The Relationship between Self-Regulation and Behaviour in Adolescents Diagnosed with Fetal Alcohol Spectrum Disorder

By

Sarah O.M. Keller

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Department of Educational Psychology
University of Alberta

Abstract

Fetal Alcohol Spectrum Disorder (FASD) describes a range of neurodevelopmental deficits that can occur due to prenatal alcohol exposure (PAE) and affects approximately 4% of Canadians. PAE has been known to impact several areas of functioning, including self-regulation which encompasses a series of higher order processes that allow individuals to control their emotions, actions, and overall behaviour. Poor self-regulation without intervention has been associated with difficulties in judgement, planning, delaying gratification, considering consequences, organization, and impulsivity. In terms of behaviour, poor self-regulation has been linked to both internalizing problems, such as social withdraw, and externalizing problems, such as rule-breaking and aggression. To date, no research has been developed to explore how these concepts may relate to one another in adolescents diagnosed with FASD. In the current study, 27 adolescents diagnosed with FASD completed measures of both self-regulation and behavioural functioning. Through correlational analyses it was found that poor short-term self-regulation skills were significantly related to reports of overall behavioural problems broadly, and externalizing behavioural problems specifically. As PAE is known to impact self-regulation as well as behaviour, coming to a better understanding of how these factors relate could help researchers, clinicians, and policymakers to make informed decisions in terms of interventions.

Preface

This thesis is an original work by Sarah Keller. The research project, of which this thesis is a part, received ethics approval from the University of Alberta Research Ethics Board, No. Pro00064830, October 23, 2017.

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Table of Contents

List of Appendices

The Relationship between Self-Regulation and Behaviour in Adolescents diagnosed with Fetal Alcohol Spectrum Disorder

Fetal Alcohol Spectrum Disorder (FASD) is a term used to describe the neurodevelopmental deficits that can occur due to prenatal alcohol exposure (PAE; Chudley et al., 2005). Although research is limited in the context of the general Canadian population, the current prevalence rate of FASD is estimated as impacting approximately 4% of births (Flannigan, Unsworth, & Harding, 2018). Moreover, these numbers may be low due to issues such as accurate self-reporting of mothers' alcohol use during pregnancy (Chudley, Kilgour, Cranston, & Edwards, 2007; Popova, Lange, Chudley, Reynolds, & Rehm, 2018). Over the past several decades much research has been conducted examining the specific challenges faced by individuals diagnosed with FASD in order to better understand and to aid this population. In doing so, it has been found that individuals diagnosed with FASD often struggle across the lifespan with an array of cognitive, behavioural, and socio-emotional challenges (Moore & Riley, 2015) and subsequent adverse life events (Striessguth et al., 2004) attributable to PAE.

A key challenge that those with FASD are known to face is deficits in self-regulation (Crocker, Vaurio, Riley & Mattson, 2009; Kodituwakku, Handmaker, Cutler, Weathersby & Handmaker, 1995). Specifically, those who have experienced PAE have been shown to struggle with flexibly identifying, manipulating, and maintaining their cognitions, emotions, and behaviours in response to their environment (Crocker et al., 2009; Kodituwakku et al., 1996). As self-regulation is a fundamental cognitive and adaptive skill set that is predictive of how well one is able to function in their environment, these self-regulation challenges experienced by those with FASD leaves them vulnerable to an array of adverse life events (Crocker et al., 2009; Kodituwakku et al., 1996). Specifically, poor self-regulation has been tied to negative outcomes

across the lifespan such as trouble in school, negative peer-relations, violence, run-ins with the law, and incarceration (Streissguth, 2004).

A developmental period in which those diagnosed with FASD are particularly vulnerable to adverse outcomes due to cognitive, behavioural, and socio-emotional challenges is adolescence. As adolescence is a time of often rapid development and change within the individual, dysfunction in the development of key skills such as self-regulation limits the individuals' odds of experiencing success later in life (Gestsdottir & Lerner, 2008). Additionally, adolescents diagnosed with FASD are known to struggle with specific behavioural problems, especially those which are externally focused (e.g., violence, aggression, negative peer-relations; Clark & George, 2012). While the relationship between the unique facets of self-regulation skills and behavioural problems has been studied quite extensively in adolescents who have not experienced PAE, the relationship among those that have been is still unclear.

Specific to the current study, no research has been conducted to look at the relationship between poor short-term and long-term self-regulation, and negative internalizing and externalizing behaviours, common challenges those diagnosed with FASD are known to face. The aim of this current study was to fill this existing gap in the literature, and to explore if and how strongly self-regulation skills may relate to behavioural problems in adolescents diagnosed with FASD. By gaining a better understanding of how these two common areas of dysfunction relate to one another may help to better inform policy makers and clinicians in selecting interventions to aid this population. In the coming sections, an overview of FASD, self-regulation, behavioural problems, and how these are understood in adolescents in general, and adolescents diagnosed with FASD in particular, is provided.

FASD

FASD is often characterized as a complex disability, with no clear or consistent profile of dysfunction. That said, several areas of difficulty have been consistently reported for the population as a whole, including deficits in attention (Mattson, Calarco, & Lang, 2006), executive functioning (Rasmussen, 2005), self-regulation (Crocker et al., 2009; Kodituwakku et al., 1996), academic achievement (Streissguth & O'Malley, 2000), memory (Green et al., 2009), intelligence (Raldiris, Bowers, & Towsey, 2014), language (Mattson, Crocker, & Nguyen, 2011), and social-emotional (Kully-Martens, Denys, Treit, Tamana & Rasmussen, 2011) and behavioural functioning (Clark & George, 2012). Since first identified as Fetal Alcohol Syndrome in 1973 (Jones & Smith), researchers have sought to better understand the effects of PAE on the individual across the lifespan in order to help better understand and aid this population. In addition to Canadian diagnostic criterions evolving throughout the past few decades, our understanding of the long-term impacts of PAE have evolved as well. These topics are discussed in detail below.

Identifying FASD

In 2016, Cook and colleagues updated the Canadian FASD diagnostic guidelines previously outlined by Chudley et al. (2005). In doing so, several important changes were made. Most notably, while Chudley and colleagues' previous guidelines outlined four possible diagnoses under the umbrella term of FASD, which included Fetal Alcohol Syndrome (FAS), partial Fetal Alcohol Syndrome (pFAS), Neurobehavioural Disorder/Alcohol Exposed (ND/AE), and Static Encephalopathy/Alcohol Exposed (SE/AE), the new guidelines involve simplified diagnostic terminology. Specifically, the current guidelines proposed a diagnostic algorithm with the possible diagnoses being FASD with sentinel facial features (3 or more facial anomalies characteristic of those with FASD), FASD without sentinel facial features, and those At-Risk of

having FASD but do not currently meet the diagnostic criterion. For those with FASD with sentinel facial features, a confirmation of PAE from the mother or other reliable sources may not be required, as the facial dysmorphology acts as an alcohol proxy thus providing confirmation of prenatal alcohol consumption in the absence of other available information.

Additionally, in the new Canadian diagnostic guidelines for FASD the need for attaining a comprehensive social and medical history, as well as a physical exam is emphasized (Cook et al., 2017). Furthermore, the authors set a new diagnostic standard in which two criteria must be met for diagnoses. Specifically, there must be confirmation of PAE, be it through parental/familial confirmation or the presence of facial dysmorphology, as well as the presence of severe impairment in at least 3 neurodevelopmental domains (e.g., cognition, memory, language, affect regulation, motor skills, impulse control, hyperactivity, social skills, etc.). Additionally, this set of guidelines provides specific recommendations in diagnosing infants, pre-schoolers, school-aged children, and adults, providing an approach that is more developmentally conscious.

Challenges Related to PAE

Due to the brain trauma sustained by exposure to alcohol while in-utero, those with FASD experience several difficulties related to cognitive, behavioural, and socio-affective abilities that are often persistent across the lifespan (Moore & Riley, 2015). While each category of these challenges may manifest in distinct ways, they often influence one another, and are thought by some to be encompassed by deficits in executive functioning (Green et al., 2009). Each of these areas of dysfunction, as well as how they relate to one another and influence how an individual relates with their environment are discussed below.

Regarding cognitive challenges in particular, several commonalities have been identified in those who have experienced PAE. Specifically, these challenges include attention problems (Mattson, Calarco, & Lang, 2006), language delays (Mattson, Crocker, & Nguyen, 2011), memory deficits (Green et al., 2009), poor self-regulation (Crocker et al., 2009; Kodituwakku et al., 1996) and visuospatial challenges (Uecker & Nadel, 1996). Regarding behavioural challenges, those diagnosed with FASD have been known to struggle with impulsivity, delinquent acts such as breaking the law or acting out in class, and inappropriate behaviour in various settings such as at home, at, school, and in the community (Clark & George, 2012). While such behaviours are often conceptualized as being issues unto themselves, they can also be considered the result of cognitive dysfunction (Green et al., 2009). For example, issues regarding impulsivity, which may be seen as behavioural in nature, may be the result of one struggling with cognitive challenges such as attentional issues and self-regulation deficits (Green et al., 2009).

Some of the socio-affective challenges faced by this population, which may also be tied back to cognitive and behavioural challenges, include trouble learning from experience, difficulty understanding social cues, having poor social judgement, difficulty communicating in social contexts, and indiscriminate social behaviour (Kully-Martens et al., 2011). Additionally, adolescents exposed to PAE are at an increased risk for environmental adversity. Specifically, they are especially vulnerable, as compared to those without PAE, to poverty, abuse, and an overall poor-quality home environment (Smith, Johnson, Pears, Fisher, & DeGarmo, 2007).

In addition to, and often encompassing the aforementioned deficits, the most pervasive and common challenges faced by those exposed to PAE are with executive functioning (Green et al., 2009). Executive functioning, which refers to a broad range of cognitive and socio-affective

abilities, has been shown to be compromised from a young age in those diagnosed with FASD (Green et al., 2009). However, cognitive and socio-affective executive functioning abilities are not independent of one another (Green et al., 2009). Rather, they work in conjunction and determine how well one is able to regulate themselves in interacting with the outside world, thus impacting behaviour (Green et al., 2009).

In addition to organic issues, such as diminished intellectual functioning, poor executive functioning, and issues with memory, learning, and attention, those with FASD often struggle with issues that stem from their interactions with their environment that are influenced by these difficulties (Streissguth, Barr, Kogan, & Bookstein, 1996). These issues may include, but are not limited to: troubles in school, drug and/or alcohol abuse, anti-social behaviours, and run-ins with the law (Streissguth, 2004). It is in this way that PAE not only creates difficulties, but also influences how those impacted by them interact with the outside world.

Based on the current state research, the majority, if not all of the aforementioned abilities are contingent on one's ability to self-regulate, an important facet of executive functioning. As it encompasses the broad range of abilities needed to engage successfully with one's environment, self-regulation, an area prone to deficits in those who experienced PAE, is the focus of the current study. In the following sections, self-regulation, its impact on behaviour, and how it develops and presents in adolescents broadly, and adolescents diagnosed with FASD specifically, is discussed, as well as current self-regulation interventions.

Self-Regulation

For decades, researches have debated the definition and scope of the complex concept that is self-regulation (Nigg, 2017). One specific area of discussion has been whether the subdimensions of self-regulation (i.e., emotions, behaviour, attention, and delay of gratification)

are best understood independently, or if self-regulation is to be seen as a sum of these components (Moilanen, Padilla-Walker, & Blaacker, 2018). Despite these differences, in the current literature self-regulation is broadly described as one's ability to flexibly activate, monitor, and adapt their attention, emotions, behaviours, and cognitive strategies in responding to their environment, in order to attain personal goals (Moilanen 2007; Moilanen et al., 2018). Essentially, one's self-regulation skills determine how well they are able to cope emotionally and behaviourally with the challenges of everyday life, while keeping in mind the attainment of short and long-term goals. As the aforementioned definition appears to guide the research currently being done on self-regulation, for the purpose of the current study self-regulation is conceptualized as the sum of these emotional, behavioural, and attentional processes.

Although there have been arguments regarding the definition of self-regulation, there has been growing consensus in recent decades regarding factors influencing self-regulatory abilities. Specifically, several researchers have argued that individual differences in self-regulatory abilities are due to both internal characteristics (e.g., genetics, neurobiology, and individual temperament) and familial influence (Moilanen et al., 2018). In other words, self-regulation appears to be influenced by individual make-up as well as how well close family members are able to self-regulate, which is known to have an impact on childrearing processes (Bridgett, Burt, Edwards, & Deater-Deckard, 2015; Morris, Silk, Steinberg, Myers, & Robinson, 2007). Furthermore, as children are known to learn how to self-regulate first by observing those around them, having parents with poorer self-regulation skills has been shown to have a negative impact on future self-regulatory abilities of the child (Bridgett et al., 2015; Morris et al., 2007). Overall, it is the current consensus in the literature that individual characteristics and familial socialization experiences have the largest impact on the development of self-regulation.

In advancing further towards understanding the nuances of self-regulation, several theorists (e.g., Barkley, 1997; Moilanen, 2007) have proposed that self-regulation be further broken down into short and long-term abilities. In the following sections, each of these concepts is further defined, and how each may relate to behaviour is discussed. Furthermore, in keeping with the context of the current study, self-regulation as it relates to adolescents broadly, and adolescents diagnosed with FASD specifically, is discussed.

Short-Term Self-Regulation

Short-term self-regulation refers to the ability to regulate one's behaviours and impulses over short periods of time (Moilanen, 2007). More specifically, this involves controlling one's immediate attention, the momentary inhibition of impulses, and the moderation of present emotions (Moilanen, 2007). Said differently, short-term self-regulation refers to the ability to control one's attention, emotions, and impulses in the immediate context. Examples of poor short-term self-regulation include fidgeting and/or an inability to sit still, difficulties staying focused when there are distractions present in one's environment, having trouble picking up where one left off on a project or task after being distracted, and difficulties keeping track of things when stressed (Moilanen, 2007). Overall, short-term self-regulation encompasses one's ability to control their thoughts, actions, emotions, and impulses in reaction to events in their immediate surroundings.

Long-Term Self-Regulation

As short-term measures of self-regulation have historically been easier to obtain, long-term facets of self-regulation have largely been overlooked (Moilanen, 2007). In contrast to short-term self-regulation, long-term self-regulation refers to the ability to purposefully regulate one's attention, feelings, and actions over time, in order to attain long-term goals (Moilanen,

2007). In other words, while short-term self-regulation involves reacting in an appropriate manner to events currently happening, long-term self-regulation involves the ability to persevere and stay focused on long-term goals. Examples of poor long-term self-regulation abilities include struggling to have the ability to follow through on big tasks or projects, trouble with identifying and understanding one's emotions before expressing them to others, and difficulty changing one's actions in accordance to obtaining goals when previous actions proved unsuccessful (Moilanen, 2007). Overall, long-term self-regulation refers to one's ability to control their thoughts, actions, emotions, and impulses, over longer periods of time, in service of attaining a goal.

Self-Regulation and Behaviour

At its core, behaviour can be understood as the actions undertaken by individuals. Essentially, it refers to how one conducts themselves within their environment. Of specific interest to those studying the negative impact of poor executive functioning (e.g., self-regulation, the focus of the current study) on behaviour, the broad term of maladaptive behaviours has been adopted. To further parse apart the concept of behaviours, broadly, and negative behaviours, specifically, researchers have proposed a distinction between externalizing and internalizing behaviours (e.g., Achenbach, 1978). Although types of maladaptive behaviours vary immensely in terms of their expressions (e.g., violence vs. self-harm), both have been found to have a deleterious effect on quality of life (Symeou & Georgiou, 2017). Each of these unique facets of maladaptive behaviour, and how they are known to relate to self-regulation are discussed below.

Externalizing behaviours. Externalizing behaviours refer to behaviours that are characterized by negative actions focused towards the outside world (Symeou & Georgiou, 2017). Such behaviours include hostility, aggression, and rule-breaking behaviour (Symeou &

Georgiou, 2017). These behaviours while ranging in type and severity, are always focused outwards. Such behaviours are known to lead to several negative outcomes, such as violence, delinquency, and incarceration (Liu, 2004; Symeou & Georgiou, 2017).

Researchers have linked externalizing behaviours to self-regulation, suggesting that self-regulation abilities serve as a resiliency factor against maladaptive externalizing behaviours. For example, Gardner, Dishion, and Connell (2008), examined the role of self-regulation in moderating the negative impact of peer deviancy on anti-social behaviour, a maladaptive externalizing behaviour. They found that those adolescents with stronger self-regulation skills, as evaluated by themselves, their caregivers, and their teachers, were less likely to engage in anti-social behaviours despite being exposed to and/or having engaged in delinquent peer behaviour in the past. As such, it was concluded that self-regulation skills act as a protective factor against maladaptive externalizing behaviours such as anti-social behaviour.

Conversely, it has also been found that poor self-regulation skills may increase the risk of maladaptive externalizing behaviours. For example, Eisenberg and colleagues (2000), examined attentional and behavioural self-regulation, negative emotionality, and externalizing problem behaviours in children. They found that behavioural dysregulation significantly predicted externalizing behaviour problems regardless of negative emotionality, and that attentional dysregulation predicted externalizing behaviour problems, but only in those with existing issues of negative emotionality. Overall, the authors concluded that attentional self-regulation issues narrowly, and behavioural self-regulation issues broadly served as predictors of externalizing problem behaviours.

Internalizing behaviours. Internalizing behaviours refer to behaviours that are characterized by processes within oneself (Madigan, Atkinson, Laurin, & Benoit, 2013; Symeou

& Georgiou, 2017). Examples of such issues include anxiety, depression, social withdrawal, fearfulness, and somatization (Madigan et al., 2013; Symeou & Georgiou, 2017). In other words, while externalizing behaviours are characterized by negative actions focused towards the outside world, internalizing behaviours, while are known to negatively impact interpersonal relationships as well, are targeted much more inwards and are known to negatively impact self-esteem and self-efficacy (Kerr & Stattin, 2000; Symeou & Georgiou, 2017) .

While a fairly strong link has been established in the literature between self-regulation and externalizing behaviours in children and adolescents, the connection between self-regulation and internalizing behaviours has been less clearly supported. This may be due in part to externalizing behaviours being easier to measure, especially in children and adolescents, than internalizing behaviours. Said differently, it may be easier to measure overt, outward focused behaviours (e.g., violence) than more covert, inward focused behaviours (e.g., anxiety) in these populations.

However, there has still been some evidence to show that certain facets of self-regulation may predict internalizing behaviours. For example, in a study conducted by Lengau (2003), the author sought to understand, in part, the relationship between self-regulation and adjustment problems in older children. In doing so, it was found that better attentional regulation was significantly related to lower levels of depressive behaviour. Additionally, it was found that better inhibitory control was significantly related to lower internalizing behavioural problems overall. Taken together, the author concluded that good self-regulation skills, in particular attentional regulation and inhibitory control, significantly predicted lower levels of internalizing behavioural problems.

Overall, both externalizing and internalizing problems have been proven to relate to poor self-regulation. In an example that encompasses both, White, Jarrett, and Ollendick (2012) studied the relationship between self-regulation, reactive aggression, adjustment problems, and internalizing and externalizing behaviours in adolescents. In doing so, the authors found that reactive aggression, as well as both internalizing and externalizing adjustment problems were significantly related to behavioural regulation and metacognitive skills. As adolescence is the particular developmental period of interest in the current study, further findings regarding their self-regulatory abilities are discussed below.

Self-Regulation and Adolescence

Moilanen (2007) argued that is particularly important to distinguish between short and long-term self-regulation due to the many cognitive changes happening during adolescence. Specifically, she argued that while children are limited to reacting to events that are temporally near, adolescents are slowly able to better manage their behaviours and actions in light of long-term goals (Moilanen, 2007). It is in this way that time, not only in terms of chronological age but in the ability to appreciate the concept of time itself, is seen as a crucial element of self-regulation (Moilanen, 2007).

Long-term self-regulation, as it involves more intensive planning, is argued to develop later in adolescence as opposed to short-term self-regulation which develops in childhood (Moilanen, 2007; Moilanen et al., 2018). Typically developing adolescents, once given more life experience and opportunity to face challenges and make goals, hone their self-regulation abilities (Moilanen, 2007; Moilanen et al., 2018). As such, it becomes more controllable, efficient, focused, and intentional as time goes on (Moilanen, 2007, Moilanen et al., 2018). An example of an adolescent exercising their developing long-term self-regulation abilities would be taking on a

weekend job to save up to buy a first car, even though this means they may have to miss social events to do so. In order to obtain the long-term goal (buy a car), one must take certain proactive steps (getting a job), which may also at times test one's impulse inhibitions (turning down an invite to a party). In engaging in these actions, an adolescent would be exhibiting long-term self-regulation.

Self-regulation is an essential skill set needed for adolescents to successfully navigate through their environment (Gardner et al., 2008; Gestsdottir & Lerner, 2008). Adolescents with self-regulation deficits may exhibit rigid thinking, literal interpretation of statements with double meaning, and situation specific applications of learning (Wills, Sandy, & Yaeger, 2002). Deficits in self-regulation in adolescence can also lead to careless decision making at a particularly vulnerable developmental period, putting one at risk for adverse life experiences (Wills & Dishion, 2004; Wills et al., 2002). Specifically, poor self-regulation during this time can lead to behavioural problems at school, social isolation or inappropriate social behaviour, association with deviant peers, and substance abuse (Wills & Dishion, 2004; Wills et al., 2002). These negative outcomes are also tied to the increase in autonomy experienced by adolescents. Thus, at a time riddled with change and development, self-regulatory abilities become evermore important in ensuring that the adolescent experiences success.

Self-Regulation and FASD

Adolescents impacted by PAE have been shown to experience a wide range of cognitive difficulties. Such difficulties include deficits in attention (Mattson, Calarco, & Lang, 2006), executive functioning (Rasmussen, 2005), self-regulation (Crocker et al., 2009; Kodituwakku et al., 1995), memory (Green et al., 2009), and social-emotional (Kully-Martens et al., 2011) and behavioural functioning (Clark & George, 2012). PAE is also known to negatively effect the

regions of the brain responsible for self-regulation, including the pre-frontal cortex, hippocampus, and frontal lobe (Crocker et al., 2009; Kodituwakku et al., 1995). Global self-regulation deficits are the result of brain injury occurring before the age of 3, with injuries later in life effecting other areas of brain functioning (Anderson, Jacobs, & Anderson, 2008; Nash et al., 2015). As those diagnosed with FASD experience brain injury in-utero due to alcohol consumption, self-regulation has been found to be a primary deficit in this population (Kodituwakku et al., 1995).

Vulnerability across the lifespan. Deficits in self-regulation have been observed in children diagnosed with FASD from an early age (Connor, Sampson, Bookstein, Barr, & Streissguth, 2000). Specifically, in infancy, some indicators of poor self-regulation include variable arousal states and abnormal sleep/wake cycles (Coles, Kable, Drews-Botsch, & Falek, 2000). In toddlerhood, sensory processing issues, high levels of hyperactivity and distractibility, and heightened reactivity are signs of self-regulation difficulties (Nulman et al., 2004). Finally, as children diagnosed with FASD reach school age and beyond, poor self-regulation often presents as significant and higher order executive functioning (cognitive flexibility, inhibitory control, attentional capacity, working memory, etc.; Green et al., 2009) deficits. While work has been done examining self-regulation and behaviour in children diagnosed with FASD, there is relatively little known about the developmental trajectory of these issues into adolescence.

Focusing on adolescence, a sensitive developmental period in which many physical, emotional, and social changes occur, and more demands are placed on the individual as they navigate towards adulthood, poor self-regulation presents itself in a number of ways. Specific to skills characteristic of short-term self-regulation, although one would expect a typically developing adolescent to be able to manage their immediate impulses, emotions, and actions in

response to current environmental cues, adolescents diagnosed with FASD have been known to struggle with these more basic self-regulatory skills (Clark & George, 2012). This population is also known to struggle with skills characteristic of long-term self-regulation, such as the ability to monitor, manage, and adjust their actions and emotions in congruence with personal goals (Clark & George, 2012). Thus, it appears the damaging impact of PAE on the areas of the brain responsible for self-regulation has a deleterious effect on its short and long-term development.

As adolescents diagnosed with FASD have been shown to have notable deficits in areas encompassing both short and long-term self-regulatory abilities, this puts this population at risk for several negative outcomes. For instance, as poor cognitive and socio-affective regulation has been shown to negatively impact social competence, adolescents in this population who struggle with self-regulation may face significant social issues (Wills & Dishion, 2004; Wills et al., 2002). Additionally, the struggle to control one's impulses often leads to getting into trouble in class, thus leading to conflict with fellow students and staff, making them vulnerable to early drop-out (Clark & George, 2012).

To begin to address these issues, some research has been conducted looking at the efficacy of targeted interventions in improving self-regulation in children diagnosed with FASD (e.g., Nash et al., 2015). One notable example has been the development of the GoFAR program (Kable, Taddeo, Strickland, & Coles, 2016). This program has three key components. First, a computer game is utilized to teach children about the FAR metacognitive strategy. This strategy works to teach children to focus their attention on a goal, to formulate a plan to achieve such goal, enact their plan, and then reflection on what worked and what did not. Although research has not been conducted into its use with adolescents, Coles, Kable, Taddeo, and Strickland

(2018) found that the implementation of the GoFAR program led to improvements in attention in children diagnosed with FASD.

There is also the Alert Program for Self-Regulation (ALERT; Williams & Shellenberger, 1996). This program focuses on improving self-regulation through cognitive processing and sensory integration. ALERT has shown success in improving self-regulation in a variety of populations, such as children with emotional disturbances (Barnes, Vogel, Beck, Schoenfeld, & Owen, 2008) and childhood obesity (Israel, Guile, Baker, & Silverman, 1994), and has also been shown to improve behavioural and emotional regulation in children with FASD (Wells, Chasnoff, Schmidt, Telford, & Schwartz, 2012).

The above findings show that progress is indeed being made in addressing self-regulation challenges in those diagnosed with FASD. However, these methods are still in their infancy, and are limited in scope. Specifically, to date, most of the research regarding self-regulation deficits and interventions to address these issues have been focused solely on children, rather than adolescents, young adults, and adults. This may point to a lack of understanding of the nature of self-regulation and behaviour in adolescents diagnosed with FASD. Thus, in the current study, the goal is to gain a better understanding of self-regulation and its impact on behaviour in adolescents exposed to PAE. If a better understanding can be obtained, this may influence future researchers to look at the impact of self-regulation interventions, such as the ones mentioned above, on not only the self-regulation, but the behaviour of adolescents diagnosed with FASD.

Research Questions and Hypotheses

Although difficulties with both self-regulation and behaviour have been noted in adolescents diagnosed with FASD, how these challenges may specifically relate to one another

in the population has not been explored. As such, the current study was developed with a series of questions in mind.

1. Does a significant relationship exist between self-regulation and behaviour in adolescents diagnosed with FASD? If a relationship does exist, which we hypothesize it does, what is its specific nature?

I hypothesized, based on previous findings in the literature that poor self-regulation is related to negative behaviours (e.g., Eisenberg et al., 2000; Lengau, 2003; White et al., 2012), that those adolescents with poorer self-regulation would exhibit higher occurrences of negative behaviours than those with relatively better self-regulation.

2. Does self-regulation relate to externalizing or internalizing behaviours more strongly, or is it equal?

I hypothesized, based on previous findings in the literature that poor self-regulation more strongly relates to externalizing behaviours (Eisenberg et al., 2000; Gardner et al., 2008) rather than internalizing behaviours, that those participants with poorer self-regulation would exhibit more externalizing than internalizing behaviours.

3. Does short-term and long-term self-regulation relate differently to internalizing, externalizing, and overall behaviours?

I hypothesized, based on previous findings in the literature that short-term self-regulation more strongly relates to behavioural problems (Moilanen et al., 2018), that those with poorer short-term than long-term self-regulation would exhibit more behavioural problems. Furthermore, again, it was hypothesized that externalizing behaviours would more strongly relate to self-regulation issues than internalizing behaviours.

Significance

The current study is the first to explore the specific relationship between short- and long-term self-regulation and internalizing and externalizing behaviours in adolescents diagnosed with FASD. This area of study is of particular importance because if we can better understand the influences impacting behaviour in adolescents diagnosed with FASD, we may be better able to tailor interventions to improve these abilities, thus making for a better quality of life for this population. Furthermore, if these behaviours can be improved, those adolescents diagnosed with FASD may become less vulnerable to negative outcomes that are linked to negative behaviour (e.g., incarceration, poverty, addiction, etc.).

Methods

Participants

Participants in this study included 27 adolescents with an existing diagnosis of FASD. The participants included 15 females and 12 males, all ranging in age from 11 to 17-years old. The participants in this study were recruited as part of a larger study examining a self-regulation intervention for adolescents diagnosed with FASD. The data used for the current study was collected during the initial intake assessment prior to the administration of the self-regulation intervention. All caregivers and adolescents signed an informed consent or assent form, respectively, that described the nature of the study and it was explained that participation in the study was voluntary and they could withdraw without consequence. This study received ethics approval from the University of Alberta Research Ethics Board (Pro00064830).

Measures and Procedure

Adolescent Self-Regulatory Inventory (ASRI). To measure self-regulation skills, the ASRI self-report questionnaire (Moilanen, 2007) was administered to each adolescent during the

initial intake assessment prior to the administration of the self-regulation intervention. This measure consists of 36 multiple choice questions that aim to evaluate one's perception of their self-regulation abilities. Each question (e.g., I am good at keeping track of lots of things going on around me, even when I'm feeling stressed) is accompanied by a 5-point answer scale ranging from "not at all true for me" to "really true about me", with higher scores indicating a greater ability to self-regulate.

Additionally, this measure allows for comparison between short-term and long-term self-regulations skills. Specifically, 14 questions (e.g., after I'm interrupted or distracted, I can easily continue working where I left off.) are aimed at measuring short-term self-regulation, while 13 questions (e.g., if something isn't going according to my plans, I change my actions to try and reach my goal.) are aimed at measuring long-term self-regulation, with higher scores once again indicating greater self-regulatory abilities.

Child Behaviour Checklist (CBCL). To measure behaviours exhibited by the adolescents in the current study, the CBCL (Achenbach & Ruffle, 2000) was administered to the primary caregiver of each participant during the initial intake assessment. This measure consists of 113 questions that aim to evaluate emotional and behavioural problems in children and adolescents, as assessed by their caregivers.

This measure is broken down into three scales: internalizing, externalizing, and total problems. More specifically, the internalizing scales contain questions regarding issues such as depression, anxiety, withdrawal, and somatic complaints, while the externalizing scale contains questions regarding issues such as aggression, rule-breaking, and delinquent behaviour. The sum of the scores of these two scales make up the total problems score.

Results

Analyses

Descriptive Statistics

All descriptive information about the variables is presented in Appendix 1.

Research Question #1

To assess the relationship between overall self-regulation and behavioural problems, Pearson correlational analyses were run between the ASRI total self-regulation scores and the CBCL total behavioural problem scores.

In conducting analyses between the ASRI total self-regulation scores and the CBCL total behavioural problem scores, a significant correlation was not found, r (27) = -.291, p = .141.

Research Question #2

To assess the relationship between overall self-regulation and externalizing and internalizing behaviours, Pearson correlational analyses were run between the ASRI total self-regulation scores and the CBCL externalizing and internalizing behavioural problems scores.

In conducting analyses between the ASRI total self-regulation scores and the CBCL externalizing and internalizing behaviours scores, no significant correlations were found. Specifically, the ASRI total self-regulation scores did not significantly relate to either the CBCL internalizing, r (27) = .164, p = .415, or externalizing behavioural problem scores, r (27) = .175, p = .384.

Research Question #3

To assess the relationship between short- and long-term self-regulation and externalizing, internalizing, and total behavioural problems, Pearson correlation analyses were

run between the ASRI short- and long-term self-regulation scores and the CBCL externalizing, internalizing, and total behavioural problem scores.

In conducting analyses between the ASRI short- and long-term self-regulation scores and the CBCL internalizing, externalizing, and total behavioural problems scores, one significant correlation was found. Regarding the relationship between short-term self-regulation and behaviour, a significant negative correlation was found between the ASRI short-term self-regulation scores and the CBCL total behavioural problems scores, r (27) = -.418, p = .030. Additionally, the negative correlation between the ASRI short-term self-regulation scores and the CBCL externalizing behaviour problems score approached significance, r (27) = -.358, p = .067. However, no significant relationship was found between the ASRI short-term self-regulation scores and the CBCL internalizing behaviour problems, r (27) = -.200, p = .318.

Regarding the relationship between long-term self-regulation and behavioural problems, no significant correlations were found. Specifically, no significant correlations were found between the ASRI long-term self-regulation scores and the CBCL internalizing, r (27) = .017, p = .933, externalizing, r (27) = .022, p = .915, and total behavioural problem scores, r (27) = .013, p = .949.

Additional Analyses

To assess the relationships of short-and long-term self-regulation within the broader concept of total self-regulation, Pearson correlational analyses were run between the ASRI short-term, long-term, and total self-regulation scores. Additionally, to assess the relationships of externalizing and internalizing behavioural problems within the broader concept of total behavioural problems, Pearson correlational analyses were run between the externalizing, internalizing, and total behavioural problem scores.

In conducting analyses between the ASRI short-term, long-term, and total self-regulation scores, it was found that there was no significant relationship between short-term and long-term self-regulation scores, r (27) = .156, p = .436. However, a significant correlation was found between total self-regulation scores and both short-term, r (27) = .725, p <.001, and long-term self-regulation scores, r (27) = .715, p <.001.

Regarding the relationship between externalizing, internalizing, and total behavioural problem scores, it was found that there was no significant relationship between externalizing and internalizing behavioural problems, r (27) = .151, p = .452. However, a significant correlation was found between total behavioural problems scores and both externalizing, r (27) = .666, p <.001, and internalizing behavioural problem scores, r (27) = .715, p <.001. See Appendix 2 for the analyses included.

Discussion

The aim of the current study was to gain an understanding of how self-regulation and behaviours relate in adolescents diagnosed with FASD. More specifically, the relationship between short-term and long-term self-regulation and externalizing and internalizing behaviours was examined. In doing so, a significant relationship between short-term self-regulation and total behavioural problems was found in which poorer self-regulation skills, as reported by the adolescent, were significantly related to higher reports of total behavioural problems from the primary caregivers. Furthermore, it was found that poorer short-term self-regulation skills were more strongly related to reports of externalizing rather than internalizing behaviours. The specific findings, their implications, study limitations, and future directions are discussed below.

Findings

While the overarching objective of the current study was to come to a better understanding of how the different facets of self-regulation relate to behavioural problems in adolescents diagnosed with FASD, three main research questions were posed. The first and broadest research question was what is the relationship between overall self-regulation and overall behavioural problems? The second research question was how does self-regulation in general relate to the externalizing and internalizing facets of behavioural problems? The third, and most nuanced question, was how do the short-term and long-term facets of self-regulation specifically relate to externalizing, internalizing, and total behavioural problems in this population?

Questions #1 and #2

Pertaining to the first two research questions, it was expected that total self-regulation would significantly relate to total behaviours in general, and more strongly to externalizing than internalizing problems. However, in conducting analyses, no significant results were found. Specifically, regarding total self-regulation, as measured by the ASRI (Moilanen, 2007), and total behavioural problems, as measured by the CBCL (Achenbach & Ruffle, 2000), in it was found that there was no significant relationship between these two broad concepts. Furthermore, in conducting correlational analyses between total self-regulation and externalizing and internalizing behavioural problems separately, no significant relationships were found.

Overall, the hypotheses regarding the first two research questions were not supported. Although this finding was initially surprising, upon taking into account several factors the outcome came to make more sense. Specifically, as has been found in previous literature, total self-regulation and total behaviour are very vast concepts. Said differently, in the literature both self-regulation and behavioural problems are often broken down into their smaller facets, with

self-regulation among adolescents being broken down into short-term and long-term self-regulation (e.g., Moilanen, 2007; Moilanen et al., 2019) and behaviour being broken down into internalizing and externalizing behaviours (e.g., Achenbach, 1978; Symeou & Georgiou, 2017). Although the second research question broke behavioural issues down to their unique components, it still regarded self-regulation as one, all-encompassing concept. It is theorized that by leaving such a complex concept, which manifests differently between its short-term and long-term components, the analyses may not have been nuanced enough to detect any significant relationships. Thus, it appears that lumping together short-term and long-term self-regulation may not have allowed for a true understanding of how self-regulation and different facets of behavioural problems may relate.

An additional consideration in interpreting the above findings is that it has been shown in previous studies that adolescents diagnosed with FASD and their caregivers often vary significantly in the assessment of their issues. For example, Mariasine, Pei, Poth, Henneveld, and Rasmussen (2014) found that adolescents and their caregivers showed disagreement in their assessment of the adolescents' adaptive skills, social skills, mental health functioning, and personal strengths. Specifically, it was found that the caregivers reported significantly higher prevalence of issues than the adolescents themselves. Thus, this may indicate that the adolescents in the current study simply did not identify their self-regulation skills as being deficient, whether or not it is true.

If the lack of significant findings regarding the first two research questions is in fact due to discrepancies between the adolescents and their caregivers' assessment of their challenges, this may also be due in part to the fact that it has been shown that children with FASD may lack the metacognitive knowledge necessary to accurately interpret their cognitive skills (Makela et

al., 2019). Specifically, metacognitive knowledge refers to one's own appraisal of their cognitions and cognitive abilities (Flavell, 1970). Thus, it may be the case that deficits in metacognitive knowledge may have impacted the current findings as a result of the adolescents either under-estimating, or more likely under-estimating their self-regulatory abilities.

Question #3

Pertaining to the third research question, it was predicted that short-term self-regulation would most strongly relate to behavioural problems, and that this relationship would be more strongly associated with externalizing rather than internalizing behaviours. In conducting correlational analyses to address this question, some significant findings were discovered. Specifically, it was found the while short-term self-regulation, as measured by the ASRI (Moilanen, 2007), significantly related to total behavioural problems, as measured by the CBCL (Achenbach & Ruffle, 2000), long-term self-regulation was not found to relate to internalizing, externalizing, or total behavioural problems. Additionally, short-term self-regulation related more strongly to externalizing behaviours rather than internalizing behaviours.

Regarding the finding that short-term self-regulation significantly relates to behavioural problems while long-term self-regulation does not, this result is in keeping with other research findings in the area. Indeed, short-term self-regulation is conceptualized as the ability to monitor and regulate one's immediate thoughts, feelings, and actions in response to events happening in their immediate consciousness (Moilanen 2007). Deficits in this facet of self-regulation are known to lead to behavioural challenges such as losing one's temper when they do not get their way, being combative towards others, and can even manifest in acts of violence (White et al., 2012). Such behavioural challenges related to self-regulation are most commonly identified as externalizing rather than internalizing (e.g., Eisenberg et al., 2000; Gardner et al., 2008), thus

accounting for the current finding that externalizing behavioural problems were more significantly related to short-term self-regulation deficits than internalizing problems. As such, the significant relationship between short-term self-regulation and externalizing behavioural problems is supported by the current state of knowledge.

Somewhat conversely, long-term self-regulation is conceptualized as a higher order ability to think and act purposefully in order to persevere and stay focused on long term goals (Moilanen 2007). Deficits in this facet of self-regulation often present as being unable to follow through on big projects or tasks, trouble with identifying and understanding one's emotions, and difficulty changing one's actions when met with challenges (Moilanen 2007). As such, the finding that this facet of self-regulation did not significantly relate to any facet of behavioural problems is in keeping with the current body of knowledge. Specifically, while short-term self-regulation can be explicitly tied to externalizing behaviours (Eisenberg et al., 2000; Gardner et al., 2008), long-term self-regulation, which is a higher level of self-regulation developed after short-term, does not appear to be as strongly tied to behavioural problems. Additionally, as long-term self-regulation is not typically well developed until later adolescence (Moilanen, 2007) and that the current population is known to struggle with the development of self-regulatory skills, it may be that they did not possess enough of these skills to be adequately measured in the current study. Alternatively, as mentioned above, challenges regarding metacognitive skills in this population may have impacted their abilities to accurately appraise their long-term self-regulation skills.

Intra-Concept Analyses

In addition to the aforementioned analyses, correlations were also run which provided unique insight into the relationships within the broad concepts of total behavioural problems and

total self-regulation. Regarding behaviour, while internalizing and externalizing behaviours made up the total behavioural problems composite on the current measures used, through analyses it became clear that while each are significantly related to total behavioural problems, they are independent concepts. This finding is consistent with previous findings that those who experience externalizing behavioural problems may not necessarily experience internalizing behavioural problems, and vice-versa (Reitz, Deković, & Meijer, 2006; Symeou & Georgiou, 2017).

A similar pattern was also found regarding the unique facets of self-regulation. Specifically, while short-term and long-term self-regulation measures combined to create the total self-regulation composite on the self-regulation measure in the current study, analyses proved that they are not significantly related to one another. Indeed, while both short-term and long-term self-regulation significantly related to total self-regulation, they did not prove to relate to one another. This again is consistent with previous findings in the literature that short-term and long-term self-regulation tap into a different skill set, thus potentially explaining individual differences (Moilanen 2007; Moilanen et al., 2018).

Overall, the aforementioned additional analyses provide support for the other findings in the current study. Specifically, in addressing our third research question, it was found that short-term and long-term self-regulation related differently to behavioural problems. Additionally, it was found that externalizing behaviours related to short-term self-regulation while internalizing behaviours did not. These findings are in keeping with the additional analyses' findings that while each unique facet of self-regulation of behaviour significantly relate to the overall concepts (i.e., self-regulation and behaviour), they do not significantly relate to each other. Said

differently, the concepts of both self-regulation and behaviour are made up of further nuanced facets that were found to not significantly relate to one another.

Overall Findings

Taken together, several key findings were made. Firstly, while it was hypothesized that total self-regulation would significantly relate to internalizing, externalizing, and/or total behavioural problems, no such relationship was found. However, in parsing down self-regulation to its more basic components, being short-term and long-term self-regulation, significant findings emerged. Specifically, it was found that while long-term self-regulation did not significantly relate to behavioural problems, short-term self-regulation did. Additionally, it was found that externalizing behaviours were more related to short-term self-regulation than internalizing behaviours.

Implications

Given the results of the current study, a better understanding has been gained regarding the relationship between self-regulation and behaviour in adolescents diagnosed with FASD. As mentioned previously, adolescents diagnosed with FASD often experience an array of cognitive, social, emotional, and behavioural challenges. Specific to self-regulation, the primary cognitive challenge focused on in the current study, deficits may manifest as rigid thinking, poor decision making, poor self-control when faced with adversity, and difficulties planning for events in the near future and long-term (Wills & Dishion, 2004; Wills et al., 2002). Specific to behaviour, the other main focus of the current study, challenges may manifest either externally, leading to aggression, hostility, social inappropriateness, and/or violence, or internally, leading to social withdrawal, anxiety, and/or depression (Symeou & Georgiou, 2017). These challenges when experienced during adolescence, a time of often rapid development and change, often lead to

negative outcomes such as problems in the classroom, truancy/drop-out, negative peer interactions, and run-ins with the law (Symeou & Georgiou, 2017; White et al., 2012).

A key finding in the current study is that short-term self-regulation deficits more strongly related to externalizing behavioural problems than internalizing problems in adolescents diagnosed with FASD, a connection that had not been explicitly explored in previous literature. In coming to understand that these particular facets of self-regulation and behaviour are indeed related, this may point to a shift in how each is conceptualized. Based on these findings, researchers may consider reframing externalizing behavioural problems as issues of poor self-regulation, which is malleable, rather than a fixed set of issues with unknowable causes. Indeed, as self-regulatory deficits are known to manifest in ways that directly overlap with maladaptive externalizing behaviours (e.g., impulsivity, hyperactivity, poor social conduct), it may be that externalizing behaviours are not organic issues unto themselves, but rather a symptom of poor self-regulation. By reframing externalizing behaviours as a facet of a larger problem (i.e. self-regulatory deficits) not the problem itself, clinicians may be more proactive in treatment. In this way, the perspective of externalizing behavioural problems experienced by adolescents diagnosed with FASD may shift away from them simply being “bad kids”, to young people experiencing a brain dysfunction that may be improved.

In extending upon the above logic, the current findings may also point to considering alternative courses of action when dealing with adolescents diagnosed with FASD who are experiencing externalizing behavioural challenges. Specifically, as short-term self-regulation and externalizing behavioural problems have been proven to be intimately related, empirically proven interventions targeting improving short-term self-regulation may also positively impact negative, outward-directed behaviour. Furthermore, if externalizing behaviours, argued here to

be a symptom of poor self-regulation, can be improved, then this may improve relational skills and decrease the risk of individuals experiencing adverse life events. Thus, future clinicians may consider interventions that incorporate self-regulation training, such as GoFAR (Kabel et al., 2016) and ALERT (Williams & Shellenberger, 1996) in addressing negative behaviours in adolescents diagnosed with FASD.

Limitations

The current study had several limitations. Firstly, no control group data was collected for means of comparison. Specifically, there were no means of comparison provided for the scores obtained on the measures, thus providing an incomplete picture of the exact magnitude of self-regulation and behavioural problems in this population compared to others. As such, these findings cannot be directly compared to adolescents without a diagnosis of FASD. Secondly, due to the correlational design of the current study, we are unable to draw conclusions regarding causality. Specifically, while we observed that a significant relationship exists between short-term self-regulation and behavioural problems, we cannot definitively say that one is responsible for the existence of the other.

A further limitation of the current study is that self-regulation data was only collected from the adolescents themselves, and behavioural data was only collected from the primary caregivers. As such, the scope of interpretation may be limited as corroboration from each source of information (i.e., adolescent, caregiver) was not obtained for each measure. Specifically, we are unable to know whether the adolescents would appraise their behavioural problems similarly to their caregivers, as well as how the caregivers consider their children's specific self-regulation abilities.

Future Directions

Given the knowledge gained through the current findings, several future directions of study are recommended. Firstly, to address a notable limitation in the current study, a control group of adolescents without PAE should be introduced. In doing so, researchers may come to a more nuanced understanding of the relationship between self-regulation and behaviour in adolescents in general, and adolescents diagnosed with FASD specifically.

Furthermore, in the current study the tools that were utilized were the ASRI (Moilanen, 2007) and CBCL (Achenbach & Ruffle, 2000), which are commonly used and well-supported measures of self-regulation and behaviour in adolescents, respectively. Going forward, other measures of self-regulation and behaviour such as the Self-Regulation Formative Questionnaire (SRFQ; Gaumer Erikson & Noonan, 2018) and the Behaviour Assessment System for Children – Third Edition (BASC-3; Reynolds & Kamphaus, 2015) could be used to see if similar results are obtained. Additionally, as the BASC-3 includes questionnaires which can be completed by the adolescent themselves, their caregivers, and their teachers, one may gain a more comprehensive understanding of the adolescents' behaviours across contexts. Furthermore, as metacognitive skills are known to be an issue in this population, the use of additional, non-self-report measures may be considered. Specifically, to alternatively assess self-regulation, one could present the participants with real-life scenarios that tap into self-regulatory abilities and see how they respond. For example, to assess short-term self-regulation you may ask the participant to complete a task while exposed to interruptions.

Additionally, as a significant relationship was established between short-term self-regulation and behavioural problems, especially externalizing problems, future researchers should look to how improving short-term self-regulation may improve such behaviours. Specifically, future researchers may want to study the efficacy of existing self-regulation

interventions, such as GoFAR (Kabel et al., 2016) and ALERT (Williams & Shellenberger, 1996) in not only improving overall self-regulation, which it has been proven to do in children diagnosed with FASD, but in improving specific related behaviours. In doing so, this may accomplish two goals. First, if it is found that such programs do indeed lead to improvements in behavioural problems, especially externalizing problems, this may lend support to the current study's findings. Additionally, if improving self-regulation can lead to improvements in behavioural problems, this may help to steer the narrative of behavioural problems in this population away from being indicative of them being simply "bad kids", to being indicative of a brain dysfunction that can indeed be improved.

Conclusion

In examining the relationship between short-term and long-term self-regulation and externalizing and internalizing behaviours in adolescents diagnosed with FASD, several insights were discovered. While no significant relationship was found between long-term self-regulation and behaviour, a significant relationship was found between short-term self-regulation and total behavioural problems. Specifically, it was found that poorer self-regulation related to increased reports of behavioural problems. Furthermore, it was found that short-term self-regulation was more strongly related to externalizing than internalizing problems.

While it was anticipated that total self-regulation would show to significantly relate to total behavioural problems, this was not the case. Indeed, it was found that these broad concepts needed to be parsed down to their more basic components in order to understand how they relate to one another in this unique population. In doing so, it was found that the overt, outward-directed, often aggressive externalizing behaviours were more closely related short-term self-regulation than the covert, inward, often self-harming internalizing behaviours. Furthermore, it

was shown that long-term self-regulation had no significant relationship with any measured form of behaviour, which may indicate that deficits in short-term self-regulation are more tied to behavioural problems, while possessing long-term self-regulation skills may indicate more behavioural stability.

In gaining an understanding of the connection between short-term self-regulation and externalizing problems (i.e., the poorer the short-term self-regulation the more problems), policymakers and clinicians may be able to make better informed decisions when deciding on interventions for adolescents diagnosed with FASD. Specifically, based on the current findings it is proposed that currently well supported self-regulation interventions for children diagnosed with FASD (e.g., ALERT and GoFAR) be administered to adolescents. In doing so, if self-regulation can be improved in this population related behaviours may be improved as well, given the discovery of the significant relationship between the two. Overall, it is hoped that the current study may add a meaningful contribution to the growing body of literature surrounding the challenges faced by adolescents diagnosed with FASD and how best to improve their quality of life.

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Appendix 1

Descriptive Statistics

	Mean	Std. Deviation	N
Short term self-regulation	37.67	9.564	27
Long-term self-regulation	47.00	9.668	27
Total self-regulation	112.85	17.571	27
Internalizing problems	66.444	8.6617	27
Externalizing problems	65.185	8.6915	27
Total problems	68.963	4.9106	27

Appendix 2

Pearson correlations between CBCL and ASRI

	Short term self-regulation	Long-term self-regulation	Total self-regulation	Internalizing Problems	Externalizing Problems	Total Problems
Short term self-regulation	1	.156	.752**	-.200	-.358	-.418*
Long-term self-regulation	.156	1	.715**	.017	.022	.013
Total self-regulation	.752**	.715**	1	-.164	-.175	-.291
Internalizing Problems	-.200	.017	-.164	1	.151	.715**
Externalizing Problems	-.358	.022	-.175	.151	1	.666**
Total Problems	-.418*	.013	-.291	.715**	.666**	1

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

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