard about the capabilities of children with FASD, and how that affected their thoughts on the ability for change. One caregiver said, “I never raised the boys as having FASD; I just raised them as being capable. And I’m very grateful that we did that because we may very well have crippled them by falling into the trap of thinking they couldn’t accomplish anything, and we just never did.” Caregivers and adolescents stressed the importance of having an optimistic outlook despite hearing deficit-oriented messaging about the many things that children with FASD cannot do.

Increased understanding of SR. Participants discussed increasing their awareness and knowledge of SR, which helped them understand the possibilities of change. One participant said, “I guess what I came to realize through the process was that SR can be learned. For some of us, it’s a natural progression in our development, but for some of us, we have to learn that.” Adolescent participants described developing an awareness of their feelings and moods, and also empathy for the feelings and moods of others.

Hope and positivity. Participants described the need to have hope and a positive attitude in order to see SR change. Both caregivers and adolescents said thinking positively helped them to believe that SR can change. One participant said, “In our family we have a really high level of hope. We’ve seen how change can happen; we have seen how, with supports in place, with strategies in place, with opportunities for growth in place, we’ve seen how, if you put these together in the right combination…there is real hope for what [regulation] can look like.”

Discussion

Interviews with caregivers and adolescents with FASD revealed important themes around growth and what contributes to the belief in the changeability of SR. I used qualitative methods to explore the influences caregivers and adolescents describe on their SR mindset. I interviewed a subsample of the study sample, and six themes emerged regarding the belief that SR can change, as well as different factors that support a growth mindset. Caregivers and

adolescents who participated in the interviews discussed how making meaning of the FASD diagnosis, having hope and thinking positively, having an increased understanding of SR, and having support and resources in place all contribute to the belief that SR can change for adolescents with FASD. This exploration of caregiver and adolescent perspectives about the belief that SR can change increases our understanding of the factors that make up a growth mindset for individuals with FASD. Knowing these factors gives researchers and practitioners insight into the beliefs of the families they are serving and offers potential areas to explore with families raising a child with FASD.

A belief that SR can change is fostered by having supports and resources that reinforce a belief in change and, in turn, contribute to growth. It has been well-established in the FASD literature that families raising a child with FASD, and individuals with FASD themselves, need appropriate supports and resources to assist them given the vast challenges individuals with FASD face (Jirikowic, Gelo, & Astley, 2010). Having a network of helpful and understanding professionals, along with accurate information about FASD, are necessary to aid family functioning and, in turn, reduce the risk of adverse outcomes (Kapasi & Brown, 2017; Streissguth et al., 2004).

Participants also explained that making meaning of the FASD diagnosis, including being optimistic and ignoring negative messaging, helped them have a growth mindset. Similarly, participants reported having hope and positivity as being important in believing that change can occur. In previous literature, researchers have discussed the importance of hope as an important quality for caregivers raising a child with FASD (Streissguth, 1997). Moreover, positivity has been linked to lower stress levels in high-stress parenting situations (Blacher & Baker, 2007). Research with typically developing children has shown that having a growth mindset had a significant positive effect on levels of hope, and that hope and a growth mindset are both positively correlated with children's happiness (Lee, Park, & Hwang, 2016). Making meaning of the diagnosis and having hope and positivity can contribute to a belief that SR can change for individuals with FASD.

Increased understanding of SR also contributed to a growth SR mindset in participants, because having awareness and knowledge of SR (i.e. what it is, how it works) allowed participants to acknowledge it as something that can change. Learning about SR helped caregivers and adolescents with FASD see the malleability of SR and the ways in which SR can be changed through direct instruction and practice.

Observation of SR improvement influenced the belief about the possibility for SR growth. Participants reported that they believed SR can change because they observed it improve in

their households. They also witnessed the use of strategies as a key mechanism in helping improve SR. Seeing the process by which SR changed (i.e. implement strategies) supported beliefs about the prospect of new skill development. The use of sensory strategies to facilitate changes in SR has been found to be beneficial for children with FASD in previous research (Nash et al., 2015; Wells, Chasnoff, Schmidt, Telford, & Schwartz, 2012), and it is promising that participants in this study reported that using strategies helped them to change their SR. Based on this information, in order to foster motivation, practitioners may want to inquire about changes families have observed and what strategies or components brought about those changes.

General Discussion

This study used both quantitative and qualitative methods in order to generate data that moves researchers towards a more comprehensive understanding of the levels and sources of achievement motivation in adolescents with FASD and their caregivers. Using multiple methods helped to capture nuances in the data that may otherwise be overlooked. In this study, I first measured participant's mindsets and psychological need satisfaction in an intervention with adolescents with FASD. Next, I explored mindset development and influences in the context of an intervention study. These stages together provide depth to understanding mindsets. Knowing what SR mindset participants hold, as well as how they describe their belief of the malleability of SR, provides rich data about implicit beliefs in the FASD population. There has been no previous research conducted on mindsets for individuals with FASD or their families, and this research adds to the mindset literature by describing the mindsets of a population that have not been given much research attention in the area of MT, or achievement motivation in general. This new knowledge of levels of mindsets in adolescents with FASD, and their caregiver's mindsets for the adolescents, may encourage practitioners to consider an adolescent's mindset when conducting psychological assessment and intervention. If adolescents with FASD have a growth mindset, as was the majority in this sample, it is important to continue to foster that mindset through messaging that individuals can change and develop despite the challenges that accompany having FASD.

The predominance of a growth mindset from stage 1 was exhibited in the themes that emerged in stage 2. The majority of participants held a growth mindset, and upon further exploration, these growth mindsets were fostered by experiences and factors present in the lives of the families interviewed. This research study is novel in its use of qualitative methods to explore the factors that contribute to mindsets. Although the themes of needing support and resources, making meaning of the diagnosis, increased understanding of SR, and hope and

positivity are not new strategies in the FASD literature, they are new in the context of SR mindsets and help to inform researchers and practitioners what is needed to foster a growth mindset. In addition, the follow-up interviews provided support for the benefit of the SR intervention. Interviewees reported that they observed changes in SR and found the use of strategies helpful, giving merit to the intervention program and the positive impact it has had on the participants.

The significant correlations within the IMI measure add to the confidence for using this measure by demonstrating that the four subscales of interest/enjoyment, autonomy, competence, and relatedness all correlate positively with each other. In this study, I found that there were no significant correlations between the IMI and the Mindset Questionnaire results, which implies that, although both MT and SDT are theories of achievement motivation, they are not associated with each other in the context of this intervention. When future researchers are considering these theories for individuals with FASD, it is important to note that they may not be related to one another and that they provide different information about achievement motivation in this population.

Limitations and Future Directions

Firstly, these findings are limited by the generalizability of the study based on the sample of participants and the specific intervention. The sample was primarily obtained from individuals connected to community resources who have personal resources (e.g. financial, transport, time) to participate in the study. Furthermore, all caregivers who participated in interviews were female caregivers, and it is important to acknowledge the different perspectives female caregivers may have in comparison to male caregivers. Additionally, this research is based on a sample of adolescents and caregivers who chose to participate in an intervention study, and therefore their motivation may look different than those adolescents and caregivers who chose not to participate. This potential selection bias in the results is important because individuals who participated in the intervention are likely to be more open to the possibility of change and growth than other individuals who did not participate in the intervention. The intervention itself presents a limitation in this research study because the achievement motivation variables that were used were dependent on the SR intervention program and how it was delivered. SR mindsets were measured because the context of the study was an SR intervention, however, it is not clear how well SR mindsets translate to other types of mindsets in this population. Specifically, future research should look at intelligence mindsets in individuals with FASD as that is the most widely researched mindset type in adolescents. Intelligence mindsets would contribute to the wider mindset literature by representing a disability population that has not

received any research attention to date. In addition, the interviews were set in the context of the SR intervention and the changes seen in SR, which is specific to this intervention and the themes found, may not generalize to other contexts. Psychological need satisfaction is also dependent on the SR intervention because these needs were fostered in the context of a manualized intervention program. The environmental conditions that fostered competence, autonomy, and relatedness in the intervention are dependent on the program design and delivery. It is unclear if the same results would be found in another intervention program using the same methods to promote the psychological needs, or if these conditions were unique to this SR intervention.

The small sample size (n = 24) may have made it difficult to detect significant correlations. However, the sample size is realistic for clinical populations and the given timeframe of dissertation research.

Another limitation of this study is the reliance on self-report measures. Self-report measures are used in this study in order to capture the thoughts, feelings, and beliefs of participants. Inherent in a self-report measure is the assumption that the participant responded honestly and accurately. In addition, self-reports are vulnerable to intentional or unintentional distortions by the participants (Heppner, Wampold, & Kivlighan, 2008). Participants may consciously or unconsciously have had a response bias; they may have responded in a way that they think would confirm the researcher's inference, in a manner that made them look good, in a way that made them appear more distressed, or in a socially desirable way (Heppner et al., 2008). Another potential limitation of self-reports is that they assume participants have sufficient insight into their experience (Heppner et al., 2008). This is particularly relevant in this study, as adolescents with FASD may lack insight into their experience due to cognitive deficits. Despite these limitations, self-report measures allow for the participant to report their personal beliefs; beliefs and perceptions are difficult to capture using other methods.

A limitation of qualitative data with a sample of adolescents with FASD is that some adolescents had limited verbal abilities to describe their experiences and influential factors on mindset. Adolescents with FASD have known cognitive difficulties that may have made it difficult to report on the development of their mindset, especially as mindsets are an abstract concept. In order to address this, I clarified questions using concrete and simple language. In some instances, the caregivers were also present for the interviews, and in these cases, caregivers provided assistance with clarifying questions. Future researchers may want to consider using alternative methods, such as incorporating visuals, to help participants share their experiences.

Conclusion

In this research study, I described the mindsets of caregivers and adolescents with FASD in regard to their belief of whether SR can change or not for the adolescent with FASD. In addition, I explored the relationship between MT and SDT by examining the relationship between mindsets, psychological needs (i.e. competence, autonomy, and relatedness) and interest/enjoyment. This is the first study to measure the SR mindsets of adolescents and caregivers with FASD, and I found that many caregivers and adolescents with FASD who chose to participate in an intervention study do believe that SR can change in adolescents with FASD. A subset of participants reported that they have observed SR to improve in adolescents with FASD, and that the use of regulation strategies helped foster this change. These participants found that having positivity and hope, understanding of SR, support and resources, and making meaning of the FASD diagnosis influenced their belief in the malleability of SR in adolescents with FASD. Wisdom from participants and caregivers who participated in this study can guide and support other families raising a child with FASD. By exploring MT in an FASD population, we can form a better understanding of how best to support individuals with FASD and their families to move towards achieving goals and successes.

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Appendix

Caregiver Follow-up Interview Questions:

1. On the questionnaire you completed I asked you questions about whether you thought your child's self-regulation was changeable. What makes you think that his/her self-regulation can or cannot change?
2. Can you remember any particular people or experiences that might have contributed to your thinking about whether self-regulation can change or not?
3. What messaging have you heard about FASD that might have influenced your thinking that self-regulation can or can't change?

Adolescent Follow-up Interview Questions:

1. On the questionnaire you completed I asked you questions about whether you thought your self-regulation was changeable. What would need to happen for self-regulation to be able to change?
2. What is the name of one of your friends? So if ____ changed his/her self-regulation, how would you know? *Or reworded for clarification if needed:* What would look different in ____ if he/she changed his/her self-regulation?
3. Can you think of any people that might have affected how you think about whether self-regulation can change?
4. Can you remember any experiences that you had that might have affected how you think about whether self-regulation can change?
5. Can you tell me something that you learned in the intervention?
   Prompt: Did you learn something new?
6. Are there things you do now that are different than you did before you worked with us?
   Prompt: can you tell me a story about a time you did something different after you worked with us?
7. How does that go together with what you have told me about change in self-regulation?
8. If you got to design an intervention for self-regulation, what would you do?
   Prompt: what would be helpful? What did we miss?

Chapter 4. Achievement Motivation in a Self-Regulation Intervention for Adolescents with FASD

Interventions are treatments, therapies, procedures, or actions that are implemented in response to health problems to improve conditions and achieve beneficial outcomes (Sidani, 2015). Children and adolescents with Fetal Alcohol Spectrum Disorder (FASD) are often exposed to various interventions in an attempt to improve their physical and psychological health. One area in particular that individuals with FASD have difficulty with is self-regulation (SR), which is the ability to manage thoughts, impulses, and emotions (Kodituwakku, 2010). A core component of SR is inhibition. Inhibition can be described as the ability to stop an automatic response. Combined with other difficulties, challenges with SR and inhibition may lead to adverse outcomes including substance use, school truancy, and trouble with the law (Streissguth et al., 2004). Recognizing these risks, research in intervention programs is crucial to help support individuals with FASD to improve their SR. When examining intervention outcomes, it is important to move beyond solely measuring outcomes to exploring the mechanisms that contribute to change, including thoughts and beliefs. Indeed, in school settings, researchers have found that targeting student's beliefs about the malleability of intelligence has had positive, lasting impacts on educational achievement (Yeager & Walton, 2011). Intervention programs are another achievement setting where adolescents are learning new information and skills, thus in this research study, I investigated whether similar beliefs had an impact on a targeted intervention outcome (i.e. inhibition). Informed by two achievement motivation theories, namely Mindset Theory (MT) and Self-Determination Theory (SDT), I also explored the impact the intervention had on prominent achievement motivation factors. Looking beyond the skills component of an intervention to the psycho-social variables that are present can help create more effective treatments to address the unique needs of adolescents with FASD.

Background

Fetal Alcohol Spectrum Disorder (FASD) and Interventions

FASD is a neurodevelopmental disorder caused by in utero alcohol exposure. Individuals with FASD experience widespread difficulties, including cognitive, behavioural, and emotional challenges. A systematic review identified over 400 comorbid conditions that co-occur with FASD, with the most common being physical, behavioural, and language disorders (Popova et al., 2016). Executive functions (EF) are one specific cognitive area that individuals with FASD are known to have challenges (Rasmussen & Bisanz, 2009). EF are higher-order cognitive processes that support goal-directed behaviours, adaptation to environmental

changes, the development of social competence, and regulation of behaviour (Anderson, 2008). These cognitive processes include working memory, cognitive flexibility, planning, problem-solving, and inhibition, which are necessary to support functioning in many areas of daily life including academic performance, relationships, and health and safety (Anderson, 2008).

Inhibition is the ability to stop an automatic response, and it is a cognitive process of EF that is linked closely to SR (Sattler, 2014). When individuals are able to inhibit responses, they are better able to resist making impulsive remarks and decisions, suppress irrelevant or distracting information, and think through ideas before acting on them (Sattler, 2014). Researchers have recognized the importance of inhibition in the process of SR (Gill & Thompson-Hodgetts, 2018), and it is an area of functioning that had frequently been identified as a weakness for individuals with FASD (Fryer et al., 2007; Noland et al., 2003; Rasmussen & Bisanz, 2009). In studies of inhibition in alcohol-exposed children ranging from age four (*n*=316) (Noland et al., 2003), to the ages of 8-16 (*n*=29) (Rasmussen & Bisanz, 2009), and up to age 18 (*n*=13) (Fryer et al., 2007), impairments in inhibition have been noted. Older children with FASD have demonstrated more impaired performance than younger children relative to the norm on verbal measures of inhibition, suggesting that with age, children with FASD may fall further behind their peers (Rasmussen & Bisanz, 2009). In a study which used event-related potentials (ERP) to examine response inhibition, 10 to 13-year-old children with FASD (*n*=7) were found to behaviourally inhibit responses equally well as control groups on a Go/No-Go task; however, the level of neural activation was greater in children with FASD, suggesting these children required greater cognitive effort to accomplish the task (Burden et al., 2009).

Encouragingly, targeted, direct instruction interventions have been found to be effective to improve SR and inhibition in children with FASD (Kable, Taddeo, Strickland, & Coles, 2016; Nash et al., 2015; Wells, Chasnoff, Schmidt, Telford, Schwatz, 2012). Interventions have been developed to help individuals with FASD develop skills and mitigate challenges. With support, individuals with FASD are able to improve their abilities and find success; however, the role motivation plays in the effectiveness of these interventions is unknown.

Targeted Cognitive Interventions for SR. Among individuals with FASD, targeted cognitive interventions can lead to an improvement in attention (Kerns, MacSween, Vander Wekken, & Gruppuso, 2010), working memory (Loomes, Rasmussen, Pei, Manji, & Andrew, 2008), mathematics (Kable, Coles, & Taddeo, 2007), adaptive functioning, behaviour (Coles, Kable, Taddeo and Strickland, 2015), and executive functioning (Kerns, Macoun, MacSween, Pei, & Hutchison, 2017; Nash et al., 2015).

The Alert Program® is a targeted intervention program that aims to improve children's

SR abilities. The program was developed by Williams and Shellenberger (1996), and it is comprised of 12 sessions, which are broken down into three-stages to teach children to recognize regulation levels, learn strategies to help get to a "just right" place to focus. The program also helps participants integrate their regulation strategies into their homes and classrooms. After completing the program, children with FASD have shown improved executive functioning, social cognition, as well as behavioural and emotional regulation (Nash et al., 2015; Wells et al., 2012). An adolescent adapted version of the Alert Program® was used in this study with a sample of adolescents with diagnosed FASD.

Although it is important to determine if the intervention fostered changes in targeted outcomes, it is also important to understand psycho-social variables present in the intervention that may interact with the intervention outcomes. Aptitude-Treatment Interaction (ATI) research is a research paradigm that highlights the interaction between intervention outcomes and personal characteristics of participants (Yeh, 2012). To understand how, and for whom, an intervention works best, researchers should consider personal variables such as motivation, as these variables may have an impact on intervention effectiveness (Cronbach & Snow, 1977).

Achievement Motivation

Achievement motivation involves activation and intention and concerns energy, direction, and persistence that leads to production (Ryan & Deci, 2000). Achievement motivation can be defined as "the process whereby goal-directed activity is instigated and sustained" (Schunk et al., 2008, pg.4). Many theories aim to describe achievement motivation, including MT and SDT. These theories help individuals make sense of their environment and guide their choices in achievement settings (Chao, Visaria, Mukhopadhyay, & Dehejia, 2017). By studying both MT and SDT together, I have an opportunity to explore motivation through different cognitive, social, and environmental lenses. Converging these two social-cognitive theories allows for a deeper conceptualization of achievement motivation in individuals with FASD, as together they provide an understanding of both the environmental conditions that facilitate motivation, as well as the psychological conditions.

Mindset Theory. Mindset theorists posit that individuals differ in the degree to which they see their abilities as being able to change (Dweck & Leggett, 1988). Those with a fixed mindset believe that their abilities are set and unchangeable. Alternatively, those individuals with a growth mindset believe their abilities are malleable, and that they can improve with practice and effort (Dweck & Leggett, 1988).

Mindsets can be changed through targeted interventions that aim to teach individuals about growth and the ability to change (Dweck & Molden, 2005). Mindset interventions foster

students' motivation to learn and pursue challenges by changing their beliefs about the malleability of their abilities, often by describing how the brain can develop and improve (Dweck, 2006). These mindset interventions encourage students to persist in the face of challenges and advance their performance, especially for low-achieving students (Yeager et al., 2016). This was demonstrated in a study investigating self-esteem in students whose self-esteem was reportedly contingent on academic success. Niiya et al. (2004) found that students who read a passage about how intelligence is hereditary and unchangeable showed lower levels of self-esteem after failure on an exam than those who read a passage about how intelligence can increase. Those who read the passage about how intelligence can increase did not show any change in self-esteem regardless of exam performance (Niiya et al., 2004). Simply reading a passage that primed a growth mindset was found to protect students from decreases in self-esteem and protect from increases in anxiety and depression.

In a study with seventh-grade students, students were given an eight-session workshop on the physiology of the brain, study skills, and anti-stereotype thinking. Children in the experimental group were taught about growth mindsets; specifically, the children were taught that the brain changes and grows when you learn new things and that they have influence over how smart they become. Students in the control group learned about memory and academic issues and did not receive any information about mindsets. Students in the growth mindset group ultimately earned higher math grades in comparison to those in the control group. Furthermore, teachers identified those in the growth mindset group as showing more positive motivational change, despite not knowing which students were in which group (Blackwell, Trzesniewski, & Dweck, 2007). Positive outcomes were found to be linked to boosting student's value of learning and improvement, and a belief in their effort. These positive outcomes of a growth mindset are important to promote in individuals with FASD in order to combat learned helplessness and disengagement that often accompanies a personal history of challenges and experiencing failures.

Individuals who believe that their abilities are malleable are more likely to exert effort, try new things, and challenge themselves (Dweck, 2006). Positive outcomes associated with having a growth mindset include predicting an increase in grades (Blackwell et al., 2007), alleviating the impact of socio-economic status on academic achievement (Claro, Paunesku, & Dweck, 2016), influencing positive parenting (Moorman, & Pomerantz, 2010), and decreasing academic stereotype threat in minority populations (Good, Aronson, & Inzlicht, 2003). When individuals with FASD are willing to exert effort, try new things, and challenge themselves, they may optimally benefit from interventions and programs that are asking them to do just that - try

something new in order to help assuage difficulties.

Self-Determination Theory. Self-determination theory is a theory of motivation that proposes three psychological needs (autonomy, competence, and relatedness) that are important to foster intrinsic motivation and psychological well-being (Ryan & Deci, 2000). Intrinsic motivation is "the inherent tendency to seek out novelty and challenges, to extend and exercise one's capacities, to explore, and to learn" (Ryan & Deci, 2000, p. 3). Autonomy refers to the need to experience oneself as in control of one's own actions. Competence refers to the need to achieve outcomes and understand how one's abilities lead to those outcomes. Relatedness refers to the need to experience positive relationships with others and to feel a sense of belonging to the social group (Ryan & Deci, 2000). These needs are important to foster intrinsic motivation, which in turn increases interest, excitement, and confidence, leading to increased performance, persistence, and creativity (Ryan & Deci, 2000).

Veronneau, Koestner, and Abela (2005) found that low competence, in particular, was a large contributor to negative well-being outcomes in adolescents. It was the only psychological need that predicted both depressive symptoms and negative affect over a six-week period. Moreover, a noted difference in feelings of competence was demonstrated between third and seventh graders; lower levels of competence were found in the seventh-grade students. In another study with adolescents, higher levels of autonomy were associated with lower levels of depressed mood and higher self-esteem (Noom, Dekovic, & Meeus, 1999). When autonomy is supported, students have shown greater school persistence, academic achievement, and challenge-seeking behaviour (Guay, Ratelle, & Chanal, 2008). In regard to relatedness, relationships have been found to be a source of happiness and a buffer against stress. Relationships provide help overcoming challenges, emotional support, companionship, and a way to teach adolescents beliefs and values (Martin & Dowson, 2009). Theoretically, FASD interventions that meet the basic psychological needs of competence, autonomy, and relatedness are more likely to allow intrinsic participation, including interest and enjoyment in the intervention. When participants experience psychological need satisfaction in the intervention, it may lead to better treatment outcomes.

Motivation in a SR Intervention for adolescents with FASD

The intervention used in this study is not a mindset intervention, and the researchers were not specifically targeting mindsets, but rather SR. It is unknown whether mindsets are able to change by participating in an intervention that produces noticeable growth but does not directly target mindsets. By participating in a SR intervention, participants are exposed to new ideas and strategies about improving their ability to self-regulate, however, at no point does the

intervention directly teach concepts of brain growth and the ability to change. Based on the implicit nature of mindsets and the indirect methods used to promote a growth mindset in mindset interventions (Yeager & Walton, 2011), it may be possible to promote a growth mindset through an underlying growth philosophy of an intervention rather than direct information about growth and malleability.

In regard to SDT, competence, autonomy, and relatedness are key factors in promoting success in individuals, and fostering self-esteem and happiness (Ryan & Deci, 2000). In the development of the intervention for this study, researchers emphasized methods to increase a sense of competence, autonomy, and relatedness throughout the intervention. This was done in order to promote a person-centered, individualized intervention approach, which is thought to be beneficial for individuals with FASD (Kalberg & Buckley, 2007; Pei, Baugh, Andrew, Rasmussen, 2017). For instance, competence was fostered by repeating sessions until the participant understood the concepts, incorporating plenty of repetition of concepts throughout the intervention, and providing clear expectations for each session. Autonomy was fostered by giving the participants many choices throughout the intervention, such as which activities they would like to do each session and co-creating SR strategies. Relatedness was fostered by delivering the intervention one-on-one to allow participants to develop a positive rapport with the interventionist. It is important to know whether the participants did indeed experience a sense of competence, autonomy, relatedness, and interest/enjoyment and whether their experience of these constructs changed over the course of the intervention, and/or had an influence on its effectiveness.

Purpose and Research Questions

The main purpose of this study was to examine the impact of motivation variables on an outcome of a SR intervention (i.e. inhibition) for adolescents with FASD. The intervention was designed to target inhibition and support psychological needs, therefore I investigated whether inhibition changed in the sample of adolescents with FASD and whether the intervention did foster a sense of competence, autonomy, and relatedness, as it was designed to do. As a follow-up question, I investigated the impact of the intervention on the mindsets of participants. This study was the first to investigate changes in MT and SDT variables in an intervention for adolescents with FASD and it adds to our knowledge of the relationship between motivation variables and outcomes of an intervention. The specific research questions of this study were:

1) Do total mindset and psychological need satisfaction predict outcomes of inhibition? SDT posits that a sense of competence, relatedness, and autonomy are necessary to be self-determined, and the process of self-determination is intrinsically motivating. These three needs

foster enjoyment, interest, and well-being (Ryan & Deci, 2000), and have been shown to predict school achievement (Taylor et al., 2014). I hypothesize that participants who experience more competence, autonomy, relatedness in the intervention will have greater improvements in inhibition, and higher levels of interest/enjoyment. Likewise, research has shown that a growth mindset can predict an increase in outcomes, such as grades (Blackwell et al., 2007), therefore I hypothesize that participants with a stronger growth mindset will show greater improvements in inhibition.

2a) Did the adolescent participants describe the intervention as interesting/enjoyable, and meeting the needs of competence, autonomy, and relatedness at the end of the intervention, and 2b) does this change from the beginning of the intervention to the end? I hypothesize that the majority of adolescent participants will report the intervention as meeting the needs of competence, autonomy, relatedness and will report the intervention as interesting/enjoyable. I also hypothesize that all three needs will increase from the beginning of the intervention to the end, as the participants will have more time to experience competence, autonomy, and relatedness throughout all the sessions, and enjoy the intervention.

3) Did participating in the intervention change the total SR mindset of the participants and their caregivers? Mindset literature states that mindsets are fairly stable (Dweck, 2006), and the intervention is not a direct mindset intervention, therefore I hypothesize that participants' mindsets will not change over the course of the intervention.

Methods

Procedure

Data collection for this study took place as part of a larger intervention study investigating a SR intervention with adolescents with FASD. Data were collected between January 2016 and November 2018. The study took place in hospital settings in Edmonton, AB, and in Vancouver, BC, using a non-randomized waitlist control design. Participants were placed in Group A (intervention) or Group B (waitlist), and attempts were made to match participants in each group on gender and age. Both groups received the intervention and completed pre- and post- testing, but in different orders (see Figure 4.1). A large battery of pre- and post-testing measures were used; however, only those measures that pertain to this study are shown in Figure 4.1. A $5.00 gift card was given to participants as a thank-you for completing the testing sessions.

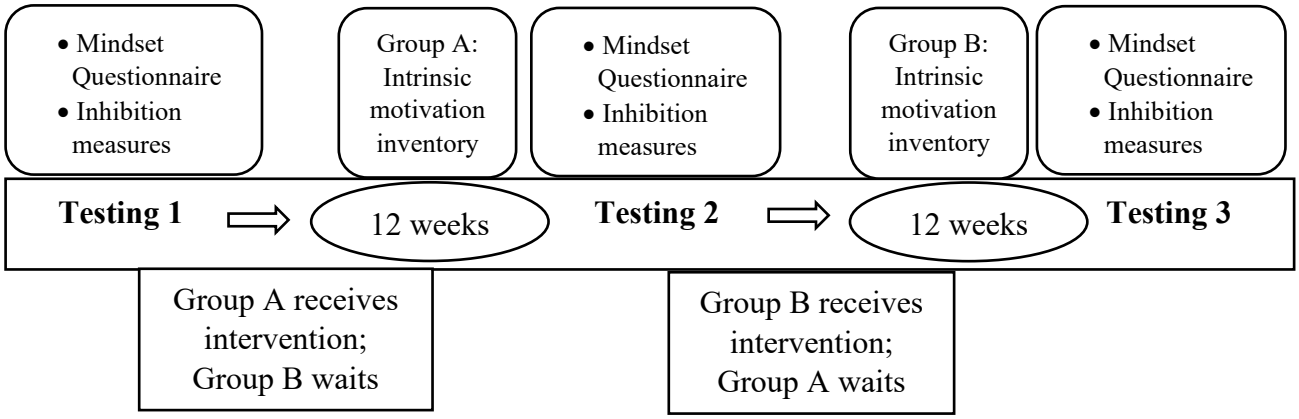

Figure 4.1. Self-regulation study design

Self-Regulation intervention. The SR intervention was a manualized intervention called the Alert Program® Teen Adaptation. The adaptation was created by TherapyWorks Inc. with prior approval and permission. The research team in conversation with TherapyWorks Inc. then modified the program as necessary to ensure ecological validity in Canada and with the FASD population. Modifications were made to the Alert Program® to make the intervention more appropriate for adolescents with FASD. Specifically, the activities were altered to be more suitable for adolescents, and the caregiver and teacher components were removed in order to reduce barriers to participating in the intervention study. The program teaches adolescents to monitor, maintain, and regulate their alert levels (Williams & Shellenberger, 1996). An alert level is a level of SR, and can be described as high, low, or just right. The program is divided into three stages. In stage 1, the participants learn how to identify their alert levels. In stage 2, the participants learn to experiment with strategies to change his/her alert levels. Participants learn five ways to regulate using sensory strategies (i.e. mouth, move, touch, look, listen). In stage 3, the participants practice regulating their alert levels. The intervention is comprised of 12 sessions, which were administered approximately once a week for an hour.

Participants

Participants were recruited through the Glenrose Hospital FASD clinic, SunnyHill Health Centre, and advertising through other community partners. Participants were required to have an FASD diagnosis, with no known genetic disorders (e.g. Down's syndrome), other severe neurodevelopmental disorders, or significant motor/sensory impairments. Twenty-seven participants were initially enrolled in the study, and four participants did not complete the intervention, therefore their data has not been used in this study, resulting in a final sample size of 23 (15 from the Edmonton site, and 8 from the Vancouver site). Although this sample size is fairly small for an intervention study, it is in keeping with previous studies that have provided SR

interventions for individuals with FASD, which have sample sizes between 25 to 40 participants (e.g. Kable et al., 2016; Nash et al., 2015; Wells et al., 2012). See table 4.1 for participant demographic information.

Table 4.1. Participant Demographic Information by Site and Total Sample

	Age	Gender	IQ	Group Size
Edmonton Site	Mean = 13.53 (*SD* = 1.92; range = 11-17)	10 females, 5 males	Mean = 93.00 (*SD* = 11.81; range = 72-114)	Intervention = 7 Waitlist = 8
Vancouver Site	Mean = 14.13 (*SD* = 2.03; range = 12-17)	4 females, 4 males	Mean = 97.38 (*SD* = 15.17; range = 66-121)	Intervention = 5 Waitlist = 3
Total Sample	Mean = 13.74 (*SD* = 1.94; range = 11-17)	14 females, 9 males	Mean = 94.52 (*SD* = 12.90; range = 66-121)	Intervention = 12 Waitlist = 11

Measures

Motivation measure: Mindset Questionnaire. This measure was adapted by our research team to measure the level of the caregiver and the youth's mindset regarding SR. Two versions of the questionnaire were made, one with wording for the participant asking about his/her beliefs, and one with wording for the caregiver inquiring about their beliefs about their child's abilities. The questionnaire is comprised of eight statements, which were rated on a Likert scale of 1-6, from strongly agree to strongly disagree. The original mindset questionnaire on which we based the adaptation displayed good internal consistency (α=0.82-0.97), and test-retest reliability (α=0.80-0.82) (Dweck, Chiu, & Hong, 1995a,b). The original scale has good construct validity with scores predicting theoretically meaningful relationships for a range of variables, and good discriminate validity against possibly confounding variables including social desirability, intellectual abilities, or self-preservation concerns (Dweck et al., 1995a,b).

Motivation measure: Intrinsic Motivation Inventory (IMI). This self-report measure is a multidimensional measurement tool to assess participants' subjective experiences related to an activity (Jenkins-Guarnieri, Vaughan, & Wright, 2015; McAuley, Duncan, & Tammen, 1987). It assessed participants' perceived competence, perceived choice and autonomy, sense of relatedness, and perceived interest/enjoyment. This measure was adapted for this study and consisted of 31 items. The measure uses a Likert rating scale of 1-7, from *not true at all* to *very true*. The original items in the measure have been shown to be factor analytically coherent and

stable across a variety of tasks, conditions, and settings (McAuley, Duncan, & Tammen, 1987). This measure was given to participants at the beginning of the fourth intervention session, and at the beginning of the last intervention session. Although the interventionist administered this measure, the interventionist gave the participant the questionnaire with an envelope and did not observe the participant complete the questionnaire. The interventionist remained in the room and did answer any questions the participant had about the questionnaire (e.g. word meaning, clarifying questions) given the known difficulties individuals with FASD have in reading and language. The participant was asked to answer honestly and told that the interventionist would not know how the participant answered the questions. The participant handed back the questionnaire in a closed envelope and the questionnaire was kept confidential from the interventionist for the remainder of the intervention.

Inhibition measure: Delis-Kaplan Executive System (D-KEFS) Color-Word Interference Test. The D-KEFS is a normed measure of different executive functions including problem-solving, cognitive flexibility, planning, inhibition, and concept formation (Delis, Kaplan, & Kramer, 2001). These are measured through nine subtests for individuals between the ages of eight to 89. The DKEFS is co-normed on a large and representative USA sample. Raw scores are converted to scaled scores (M = 10, SD = 3), with lower scores indicating poorer performance on the test. For the purpose of this study, the Color-Word Interference Test (CWIT) was used. The CWIT is a test of verbal inhibition, and it is comprised of four parts: colour naming, word reading, inhibition, and inhibition/switching. For this study, only the inhibition test was used because inhibition was the outcome of interest. The inhibition test presents participants with a page of colour words written in a different colour ink. For example, the word red is written in blue ink. The participant is asked to say the colour of the ink and inhibit themselves from reading the word. The time it takes to read the page is the raw score, and it is then converted into a standard score using age-based norms. Moderate to high split-half reliability (0.62-0.86), and test-retest reliability have been determined for the CWIT (Homack, Lee, & Riccio, 2005).

Inhibition measure: Whack-A-Mole. Whack-A-Mole is a computerized Go/NoGo paradigm used to measure inhibitory control, modeled after the “whack-a-mole” arcade game. Participants press a button every time a mole appears in a garden hole (go) but withhold responding when a garden vegetable appears (nogo). The game contains six runs, consisting of 60 trials (25% nogo), which last 90 seconds each. The stimuli are shown for 250 ms, and there are 45 moles with 12 different disguises, and 15 vegetables (Nash, 2012). The number of correct hits was used from this measure for analyses (i.e. hitting the mole).

Inhibition measure: Behavioral Rating Inventory of Executive Functioning-2 (BRIEF-2). The BRIEF-2 is a normed parent-report measure of executive functions, namely inhibit, self-monitor, shift, emotional control, initiate, working memory, plan/organize, task-monitor, and organization of materials (Gioia, Isquith, Guy, & Kenworthy, 2000). These domains form three indexes, the Behavioural Regulation Index, the Emotional Regulation Index, and the Cognitive Regulation Index, and these all yield a Global Executive Composite score. The BRIEF-2 is normed based on a USA sample for children aged 5-18 and has norms specific to age and gender. Raw scores are converted to t-scores (M = 50, SD = 10). Internal consistency measured by Cronbach coefficient was shown to be satisfactory (0.80-0.98), and test-retest reliability was found to be r=0.81. Convergent, discriminant, and predictive validity were also tested. The BRIEF-2 is a useful measure to contribute to behavioural analysis and subtyping, particularly with children with ADHD (Gioia et al., 2000). For this study, only the inhibit subscale on this measure was used.

Data Scoring and Analyses

Mindset Questionnaire

Of the 23 participants, three participants and their caregivers did not complete the Mindset Questionnaire at Time 1 testing, and therefore their data was not used in the analyses that involved the mindset questionnaire. A total of 20 participants were included in the Mindset Questionnaire analyses. The Mindset Questionnaire was scored by separately totaling the Likert scale responses of the fixed mindset items and the growth mindset items. The totaled items that had the lower score was the dominant mindset. A total mindset score was then calculated to obtain level of mindset by adding the growth mindset score with the reverse-scored total of the fixed mindset. A lower score indicated a more growth mindset. A mindset change score was calculated in order to do group level statistical analyses by subtracting the total mindset post-score from the total mindset pre-score; a positive number indicated a more growth mindset. The mean growth SR mindset score for adolescent participants was 10.04 (SD = 4.22, range = 4-21). The mean fixed SR mindset score was 13.50 (SD = 4.04, range = 7-20). Cronbach's alpha was calculated for the total mindset score for adolescents (α = 0.75), and caregivers (α = 0.86).

Intrinsic Motivation Inventory (IMI)

Of the 23 participants, one did not complete the IMI during the intervention, and therefore their data was not used in the analyses that included the IMI (n = 22). Each subscale had items that were reverse scored. Each of the four subscales were totaled separately. A higher score indicated more interest/enjoyment, more perceived choice/autonomy support, higher perceived competence, and a higher sense of relatedness. The three psychological

needs subscales (competence, autonomy, relatedness) were then totaled to create a "need satisfaction" variable. Cronbach's alpha was calculated for reliability and the results were: interest/enjoyment = 0.92, autonomy = 0.81, competence = 0.87, and relatedness = 0.65, and need satisfaction = 0.93.

Inhibition

Inhibition was measured using three different measures. The D-KEFS Color Word Interference test was scored, and standard scores were used in analyses. A change score was calculated by subtracting the CWIT pre-test score from the CWIT post-test score. In doing this, a positive number indicated improvement in inhibition. The BRIEF-2 was scored and t-scores were used in analyses. A higher t-score indicated more difficulties with inhibition as observed by the caregiver. A change score was calculated by subtracting the post-test t-score from the pre-test t-score, in order to have a positive number indicate improvement. The third measure used was the Whack-A-Mole test, and the hit rate was calculated by the number of correct hits the participant made. A change score was calculated by subtracting the pre-test number of hits from the post-test number of hits, therefore a positive number indicated improvement.

Analyses

Data were analyzed in multiple ways. Independent *t*-tests were conducted for comparisons between the intervention group (Group A) and the waitlist control group (Group B) on the CWIT, BRIEF-2, and Whack-A-Mole. These analyses were done to compare those who received the intervention with those that had not yet received the intervention. Hedges *g* was used to calculate effect size in independent samples *t*-tests due to unequal group sizes. Paired-sample *t*-tests were conducted for pre-post analyses, which allowed for a larger sample size that included all participants who completed pre- and post-testing and received the intervention. Linear regression analyses were used in order to determine if the motivation variables (total mindset, competence, autonomy, and relatedness) predicted a change in the outcome variables. Lastly, individual change is discussed in regard to the inhibition outcome measures. I looked at changes that were at, or above, one standard deviation in either direction. Examining individual change adds interesting information about clinically relevant, personal changes seen in the adolescent participants.

Results

Question 1: Do total mindsets and psychological need satisfaction predict outcomes of inhibition?

First, paired sample *t*-tests were conducted to determine if there was a significant difference in scores between pre-and post-testing on the three measures of inhibition using all

participants in the intervention study (n = 23). A significant difference was found on the CWIT, $t(22) = -2.36$, $p = 0.03$, $d = 0.48$, with the average post-test score being higher than the average pre-test score, which demonstrates significant improvement between pre-and post-intervention. Neither the Whack-A-Mole or the BRIEF-2 inhibition measure had a significant change between pre-and post-testing (*p*s>0.05). Importantly, all measures of inhibition demonstrated mean-level movement in the direction of improvement in inhibition (See Table 4.2).

Table 4.2. Outcome Measures Statistics for Pre- and Post- Testing

Variable	Mean Pre-Test	Mean Post-Test	Significant change at 0.05
BRIEF-2 Inhibition	69.35 (*SD* = 9.23)	68.87 (*SD* = 10.55)	No ($p = 0.78$)
D-KEFS CWIT	8.00 (*SD* = 3.75)	9.17 (*SD* = 3.42)	Yes ($p = 0.03$)
Whack-A-Mole hit rate	215.13 (*SD* = 12.13)	217.61 (*SD* = 11.66)	No ($p = 0.38$)

Independent sample *t*-tests were also conducted to determine if there was a significant intervention effect when comparing the intervention group to the waitlist group on the three measures of inhibition. No significant differences were found between the intervention group (n = 12) and the waitlist control group (n = 11) (*p*s > 0.05). Observationally, the mean change scores in the intervention group were greater on the CWIT and Whack-A-Mole measures than the mean change score in the waitlist control group; however, the mean change score was higher in the waitlist group than the intervention group for the BRIEF-2 (see table 4.3).

Table 4.3. Inhibition Measures Change Scores Statistics

Variable	Mean Change	Significant difference at 0.05
BRIEF-2 Inhibition		
Intervention	0.42 (*SD* = 7.34)	No ($p = 0.37$)
Waitlist	3.00 (*SD* = 6.18)	
D-KEFS CWIT		
Intervention	1.00 (*SD* = 2.98)	No ($p = 0.62$)
Waitlist	0.45 (*SD* = 2.02)	
Whack-A-Mole hit rate		
Intervention	3.00 (*SD* = 16.71)	No ($p = 0.68$)
Waitlist	0.55 (*SD* = 10.52)	

Looking at individual change across all participants who received the intervention (n = 23) using the CWIT and BRIEF-2 measures only (Whack-A-Mole was not included because it is not a normed measure), eight (35%) individuals improved one standard deviation or more. Four participants (17%) had a decrease in scores one standard deviation or more. Of the eight that had an increase in scores, all but one was aged over 14, and of the four that had a decrease in scores, all but one was 13 or younger.

Regression Analyses

Regression analyses were conducted to examine the association between the achievement motivation variables and the changes in inhibition for all participants. The need satisfaction variable (i.e. the sum of competence, autonomy, and relatedness from the IMI) from the end of the intervention, as well as the total SR mindset score from testing time 1 (baseline), were used as predictor variables. The outcomes variables were the changes in the scores for the D-KEFS CWIT, the BRIEF-2 inhibition scale, and the Whack-A-Mole hit rate. Results of three separate regressions indicated that need satisfaction was a significant predictor of the D-KEFS CWIT change scores. Need satisfaction was not a significant predictor of the BRIEF-2 change scores or the Whack-A-Mole hit rate change scores (see Table 4.4). Results of three more regressions indicated that there were no significant relationships between SR total mindset at testing time 1 and the BRIEF-2 change scores, the CWIT change scores, or the Whack-A-Mole hit rate change scores (see Table 4.5).

Table 4.4. Three Regression Analyses Between Need Satisfaction and Inhibition Measures

Measure of Inhibition	β	*t*	*df*	*p*	R^2
BRIEF Inhibition	-0.40	-0.50	1,20	0.62	0.01
DKEFS CWIT	-0.82	-3.31	1,20	0.00*	0.35
Whack A Mole Hit Rate	2.67	1.63	1,20	0.12	0.11

Note: n = 22, * = statistically significant at $p < 0.05$

Table 4.5. Regression Analyses for Total SR Mindsets at Time 1 and Inhibition Measures

Measure of Inhibition	β	*t*	*df*	*p*	R^2
BRIEF Inhibition	-0.16	-0.72	1,21	0.48	0.02
DKEFS CWIT	0.35	1.74	1,21	0.10	0.13
Whack A Mole Hit Rate	-0.23	-0.10	1,21	0.28	0.06

Note: n = 23

A simple linear regression was calculated to predict need satisfaction based on total mindset at time 1, and a significant regression was not found ($F(1,18) = .19$, $p > 0.05$) with an R^2 of .01.

Question 2: 2a) Did the adolescent participants describe the intervention as interesting/enjoyable, and meeting the needs of competence, autonomy, and relatedness at the end of the intervention, and 2b) did this change from the beginning of the intervention to the end?

Adolescents reported that at the end of the intervention, they felt fairly high rates of interest/enjoyment in the intervention (range = 3.57-7.00), autonomy support (range = 4.60-7.00), competence (range = 4.50-7.00), and relatedness (range = 3.63-6.75), as suggested by the average participant scores on each subtest being on the upper half of the scale (i.e. above 3.5 on a scale of 1 to 7) (see table 4.6).

Paired sample *t*-tests were conducted to examine changes in the IMI subscales from the beginning of the intervention to the end. There was a significant difference found between the initial perceived competence scores ($M = 5.58$, $SD = 0.87$) and the final perceived competence scores ($M = 6.02$, $SD = 0.64$); $t(21) = -2.73$, $p = 0.01$, $d = 1.91$, which indicates a significant improvement in the level of competence participants experienced from the beginning of the intervention to the end. There were no significant differences found between interest/enjoyment, autonomy support, and relatedness between the beginning and end of the intervention (*p*s > 0.05).

Table 4.6. Intrinsic Motivation Inventory Statistics for Time 1 and Time 2

Variable	Mean Time 1 (session 4)	Mean Time 2 (session 12)	Significant change at 0.05
Interest/Enjoyment	6.20 (*SD* = 0.84)	6.05 (*SD* = 1.02)	No (*p* = 0.39)
Autonomy Support	6.23 (*SD* = 0.69)	6.33 (*SD* = 0.62)	No (*p* = 0.30)
Perceived Competence	5.58 (*SD* = 0.87)	6.02 (*SD* = 0.64)	Yes (*p* = 0.01)
Relatedness	5.88 (*SD* = 0.87)	5.77 (*SD* = 0.83)	No (*p* = 0.34)

Question 3: Did participating in the intervention change the total SR mindset of the participants and their caregivers?

The total mindset score was compared between adolescents and caregivers who received the intervention first (Group A; n = 9) to those the waitlist control group (Group B; n = 11). To determine whether these results were statistically significant, total mindset change scores were analyzed with an independent samples *t*-test. Levene's Test for Equality of

Variances was not significant, therefore equal variances were assumed. Adolescents who received the intervention reported a significantly larger growth SR mindset change score (M = 4.67; SD = 7.11) than those in the waitlist control (M = -3.64; SD = 4.18), t (18) = 3.26, p = 0.004, g = 0.18 (see Figure 4.2). There was no significant difference in the intervention group caregiver's SR mindset change scores (M = -3.89, SD = 8.56) in comparison to the waitlist control group (M = -2.82, SD = 4.58); t(18) = -0.359, p > 0.05.

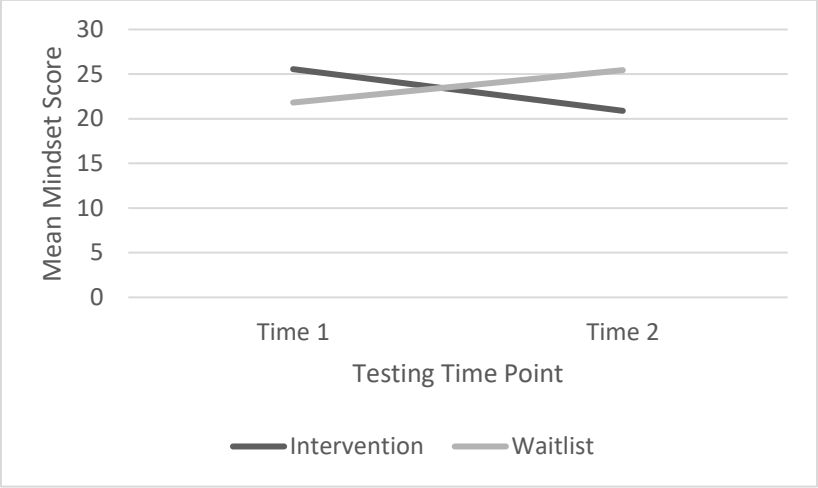

Figure 4.2. Group comparison of adolescent participant change in mindset.
Note: a lower score indicates more a growth mindset

Interestingly, out of the 20 adolescent participants who participated in the intervention and completed mindset questionnaires, 90% (n = 18) reported having a growth mindset by post-testing, in comparison to 65% (n = 13) at pre-testing. Five participants (25%) changed their mindset from fixed to growth. No participants changed mindset from growth to fixed; two participants reported a fixed mindset at both pre- and post-testing time points.

Discussion

This study explored relationships between achievement motivation variables and a SR intervention with adolescents with FASD. The achievement motivation variables in this study were SR mindsets, which provided information about beliefs about changeability, and psychological needs, which provided information about perceived competence, autonomy, and relatedness. Of particular interest was determining if these motivation variables predicted any changes in a selected intervention outcome (i.e. inhibition). In addition, I examined changes in the mindsets, need satisfaction variables, and interest/enjoyment before and after the intervention. The results of this study demonstrated changes in verbal inhibition that were significantly predicted by need satisfaction, as well as significant changes in adolescent motivation variables, but I did not find significant changes in caregiver's mindsets.

Achievement Motivation and Intervention Outcomes

Inhibition outcomes from the SR intervention provided some evidence of improvement; however, mixed results were found, perhaps in part explained by the small sample size, differences between measures, and influence of participant's ages. It is possible that the impact of a SR intervention on inhibition is nuanced and complex, and therefore was not easily captured or explained using the methods of this study.

When looking at all participants who received the intervention, it was found that participants showed a significant increase on the D-KEFS CWIT, which measured verbal inhibition, from pre- to post-intervention. Additionally, the means of all three inhibition measures moved towards improvement when pre- and post- testing data were compared. These results are promising because they suggest that many participants did demonstrate personal improvements in inhibition after participating in the SR intervention. When comparing the intervention and waitlist group (n=12 and 11), there was no significant difference found on any of the three measures of inhibition. The smaller group sizes may have made it difficult to detect statistically significant differences in inhibition measures between the intervention group and the waitlist control group. Notably, the change observed between the intervention group and the waitlist group were not consistent across measures; the intervention group demonstrated greater improvement on both the Whack-A-Mole and the CWIT measures compared to the waitlist control; however, on the BRIEF-2, those in the waitlist control group improved more than those in the intervention group. This may be due to differences in the nature of the measure, as the BRIEF-2 provides a parental report of observations of inhibitory control whereas the other measures are done by in-person cognitive testing. Researchers have shown that parent rating of EF and performance-based measures of EF show insignificant to modest correlations (Mahone & Hoffman, 2007; Payne et al., 2011), which may explain the differences in findings. The BRIEF-2 is likely more subject to changes in the children's home environment and parents' perceptions.

When examining individual change using the CWIT and BRIEF-2 standard scores, 35% of participants improved one standard deviation or more, whereas 17% of participants decreased a standard deviation or more. Interestingly, the majority of the participants who improved at least one standard deviation were older in age (14 years or older), and the majority of those that decreased at least one standard deviation were in the younger age group (11-13 years old). It appears that older participants were more likely to demonstrate improved inhibition, as measured by CWIT and BREIF-2 parent report, when examining individual change from before to after the intervention. Interestingly, as described in Chapter 3 of this dissertation,

older adolescent participants (aged 14-17 years) were also more likely to hold a growth mindset in comparison to younger participants (aged 11-13 years). Although this data is based on a small sample of individual scores, the results suggest that there may be a difference in the effects of an intervention on younger and older adolescent's inhibition abilities. Previous researchers have found similar results; in a meta-analysis of depression prevention programs for youth, researchers found that the prevention programs produced larger effects for older adolescents relative to younger adolescents and children (Stice, Shaw, Bohon, Marti, & Rohde, 2009). Stice and collogues (2009) posited that older adolescents may respond more favourably to programming because they are better able to understand and integrate the concepts taught. As a next step, researchers may want to further explore how intervention outcomes may differ for adolescents with FASD based on age, and perhaps consider mindsets as a contributing factor.

A regression analysis demonstrated that need satisfaction was a significant predictor in changes in verbal inhibition, as measured by the CWIT. This finding suggests that adolescents who felt higher amounts of competence, autonomy, and relatedness in the intervention were more likely to demonstrate improvements in their inhibition. None of the other inhibition measures were found to be significantly predicted by need satisfaction, and mindsets also did not predict any changes in inhibition. In this study, I aimed to explore interactions between achievement motivation variables and inhibition using regressions, in keeping with an ATI research paradigm. In a future study with a larger sample size, it would be informative to examine the potential mediating effect of autonomy, competence, and relatedness, and the possible moderating effect of mindset, on intervention outcome variables using alternative statistical methods.

Intrinsic Motivation and Psychological Needs in the Intervention

Adolescents in the study reported experiencing interest/enjoyment, competence, autonomy, and relatedness in the intervention. All four scales from the IMI had a mean in the upper half of the Likert scale, and the responses also all ranged from above the halfway point of the scale to the maximum of 7. This is in line with my hypothesis that, overall, adolescent participants would report experiencing interest/enjoyment, competence, autonomy, and relatedness in the intervention. This study demonstrates that it is possible to run an intervention that successfully promotes a sense of interest/enjoyment and psychological need satisfaction with adolescents with FASD. There was a significant difference found in the sense of competence participants felt in the intervention from the beginning of the intervention to the end. This significant difference may be explained by the increased number of sessions the

adolescent had completed at the time of completing the questionnaire at the end of the intervention. After completing the intervention, participants likely felt that they were better able to understand SR and use the strategies and techniques they had learned throughout the intervention. Especially given the highly repetitive nature of the SR program, it is plausible that participants would increase their feelings of competence because they are given plenty of practice and guidance throughout the program. Given that a lack of competence contributes to negative well-being outcomes in adolescents (Veronneau et al., 2005), it is encouraging to find that a sense of competence can be fostered in an intervention program.

These results differ from my hypothesis that all scales (interest/enjoyment, competence, autonomy, and relatedness) would significantly increase. In the intervention, a sense of autonomy and relatedness may have been less likely to change because the components of the intervention that foster these needs are present throughout the intervention (i.e. providing choices, one-on-one support), therefore participants who felt autonomous and belonging at the beginning of the intervention likely remained feeling that way throughout the program. However, the components that fostered competence, such as repeating sessions if needed and repeating information, were implemented as the intervention went on depending on how the participant was doing. Interest/enjoyment decreased from the beginning of the intervention to the end, although not significantly. This may be explained by the participants losing interest as the novelty of the intervention wore off. Another explanation may be the change in focus at the end of the intervention, which switched to incorporating strategies into daily life, rather than learning about and trying the strategies. There were also some sessions near the end of the intervention that involved many worksheets, which were potentially less interesting for the participants then the beginning sessions that included more games and hands-on activities. When designing interventions in the future, it will be important to incorporate engaging activities throughout the intervention in order to sustain interest/enjoyment.

Mindsets in the Intervention

Adolescents with FASD who participated in the SR intervention were found to have significantly changed their mindset level to a more growth orientation. In comparison to the waitlist group, the intervention group showed a significant change towards a more growth level of mindset. I found that after the intervention, 25% of adolescents had moved to a predominantly growth SR mindset from a predominantly fixed mindset. This is somewhat surprising given that the intervention was not in itself a mindset intervention. This finding provides evidence that SR mindsets can change despite never directly teaching participants about mindsets or brain development. It is perhaps inherent in the intervention that the premise

is, by learning about SR and strategies that can be used to help with SR, individuals can improve their ability to self-regulate. It is possible that this underlying message of change promoted by the intervention was implicitly communicated. These results are contrary to my hypothesis, but they are positive as they demonstrate that by partaking in the SR intervention, adolescents significantly changed in their belief of whether or not their SR can change, moving them towards holding a growth SR mindset. It is encouraging that overall 90% of adolescents reported a growth mindset by the end of the intervention.

On the other hand, caregivers did not significantly change in their belief as to whether SR could change or not in their children. It is interesting to note that caregivers in both the intervention and the waitlist group had a negative mean change score, indicating that, in general, their mindsets became more fixed. These results may have occurred because the caregivers did not participate in the intervention themselves, and therefore did not receive the same education around SR. The trend that caregiver's mindsets became more fixed may be due to increased focus on SR abilities in their children, and their understanding of the stable nature of FASD. It may also be due to a difference in expectation versus reality; caregivers may have expected bigger changes when starting the intervention and therefore reported believing in change more initially. Once the intervention was complete and they saw how much their children had really changed (which was perhaps, observationally, quite small or not at all), it is possible that they may have revised their answers to fit the reality of the situation. Caregivers may require a targeted mindset intervention approach in order to foster significant changes in their mindsets and help them move towards holding a growth mindset for their children with FASD.

Overall, this study revealed some important positive findings, including providing evidence that need satisfaction does predict a change in inhibition as measured by CWIT. When participants' needs are satisfied, they demonstrate improved targeted outcomes. This is an important finding as it speaks to the importance of ATI research and understanding the differential impact of characteristics like need satisfaction on intervention outcomes. This study is the first to investigate the relationships between SDT need satisfaction and inhibition outcomes in an intervention with adolescents with FASD. I also found that adolescent's SR mindsets can change to become more growth oriented. After the intervention, adolescents with FASD were more likely to believe that their SR could change, which is an important factor that may influence levels of effort, openness to learning from mistakes, and willingness to try new things (Dweck, 2006). In addition, I found that adolescents with FASD enjoyed the intervention. Engaging adolescents with FASD in interventions is an important outcome on its own, given that

adolescence is an age where a decrease in engagement is seen in learning environments (Li & Lerner, 2011). Adolescents also increased their sense of competence throughout the intervention, paving the way for them to feel confident and able to use the information they learned.

In general, some significant differences were found; however, some results were counter-intuitive, or not seen at all. Inhibition was found to be a complicated construct and more research is required to understand why some measures of inhibition showed changes and others did not. Individuals with FASD have higher levels of intra-individual variability compared with typically developing peers (Ali, Kerns, Mulligan, Carmichael Olson, & Astley, 2018), and these within-person variations in performance may explain some of the variances in the results found. When conducting research with a population that demonstrates such high variability in abilities, it is becoming increasingly apparent that individual change is important to consider when determining the effectiveness of an intervention. Overall, positive trends were found, and the results of this study are in keeping with previous intervention research with individuals with FASD that promotes the message that change can occur.

Limitations

An important limitation of this research study is the singular intervention study it was embedded in. The changes in mindsets, psychological needs, and inhibition that were found may be dependent on the intervention design and delivery; these results may not translate to other interventions. Another limitation of this study was the length of the intervention. The study involvement spanned over six months, which is a different length of time to commit to for families. Out of the 27 individuals who began the study, four did not complete the intervention. Likewise, the sample in the study primarily comprised of families who were able to commit to an intensive intervention, presenting another limitation to the findings. The families who chose to participate in the study were typically well-connected to community resources and had personal resources, such as time and transportation, which limits the generalizability of the findings.

An additional possible limitation was the reliance on self-report measures, which were used in this study to capture the mindsets and psychological need satisfaction of participants and to obtain an indication of executive functioning. The BRIEF-2 was completed by caregivers in the intervention to measure inhibition in day-to-day functioning and it is also subject to biases of reporting. Importantly, the BRIEF-2 measure has scales for infrequency, negativity, and inconsistency, which assists in detecting response bias (Gioia et al., 2000). All BRIEF-2 measures were deemed valid for use in this research. In the measurement of inhibition, both parent report and direct performance-based measures were used, which was beneficial to

provide multiple measures of inhibition. Many researchers have argued that both parent ratings and performance-based measures are important, as they capture different, but related, information (Silver, 2014). When interpreting self-report measures, I assumed that the participants responded accurately and honestly. This assumption is noteworthy in this study given that adolescents with FASD experience cognitive deficits that may affect their ability to have insight into their beliefs and respond accurately. In response to this potential limitation, a research assistant was present as the participants were completing the questionnaires. The research assistant informed the participant that they could explain or clarify any questions that the participant did not understand. Self-report measures are frequently used in achievement motivation research as it is a feasible way to measure beliefs and thoughts. As part of this study, I specifically wanted to explore mindsets and psychological needs from the perspective of the adolescents with FASD, as this has not been done before, therefore it was important to have the participants complete questionnaires themselves.

The low consistency (i.e. high intra-individual variability) exhibited in individuals with FASD complicates the use of cognitive testing as an indication of change due to intervention. It is well-known in the FASD community that individuals with FASD often know something one day, but not the next, and inconsistencies are the norm for this particular population. However, research also shows that intra-individual variability decreases in adolescence and adulthood, likely due to improved brain maturation, therefore is it possible that these effects were minimal in this study (Tamnes, Fjell, Westlye, Ostby, & Walhovd, 2012). In future research, it will be important to include more testing points before, during, and after the intervention to gain a better sense of the participant's abilities over numerous days, instead of just one.

Lastly, in regard to the results, the small sample size limited the statistical power in this study. In addition, the follow-up testing time point was not analyzed as part of this study, and therefore it is unknown whether adolescents with FASD maintained their growth mindsets and gains in inhibition.

Implications and Conclusions

In this study, I examined the interaction between MT, SDT, and a SR intervention with adolescents with FASD. I analyzed changes in inhibition as an outcome of the SR intervention, and I looked at motivational variables as predictors of inhibition change. I also investigated adolescent's changes in interest/enjoyment, and the psychological needs of competence, autonomy, and relatedness, as well as the change in adolescent's and their caregiver's level of SR mindsets after participating in the SR intervention.

Participants significantly improved their verbal inhibition, as measured by CWIT, after the

intervention, which offers support to the benefit of the SR intervention. Inhibition is a component of SR, therefore improving SR abilities has important implications for self-control and reducing impulsivity. Out of this study comes a strength-based message that adolescents with FASD can grow and develop, which is an important message to community, personal, and professional resources supporting adolescents with FASD. Although there are many benefits to early intervention, this study shows that interventions for adolescents are also worthwhile. In this study, significant changes in verbal inhibition were found to be predicted by need satisfaction in the intervention. More research is needed to investigate motivational variables in adolescents with FASD to further explore the impact achievement motivation has on intervention outcomes for adolescents with FASD. Following an ATI research approach, when researchers investigate the psycho-social characteristics that accompany participants in interventions, we are better able to predict who will benefit from interventions and use more targeted approaches to foster positive change.

The majority of adolescent participants reported having a growth mindset, and mindsets changed in the direction of growth after the intervention. This is promising because individuals with growth mindsets are more likely to aspire to master knowledge and develop learning strategies (Dweck, 1998). Furthermore, individuals with growth mindsets are more likely to attribute failure to lack of effort, and thus are typically more persistent and invest more effort into achieving their goals (Blackwell et al., 2007). These are qualities that are important to foster in adolescents with FASD in order to help them succeed in adulthood. The intervention itself was not a mindset intervention, and yet mindset change was noted in adolescents with FASD. This suggests that interventions that teach knowledge and skills on a specific topic can have an influence on mindset for that topic without explicitly doing so. In the future, interventions can be designed to implicitly convey the idea that a certain ability can change by developing the intervention using a growth-based, person-centered model that allows for the participants to reflect on their abilities and take notice of the changes they are able to make. When interventions are able to change mindsets along with other targeted behaviours, participants benefit by a reduction in the number of interventions they might take part in, and by experiencing growth in more than one area.

It is also promising that adolescents found the intervention to be interesting/enjoyable, and they felt a sense of autonomy, competence, and relatedness in the intervention. When adolescents feel autonomous, competent, and a sense of relatedness, it increases the likelihood they will be more engaged and intrinsically motivated. These psychological needs may contribute to participants actually using the knowledge and skills they have learned, and also

feeling comfortable and safe to do so. Interventions in the future may want to consider a design that fosters a sense of competence, autonomy, and relatedness to promote increased intervention effectiveness and self-determination.

These findings have the potential to inform future intervention research for alcohol-affected individuals. I encourage future researchers to take into consideration achievement motivation in the development of intervention studies in order to provide adolescents with FASD the best possible chance of success.

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Chapter 5. Conclusion

Fetal Alcohol Spectrum Disorder (FASD) is a lifelong disability that results from prenatal alcohol exposure. Individuals with FASD can have a wide range of physical, behavioural, and cognitive disabilities that impact their ability to cope with everyday demands. Difficulties with motor skills, cognition, language, academic achievement, memory, attention, executive functions, affect regulation, and adaptive behaviour are all common domains that may be impacted in an individual with FASD (Cook et al., 2016). Adolescents with FASD are a particularly vulnerable group of individuals given that adolescence is already a precarious time in development, and their experience is compounded with the many challenges that accompany an FASD diagnosis. Interventions and supports are crucial in helping adolescents with FASD improve their abilities and transition successfully into adulthood (Pei, Flannigan, Walls, & Rasmussen, 2016).

Achievement motivation factors, such as belief about malleability of abilities and psychological need satisfaction, influence the potential for success. In this dissertation, I chose to focus on two achievement motivation theories in order to add breadth to the exploration of achievement motivation; Mindset Theory (MT) described the innate beliefs participants held (Dweck, 2006), and Self-Determination Theory (SDT) incorporated the social conditions in which participants were learning (Ryan & Deci, 2000). There is a gap in the literature in exploring achievement motivation from the perspective of individuals with FASD themselves. Additionally, research in FASD interventions for adolescents is scarce. A large majority of intervention researchers investigate interventions that are for *children* with FASD because of the known benefits of early intervention; however, intervention development for *adolescents* warrants consideration, given that adolescence is a time of vast changes in development.

In this dissertation, I described Mindset Theory (MT) and Self-Determination Theory (SDT) in adolescents with FASD and applied these theories to a self-regulation (SR) intervention program. The purpose of this dissertation was to increase understanding of mindsets in adolescents with FASD and their caregivers, as well as assess how achievement motivation variables, namely mindsets and psychological need satisfaction, interacted with intervention outcomes. Three related, but independent, papers addressed this purpose. Paper 1 was a conceptual review focusing on describing the relationships between motivation, FASD, and intervention research. Paper 2 was a multiple methods study that applied Mindset Theory and Self-Determination Theory to a population of adolescents with FASD and their caregivers. Lastly, Paper 3 was an intervention research paper that incorporated mindsets and psychological needs into a SR intervention program for adolescents with FASD.

Achievement Motivation in Adolescents with FASD

In a critical analysis of the literature, it was revealed that individuals with cognitive disabilities have particular experiences that are important to consider when seeking to understand achievement motivation. To begin with, motivation is a social-cognitive goal-directed process, which inevitably places individuals with executive functioning difficulties, like those with FASD, at a disadvantage. Key motivational factors such as expectancy, competence, belief of malleability, and intrinsic motivation differ in children with cognitive disabilities given their learning differences and social histories. Experiences of failure, in particular, were found to be detrimental to children's achievement motivation. Unfortunately, many children with cognitive disabilities experience academic and behavioural failure all too often in the classroom and at home. Notably, the populations that were selected in these research studies (i.e. children with intellectual disabilities, autism spectrum disorder, learning disabilities, emotional and behavioural disorders) have similar difficulties to children with FASD. Research on achievement motivation and FASD is limited, and the research that has been conducted has looked at the thoughts and beliefs of caregivers and teachers rather than the thoughts and beliefs of individuals with FASD themselves.

Individuals with FASD can benefit from interventions to improve their skills and help them function day-to-day with increasing independence. There are a number of direct, targeted interventions that have demonstrated improvements in skills in children with FASD (Pei et al., 2016). When investigating intervention effectiveness, taking an Aptitude *x* Intervention (ATI) research approach can be beneficial as this approach emphasises the incorporation of personal characteristics, such as motivation, when analyzing intervention effects (Yeh, 2012). When conducting interventions with adolescents with FASD, consideration of different motivational factors that may be impacting participants will help to provide an understanding of how to optimally design interventions to support positive outcomes.

Describing Achievement Motivation in Adolescents with FASD

Given the lack of research on mindsets in the FASD population, it was important to first examine the mindsets of individuals with FASD. In a multiple methods study that took place in the context of a SR intervention program, I investigated the SR mindsets of adolescents with FASD, as well as their caregiver's mindsets about their child's ability to change. The majority of adolescents with FASD and their caregivers reported holding a growth mindset for the adolescent's SR abilities.

I also investigated the relationship between mindsets, psychological needs, and interest/enjoyment. Interest/enjoyment was found to be related to all three psychological needs

(competence, autonomy, and relatedness), which holds up to SDT. Mindsets were not found to be highly correlated with psychological needs or interest/enjoyment, which suggests that these two theories tap into distinct constructs.

In addition, I interviewed adolescents with FASD and their caregivers to explore the influences on mindset development. Six themes were revealed; four themes related to influences on a growth mindset, and two themes which were concerned with the ability of SR to change and develop. *Support and resources, making meaning of the diagnosis, increased understanding of SR,* and *hope and positivity* were all components that caregivers and adolescents reported fostered a growth mindset. They expressed the importance of having these components to help believe in the malleability of SR. *Strategy development and use* and *observation of change* were ways that caregivers and adolescents reported knowing that SR could change. These findings are the first to describe mindsets in adolescents with FASD, and analyze the interactions between mindsets, psychological needs, and interest/enjoyment.

Achievement Motivation in a Self-Regulation Intervention for Adolescents with FASD

Adolescents with FASD commonly struggle with SR, and a SR intervention program was conducted to teach adolescents information and strategies that would improve their ability to self-regulate. One important component of SR is inhibition, and inhibition was found to improve in the majority of adolescents with FASD after completing the intervention. Importantly, psychological need satisfaction, which includes sense of competence, autonomy, and relatedness, was a significant predictor of change in one measure of inhibition. This study is the first to show that outcomes of an intervention program for adolescents with FASD are influenced by psychological need satisfaction.

Adolescents reported that, on average, the intervention did meet the psychological needs of competence, autonomy, and relatedness, and participants also felt interest/enjoyment in the intervention. Sense of competence was found to significantly improve from the beginning of the intervention to the end, which suggests that adolescents increased their knowledge and skills in the intervention. Adolescents who felt a sense of competence in the intervention may be more likely to use their new knowledge and strategies at home and school.

Lastly, the majority of adolescents who participated in the intervention reported a change to a more growth SR mindset orientation. The SR intervention, despite not being a mindset intervention, contributed to a change in SR mindsets. This finding supports the notion that it is possible for adolescents to benefit from interventions in multiple ways. When adolescents with FASD engage in intervention programs, there are many outcomes that occur, such as changes in their beliefs, in addition to changes in the actual skills being targeted.

Contributions and Implications

In this dissertation, I have contributed to our understanding of the mindsets of adolescents with FASD. I also added to our knowledge of psychological needs and interest/enjoyment in an intervention with adolescents with FASD, and the impact competence, autonomy, and relatedness have on intervention outcomes. Additionally, I have provided preliminary evidence that supports the use of a SR intervention with adolescents with FASD. This research underscores the importance of considering MT and SDT when delivering intervention programs to adolescents with FASD. Conclusions drawn from this dissertation are consistent with a strengths-based research approach. Adolescents with FASD can improve their inhibition and overall SR, hold a growth mindset, and experience psychological need satisfaction in an intervention program. Key influential supports and practices help make this possible.

Clinical implications of this work include messaging about how best to support achievement motivation and optimize intervention outcomes in adolescents with FASD. Firstly, it is important to note that it is possible to foster a sense of competence, autonomy, relatedness, and interest/enjoyment in an intervention for adolescents with FASD. This alone has important clinical implications because engagement in interventions can be a struggle for this population; therefore, finding an intervention that fosters interest/enjoyment demonstrates that interventions can, in fact, be designed to be enjoyable and interesting to adolescents with FASD. Furthermore, adolescents will benefit from programs that foster competence, autonomy, and relatedness. Some suggestions to foster these psychological needs include holding children and adolescents to high, yet realistic, standards; providing choices and co-creating strategies; and providing one-on-one, individualized support. Another important clinical implication of this research comes from assessing the mindsets of adolescents with FASD. Clinicians with knowledge about a participant's mindset may alter the way in which the treatment is delivered, perhaps incorporating mindset interventions into the intervention to foster a growth mindset. Additionally, I found that adolescent's mindsets changed towards a more growth-orientation after participating in the intervention study. This finding suggests that mindsets can change in adolescents with FASD even without participating in an explicit mindset intervention. Clinicians that deliver interventions that convey the messaging that growth and change are possible may help to foster a growth mindset, which optimizes intervention settings by promoting multiple positive outcomes. In this research study, I provided important clinical information for helping professionals support a growth mindset in adolescents and their families. Some ways to do this include helping families raising a child with FASD find support and resources, make meaning of

the diagnosis, increase their knowledge and understanding of the intervention, as well as help to promote hope and positivity.

Research implications that are emphasized in this dissertation include the importance of research in FASD interventions, and more specifically, research that includes the perspectives of children and adolescents themselves. By including data collected directly from individuals with FASD, such as from interviews and questionnaires, researchers are able to increase their awareness of the experiences of individuals with FASD and apply this knowledge to the development and study of interventions. Ultimately, by including the experiences of affected individuals into the development of interventions, interventions will be more likely to be relevant, feasible, and effective for the individuals they are designed for. Best practice guidelines for many helping professions emphasize the importance of evidence-based practice, which urges professionals to incorporate research evidence, client characteristics, and clinical expertise in their clinical decision-making process (American Psychological Association, 2006). However, in order to confidently employ an evidence-based practice approach, appropriate research must be available. Researchers are tasked with designing intervention research studies that not only provide evidence for interventions but that also incorporate information about who the intervention may be most effective for. The results of this study contribute to a growing knowledge base of how best to support this growing and underserved population.

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