Goal-Striving and Pilot Goal Management Training in

Adolescents with Attention-Deficit/Hyperactivity Disorder

by

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This thesis consists of material all of which I authored or co-authored: see Statement of

Contributions included in the thesis. This is a true copy of the thesis, including any required final

revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Statement of Contributions

Mahsa Sadeghi-Janbahan was the sole author for the General Introduction and the General Discussion, which were written under the supervision of Dr. Tara McAuley and were not written for publication.

This thesis consists in part of four manuscripts written for publication. Each manuscript was based on originally collected data. As lead author of these studies, Mahsa Sadeghi-Janbahan was responsible for conceptualizing study designs, carrying out data analyses, and drafting and submitting manuscripts. Data was collected by Mahsa Sadeghi-Janbahan and Eleenor Abraham. As co-author and supervisor, Dr. Tara McAuley contributed intellectual input on study design and analyses and provided feedback and editing for each manuscript.

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Abstract

Goal-striving across academic, social, and psychological domains of life is associated with many positive outcomes. Unsuccessful goal pursuits increase the risk of engagement in health-risk behaviours, future vocational difficulties, and interpersonal challenges. Individuals with ADHD have difficulties in academic and interpersonal areas of life, with well-documented motivational and executive functioning (EF) challenges. Stimulant medications, the most used treatment for ADHD, do not target these challenges and few interventions offered to adolescents with ADHD appear to support goal-striving. Although research investigating motivational and EF difficulties in ADHD has determined that support is necessary for successful goal-pursuit, little is known about how motivation, EF, and other factors such as grit (i.e., task persistence) impact efforts made by adolescents with ADHD to work on their goals. The current dissertation focuses on the EF deficits and motivational insight of adolescents with ADHD, in service of best supporting youth in both everyday contexts and interventions. The work presented in Studies 1 - 3 sought to present a fulsome description of how goal-striving difficulties lead to the functional impairments noted in adolescents with ADHD (i.e., ineffective goal-striving), by describing the motivation and EF of adolescents with ADHD compared to their same-aged peers and emerging adults in university. The sample included adolescents aged 14 – 17 years with and without ADHD, as well as emerging adults aged 19 – 22 years; each group was approximately 50% female. Study 1 highlighted that adolescents, as compared with their emerging adult peers, appear to require more effort and support to work on their goals. However, adolescents with ADHD also endorse less interest towards their academic goals, demonstrate difficulty linking their immediate goals to their future ambitions, and do not apply flexibility to their goal-pursuit strategies. In Study 2, adolescents with ADHD endorsed significantly more EF challenges and

less grit compared to their peers, suggesting that support for adolescents with ADHD must uniquely address these challenges. For all adolescents, more external motivation was associated with higher levels of EF challenge. When considering motivation across any kind of goal (i.e., academic and non-academic), adolescents with ADHD demonstrated both internal and external motivational styles. This may indicate that adolescents with ADHD demonstrate nuances in their motivation not captured in previous studies, such that they are not simply "less motivated" than their peers, but rather that their EF difficulties may lead to less internal motivation towards academic goals. Building upon this, Study 4 outlined how these groups regulate their motivation by attempting to create a fit between their motivational state and task strategies, an ability known as metamotivation. Generally, all groups reported their experiences of both high and low motivational states (e.g., interest, meaningfulness, boredom, frustration), and strategies that bolster their goal striving in response to those feelings. However, there was variability in the metamotivational insight held by participants, such that those with ADHD tended to have a harder time recognizing feelings of low motivation and strategizing for conflict between complex goals. Results from these studies supported the need for a goal-striving intervention targeted for adolescents with ADHD, for whom EF difficulties and motivational awareness appear to create barriers to their goals. The final study of this dissertation piloted a modified Goal Management Training intervention for adolescents with ADHD, providing preliminary evidence of the feasibility of this EF intervention. Six participants (M_{age} = 15 years, SD = 1.1; 2 females; 66% taking stimulant medication for ADHD management) demonstrated adherence and tolerance to the training, and for some participants there was reliable change in self-reported executive functioning, functional impairment, and tasks of inhibition/switching, as well as parent-rated executive functioning. All parents reported improvements in their adolescent's functional

impairment. All but two participants met the goal they had selected prior to training. Results show that further exploration of the benefits and effects of training is warranted, showing the potential for a goal-based intervention as a new direction for treatment of difficulties associated with ADHD. Overall, the studies presented in this dissertation demonstrate the possibility of integration various social and clinical psychological constructs and provides a framework for future larger-scale studies.

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Dedication

To my most precious mama, Mahnaz Esmailpour. As that one Rumi poem says (the one grandma always misquoted), "it is just kindness and affection that remains. All others are nothing."

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General Introduction

Goals are central to success across various domains, such as academic achievement, career success, and even psychological well-being (Cantor et al., 1987; Deci & Ryan, 2008; Grant & Dweck, 2003). Individuals with ADHD have difficulty in many of these domains of life, including school, work, and interpersonal functioning (Barkley, 2002). This doctoral dissertation focuses on more comprehensively understanding and effectively supporting goal-striving in adolescents with ADHD, who are at a key transitional stage and thus have unique developmental needs, with special consideration for intervention support. To date, few studies have assessed goal-striving in the adolescent ADHD population, and this dissertation seeks to address gaps in our understanding of goals for this group. Goal-striving is often assessed through its separable components, which can be broadly viewed as goal setting and goal pursuit. Goal setting encompasses the content of goals, such as the thematic properties and relative importance of tasks as well as factors that influence their selection (Gollwitzer & Brandstatter, 1997; Deci & Ryan, 2000; Fishbach & Ferguson, 2007; Locke & Latham, 2006; Markus & Wurf, 1987). Goal pursuit includes cognitive, behavioural, and affective processes that are associated with carrying out a goal, such as strategies for carrying it out, appraisal of progress towards the goal, or perceived difficulty and subsequent adjustment of the goal (Carver & Scheier, 1998; Higgins & Kruglanski, 2000). Though traditionally viewed separately, goal setting and pursuit often happen in conjunction and are influenced by a combination of personal and situational factors that are described more fully below.

Goal-Striving in Adolescence

Adolescence is a life-stage marked by changes in cognitive, emotional, and social function coupled with shifting environmental demands (Heckhausen et al., 2010; Steinberg &

Morris, 2001). Adolescents contend with life tasks such as selecting academic and vocational paths, peer groups, introductions to romantic and sexual partnerships, increasing autonomy from parents, and the overarching path to self-identity (Dietrich et al., 2012; Marcia, 1983; Nurmi, 2004). Cognitively, adolescents' ability to regulate emotions and behaviours, especially when decision making, matures gradually into young adulthood (Casey et al., 2005). This shift is also noted in developmental studies of neural change, particularly increases in overall white matter volume, posited to foster more efficient pathways within frontal regions and between other fronto-cortical circuits (Steinberg, 2005). This gradual developmental shift toward increased self-regulation and decreased external structure/guidance from adults is in accordance with movement to future-oriented tasks (Dahl, 2001; Keating, 2004), as adolescents' knowledge regarding the future, ability to plan, and carry out future-focused tasks increases (Nurmi, 1991).

Future orientation is a major characteristic of goal-directed behaviour, perhaps because the setting and pursuit of goals is influenced by our ideas regarding what we wish to become and avoid becoming and/or closing the gap between current behaviours and emotional states and those we wish to acquire (Carver & Scheier, 1982; Markus & Nurius, 1986; Oppenheimer, 1987). Adolescent future orientation influences both facets of goal-striving. The content of adolescent goals often reflects major tasks that are consistent with developmental expectations and prioritized according to cultural norms. For example, the most recent international review of adolescent goals noted that most adolescents prioritize educational and occupational goals, followed secondarily by social goals, with material/financial goals being set last (Massey et al., 2008). In contrast to goals set by parents or teachers, personalized goals emerge as adolescents increasingly gain the ability and freedom to plan and explore (Keating, 2004). Sociodemographic and cultural factors (such as age, gender, family characteristics, ethnic membership) also

influence goal content, as do institutional structures such as educational setting and socio-economic status (Massey et al., 2008). Considerations of resources available (i.e., social, cognitive, and material) influence both the content and pursuit strategies of goals (Hill et al., 2004). Goal pursuit is also shaped by parental involvement, in addition to beliefs about self-efficacy held by the adolescent and by their parents (Marjoribanks, 2003; Massey et al., 2008). Goal-striving is a developmental task that contributes to the formation of adolescent self-concept through evaluation of both goal selection and selected strategies for goal pursuit, ultimately influencing future expectations and outcomes (Hill & Chao, 2009). As an illustrative example, adolescents who endorse high-aspiration goals tend to demonstrate higher levels of academic achievement (Schoon & Parsons, 2002). Conversely, adolescents who are primarily focused on being liked or popular are more likely to engage in smoking and drinking (Simons et al., 2004).

Goals appear to impact numerous well-being outcomes in typically developing adolescents. Generally, adolescence is a time of increased risk for delinquency, engagement in health-risk behaviours, and overall reductions in well-being (Carroll et al., 1997), with individual differences in behavioural change, including intensity and duration of difficulties. Personal goals are one such difference, and adolescents with personal goals are more likely to have higher subjective well-being (Massey et al., 2008) as well as lower levels of risky behaviours (e.g., Aloise-Young et al., 2001, Vesely et al., 2004). Though personal goals may bolster well-being, it is suggested that goals set by adolescents may prove unrealizable (Markus & Nurius, 1986), and much research points to pursuit of long-term goals being a struggle for adolescents (e.g., Romer et al., 2010, Wong & Czikszentmihalyi, 1991). As noted by Massey and colleagues (2008), interventions for effective goal-striving remain a challenge given our incomplete understanding of adolescent goal-striving.

Attention-Deficit/Hyperactivity Disorder

Attention-deficit/hyperactivity disorder (ADHD) is a neurodevelopmental disorder with a childhood onset, defined by impairing symptoms of inattention (e.g., difficulty sustaining attention, disorganization, difficulty planning) and/or hyperactivity-impulsivity (e.g., difficulty sitting still, being fidgety/restless, interrupting others) that reflect a pattern of enduring and developmentally inappropriate behaviours (DSM-5-TR; APA, 2022). Current estimates suggest an ADHD prevalence rate of 5% to 7% of school-aged children and 3% of adults (Polanczyk et al., 2007; 2015; Thomas et al., 2015), with males diagnosed at least twice as frequently as females (APA, 2022). It is noteworthy, however, that approximately 60% of children who are diagnosed with ADHD will have impairing symptoms that persist into adulthood (Faraone & Biederman, 2005). In children and youth, ADHD is strongly associated with increased risk for accidental injury, decreased academic achievement, impaired family and peer interactions, emotion dysregulation, and long-term risk for substance abuse (Goldman et al., 1998). These problems persist into the adult years, as reflected by decreased occupational performance, higher risk of unemployment, as well as elevated interpersonal difficulties (Murphy & Barkley, 1996; Biederman et al., 1993). ADHD is a relatively common neurodevelopmental disorder in which chronicity of symptoms and impairments is thus a central feature.

Stimulant medications are widely studied and the most used treatment for symptoms of ADHD (Greenhill et al., 2001; Spencer et al., 2000). Most individuals with ADHD experience fewer symptoms and improved sustained attention while taking stimulant medication, though it is unclear if these benefits persist when medications are ceased (Jensen et al., 2007), and generalization to academic or social functioning has not been consistently shown in the literature (Cortese et al., 2018). Other treatment approaches for ADHD include parent management

training and educational interventions (Pliszka, 2007), as well as alternative treatments with limited evidence (e.g., neurofeedback, special diets; Sonuga-Barke et al., 2013). Overall, these common treatments for ADHD do not address goal-striving challenges, as discussed in succeeding sections of this dissertation.

Goal-Striving in Adolescents with Attention Deficit/Hyperactivity Disorder

Unlike their typically developing peers, goal-striving in adolescents with attention deficit/hyperactivity disorder (ADHD) has not been as widely studied, though there are some studies that suggest goal success may be more difficult for individuals with ADHD (Newcorn et al., 2001; Nyman et al., 2010). One example of goal-pursuit challenges in ADHD is the finding that ADHD is associated with more academic difficulty, including carrying out assignments and making more errors (Gureasko-Moore et al., 2007). Academic achievement goals such as pursuing post-secondary education are more difficult to attain for those with ADHD (Barkley et al., 2006), and factors such as goal-setting skills and autonomy influence goal success (Masten et al., 2004; Sibley & Yeguez, 2018). Feelings of low agency and a need for increased support in areas of deficit such as planning were identified as contributors to academic difficulties by adolescents with ADHD in a qualitative study (Wiener & Daniels, 2015). These findings highlight not only that their goals were challenging, but that these individuals with ADHD could endorse their areas of weakness as well.

To set a goal, an individual must be able to self-initiate, make a choice, and plan; to carry out the goal, self-regulation and problem-solving skills are necessary (Shogren & Wehmeyer, 2017). With challenges in self-regulation (the ability to resist impulses, work through challenges, and delay gratification; Fitzsimons & Finkel, 2011), individuals with ADHD are at a disadvantage when goal-striving. Successful self-regulation requires an individual to have

awareness of their future goals, their own skills, and what kinds of actions are necessary to carry out their goals (Shogren & Wehmeyer, 2017). This kind of self-insight and awareness is noted as more challenging for adolescents with ADHD (Smith et al., 2000), particularly when self-reporting ADHD symptoms, thus the question remains whether goal-directed regulation may be impeded as well. Further, there is evidence that adolescents with ADHD describe their skills with a positive bias (McQuade et al., 2011), which presumably influences their ability to work on a goal (e.g., their goals may not be realistic per their skills, or they overestimate the time/effort required). To address this, in Chapter 2 I explored whether adolescents with ADHD demonstrate self-insight into their goal-striving, by asking not only about their reasons for selecting a goal and chosen pursuit strategies, but also the perceived challenges, which could be compared to how their non-ADHD peers discuss their goals.

Metamotivation

Motivation is a critical self-regulatory mechanism that, broadly, encompasses biological, cognitive, and social factors influencing how people think, feel, and behave (Ryan, 1970). Motivation is often assessed as a determinant of positive outcomes, such as academic achievement (e.g., Deci et al., 2011), and is predictive of successful goal pursuit (Sheldon & Houser-Marko, 2001). Decreases in motivation, particularly inherent interest towards academics, are well-documented in adolescence (e.g., Gnambs & Hangstingly, 2015), along with evidence that individuals who demonstrate overall low levels of motivation are at higher risk of academic decline throughout high school (Gottfried et al., 2001).

As conceptualized by self-determination theory, individuals can express various styles of motivation along a continuum of autonomy (Deci & Ryan, 2008). That is, individuals express not only varying quantities of motivation towards a task, but the qualities of their motivation may

fluctuate as well. Behaviours carried out because they are inherently interesting tend to be internally motivated (and thus more autonomous), whereas externally motivated behaviours tend to be controlled by specific external rewards and are often associated with decreases in time and effort spent on a task (Deci & Ryan, 2000). Both internal and external motivation are associated with self-regulated learning (Zimmerman, 2002), while internal motivation is more predictive of subjective performance indicators (e.g., depth of knowledge; Cerasoli et al., 2014) and external motivation is more strongly associated with objective task indicators (e.g., grades achieved on a test; Burton et al., 2006).

Motivation predicts successful goal pursuit (Sheldon & Houser-Marko, 2001), and is understudied in the adolescent ADHD literature. Internal motivation appears to be lower in adolescents with ADHD compared to their typically developing peers (Smith & Langberg, 2018). It is posited that the repetitive and complex nature of academic tasks makes interest towards academic goals lower for adolescents with ADHD, suggesting that they will approach such goals with less internal motivation (Barber & Olsen, 2004; Carlson et al., 2002; Morsink et al., 2017). Some studies suggest that external motivation is also lower in adolescents with ADHD because some features of the disorder, such as insensitivity to future consequences or difficulty delaying gratification, render external motivators such as avoiding negative outcomes or seeking long-term successes less effective (Scheres et al., 2006; Toplak et al., 2005). Orientation towards the future is an asset towards goal pursuit (Mansfield, 2007), leaving adolescents with ADHD at a disadvantage if they are unable to consider future outcomes as suggested by the literature. It is unknown if adolescents with ADHD are able to link their current goals with future aspirations, a skill typically developing adolescents demonstrate (Malka & Covington, 2005). Further, in adolescents with ADHD, both ADHD symptoms and internal

motivation are predictive of academic achievement (negatively and positively associated, respectively; Birchwood & Daley, 2012). Self-reported levels of internal and external motivation as they relate to goal-striving are further explored in Chapter 3 of this dissertation.

A burgeoning field of research focuses on metamotivation, a construct broadly describing both the knowledge and processes required to regulate motivation (Miele et al., 2020). Individuals reciprocally engage in metamotivational monitoring (evaluating the quantity and quality of motivation towards a goal) and metamotivational control (carrying out goal-pursuit strategies based on the monitoring process) towards a specific goal (Miele & Scholer, 2018). Quality is defined as the type of motivation (e.g., internal or external), while quantity refers to the amount of engagement towards the task (Miele et al., 2020). Importantly, many motivational theories refer to the quantity of a particular state, such as self-determination theory's description autonomy as captured by the amount of internal motivation an individual expresses. The metamotivational framework goes beyond this, providing the novel perspective of how individuals regulate (i.e., monitor and control) the appropriateness of their motivation as well (i.e., the quality).

One result of metamotivational regulation is the ability to create task-motivation "fit," aligning motivational states with the demands of a task (Scholer et al., 2018). This flexible task-motivation fit is created by individuals based on their knowledge of the particulars of a task and their monitoring of their current state (i.e., the quality and quantity of feelings and strategies applied towards the task; see Miele et al., 2020 for a review). For example, Wolters (1998) found that students described the use of different strategies based on their experienced motivational challenge towards school tasks (e.g., reminding themselves that they want a good grade in the course when finding the material irrelevant). Other work similarly shows that students use

strategies to maintain or increase their motivation when with faced with barriers/challenges (e.g., Sansone & Thoman, 2005; Wolters, 2003). One study demonstrated that individuals had knowledge that they would perform better when they matched their motivational states to the task demands (e.g., being more vigilant for a proof-reading task, versus being more eager for brainstorming; Scholer & Miele, 2016). Recent work suggests individuals are aware of differences in task-motivation fit and show individual variability in this metamotivation awareness (Nguyen et al., 2019).

Though studies of school outcomes have broadly assessed motivation and goal-pursuit in children and adolescents (Lazowski & Hulleman, 2016), there remains a paucity of research on how adolescents use metamotivation to select strategies when working towards their goals. More specifically, few studies have examined which aspects of knowledge about a task adolescents endorse, including the strategies they select in response to varying motivational challenges. As a result, it is unknown if and how metamotivation differs in adolescents compared with adults. It is posited that effective metamotivation emerges from the ability to flexibly use both knowledge about the task at hand, and strategies available to an individual (Scholer et al., 2018), suggesting metamotivational ability varies across individuals based on higher-level cognitive processes such as flexibility and self-monitoring (Miele et al., 2020; Nguyen et al., 2019). Given that metamotivation appears to differ across individuals and is related to cognitive processes implicated in goal-pursuit (i.e., flexibility and self-monitoring; Miele et al., 2020), further examination of metamotivation in Chapter 4 is presented to add to our understanding of self-regulatory success or failure.

Grit

The concept of grit has been used to describe passion and persistence towards long-term goals (Duckworth et al., 2007). Grit encompasses both perseverance of effort and consistent interest in a task, with the former appearing to drive effects in the broader grit literature (Crede et al., 2017; Duckworth et al., 2007). Gritty individuals engage in more practise required for expertise and will persist in their effort to attain a goal even in the absence of positive feedback and irrespective of traditionally measured cognitive abilities such as intelligence (Duckworth et al., 2011; Robertson-Kraft & Duckworth, 2014). Studies suggest that grit uniquely predicts academic outcomes such as grade point average and that grittier students are more satisfied with their education, have a greater sense of belonging, and engage in more academic activities compared to their less gritty peers (Bowman et al., 2015; Strayhorn, 2014; Von Culin et al., 2014). One caveat to the cognitive utility of grit is that individuals high in grit may be less likely to adjust their goal or effort based on their performance, such as asking for help or pivoting to another task when it would be advantageous to do so (Crede et al., 2017); though it has not been studied, it could be the case that individuals inherently interested in the pursuit of the goal (intrinsically motivated) may be gritty towards it, aligning with the finding that internal motivation may not always lead to objective performance gains.

To date, grit has been studied in adults as well as adolescents (though to a lesser extent), and grit has been found to increase with age (Crede et al., 2017). Neither grit nor the interplay of grit and other self-regulatory processes (such as executive functions, described below) have been examined in adolescents with ADHD. However, Gray et al. (2015) found that university students with ADHD reported grittiness about one standard deviation lower than that of a non-ADHD comparison group, and lower levels of grit were associated with executive functioning challenges. Studies with adolescents have established that grit is moderately associated with

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academic performance outcomes (e.g., grade point average, high school graduate rates, engagement; Eskreis-Winkler et al., 2014; Sturman & Zappala-Piemme, 2017; Tang et al., 2019). However, some non-academic performance outcomes have been associated with grit, including completion of basic military training (Eskreis-Winkler et al., 2014), success in a national spelling bee (Duckworth et al., 2011), reduction of risky behaviours such as substance use (Guerrero et al., 2016), and high school athletic performance (Moles et al., 2017). In adolescents, higher levels of grit are linked to prior achievement, self-efficacy, growth mindset (believing that skills are malleable, and goal is achievable), and goal commitment (Albert et al., 2019; DiMenichi & Richmond, 2015; Richardson et al., 2012; Wang et al., 2018). Despite evidence that one component of grit, the perseverance of effort, explains unique variance in performance outcomes, grittiness as a whole in the context of adolescent goal-pursuit is unknown.

Executive Functions

Executive functions (EF) are a set of cognitive processes that facilitate goal-oriented behaviour (Goldstein et al., 2014). Complex behaviours such as planning, organization, and emotion regulation are examples of successful executive functioning (Miyake & Friedman, 2012). A conceptualization of EF pioneered by Miyake et al. (2000), referred to as the unity and diversity framework, identifies response inhibition, working memory, and cognitive flexibility as core executive skills. Response inhibition is the ability to intentionally inhibit automatic or prepotent responses (Nigg, 2000). Working memory is a system that involves the maintenance and updating of verbal and visual-spatial information (Baddeley, 1992). Cognitive flexibility is required to switch between different mental sets or tasks (Norman & Shallice, 1986). Recent work suggests that these core executive skills are nested within a common EF factor, reflecting maintenance and management of goals (Friedman & Miyake, 2017). Though historically viewed

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as skills related to the frontal lobes, contemporary work has demonstrated that EFs are associated with broad neuroanatomical networks including the basal ganglia and dopaminergic reward-learning pathways (Castellanos & Proal, 2012; Cortese et al., 2012; O'Reilly & Frank, 2006).

EFs have been implicated in many facets of cognitive and social-emotional development, such as problem behaviours in childhood (Espy et al., 2011), activities of daily living in adults (Bell-McGinty et al., 2002), and risky or criminal behaviour in adults (Moffitt et al., 2011). Studies of healthy adults show that goal attainment is related to an individual's ability to hierarchically organize goals (e.g., an achievement goal might deactivate desire to socialize), plan steps and make decisions within each goal, inhibit distractions or non-task related goals, as well as use feedback and monitor their progress (e.g., Fishbach et al., 2003; Fishbach & Ferguson, 2007; Sherman et al., 2013). Further, studies of adult neurological patients demonstrate that maintenance of goal-pursuit is impaired in individuals with impaired EF (Levine et al., 2000). In children, deficits in EFs are linked to academic underachievement, with one contributing factor being unsuccessful goal-striving (Howse et al., 2003). Greater challenges with EF suggest that goal pursuit would be more difficult (e.g., organizing, planning, and staying on task to work towards the goal could all be challenges), thus individuals with EF difficulties may require more external motivation to continue work towards a goal (Taylor et al., 2004). Despite changes toward autonomous goal-striving in adolescence and the ongoing maturation of EF into late adolescence (Huzuinga et al., 2006; McAuley & White, 2011), the role of EF in adolescent goal-setting and pursuit remains unexplored.

Although less than half of children diagnosed with ADHD show impairment on any one EF task (e.g., Nigg et al., 2005), robust EF deficits have been documented on tasks of response inhibition (Lipszyc & Schachar, 2010) and working memory (Martinussen et al., 2005) – with

the former deficit persisting even when ADHD symptoms resolve (McAuley et al., 2014). Moreover, EF deficits are quite common in both children and adults with ADHD when informant ratings of EF challenges in everyday life are solicited – suggesting that, even amongst individuals with relatively intact executive skills, there may be problems effectively applying those skills in daily life (Seidman, 2006; Toplak et al., 2008). Individuals with ADHD and EF deficits show greater self-reported ADHD symptoms as well as significantly higher rates of social problems, academic difficulties, and post-secondary unemployment (Burgess et al., 2010; Fried et al., 2016; Silverstein et al., 2018). These impairments may be concrete manifestations of ineffective goal-striving, reflecting problems with goal setting and/or goal pursuit. Further, ineffective goal-striving has also been linked to challenges such as getting started on a task, staying on track, and disengaging from irrelevant tasks (Gollwitzer, 2015) – all of which are reflected in the diagnostic criteria for ADHD and may be thought of as downstream sequelae of deficits in core executive skills. As such, the exploration of EF influences on goal-striving behaviour seems critical to understanding adverse outcomes in ADHD.

EF difficulties contribute to challenges with many goal-related behaviours such as self-initiation, decision-making, monitoring, and problem solving (Shogren & Wehmeyer, 2017), and individuals with ADHD and EF deficits endorse having greater difficulty with both their ADHD symptoms and these aspects of EF (Silverstein et al., 2018). Interventions of EF as a unified set of skills have not been widely studied in adolescents, particularly those with ADHD, though there is support that interventions focusing on self-regulation and strategy implementation in everyday routine may benefit participants at least as much as those interventions that explicitly train EF skills (such as through working memory programs, Takacs & Kassai, 2019). Others

have also supported the idea of training EF via everyday functioning (e.g., Diamond & Ling, 2016; Sonuga-Barke et al., 2013).

Goal Management Training

Goal management training (GMT) is an intervention designed to promote everyday executive functioning, by focusing on improving awareness of EF deficits, self-monitoring, and learning skills and strategies to successfully complete tasks of daily living (i.e., goals; Robertson & Garavan, 2000; Levine et al., 2000). One of the most-studied metacognitive (i.e., awareness-building) training programmes (Stamenova & Levine, 2018), GMT is based on the theory of goal neglect, positing that difficulties in EFs like working memory, inhibition, and updating have a downstream effect on goal-striving (Duncan et al., 1996), and can occur in various clinical populations as well as healthy individuals (O'Connor et al., 2011). This standardized programme requires approximately 20 hours of training in a group format, and trains individuals to stop ongoing behaviour to interrupt automatic processing, bring their overarching goal to mind, subdivide the overall goal into subgoals, and monitor their performance; this occurs through psychoeducation, narrative examples, assignments within and between sessions, and mindfulness (Levine et al., 2012). Unlike other EF interventions that train specific skills (e.g., working memory, Melby-Lervag et al., 2016) and do not consistently show promise for meaningfully improving everyday functioning (i.e., transfer/generalizability is low; Takacs & Kassai, 2019), GMT uses individuals' goals as the primary outcome, and such metacognitive interventions appear to show effectiveness in improving everyday EF in studies to date (Cicerone et al., 2011; Rohling et al., 2009).

In a recent meta-analysis of randomized-controlled GMT studies to date, Stamenova & Levine (2018) assessed 19 samples across 21 studies (approximately 300 participants) of diverse

adult clinical populations including individuals with acquired brain injury (e.g., TBI, tumour, stroke; Bertens et al., 2015; Levine et al., 2011; Tornas et al., 2016), schizophrenia (Levaux et al., 2012), substance abuse (e.g., Valls-Serrano et al., 2016), and adults with ADHD (In de Braek et al., 2012; Jensen et al., 2021). Their review suggests small to moderate effect sizes in working memory, long-term memory, and mental health status, as well as moderate effect sizes in EF as measured by both cognitive testing and everyday EF tasks; these effects are comparable to the overall effects of cognitive training interventions (Kennedy et al., 2008). The greatest effect was observed in subjective ratings of EF (by participants and an informant) immediately following GMT, though this was not maintained at follow-up – this could be due to broader issues of measurement of EF (e.g., Barkley & Murphy, 2011; Boonstra, et al., 2005), or it is possible that goals met through the intervention (and thus targeted everyday EF) may have been met but not generalized to new goals. It is also not known how adolescents would fare in the intervention, particularly those with difficulties associated with ADHD. Findings from preliminary studies of adults with ADHD suggest participants show improvement on performance-based measures of inhibition, an EF difficulty commonly reported in ADHD and associated with academic and social difficulties, with effects lasting 6 months post-treatment (Jensen et al., 2021). Participants also reported reduced cognitive difficulties, better productivity, and improved management of ADHD in everyday life (Jensen et al., 2021).

A limited number of studies have examined the use of GMT in children with acquired brain injuries, adolescents with HIV, and adolescents reporting executive dysfunction, though none have utilized GMT in adolescents with ADHD. GMT modified for use in these populations appears to be enjoyable by participants, associated with informant reports of better every-day EF (Krasny-Pacini et al., 2014; Stubberud et al., 2021), and associated with improvements in

performance-based EFs such as flexibility and inhibition (Nunes & Seabra, 2021). Krasny-Pacini et al. (2014) adapted GMT to be used with five participants aged 8 – 14 in a single-case experimental design and found that their participants enjoyed GMT and showed improvements on everyday EF measured by informant report (i.e., the "cognition problems" sub-score on a questionnaire of dysexecutive functioning). Notably, they found that participants reported enjoyment and fun more often than utility with regard to the training and completed in-session exercises more often than their own real-life homework. Taken together, previous studies of GMT suggest that GMT may be an intervention option which is enjoyable or interesting to adolescents, and understanding their experience with GMT should include both performance-based and subjective ratings of EF. Adherence to homework and generalizability of skills to other goals are also considerations from other studies which should be considered in the context of adolescents with ADHD.

The current thesis aims to present a comprehensive summary of goal-striving in adolescence, through both qualitative and quantitative means. Chapter 2 highlights several similarities and differences in both goal content and goal pursuit of adolescents with ADHD and their typically developing peers, using a qualitative approach. Chapter 3 builds upon this by exploring the relationship between subjective ratings of everyday executive functioning, motivation, and grit as related to a personal goal. Comparisons between typically developing adolescents and those with ADHD, as well as their emerging adult peers are presented. In Chapter 4, directed content analysis of semi-structured interviews was conducted to provide a description of metamotivational awareness demonstrated across the three groups. The novel description of metamotivation in adolescents speaks to the quality of goal-striving in adolescents with and without ADHD. Finally, Chapter 5 details a pilot of modified Goal Management

Training for adolescents with ADHD, presenting adherence to the protocol and reliable change indices of primary/secondary outcomes to explore participants' experience of the intervention. The pilot of an executive functioning intervention, focusing on goals personally relevant to adolescents with ADHD, introduces a new direction for supporting goal success in this population. Broadly, these chapters contribute to the ADHD literature by describing goal-striving for adolescents with ADHD compared to their peers, which has not been studied to date, and presenting a novel intervention to support their goals in the face of executive functioning difficulties. Results in the following chapters generally support that despite executive functioning difficulties, adolescents with ADHD express varied forms of motivation and show awareness of strategies that may support the task at hand. We also demonstrate the feasibility of the modified Goal Management Training, suggesting that adolescents with ADHD not only show insight into their goal-striving but can also benefit from targeted intervention in their goal pursuit. The final chapter of this dissertation is a more detailed summary of these findings, followed by discussion of limitations and future prospective areas of study.

Study 1: A Qualitative Study of Goal-Striving in Adolescents with ADHD

ADHD is a neurodevelopmental disorder that affects approximately 7% of school-aged children, most of whom experience persistently impairing symptoms as they transition into adolescence (Faraone et al., 2006; Thomas et al., 2015). The disorder is clinically defined by early emerging and developmentally atypical traits of inattention and/or behavioural impulsivity that contribute to functional challenges in everyday life (APA, 2022). Compared with their typically developing (TD) peers, for example, children with ADHD are more likely to have difficulties getting started on academic tasks, which can lead to a greater need for monitoring and redirection from teachers and result in less work being completed (Langberg et al., 2020; Loe & Feldman, 2007). An exacerbation of these concerns has been identified in adolescents with the disorder, where issues with the completion of larger-scale projects and homework become increasingly common (Gordon & Fabiano, 2019). The academic impairment that is experienced by individuals with ADHD frequently extends to the occupational and social arenas as well (Gollwitzer & Brandstatter, 1997; Harpin et al., 2016; Ros & Graziano, 2018).

One lens through which to understand the challenges that are commonly experienced by adolescents with ADHD is goal-oriented behaviour. Successful goal attainment has been conceptualized as the outcome of two separable components: goal setting, which reflects the content of goals and influences on goal selection, and goal pursuit, which includes cognitive, behavioural, and affective processes associated with carrying out a goal (Carver & Scheier, 1998; Higgins & Kruglanski, 2000; Keating, 2004; Locke & Latham, 2006). Adolescence is a developmental period in which youth increasingly gain the ability and freedom to plan and explore, leading to the emergence of more personalized goals (compared with those established by parents and teachers) coupled with greater autonomy over goal pursuit (Keating, 2004). A

2008 review (Massey et al.) found that most youth prioritize educational and occupational goals first followed by social, material, and financial goals thereafter. This same review also noted that youth demonstrate more active attempts at achieving these goals as they get older. The review highlights general patterns in adolescent goal striving to emerge across international samples; however, because the included studies did not recruit subgroups of minority adolescents, these findings may not generalize to the lived experience of adolescents with ADHD. This limitation is important to consider because interindividual differences in goal striving emerged pending the sociodemographic particulars of youth and their family, peer, and educational contexts – contexts that are likely to be different for adolescents with this disorder (e.g., Daley & Birchwood, 2010). Thus, the impetus for our study was to begin filling a knowledge gap in the clinical research literature pertaining to goal striving in adolescents with ADHD.

Several factors likely contribute to difficult and/or unsuccessful goal striving in ADHD youth. One such factor is executive functions (EF), broadly defined as a collection of inter-related self-regulatory skills that are used to engage in purposeful, goal-oriented behaviours (Lezak, 1995). To set a goal, an individual must consider and integrate different sources of information, compare priorities, and make a choice; to achieve the goal, that individual must effectively utilize a broad suite of self-regulatory skills such as formulating a plan, staying on-task, self-monitoring progress, and troubleshooting as necessary. In this sense, executive functions are integral to both components of goal striving – yet EF abilities are often poorly developed in and/or ineffectively applied by adolescents with ADHD (Lipszyc & Schachar, 2010; Martinussen et al., 2005; Molitor et al., 2019). A related complication is that ADHD youth tend to lack episodic foresight or prospection, showing a stronger orientation to the immediate present and having difficulty imagining the future (Kostyrka-Allchorne et al., 2020; Scheres et

al., 2006). Their goal-striving may be thus hindered if they are unable to consider future outcomes or link their current goals with future aspirations, an ability that TD adolescents demonstrate (Beal & Crockett, 2010; Johnson et al., 2014). In addition, ADHD youth tend to have limited self-awareness – for example, underreporting their ADHD symptoms, underestimating associated impairment, and reporting on their skills with a positive bias (McQuade et al., 2011; Smith et al., 2000). This constellation of difficulties may make it harder for ADHD youth to create goals, lead them to select goals that are poorly matched to their abilities, and result in more obstacles as they work toward goal attainment.

Motivation is another factor that may contribute to the goal striving challenges that are frequently experienced by ADHD youth. According to self-determination theory (Deci & Ryan, 2000), motivation varies along a continuum ranging from relatively autonomous (i.e., carried out for internal values such as interest and enjoyment) to relatively controlled (i.e., carried out due to external values like reward/punishment). Different motivational styles contribute to different kinds of successful goal striving, with external motivation linked to quantifiable indicators (e.g., grades achieved in school; Burton et al., 2006) and internal motivation being more involved in subjective aspects of task performance (e.g., depth of knowledge; Cerasoli et al., 2014). A 2018 review found that adolescents with ADHD tend to evidence lower levels of both kinds of motivation compared with their TD peers – with most extant research focusing specifically on the academic domain (Smith & Langberg). ADHD youth may approach academic goals with less inherent interest due to the repetitive and/or complex nature of many academic tasks coupled with less confidence that working hard on such tasks will enhance long-term academic success (Morsink et al., 2017; Sibley et al., 2019; Smith et al., 2020). At the same time, ADHD youth

may be less swayed by external motivators due to difficulty delaying gratification and reduced sensitivity to reward (Luman et al., 2010; Patros et al., 2016).

Our study employed examined goal striving in adolescents with ADHD using a qualitative approach in which participants completed a semi-structured interview grounded in concepts previously identified in the adolescent goal striving literature (Massey et al., 2008). Our rationale for doing so was based on the paucity of research regarding goal striving in ADHD youth, which highlights the importance of hearing directly about their lived experience through the richness of open-ended questions. Building on previous research examining goal striving in adolescents (Massey et al., 2008), we were particularly interested in identifying potential similarities and differences in goal setting and goal pursuit in ADHD youth compared with their TD peers. We also sought to compare goal striving in both groups of youth vis-a-vis emerging adults, consistent with studies that have advocated for a life course perspective of adolescence by including this population (Kirkpatrick Johnson et al., 2011). Regarding goal content, we hypothesized that TD adolescents and emerging adults would prioritize academic and occupational goals most often; however, we did not have a priori hypotheses regarding goal content for adolescents with ADHD. We also hypothesized that adolescents with ADHD would endorse a greater number of barriers to and stressors associated with goal pursuit. Lastly, we hypothesized that adolescents with ADHD would endorse fewer strategies associated with goal pursuit, potentially due to difficulties with executive function and/or motivation.

Methods

Participants were recruited through community spaces located in two cities in Ontario (ADHD and TD youth), a community mental health clinic at the University of Waterloo (youth with ADHD), and an undergraduate volunteer pool in the Psychology Department at the

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University of Waterloo (emerging adults). The sample included 10 adolescents with ADHD (M_{age} = 14.6 years; SD = 1.3; 50% female; 90% White/European descent, 10% Black/African descent, 60% taking stimulant medication for ADHD management), 20 TD adolescents (M_{age} = 15.6 years; SD = 1.3; 55% female; 50% White/European, 30% East or West Asian; 20% Latinx), and 22 emerging adults (M_{age} = 19.77 years; SD = 1.3; 50% female; 45% East or West Asian, 36% White/European, 10% Black/African, 9% Other-Identifying). To be eligible, all participants had to be enrolled in school to allow for greater comparability across goal domains. Additionally, youth with ADHD were required to have been diagnosed by a registered health professional (e.g., physician or psychologist) and currently experiencing at least 6 of 9 symptoms of inattention or hyperactivity per parent report on the CADDRA Checklist (CADDRA, 2014). Written informed consent was obtained from all participants, with parental permission obtained from participants under 16 years of age. This study was approved by the Office of Research Ethics at the University of Waterloo.

Participants completed a 45 to 60-minute semi-structured interview with the researcher (M.S.) either in-person or online, followed by computer-administered self-report questionnaires (the focus of a separate study). Remuneration consisted of a $25 Amazon gift-card, one hour of community service, and parking costs for adolescents and course credit for emerging adults. Recruitment was disrupted by the COVID-19 pandemic, resulting in fewer participants than initially planned. However, coding of data began when 10 participants in each group had completed the study, and no new codes were identified for emerging adults or TD adolescents after approximately 20 interviews. Few new codes were identified for adolescents with ADHD. This suggests that our sample size met criteria for data saturation (Creswell, 1998).

At the outset of the semi-structured interview, participants were asked to describe a current goal not already achieved that felt important to them, with the interviewer suggesting "it could be any goal, like something about your friends, hobbies, school, work, family, health, anything at all." They were then asked open-ended questions pertaining to goal content (e.g., reasons why the goal was important to them) and goal pursuit (e.g., how they intended to work toward the goal, how they would know if/when the goal was achieved, barriers and supports in achieving the goal, how much control they felt in pursuing their goal, and their experience of stress associated with goal pursuit). These questions were selected based on a review of adolescent goal content and pursuit conducted in 2008 by Massey and colleagues (2008) as well as previous work by the researcher (Sadeghi et al., 2018; Sadeghi et al., 2020). To facilitate comparison of how participants describe goals currently underway versus achieved, they were then asked to describe a recent goal they already accomplished and what led to it being successful. Throughout the interview, questions followed the flow of participants, resulting in questions being asked in various orders, and participants were encouraged to elaborate on their ideas and asked numerous follow-up questions.

Analyses

NVivo 12 was used to conduct a conceptual content analysis of transcribed interviews, utilizing an iterative, thematic analysis from an interpretive epistemology. Coding was conducted by the researcher who conducted the interviews (M.S.). Verbatim transcripts were read thoroughly, and general memos were created for each interview, containing data extracts with the researcher's questions, summary keywords, and notes written to support the familiarization process. Next, each interview was coded based on the entirety of individual responses, grouping individual responses into codes based on conceptual meaning within an extract, and similarity

across extracts (thus, a single code may refer to multiple extracts from one individual). Themes were derived by noting codes recurring across participants, and then collating conceptually similar codes into a main theme (e.g., "family, self-efficacy, stepping stone to larger goal" were codes identified within each interview, and then the main theme of "reasons for choosing the goal" was created to categorize these codes). Finally, themes were reviewed and refined to ensure codes were uniquely describing ideas (e.g., "stressors" and "barriers" were combined to create a single main theme representing challenges to achieving goals). These themes were then compared across groups to show similarities and differences, in the interest of understanding goals in ADHD (Lindsay, 2018). Trustworthiness was acknowledged using interview questions derived from the adolescent/adult goal-striving literature, using iterative questioning throughout the interview, and interviewing all youth on their own chosen goal regardless of domain. Based on emergent similarities of themes within each group and across both groups, as well as similarity of concepts with extensive literature review, data saturation (i.e., indication that themes are likely to be replicable and further coding not necessary; O'Reilly & Parker, 2012) was likely reached.

Results

Goal Content

A complete table of themes is presented in Table 1. Adolescents with ADHD most often identified current goals that involved personal growth or hobbies. Their recently achieved goals represented the academic domain most often; however, they tended to describe their goals in the immediate here-and-now and often did not connect their goals to a larger plan (e.g., "[my goal was to] finish all of the math work my teacher gave me"). In contrast, TD adolescents and emerging adults most often described an academic goal as one they were both currently working

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on and had recently achieved and their descriptions tended to be long-term in scope (e.g., "In the present it does feel important for me to work hard in all my classes. It's a mixture of both the bigger goal of getting into university, but also achieving the best that I can in school as of right now.").

Table 1.

Identified themes from semi-structured interviews (n = 52)

	% Endorsed		
Theme	ADHD	TD	Emerging Adults
	$n = 10$	$n = 20$	$n = 22$
Current Goal Domain			
Academic	20	60	72
Personal Growth or Health	40	10	14
Occupation	0	10	5
Hobby	30	20	9
Social	10	0	0
Achieved Goal Domain			
Academic	60	70	77
Personal Growth or Health	0	0	23
Occupation	10	10	0
Hobby	20	10	0
Social	10	10	0
Reasons for Goal Pursuit			
Inherent Interest	60	90	64
Stepping Stone to Larger, Meaningful Goal	50	90	86
Validate Ability to Self	50	70	55
Validate Ability to Others	50	60	41
Seeing Others Pursue or Attain Similar Goal			
	30	90	68

e.g., peers/siblings, adults, cultural norms, online community, TV/books/media			
Past Experience/Attempt	50	20	23
Resources Already Invested	10	30	23
Steps & Strategies			
Planning, Scheduling, Organizing	40	80	77
Devoting Time	80	100	73
Dividing into Subgoals	40	60	36
Using Social Support			
e.g., asking for help/advice, taking breaks with others, talking/venting, validation/encouragement, good relationship with authority figures	90	80	82
Self-Care	10	20	41
Extra Resources			
e.g., resource teacher/child & youth care worker, individualized education plan (IEP) with modifications, study groups, tutor, online research, networking	30	50	73
Mindset	80	100	77
e.g., 'work hard, try your best', 'I can do this', 'I'm capable of doing it', 'this is part of your goal'			
Flexibility	10	80	73
Strategic Allocation of Resources	50	70	23
Social Competition/Striving			
e.g., seeing people doing well, comparing strategies with others, competing for grades	40	80	13
Modifying Environment	30	0	0
e.g., removing distractions			
Rewards & Reinforcements	30	10	0
e.g., breaks, video games			
Stressors			

Balancing Priorities or Tasks	30	70	91
e.g., managing time, competing priorities, amount of tasks			
Pressure From Others	30	60	68
e.g., suggestions/advice/pestering, wanting to make parents happy or proud, goal misaligned with family or friends' priorities, making decisions about future very early (i.e., in high school)			
Keeping Momentum/Engagement	50	100	36
e.g., distractions, boredom/fatigue/frustration, subgoals feel like a means to an end, procrastinating, sustaining effort, goal feels external to self			
Possibility of Failing or Not Achieving the Goal	20	50	68
Uncertainty/Novelty of Task or Outcome	20	50	36
Being Hard on Self	20	40	36
Logistical Impediments	40	30	36
e.g., finances, distance			
Mental Health	0	0	27
COVID-19 Pandemic	30	n/a	n/a
Lack of Group/Team Effort	20	0	0
Overconfidence	10	0	0
i.e., not preparing enough			
Learning Difficulty	10	0	0
e.g., memory			
Contributions to Success			
Planning, Scheduling, Organizing	20	20	36
Inherent Interest	0	60	18
Devoting Time	40	70	59
Skills Matched to Task	30	30	0
Dividing into Subgoals	10	10	18

Using Social Support	70	30	36
Self Care	10	0	0
Mindset	60	30	45
Flexibility	10	30	23
Social Competition/Striving	0	20	0
Past Experience	10	10	18
Modifying Environment e.g., removing distractions	60	0	0
Extra Resources e.g., therapy, websites	20	0	0

Reasons for Goal Pursuit

All groups provided multiple reasons for pursuing their current and past goals, ranging from relatively internal (e.g., "I really enjoy watching movies and animations…so my biggest dream would be for this to be successful…and then provide a really high-quality piece of art for people to enjoy") to relatively external (e.g., "I think that parents would also be proud of it, too"). Similar reasons were identified by all groups, though in different proportions of respondents; for example, only half of adolescents with ADHD identified that their goal served as a steppingstone to a larger goal, whereas most TD adolescents and emerging adults did. Inherent interest was frequently endorsed by all groups, though the context of goals for adolescents with ADHD was mainly non-academic. Most individuals expressed a sense of control in achieving their goals, regardless of the number of reasons endorsed.

Strategies for Goal Pursuit

Both groups of adolescents and emerging adults shared many steps and strategies in pursuit of their goals (current and recently achieved), with some of the most common being use of social supports (e.g., "taking breaks with friends", "asking parents for advice") and adopting a

particular mindset (e.g., "reminding myself 'you need to do this'"). Leveraging extra resources was also common across groups, though adolescents with ADHD most often described supports such as their Individualized Education Plan or school resource teacher, while TD adolescents and emerging adults described study groups, internships or volunteer opportunities, and online research. Being flexible (e.g., "nothing ever goes the way you planned, so you just have to be open and accepting of that even though it's hard") was described as a strategy by many TD adolescents and emerging adults but was endorsed by only one adolescent with ADHD. Compared with emerging adults, all adolescents indicated that they were more likely to prioritize completion of goals based on perceived difficulty (e.g., "the questions that I understand I will leave off and the harder questions I will do first, then I will get my brother to help me") and invest more time into goal pursuit. TD adolescents more often identified that they divide their goals into smaller subgoals (e.g., "really achievable pieces, maybe achieve it in a couple of days. Just so I can feel a sense of progress"). With regard to this strategy, adolescents with ADHD who described subdividing their goals did so with less detail/clarity (e.g., "I wanted to kind of have a goal for art every day, just to try and get myself back into something I enjoy. And small things…like taking care of myself, doing the things I enjoy"). The use of rewards and reinforcements was unique to both adolescent groups. Adolescents with ADHD also uniquely described modifying their environment (e.g., "being in my room with the door closed so I don't hear anything…having no other tabs open [on the computer], because then I'm tempted"), and did not endorse planning, scheduling, and organizing as often as TD adolescents or emerging adults.

Goal Pursuit Stressors

The most commonly identified stressor in both groups of adolescents was keeping momentum or engagement with the current goal (e.g., "struggling at one step so much, that I get bored of doing that step, that I get bored of the bigger goal too"," or "I'm doing my work and somebody says 'hey want to do this with me?' and I…don't want to miss the opportunity. I feel like I should just say 'no'…but it's just so hard when something more fun presents itself"). Balancing priorities or other tasks was frequently described as a challenge by emerging adults and TD adolescents, as well as experiencing pressure from others (e.g., "I feel like everyone feels like we are in a race sometimes"). A greater proportion of TD adolescents and emerging adults identified the possibility of failing, uncertainty of the outcome or novelty of the task, and being hard on themselves as stressful compared to adolescents with ADHD.

Successful Goal Attainment

When discussing the successful attainment of a past goal, similar proportions in all groups identified planning, scheduling, and organizing as a successful strategy – a different pattern than pursuit of a current goal in which, as noted above, use of these strategies was endorsed at a lower frequency in adolescents with ADHD compared with the other groups. Strategies commonly endorsed by all groups included dividing their goal into subgoals, adoption of a growth mindset (e.g., "this is part of your goal, you can do this"), relevant past experience (e.g., working on a similar task towards a different goal before), and devoting sufficient time to goal pursuit – with a large proportion of TD adolescents endorsing this final strategy. None of the adolescents with ADHD identified inherent interest as a contribution to their success on their recently achieved goal, which tended to be more academic in nature compared to their current goal.

Discussion

Our semi-structured interviews provided an outlet for adolescents with ADHD to share their ideas and experiences related to goal striving. All groups identified an academic or occupational goal as one they had recently attained, and these goals also were identified by TD adolescents and emerging adults as one they were currently working toward, as hypothesized. In contrast, current goals endorsed by ADHD youth tended to reflect personal growth or hobbies (e.g., building a computer, increasing score on an online game). Even when goal content was comparable, however, descriptions provided by adolescents with ADHD tended to lack specificity and were often devoid of future context such that they did not explicitly link their goal to a larger aspiration – something that was demonstrated by the other groups. This is consistent with work suggesting that adolescents with ADHD have difficulty with future prospection (e.g., Kostyrka-Allchorne et al., 2020), which may explain the lack of consideration of their goal within a future context. In TD adolescents, thinking about the future predicts the ability to attenuate future discounting, thus improving decision-making in goal pursuits (McCue et al., 2019), disadvantaging youth who are unable to do so.

All groups endorsed a variety of reasons for setting their current goal, including inherent interest in the goal and a means of obtaining validation for oneself and from others. This second reason aligns with work showing that adolescents' mastery and motivation towards goals is influenced by their social context (Bureau et al., 2021). Notably, there were no adolescents with ADHD who identified inherent interest in relation to selection of their previously acquired goal, which – like the other groups – tended to be academic. This builds on studies suggesting that intrinsic motivation towards academics decreases in adolescence, particularly for those with challenges at school (Gottfried et al., 2001). This finding also aligns with the well-understood

difficulty adolescents with ADHD have in keeping engaged at school (Zendarski et al., 2017). Adolescents who are more confident in their ability to carry out a goal are more likely to feel competent and engaged in the pursuit (Cury et al., 2006), thus it is possible that academic difficulties associated with ADHD foster less interest and engagement in academic goals. Given that academic goals may be less autonomously selected compared to hobbies or other personal goals, adolescents with ADHD may have felt less internal motivation (and thus interest) towards these goals. Taken together with their challenges linking goals to the future, adolescents with ADHD may find their academic goals are difficult to carry out especially because they are less interested and not seeing the future relevance. However, our participants described academic goals they were able to attain despite less interest, suggesting that other kinds of motivation (aside from interest) can support goal achievement for those with ADHD, much like other studies with TD youth have shown (e.g., Burton et al., 2006). More generally, the fact that adolescents with ADHD provided examples of goals they were more or less internally motivated towards fits with research on metamotivation, suggesting that multiple kinds of motivation can support goal achievement (e.g., Miele et al., 2018). Additionally, Sibley et al. (2019) found that adolescents with and without ADHD show no differences in self-rated academic interest, pointing to the idea that the experience of ADHD-related difficulty *during* goal pursuit could reduce inherent interest – and thus the type of motivation – along the way.

Further, nearly all TD youth identified setting their current goal based on modeling from others (e.g., adults, peers/siblings) and/or their awareness of cultural expectations, while few with ADHD did so. One possibility is that goals selected by adolescents with ADHD were more personally relevant (e.g., working on a hobby project, personal fitness) and less influenced by others as a result. It is also possible that social difficulties noted in the literature (e.g., social

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comprehension and interpersonal conflict; Sibley et al., 2009; Wehmeier et al., 2010) impact the ability to utilize goal-setting strategies such as influence from role models or awareness of cultural norms. With regard to their goal selection, ADHD youth were more likely to be influenced by past experience or attempts, re-attempting goals they failed to achieve in the past or working on a goal to which they could apply pre-established strategies. It is notable that these adolescents described working on goals that required high effort or multiple attempts to succeed, even when sharing personally interesting hobby or personal goals. This also suggests that when strategies work, adolescents with ADHD may stick to them and apply them to new goals.

Relatedly, flexibility was an important theme in our study. TD adolescents and emerging adults explicitly identified a stance of flexibility as an essential strategy used towards their goals. This was seen in descriptions which included ideas like adjusting the goal, trying novel solutions, or moving on to a different part of the goal. Flexibility was uncommon in adolescents with ADHD – only one participant endorsed it as a strategy necessary to work on their goal, and the description of goals as being based on previous attempts suggested less flexibility towards goal selection. We know that being flexible relies on the executive function of being able to shift with changing demands or based on feedback, which is more difficult for those with ADHD.

A variety of strategies were endorsed during goal pursuit, with adoption of a helpful mindset, making sufficient time, and seeking support from others identified by most participants. Although there were differences in strategies discussed across groups, our hypothesis that adolescents with ADHD would endorse fewer goal-pursuit strategies was not supported, suggesting that difficulties with goals may be partly explained by the quality of strategies selected or effectiveness of their deployment, rather than awareness of strategies. Adolescents with ADHD were less likely than the other groups to identify using executive skills like planning

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and organizing in relation to their current goal (personal growth/hobbies), but were as likely as the other groups to use these aspects of EF to support pursuit of their recently achieved goal (academic). This demonstrates that when using strategies that are successfully deployed, adolescents with ADHD can succeed at goals they are less internally motivated towards.

Also, ADHD youth uniquely mentioned reducing environmental distractions and were more likely than the other groups to endorse using rewards and reinforcements during goal pursuit. Somewhat counterintuitively, adolescents with ADHD were less likely than the other groups to utilize extra resources. Included in this category were strategies that are likely to be more applicable to ADHD youth, such as accommodations in an Individualized Education Plan, assistance from school personnel (e.g., child & youth workers, special education teachers), and tutoring. Although these resources may be less applicable to the non-academic goals that most ADHD youth were currently working toward, very few identified using these resources during pursuit of a previously attained goal which tended to be academic. It could be that the ADHD youth shared goals which did not require these extra supports and other strategies were sufficient. Conversely, availability of these resources differs (Wodrich & Spencer, 2007), and attitudes towards accommodations vary (Lovettt & Nelson, 2021) – it is possible that our sample of adolescents with ADHD did not wish to use them or share their experience of them with the interviewer. In a qualitative study of adolescents with ADHD, Wiener & Daniels (2015) found that youth express low feelings of agency towards their academics, and suggested that external resources are supportive of goals for which a sense of control is low (i.e., teacher support and accommodations can help when youth don't feel in control of their academic tasks). Given that our sample of adolescents with ADHD expressed feeling in control of the goals they shared, perhaps it is the case that extra resources were not necessary to support their goal pursuit.

With regard to our hypothesis that adolescents with ADHD would endorse more stressors and barriers, a few participants with ADHD mentioned a higher quantity of barriers compared to youth in other groups. Of interest, both groups of adolescents appeared to work harder on their current goals compared to emerging adults, as evidenced by more frequent mention of sub-dividing goals into smaller steps, prioritizing tasks based on perceived difficulty, and finding it difficult to maintain momentum toward their goal. The latter was true for ADHD youth even though these goals were mostly non-academic and identified as inherently interesting. All adolescents may be working hard to stay focused in school, but adolescents with ADHD are working hard to pursue even inherently interesting goals. Studies of effort exertion in individuals with ADHD suggest that emerging adults with ADHD symptoms report higher effort towards tasks (Hsu et al., 2017), and although not averse to applying effort on a task, those with ADHD may not be applying efforts optimally, leading to differences in performance (Mies et al., 2016). This aligns with the subjective experience reported by our sample, requiring more effort to stay engaged on their goals.

Implications

We found that descriptions of academic goals provided by our adolescents with ADHD were devoid of future context (i.e., no links to a larger goal or what they got out of their academic achievement), something which youth in the other groups demonstrated. It may be that adolescents with ADHD would benefit from support in learning to explicate the relevance of goals to larger ones, much like their peers do. It could be helpful to elicit specific links between current tasks and larger goals, much like chunking to break down goals into sub-goals is used as an ADHD support strategy. Aiding adolescents with ADHD to explicate their reasons for pursuing a goal could be a helpful reminder of why they endeavour to achieve it, something that

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may be missed otherwise given the finding that they aren't tying their goal to a larger goal/life context. This builds on interventions already being utilized to support those with ADHD, particularly ADHD coaching, as individuals are encouraged to set specific, achievable goals and clarify their reasons for doing so (Prevatt & Levrini, 2015). Ensuring that goals are clear, narrow in scope, and tied to important life domains is key to coaching success in emerging adults with ADHD (Prevatt et al., 2017), thus supporting adolescents to clarify the relevance of their goals in addition to pursuit-specific strategy assistance could be beneficial. Similarly, executive function support so that adolescents with ADHD can use skills such as flexibility – which they did not endorse, unlike their peers here – could bolster goal pursuit as well. This finding affirms clinical research and interventions which focus on executive functions for individuals with ADHD, and supports the idea that these skills enhance goal-striving.

Given that our participants still endorsed success in light of having little interest towards their academic goal, it is necessary to consider alternatives to strategies meant to boost internal motivation. Social support may be a way to increase more autonomous (i.e., internal) motivation for adolescents with ADHD in the academic domain (Levine et al., 2021). More generally, both parental support and positive peer relationships promote improved developmental outcomes for at-risk youth, including those with ADHD (Dvorsky & Langberg, 2016). Most participants endorsed using their social supports to work on their goal (i.e., parents and peers most often, teachers to a lesser degree), an unsurprising finding given that these relationships can be quite influential to adolescents and emerging adults. Given that individuals who provide autonomy support help to enhance goal pursuit through encouraging self-direction and meaning-making, it is important to consider the quality of social support received from others. Many participants noted that they wanted to validate their abilities to a parent or prove they can do it when they

know someone really believes in them, a mindset which they reported helped them continue pursuit even when challenging. However, if seeking support from influential others who are not autonomy-supportive, their appraisals of goals may not align with that of the youth, to the detriment of their goal-striving. In the case of individuals with ADHD, for example, parents may have their own challenges with ADHD or self-regulation, making it difficult for them to provide effective support. At the same time, adolescents with ADHD also may not be immersed in social environments which support their autonomy such as validating difficulties, offering choice, or explicating rationale for tasks; teachers have less influence in adolescence generally, and many constraints on providing these sorts of strategies. Future exploration of social support as an avenue for success in goal pursuit should seek to understand: whether adolescents with ADHD tend to receive autonomy support, and if teaching autonomy-supportive skills to people such as caregivers benefits their goal-pursuit. Based on our results, almost all participants felt control over their goal, even when endorsing external reasons for pursuing the goal. Autonomy support could be a way to emphasize this felt sense of control, which may encourage continued movement towards a goal, perhaps more effectively than attempts to enhance interest in specific tasks (i.e., an adolescent could be reminded that it is up to them to put in the hours for a task, and the benefit of completing the task would be related to something meaningful to them).

The study of motivation in adolescents with ADHD requires more understanding of motivation across both internal and external motivational styles, to better inform intervention strategies (Morsink et al., 2022). As has been demonstrated in other populations (Miele et al., 2020), finding a fit between experienced motivation and strategies used can be helpful for goal pursuit, above and beyond motivation being of a certain kind (internal or external). This task-motivation fit, known as metamotivation, requires knowledge of a task, the kind of motivation

felt towards it, and what can be done to support continual goal pursuit in light of those factors (Scholer & Miele, 2016). As such, metamotivation requires both metacognitive awareness and executive functions such as flexibility, skills which may be more difficult for those with ADHD (Balint et al., 2015; Kercood et al., 2017). Investigation of metamotivation can help our understanding of these skills in adolescents with ADHD, in addition to opening new avenues for motivational support.

Limitations and Future Directions

There are several limitations to this study which should be noted. Our participants were tested in the context of a university-affiliated study, which may have biased individuals to discuss academic/vocational goals. As well, our emerging adults were an undergraduate sample, and thus similarities in goal content with adolescents may be explained by the shared educational context. Self-reported goals also may not have been the *most* central or important goal for individuals, but rather what came to mind first during the interview, since we did not ask for participants to list all current goals. An additional limitation of our study is that we did not track longitudinal outcomes of goals, to see if endorsed current goals were eventually successful. Assessing the success of goals could, for example, address whether unutilized strategies in each group could benefit goal pursuit if learned. Further, recruitment was impacted due to the COVID-19 pandemic, resulting in fewer participants in the ADHD adolescent group. We also note that our ADHD sample was predominantly White, and as is true of generalizability on the whole, findings must be considered only within the context of our sample.

As mentioned earlier, the authors attempted to establish validity throughout qualitative analyses. However, one limitation of our study was that we had one coder of themes, with the second author using "thick/rich descriptions" of transcriptions to review themes (thus performing

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member checking). We also acknowledge that researcher biases may influence our findings. More specifically, the authors have both clinical and research experience with individuals with ADHD, and we recognize our assumption that goal-striving is more difficult for individuals with ADHD.

Our study certainly demonstrates that adolescents and emerging adults alike think about their goals in dynamic, nuanced ways. Our participants identified multiple reasons, strategies, and stressors as they work on goals, and participants with ADHD showed self-insight into their abilities and challenges. Given that motivation towards academic goals wanes in adolescence, and interest in goals changes during emerging adulthood, our understanding of well-being must include a broader discussion of goal-striving. Our study also speaks to other avenues of support that educators, clinicians, and caregivers should consider, such as the finding that enhancing interest towards academic goals may not always help adolescents with ADHD in their goal-striving. Strategies like explicating personal reasons for working on a goal and enhancing flexibility towards a goal could prove fruitful based on our findings. Finally, the exploration of autonomy-supportive educators, caregivers, and peers is a burgeoning topic worth considering in both research and practice as we continue on our own goal of best supporting individuals work on theirs.

Study 2: Comparing Influences on Goals in Adolescents with ADHD and their Peers

Attention-deficit hyperactivity disorder (ADHD) is a neurodevelopmental disorder defined by developmentally atypical and impairing levels of inattention and/or hyperactive-impulsive behaviour (APA, 2022). ADHD affects approximately 7% of elementary schoolchildren, most of whom will evidence persistent symptoms and impairment into adolescence (Thomas et al., 2015). Adolescents with ADHD have an elevated risk of experiencing negative outcomes across academic, occupational, and social domains (Barkley, 2002). Though varied in nature, these challenges may at least partly stem from difficulty setting and working toward goals (e.g., Nyman et al., 2010). Both are necessary for life success (Deci & Ryan, 2008), yet remain largely unexamined in youth with this disorder. This study assessed factors that are likely to be relevant to goal attainment in ADHD youth.

Executive Functions

Executive functions (EF) are cognitive skills that facilitate goal-oriented behaviour, with working memory, response inhibition, and mental flexibility viewed as foundational skills upon which more complex forms of EF like planning and organization develop (Goldstein et al., 2014). EF deficits are associated with ADHD, as reflected on tasks that directly assess an individuals' executive skills and even more so when informant ratings of EF challenges in everyday life are solicited (Toplak et al., 2008). The forgoing suggests that even when performance on EF tasks is seemingly intact, individuals with ADHD frequently experience problems applying their executive skills in daily life. EF is integral to setting and pursuing goals: goal-setting requires self-initiation, decision-making, and planning, while goal-pursuit necessitates self-regulation, monitoring, and problem-solving (Shogren & Wehmeyer, 2017). Weaknesses in EF may thus contribute to the goal-related challenges that have been documented

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in ADHD. Individuals with ADHD and EF deficits endorse having more ADHD symptoms and higher rates of social problems, academic difficulties, and post-secondary unemployment (Silverstein et al., 2018). Though EF influences on goal-attainment have not been directly studied in adolescents with ADHD, there is evidence in the achievement literature that bolstering EF increases the likelihood of goal success (DuPaul et al., 2008).

Grit

Goal-attainment is also linked to grit, a personality trait reflecting consistency of interest and perseverance of effort in pursuit of longer-term goals (Duckworth et al., 2007). Meta-analytic results have demonstrated that grit is positively associated with GPA in both high school and college, the likelihood of completing degree and training programs, and a variety of non-academic outcomes (e.g., athletic accomplishments, performance in military training) - with perseverance rather than consistency driving many of these significant effects (Crede et al., 2017). Gritty individuals accomplish more even in the absence of positive feedback and irrespective of traditionally-measured constructs such as intelligence and conscientiousness (Duckworth et al., 2007). To our knowledge, neither grit nor the interplay of grit and EF have been examined in adolescents with ADHD; however, in one study of university students with a previously confirmed diagnosis of ADHD, self-reported grit was about one standard deviation lower than that of a slightly older, non-ADHD comparison group and lower levels of grit were associated with more EF challenges (Gray et al., 2015).

Motivation

Motivation is a self-regulatory mechanism that encompasses biological, cognitive, and social factors influencing how people think, feel, and behave (Ryan, 1970). As conceptualized by self-determination theory, individuals can express various styles of motivation along a

continuum of autonomy (Deci & Ryan, 2008). Behaviours carried out because they are inherently interesting tend to be internally motivated (and thus more autonomous), whereas externally motivated behaviours tend to be controlled by specific external rewards (Deci & Ryan, 2008). Motivational challenges identified in youth with ADHD include difficulty staying motivated to complete work independently, having less interest in learning, and experiencing lower levels of internal motivation than typically-developing peers – although it is worth noting that most of this work has focused on children who are not yet in high school (Smith & Langberg, 2018). Among high school students, one study found that internal motivation was comparable for those with and without ADHD, although students with ADHD had lower GPAs, self-rated academic importance, and parent-rated goal-setting skills (Sibley et al., 2019). These findings suggest that high school students with ADHD may struggle to execute goals despite rating themselves as being internally motivated. It remains unknown whether EF and grit influence motivation in adolescents with ADHD.

Current Study

This study examined similarities and differences in goal-related phenomena in youth with ADHD compared to their typically-developing (TD) peers. Two comparison groups were selected: one comprised of same-aged peers in high school (13-17 years), which enabled us to examine how ADHD may influence the selection of goals and factors relevant to goal attainment compared with youth of a similar chronological age and in a similar environmental context; the other comprised of emerging adults in university (18-21 years), which enabled us to examine the selection of goals and factors relevant to goal attainment in individuals who are older and who have potentially progressed further along in goal pursuit. Our first objective was to compare youth with ADHD with these other groups on EF, grit, and motivational style. We hypothesized

that adolescents with ADHD would endorse greater EF challenges, lower levels of goal persistence, and more external motivation compared to same-aged peers and emerging adults. Our second objective was to compare the association of motivational style with EF and grit for previously attained and in-progress goals across groups. For all groups, we hypothesized higher grit would be associated with more internal motivation and that greater EF challenges would be associated with more external motivation (particularly for those with ADHD), reflecting differences in regulatory strategies based on an individual's ability to pursue their goal.

Methods

This study was approved by the Office of Research Ethics at the University of Waterloo. Written informed consent was obtained from all participants, with parental permission obtained from participants under 16 years of age. To be eligible, all participants had to be currently enrolled in high school or university to allow for greater comparability across goal domains. All participants completed the same procedure, with the addition of information collected from participants with ADHD about their diagnosis (at recruitment, described below).

Participants and Procedure

Participants included 22 emerging adults from an undergraduate sample (M_{age} = 19.77 years; SD = 1.3; 50% female; 45% East or West Asian, 36% White/European, 10% Black/African, 9% Other-Identifying), 20 typically-developing (TD) adolescents (M_{age} = 15.6 years; SD = 1.3; 55% female; 50% White/European, 30% East or West Asian; 20% Latinx), and 11 adolescents with diagnosed ADHD (M_{age} = 14.6 years; SD = 1.3; 50% female; 90% White/European, 10% Black/African). Mean age at ADHD diagnosis was 9.5 years (SD = 2.07). All of those in the diagnosed ADHD sample met criteria for current ADHD, defined as at least 6 impairing symptoms of inattention or hyperactivity-impulsivity, per the CADDRA Checklist

(CADDRA, 2014). At the time of enrollment, the sample was equally split between those with predominately inattentive and combined presentations and 60% were on stimulant medication for ADHD management.

Emerging adults were recruited from a participant pool of undergraduate students in the Psychology Department at the University of Waterloo. TD adolescents were community-recruited using flyers and emails distributed to local teen volunteer groups, libraries, and community centres, as well as contacting parents of teens previously involved in studies in our lab. Adolescents with ADHD were recruited through flyers/emails distributed through the university psychology clinic, as well as an existing re-contact database. Adolescents were from several school districts.

Participants completed computer-administered self-report questionnaires that were presented via Qualtrics in a fixed order (described below). A 45-60 minute semi-structured interview about their goals was also completed at this time, though not reported here. Remuneration consisted of course credit for undergraduate participants and a $25 Amazon gift-card, one hour of community service, and parking costs for adolescents.

Measures

Motivational Style

The Self-Regulation Questionnaire – Academic (SRQ-A; Ryan & Connell, 1989) is a 32-item rating scale assessing behavioural regulation that we modified to relate to general goal-striving. Responses ranged from *not true at all* (1) to *very true* (4) and were averaged for four scales reflecting motivational style (i.e., external, introjected, identified, and internal). The SRQ was administered twice to capture varying levels of motivation towards both an achieved and in-progress goal.

Executive Functioning

Self-reported ratings of everyday EF during a 6-month period were completed using the Barkley Deficits in Executive Functioning – Short Form (BDEFS-SF; Barkley, 2011). The scale includes 20-items that reflect different kinds of EF challenge (e.g., procrastinating, making impulsive comments, regulating emotions) with responses ranging from *never or rarely* (1) to *very often* (4). Responses were aggregated across all items to create a total EF score that reflects general executive dysfunction.

Grit

The Grit Scale – Short Form (Duckworth & Quinn, 2009) is an 8-item self-report measure of goal persistence and effort (e.g., "Setbacks don't discourage me"). Item responses are measured on scale ranging from *very much like me* (5) to *not like me at all* (1), with half of the items reverse-scored. Responses were aggregated across all items to create a total grit score.

Analyses and Results

Variables were missing completely at random (MCAR all $p > .225$; Little, 1988); across all participants, 5 items were missing from the SRQ internal motivation (current goal) and 1 from the SRQ external motivation (achieved goal), as well as 1 item from the BDEFS. Given the low proportion of missing data (i.e., < 1%), mean scores were computed at the individual level per the SRQ scoring standard, except for the BDEFS, in which a score of 1 was imputed per instructions in the manual.

Table 2 presents descriptive information and bivariate correlations. First, one-way ANOVAs were conducted to compare groups on the SRQ, BDEFS-SF, and Grit Scale. No significant main effects of group on motivational styles from the SRQ were noted for either kind of goal (all ps > .08). For current goals, all groups endorsed identified motivation most

frequently (e.g., "the goal is important to me" and "I wanted to learn new things") followed by

internal motivation (e.g., "I enjoy working on my goal"). Emerging adults and TD adolescents

maintained this endorsement for their recently achieved goal, whereas adolescents with ADHD

endorsed identified motivation followed by introjected motivation (e.g., "I should work on my

goal") most often. In contrast, there was a significant main effect of group on the BDEFS-SR,

$F(2, 50) = 5.71$, $p = .006$, $\eta_p^2 = .18$. Tukey's post-hoc tests indicated that adolescents with

ADHD ($M=47.72$, $SD=12.30$) endorsed significantly more EF challenges than TD adolescents

($M= 35.7$, $SD = 8.81$) and emerging adults ($M=37.45$, $SD=9.43$) ($ps < .01$), while emerging

adults and TD adolescents did not significantly differ. There was also a significant main effect of

group on the Grit Scale, $F(2, 50) = 6.34$, $p = .004$, $\eta_p^2 = .20$. Tukey's post-hoc tests indicated that

ADHD youth ($M= 2.44$, $SD= 0.49$) had significantly lower levels of grit than both TD

adolescents ($M=3.24$. $SD= 0.69$) and emerging adults ($M=3.26$, $SD=0.71$) ($ps < .01$). TD

adolescents and emerging adults did not significantly differ from each other.

Next, Pearson correlations were used to examine the association of different motivational

styles with EF challenges and grit. For both current and achieved goals a similar pattern emerged

across adolescents: more external forms of motivation had significant or trend-level correlations

with higher levels of EF challenge and lower levels of grit, whereas more internal forms of

motivation had the converse pattern. For emerging adults, identified motivation for current goals

was significantly correlated with fewer EF challenges. Greater EF challenges were strongly

associated with less grit for emerging adults and TD adolescents, and this pattern emerged for

those with ADHD as well, though not significant.

Table 2.

Associations between motivational styles for achieved/current goals, EF and grit for adolescents and emerging adults.

Goal	Group	Motivation	M (SD)	α	Correlations				
					Introjected	Identified	Internal	EF Problems	Grit
Achieved	ADHD Adolescents	External	2.61 (0.77)	.86	.45	-.22	-.43	.65*	-.31
		Introjected	3.01 (0.77)	.92	-	.39	.23	.12	.02
		Identified	3.31 (0.55)	.92	-	-	.69*	-.42	-.01
		Internal	2.64 (0.84)	.95	-	-	-	-.65*	.27
	TD Adolescents	External	2.72 (0.87)	.81	.59**	-.33	-.54*	.52*	-.09
		Introjected	3.01 (0.74)	.87	-	.04	-.18	.51*	-.26
		Identified	3.56 (0.46)	.70	-	-	.66**	-.23ᵃ	.44
		Internal	3.32 (1.00)	.94	-	-	-	-.55*	.37
	Emerging Adults	External	2.50 (0.78)	.86	.50*	-.01	-.20	-.02	-.16
		Introjected	2.56 (0.63)	.85	-	.27	.00	.18	-.11
		Identified	3.50 (0.61)	.87	-	-	.78**	.19	.02
		Internal	2.82 (0.92)	.95	-	-	-	.12	.21
Current	ADHD Adolescents	External	2.14 (0.69)	.88	.57	-.23	-.38	.37	-.38
		Introjected	3.06 (0.45)	.70	-	.29	.26	.19	.29
		Identified	3.49 (0.48)	.77	-	-	.32	-.30	.49
		Internal	3.14 (1.01)	.97	-	-	-	.12	.67*
		EF Problems	45.40 (10.09)	.84	-	-	-	-	-.50

		M (SD)						
	Grit	2.44 (0.52)	.72	-	-	-	-	-
TD Adolescents	External	2.12 (0.67)	.90	.59**	-.07	-.35	.24	-.13
	Introjected	3.00 (0.67)	.89	-	.07	-.34	.50*	-.45*
	Identified	3.65 (0.36)	.75	-	-	.57**	-.53*	.45*
	Internal	3.20 (0.83)	.97	-	-	-	-.43*	.71**
	EF Problems	35.7 (8.81)	.87	-	-	-	-	-.63*
	Grit	3.24 (0.69)	.79	-	-	-	-	-
Emerging Adults	External	2.25 (0.06)	.66	.56**	.43*	.07	.03	-.11
	Introjected	2.83 (0.50)	.69	-	.08	-.20	-.03	-.08
	Identified	3.65 (0.34)	.76	-	-	.24	-.44*	-.13
	Internal	3.08 (0.45)	.80	-	-	-	.01	.38
	EF Problems	37.5 (9.43)	.87	-	-	-	-	-.77**
	Grit	3.26 (0.71)	.82	-	-	-	-	-

*p < .05 ** p < .001 a p < .10

Discussion

Motivational styles associated with current goals were similar in adolescents with ADHD compared with their TD peers and emerging adults, with more expressed internal motivation overall (i.e., identified and internal). Others have also found that subjective ratings of internal motivation do not differ between TD and ADHD adolescents (Sibley et al., 2019). A caveat to our finding, however, is that this was only the case when including non-academic goals – which tended to be the preferred current goal amongst ADHD youth, compared with TD adolescents and emerging adults, who tended to select academic goals as one they were currently working toward. For recently achieved goals, which were most commonly academic in all groups, adolescents with ADHD endorsed less internal motivation (i.e., their motivational style tended to be identified and introjected). Given that internal motivation is associated with academic achievement (Birchwood & Daley, 2012) it is notable that our sample of adolescents with ADHD did not express the same amount of internal motivation for their academic goals as they did for hobby projects or social goals. One possible explanation is that adolescents with ADHD may experience less interest and/or enjoyment (i.e., internal motivation) towards academic goals because they tend to dislike the repetitive, complex nature of some academic tasks and often prefer immediate rather than delayed rewards (Smith & Langberg, 2018). As well, internal motivation towards school has been shown to decrease in adolescence (Gottfried et al., 2001), a phenomenon likely exacerbated by difficulties associated with ADHD. Although to date it has been understood that general motivational deficits exist in ADHD, our findings suggest that individuals with ADHD express various regulatory styles, though the goal in mind influences this expression.

We also found that adolescents with ADHD endorsed more EF challenges and less grit compared to the other groups, suggesting that task persistence decreases when faced with difficulty during goal-pursuit (i.e., executive dysfunction). This extends findings that emerging adults with ADHD endorse lower grit when experiencing greater EF problems (Gray et al., 2015). Whilst EF challenges in ADHD youth are well-documented (e.g., Fried et al., 2016), we are aware of few studies that have examined grit in adolescents with this disorder. Our other findings were as hypothesized, though only for adolescents; that is, a more internal motivational style was associated with lower levels of EF challenge and higher levels of grit whereas a more external motivational style showed the converse pattern. It may be the case that having greater interest and autonomy are related to expressing more persistence towards a goal, particularly in the absence of significant EF challenges for adolescents. Given that external motivation is more predictive of objective task outcomes such as grades (Burton et al., 2006), it is likely that when faced with EF problems, external strategies are more immediately reinforcing of goal-pursuit.

In contrast, grit and EF were generally not associated with motivational styles for emerging adults – an exception being a positive association between greater EF challenges and identified motivation, which is a more autonomous motivational style. Unlike their younger peers, it appears that emerging adults in a university setting may have difficulty applying their executive skills whilst also having an inherent motivation towards a goal. One possibility is that emerging adults are further along in their goal pursuit and at stages where they have more autonomy in their choices (i.e., choice in degree, courses, schedule, location), even if experiencing more EF challenges. That is, adolescents and emerging adults in our sample are representative of different *stages* within similar goals (i.e., long-term aspirational goals with more proximal academic goals, but in high school versus university), and that perhaps having EF

challenges in emerging adulthood would not draw individuals towards external motivational styles, as their goal pursuit is still fairly autonomous. Of course, there is also potential that emerging adults are more insightful raters of their subjective difficulties, and have had more experience pursuing goals within their EF capacities, making it possible to both have EF challenges and pursue important goals.

Limitations and Future Directions

One limitation of our study is that recruitment was impacted due to the COVID-19 pandemic, resulting in fewer participants in the ADHD adolescent group and limiting our sample size for questionnaire data. As a result, our correlations of EF, grit, and motivational styles should be interpreted with caution. Of note, multiplicity corrections were not made on correlations due to the exploratory and complementary purpose of this study alongside qualitative findings shared in the previous chapter, a practise informed by other quantitative research (e.g., Gelman, Hill, & Yajima, 2012). Further, our participants with ADHD were primarily white. Group characteristics, including demographic differences, are not captured in this work, a major limitation which should be addressed in future studies of these constructs in ADHD. For example, context-dependent meanings of group comparisons may be derived from more sophisticated methods such as propensity score matching. One strength of our ADHD sample was that we had an equal number of male and female participants. Finally, our sample was one of convenience, with recruitment occurring through our lab database of families interested in participating in our study, as well as community resources known to the authors (e.g., local schools, camps).

Our study sets the stage for future research, aimed at supporting individuals with ADHD to work on their goals and succeed. Given our findings that adolescents with ADHD rate their

own EF skills as an area of need, report lower grit towards their goals (despite these goals being of personal interest), and express more external motivation, efforts to bolster goal-striving through EF-focused interventions would likely enhance the self-regulation required to succeed on goals.

Study 3: Metamotivation in Adolescents with ADHD: A Qualitative Study

Motivation is an important determinant of human behaviour and may become particularly salient during adolescence as youth begin to exert more autonomy in their decision-making (Wolters, 2003). Like adults, youth simultaneously experience multiple motivational influences that have varying effects on their behaviour (e.g., Kim et al., 2020). During adolescence, for example, inherent interest toward academics tends to decline whilst responsivity to social feedback typically shows the converse pattern (e.g., Crone & Dahl, 2012; Gnambs & Hangstingl, 2015; Gottfried et al., 2001). This may explain why, for some, adolescence is characterized by an increase in school-related challenges coupled with greater engagement in risky and sometimes delinquent behaviour (Carroll et al., 1997; Fairchild, 2011).

These difficulties are further exacerbated in the context of ADHD (Wehmeier et al., 2010), which is a relatively common and highly persistent disorder characterized by developmentally atypical and impairing symptoms of inattentive and impulsive behaviour (DSM-5-TR; APA, 2022). There is evidence that adolescents with ADHD are generally less motivated than their typically-developing (TD) peers and that motivational deficits contribute to the functional impairment that ADHD youth experience (Carlson et al., 2002; Morsink et al., 2017; Smith & Langberg, 2018). Whilst the forgoing suggests that motivation may be relevant to understanding the experiences of adolescents with ADHD, it should be noted that most work has been conducted in the academic domain and focused on narrow constructs of reward sensitivity and behavioural contingency (though see Morsink et al., 2021 for an exception). Hence, there is a need for more comprehensive exploration of motivational influences in ADHD youth and adolescents more generally. Given the pluralistic nature of motivation evidenced in the non-ADHD literature (Miele et al., 2020), our understanding of motivation in ADHD would benefit

from studying the experience of regulation towards goals generally, encompassing all motivational components that may be present for individuals as they do so. Additionally, examining the nuances of self-regulation through the lens of motivation should contribute to our understanding of task engagement and goal-striving in ADHD, which are noted areas of difficulty in this population (Nyman et al., 2010).

Metamotivation

A relatively new construct in the motivation literature is metamotivation, which reflects the flexible, meta-cognitive ability to align motivational states with the demands of a task (creating task-motivation fit; Scholer et al., 2018). Recent work suggests that individuals create task-motivation fit based on their knowledge of task particulars coupled with monitoring of their feelings about and strategies applied to the task (see Miele et al. 2020 for a review). From the perspective of metamotivation, feelings represent affective cues regarding one's motivational state vis-à-vis a task (e.g., excitement) whereas strategies consist of thoughts and/or behaviours that are used to maintain or increase that motivational state in the service of task completion (e.g., using a promotion-value focus of reminding oneself what is to be gained).

Studies assessing emerging adults' ability to report their motivational strategies suggest that individuals select strategies according to the motivational components they aim to target (e.g., Schwinger et al., 2009). Theoretically, metamotivation draws upon and integrates other prominent motivational constructs, since individuals experientially self-regulate using many of these motivational states (Miele et al., 2020). The first of these is self-efficacy, referring to an individual's confidence in their skills and abilities (Bandura, 1977), and tied to unique regulatory strategies such as proximal goal-setting (Miele et al., 2020).

The subjective value of a task is also under the metamotivational control of individuals, and metamotivation theoretically combines various motivational components to describe the self-regulation of task value. One such component is self-relevant value, whereby individuals may regulate their feelings towards a task based on how aligned it is with their views of the self (Eccles, 2005). For example, feelings of important or meaningfulness of a task may be regulated using strategies like connecting to a larger life goal or value.

Task value components derived from self-determination theory (SDT) are also included in metamotivational regulation theory, positing that motivation spans a continuum ranging from autonomous to controlled (Deci & Ryan, 2000). Autonomous motivation is reflected in tasks that are carried out due to intrinsic values such as inherent interest or enjoyment, whereas controlled motivation is reflected in tasks that are conducted due to extrinsic considerations such as avoidance of punishment or availability of reward.

Finally, based on regulatory focus theory, promotion or prevention value of a task is considered. Regulatory focus theory suggests that motivation varies pending whether goals represent ideals for growth versus responsibilities or obligations for safety and security (Higgins, 1997). Individuals who approach goals with the former perspective are described as having a promotion focus and tend to adopt "eager" strategies such as actively seeking and flexibly pursuing different opportunities (Scholer & Higgins, 2012). Conversely, individuals who approach goals with the latter perspective are described as having a prevention focus and tend to uphold "vigilant" strategies such as protecting against threats and careful processing (Scholer & Higgins, 2012). These foci are important for optimizing performance on different kinds of tasks, with promotion focus associated with success on tasks of creativity (Bittner et al., 2016) and prevention focus associated with success on tasks that require logic (Seibt & Forster, 2004).

Metamotivational knowledge is reflected in knowing when to adopt either a promotion or prevention focus pending the particulars of a task, which has been demonstrated by emerging adults (Scholer & Miele, 2018). For example, emerging adults who hold a prevention value – focusing on their responsibilities – perform better on their undergraduate exams compared to those with a promotion value (Rosenzweig & Miele, 2016), and these values can be induced based on the task at hand to maximize task-strategy fit (Scholer & Miele, 2016).

The final set of constructs considered when assessing metamotivation are costs and obstacles to goals, which can impede and disrupt motivation towards tasks. Metamotivation includes an individual's ability to regulate their motivation in the face of costs and obstacles, by strategizing in the face of negative feelings towards a goal (Miele & Scholer, 2018). This includes opportunity costs, which are alternatives lost in the choice to engage in a particular task; emotional costs, or the negative feelings related to a task; and effort costs, which are efforts required for the task (Eccles, 1983). Each of the three types of costs is associated with differing strategies for regulation, with the common goal of reducing barriers to engagement with a task. Miele and Scholer (2018) offer the example of a student who may restructure a task to meet two goals when faced with opportunity costs, demonstrating the metamotivational ability to reduce negative affect using a regulatory strategy to boost task engagement.

Though studies of school outcomes have broadly assessed motivation and goal-pursuit in children and adolescents (Lazowski & Hullman, 2016), there remains a paucity of research on how youth use metamotivation to select strategies when working towards their goals. More specifically, few studies have examined which motivational challenges youth endorse (e.g., their feelings towards a task), and the strategies they select in response. As a result, it is unknown how the metamotivational skill differs in adolescent populations compared with that of adults. It is

posited that effective metamotivation emerges from the ability to flexibly use task and strategy knowledge, and flexibility is more generally critical for success in well-being outcomes such as emotion regulation (e.g., Bonanno & Burton, 2013). Further, individual differences in self-insight and emotion regulation are posited to impact metamotivational awareness (Miele et al., 2020), as individuals must accurately sense their feelings and know what to do about them (i.e., self-monitor), often requiring flexibility to handle challenges, changes in demands and shifting their motivation to respond. For adolescents with ADHD, difficulties in self-monitoring and flexibility, as well as impulse control, organization, and planning are often impediments to successful task pursuit (e.g., Boyer et al., 2014). It would be important to distinguish whether deficits in these skills would result in lower metamotivational skills, given the importance of these traits in the regulatory process, or whether perhaps adolescents with ADHD can express metamotivation such that they are aware of their task/strategy knowledge deficits in these domains.

Current Study

This exploratory study aimed to determine whether adolescents with ADHD describe metamotivational strategy knowledge towards a self-selected goal compared to their typically-developing adolescent and emerging adult peers. Given that previous research on metamotivation has focused primarily on emerging adults, the addition of typically-developing and ADHD adolescents provides a wider developmental perspective to consider. Focused coding was guided by motivational components offered by Miele and Scholer (2018), including self-efficacy, task values (self-relevant value, internal/external value, promotion/prevention value), and costs/obstacles (opportunity costs, emotional costs, effort costs). Each component was considered to determine if participants endorsed relevant metamotivational feelings and

subsequent strategies. It was hypothesized that emerging adults would discuss motivational feelings and associated strategies across the most number of components, while adolescents would spontaneously describe fewer motivational components and describe fewer accurate strategies for motivational feelings. We hypothesized that adolescents with ADHD in particular would endorse the fewest strategies for their various metamotivational feelings, though given difficulties with self-regulation towards goals, may describe greater challenges/obstacles without expressing strategies to improve or address those feelings.

Methods

The sample included 10 adolescents with ADHD (M_{age} = 14.6 years; SD = 1.3; 50% female; 90% White/European descent, 10% Black/African descent, 60% taking stimulant medication for ADHD management), 20 TD adolescents (M_{age} = 15.6 years; SD = 1.3; 55% female; 50% White/European, 30% East or West Asian; 20% Latinx), and 22 emerging adults (M_{age} = 19.77 years; SD = 1.3; 50% female; 45% East or West Asian, 36% White/European, 10% Black/African, 9% Other-Identifying). Emerging adults were recruited from an undergraduate volunteer pool at the University of Waterloo, youth with ADHD were recruited through flyers/emails distributed through the campus psychology clinic, and typically-developing adolescents were recruited through community spaces in two cities located in Ontario. Eligibility criteria included: high school or university enrollment (for comparability across goals), and for ADHD participants further criteria included diagnosis of ADHD by a registered health professional (physician or psychologist), as well as currently experiencing at least 6 symptoms of inattention and/or hyperactivity (per the CADDRA Checklist; 2014). This information was confirmed with the youth's parent/guardian via a phone call prior to enrollment. Written informed consent was obtained from all participants, with parental permission obtained from

participants under 16 years of age. This study was approved by the Office of Research Ethics at the University of Waterloo.

Participants completed a 45 to 60-minute semi-structured interview with the researcher (M.S.) either in-person or online, followed by computer-administered self-report questionnaires (the focus of a separate study). Remuneration consisted of course credit for emerging adults and a $25 Amazon gift-card, one hour of community service, and parking costs for adolescents. Recruitment was disrupted by the COVID-19 pandemic, resulting in fewer participants than initially planned. To ensure data saturation was reached despite the smaller sample size, we examined the amount of new information collected from each interview. Overall, less than 4% of coded metamotivational feelings and strategies were identified after the first 10 participants in each group, suggesting criteria for data saturation was met (Guest et al., 2020).

Participants were asked to describe a current goal they were working on and to answer subsequent interview questions with their goal in mind, which the interviewer suggested could be anything that felt important to them, such as "friends, hobbies, school, work, family, health, anything at all." Participants were then asked open-ended questions about their goal (e.g., reasons why it was important to them, how they intended to work on the goal, barriers and supports, how they would know they achieved it, stressors, how much control they felt). A separate study focuses on the thematic analysis of participants' goals and goal-pursuit strategies derived from these questions, selected based on previous literature. Interview questions were asked in various order based on participants' responses, and participants were encouraged to elaborate or asked follow-up questions as appropriate.

NVivo 12 was used to conduct a directed content analysis of transcribed interviews (Hsieh & Shannon, 2005). Verbatim transcripts were read thoroughly and coded line-by-line

based on the existing metamotivation framework (i.e., metamotivational components from Miele & Scholer, 2018), with initial codes representing data extracts of main metamotivational components (self-efficacy, self-relevant value, and so on). Next, focused coding for explicit identification of metamotivational feelings and strategies was conducted. This process was iterative, such that constant comparison of data samples from participants ensured codes aligned with the samples across participants. As informed by other thematic analyses using comparison groups, variability between groups was highlighted for each theme (Lindsay, 2018). Trustworthiness was acknowledged using iterative questioning throughout the interview, interviewing all youth on their own chosen goal regardless of domain, and coding being examined by both researchers.

Results

As shown in Table 3, our approach to examining spontaneous endorsement of metamotivation was informed by Miele and Scholer (Table 1, 2018). Statements made by participants were coded for endorsement of metamotivational regulation, defined as instances in which individuals indicated high or low feelings of previously-established motivational components or costs/obstacles, followed by a description of a strategy to regulate accordingly. Individuals were not explicitly asked to describe feelings of motivation and regulatory strategies for each, since we were interested in understanding how much of this meta-cognitive awareness was expressed spontaneously in our sample. Although motivational components and costs/obstacles are theoretically linked (i.e., promotion and prevention value-type motivation both address regulatory focus, and may be tied to the internal or external value of tasks), they are discussed independently below.

Table 3.

Metamotivational components and costs endorsed during interviews.

Self-Efficacy					
Feelings (High/Low)	Targeted Strategies	Example	% Endorsed		
			ADHD	TD	Emerging Adults
			$n = 10$	$n = 20$	$n = 22$
Confidence Frustration Hopelessness	Efficacy self-talk Proximal goal-setting Adjust goal	*"It's more reassuring…you are like: I've done this, and this, and you just feel better about things"*	90%	25%	36%
Self-Relevant Value					
Meaningfulness Importance Boredom Indifference Purposelessness	Seeing progress towards something personally relevant Connecting task to personal goals	*"I have to keep reminding myself the reason why I'm doing it. If I don't, I am going to go back into the mental state of like 'why am I doing this, this is boring, this doesn't even matter.'"*	30%	35%	32%
Intrinsic Value					
Interest Enjoyment "Zoning out" (Boredom/ Understimulation)	Make task more enjoyable by finding something to like about it Increase challenge to keep it enjoyable	*"Actually sit down and think about how things work, start understanding things, is when I find them interesting."*	50%	10%	9%
External Value					
Coercion Boredom Purposeleness (not linking task to goal)	Self-consequating	*"My mom is a single mom, I want to work hard for her…I only came to school just for her."*	40%	10%	5%

Promotion Value					
Hope Excitement Boredom Indifference Purposeless	Self-talk of what can be gained Focusing on future goal/aspiration	*"I will probably want to go into university, and if I get good grades then it would be easier to get into the program I like."*	70%	20%	23%

Prevention Value					
Feelings (High/Low)	Targeted Strategies	Example	% Endorsed		
			ADHD	TD	Emerging Adult
Obligation/Duty Anxious concern Anticipated relief Purposeless	Self-talk about duty or what can be lost	*"I don't care how miserable you are doing it, you are going to do it to make sure it gets done."*	50%	25%	36%

Temptations & Opportunity Costs					
Temptation Distraction Conflict Flow Focus	Environmental control Multi-final means Self-talk	*"I'm doing my work and somebody comes in and [distracts me]. I don't want to miss the opportunity. I feel like I should just say no…but it's just so hard when something more fun presents itself."*	70%	35%	36%

Emotional Costs/Obstacles					
Distraction Avoidance/Aversion Focus Contentedness	Response modulation/behaviour modification Reappraisal of situation	*"Yeah, I got a seventy-something and it was upsetting, but I need to sit and remind myself getting a…B is not going to ruin your life."*	80%	25%	45%

Effort Costs					
Exhaustion Fatigue Overexertion	Change approach by spacing out tasks,	*"Knowing that I have a schedule a week or two in*	100%	35%	50%

Fluency of effort Focus	adding breaks in schedule	*advance, that I have given myself time to learn the*
	Proximal goal-setting	*content."*
	Sharing concerns or seeking strategies from peers or parents	

Self-Efficacy

Adolescents with ADHD endorsed feelings and strategies related to self-efficacy with

very high frequency, compared to their peers. Notably, adolescents with ADHD did not describe

feelings associated with low self-efficacy, instead describing instances they felt confident and

strategies that maintained it. Across participants expressing metamotivational awareness of their

self-efficacy, youth shared that they engage in efficacy self-talk (e.g., "if I try hard enough,

things are only going to get better") and endorsed doing so when feeling unsure of their current

skill, feeling that more time needed to be devoted, or noticing their negative self-talk. TD and

ADHD adolescents described that their efficacy self-talk may be based on comparison to others

or encouragement from others, while emerging adults only expressed that encouragement was

helpful. One emerging adult described that feelings of low self-efficacy such as hopelessness or

frustration would be a cue that the goal is to be adjusted (see Table 3 "adjust goal" strategy).

Among both emerging adults and TD adolescents, many spoke of proximal goal-setting as a

solution for feelings of hopelessness or frustration (e.g., "the light gets a little brighter. That's the

motivation."), and frustration was also endorsed as a signal for engaging in the breaking-down of

a task into steps, such as scheduling daily practise for a tough part of a piano song a student was

learning.

Self-Relevant Value

The self-relevant value of a goal (i.e., importance and meaningfulness) can change over time, either through utilizing a strategy in response to feelings of low self-relevant value (such as purposelessness, boredom, or indifference; e.g., "my current career path isn't something that I'm super enthusiastic about. So I felt it was important to build up a hobby that I actually enjoy"), or as the goal-directed behaviour progresses with time (e.g., "seeing progress towards something personally relevant" strategy in Table 3).

Boredom was described as a feeling that cues the need for increasing personal relevance of the goal, among typically-developing adolescents and emerging adults. All participants also described that when they are feeling indifferent towards the task at hand, they remind themselves of their reasons for pursuing the larger goal. Besides indifference, adolescents with ADHD did not endorse other low self-relevant feelings described by the other groups, including purposelessness ("don't have a lot going on in my life to be honest"), boredom, or overwhelm. One emerging adult described that they feel purposeless, leading them to enhance their work toward one particular goal (i.e., school) – it is possible that metamotivational feelings lead individuals to put "more eggs" in the basket of a goal they are *not* experiencing low motivation towards. A metamotivational feeling described by some was feeling overwhelmed, which often led to a lack of progress on the goal. Participants also stated that this feeling led them to finding some self-relevant value in the task, such as "okay, you know what, this is the ultimate goal, I need to work towards it." Overall, strategies seem targeted towards raising the importance and meaningfulness of tasks.

Intrinsic Value

Similar to endorsement of self-efficacy, more adolescents with ADHD described their internal motivation (*n*=5) compared to their peers (TD adolescents *n=2,* emerging adults *n*=2).

All adolescents with ADHD described their interest or enjoyment of their goal (i.e., high motivational feeling), and how they maintain this by finding something to like about it. One emerging adult described how they may feel like they are "zoning out," until making an effort to find something to like about their task. An adolescent who had recently earned lifeguarding qualifications described that she decided to work as a lifeguard because she decided she could find something to enjoy about a skill she acquired anyway.

External Value

Regulation of external motivation was described the least overall across participants ($n=4$ adolescents with ADHD, $n=2$ TD adolescents, and $n=1$ emerging adult). High external value was endorsed as feeling forced/coerced to work on a goal, and the only strategy described to maintain this motivation was self-consequating (i.e., "you have to do this"). This was in response to a task that felt boring or not directly linked to their goal (e.g., studying daily for a test in high school, as part of the larger goal of getting into university), though adolescents with ADHD did not make this link between the goal they described and larger goals, which their peers did endorse in their descriptions.

Promotion Value

Many adolescents with ADHD discussed the promotion value of their goal ($n=7$), with a smaller proportion of TD adolescents ($n=4$) and emerging adults ($n=5$) also sharing promotion value feelings and strategies. For this component, participants' descriptions tended to more explicitly link feelings to strategies (e.g., a TD adolescent shared how they engage in self-talk after they feel unsure of their future academic career). All groups similarly discussed strategies for creating or maintaining feelings of hope or excitement (i.e., high promotion value feelings), while only TD adolescents and emerging adults shared feeling purposeless, boredom, or

indifference as cues for strategies to increase promotion value-oriented motivation (i.e., focusing on the future, self-talk). Although adolescents with ADHD shared that they experience these feelings (particularly boredom), only one participant linked this to strategies.

Prevention Value

Metamotivational feelings purported to indicate prevention value (i.e., anxious concern, duty or obligation, anticipated relief) were noted in strategies that participants discussed. One emerging adult described that "you constantly have to motivate yourself" using self-talk focused on their duty, while a TD adolescent described their self-talk as a reminder of what they stand to lose. Most participants with a prevention-value orientation described similar instances of their duty to work on their goal. Two emerging adults described that their previous experiences of receiving lower grades led to their current prevention-value focus, and four adolescents with ADHD shared past experiences that they hoped to avoid in the future.

Temptations/Opportunity Costs

A majority of adolescents with ADHD (*n=7*) described distraction and subsequent environmental control as a part of their goal pursuit. For example, one adolescent with ADHD shared that they have learned to work with noise-cancelling headphones and disable notifications on their computer. All participants endorsing this component expressed feeling tempted by competing interests (e.g., being with friends and having homework), and some discussed incorporating breaks with friends or sharing their goal with friends to compete with and motivate each other. Being distracted by text messages, videos online, or even differences in lifestyle compared to individuals in shared living spaces (parents, roommates) was frequently cited as a temptation. Both environmental control and multi-final means (e.g., "sometimes I study with my friends") were endorsed as strategies to decrease distraction. Similarly, feelings of conflict

between the goal and other personal interests were quelled with environmental control (e.g.,

regimenting break-time), though this was only endorsed by TD adolescents and emerging adults,

while those with ADHD shared feelings of conflict without a strategy to decrease it.

Emotional Costs/Obstacles

Eight of the ten adolescents with ADHD endorsed emotional costs or obstacles, with one

participant describing both high (i.e., distraction, avoidance) and low (i.e., focus, contentedness)

emotional costs, and a majority describing low emotional costs ($n=6$). Half of the emerging

adults also described emotional costs, while only five TD adolescents did so. A salient example

of emotional costs described by adolescents with ADHD was provided by one participant, who

explained that "half the time I don't even notice that I'm procrastinating…if I'm not motivated,

I'm not going to want to do it, and I'll find reasons why I shouldn't do it." In contrast, most

participants in the other groups identified situations after which they observed emotional costs

arising, such as feeling distracted or avoiding their goal when they felt blocked or upset based on

their progress (e.g., "it made me feel really down in the dumps like 'wow maybe I am not

talented in math'"). Many participants described modulating their behaviour to decrease these

feelings, including creating more structure in subtasks (e.g., concrete study plans), changing the

amount of time devoted to the goal (e.g., increasing hours spent studying), looking to others for

strategies (e.g., habits of friends who they deem successful), or simply stepping back from

working on the goal before re-approaching when ready. TD adolescents and emerging adults

spoke of these strategies as behaviours they have already implemented, while those with ADHD

tended to describe them as behaviours they hope to engage in moving forward. Social support

was often endorsed as an intermediary between feeling upset (thus avoiding working on the goal)

and picking a strategy to counter the aversion. When asked what made this type of support

helpful, one adolescent explained that "I guess it's that feeling someone loves you enough to want you to do better and I guess it's just that feeling of someone caring for you."

Effort Costs

Metamotivational feelings of effort endorsed by participants included exhaustion, fatigue, and exertion of mental effort (i.e., stress or overwork). All participants with ADHD described effort costs, with three solely endorsing high effort with strategies (e.g., "it's stressful, but just buckle up and get it done") and four solely endorsing low effort with strategies. Half of the emerging adults endorsed high or low feelings, and seven TD adolescents described high effort feelings. With regard to exhaustion, participants described making changes to their schedule to make room for breaks and spacing out subtasks, and adolescents with ADHD described this strategy more vaguely/broadly than their peers (e.g., "doing homework, actually planning my day" versus describing their schedule). Participants also described setting small proximal goals as a strategy to combat over-exertion, with one individual stating that "I actually feel accomplished and I want to do more, so I feel more motivated." Both groups of adolescents and the emerging adults discussed off-loading some effort or combatting fatigue by talking to peers or parents about their strategies, or even explicitly seeking support through tutoring/monitoring.

Discussion

To date, research on motivation in ADHD has focused on difficulties in academic engagement (e.g., Langberg et al., 2018a; Smith et al., 2020), with more general theories of motivation highlighting underlying difficulties in cognitive processes such as response inhibition, delay aversion, responsiveness to rewards or temporal discounting (e.g., Sagvolden et al., 2005; Tripp & Wickens, 2008). In non-ADHD samples, motivation can be examined as a complex, meta-cognitive process which allows for individuals to work on their goals.

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Metamotivation is one such avenue to promote goal success (Miele et al., 2020), an area not captured in the current ADHD literature despite notable difficulties in goal-striving. To our knowledge, the current study is novel in its integration of metamotivational theory within the adolescent ADHD population. As such, many of the themes identified may be novel ways of conceptualizing motivation in ADHD, though attempts to embed these findings within the current ADHD literature are discussed below.

Our hypothesis that adolescents would demonstrate less metamotivational awareness (as demonstrated by endorsement of fewer motivational components) was not supported, as both groups of adolescents and emerging adults alike expressed both feelings and associated regulatory strategies across all components. Generally, all groups are aware of their experience of high or low motivational feelings (such as boredom, frustration, hopelessness), and strategies that may bolster their goal-striving in the face of their current motivational experience. Within each motivational component, participants discussed a diverse range of feelings and numerous strategies. TD adolescents did not describe fewer motivational components or inaccurate strategies as we had hypothesized, while those with ADHD demonstrated metamotivation, though the nuances of the potential limitations within their abilities are described below.

Participants were not explicitly asked to describe their metamotivational knowledge since we were interested in understanding how much of this self-insight is expressed naturalistically without explicit instruction to do so. The focus of another paper is our thematic analyses of the youths' goals, which demonstrated that adolescents with ADHD more often chose to discuss non-academic goals (e.g., hobbies, personal interests), while almost all TD adolescent and emerging adults discussed academic goals. This inevitably influenced the strategy knowledge demonstrated by participants; for example, the non-academic goals of those with ADHD were

inherently enjoyable, and thus endorsement of high intrinsic value was likely. Studies of academic motivation in adolescents with ADHD demonstrate that internal motivation towards school is lower in those with ADHD (e.g., Smith et al., 2020), though few have used non-academic goals to assess motivation in those with ADHD. It is notable that adolescents with ADHD in our sample endorsed high internal motivation towards their non-academic goals, as this indicates that there may be strategies they use non-academically that could be used to bolster engagement in goals they are less interested in as well. This is further evidenced by the fact that individuals with ADHD endorsed mostly low emotional costs (feeling focused and content, as opposed to bored, for example), discussing strategies they *would* use if they felt costs increase, as opposed to endorsing strategies they actively use to combat high costs – which their peers did. Adolescents with ADHD thus demonstrated the metamotivational ability to reflect on a feeling (i.e., feeling focused, a low emotional cost), and then subsequent strategies to maintain that focus (i.e., adjusting the time needed for a task, breaking it down into subtasks, and taking breaks), which their TD and emerging adult peers described as strategies when faced with high emotional costs.

It is notable that these same strategies are those that adolescents with ADHD have difficulties demonstrating academically, leading to outcomes such as poor homework completion (DuPaul & Langberg, 2015; Power et al., 2006). One consideration of academic difficulties in ADHD is the associated executive functioning difficulties noted in ADHD, which result in challenges such as planning, organizing, and self-monitoring (Martel et al., 2007). These skills are necessary for carrying out many of the metamotivational strategies associated with emotional costs of a task. It may be that the executive functioning demands of the academic context – a noted area of concern for those with ADHD – make the execution of strategies difficult despite

the knowledge of them, though this has not been studied to date. Currently, efforts to improve the academic functioning of adolescents with ADHD (and goal-striving more generally) focus on accommodations for difficulties or teaching new learning skills (Lovett & Nelson, 2021). As a result, little is known about the strategy knowledge of adolescents with ADHD towards the goals they are already having difficulty with.

Motivational interventions for ADHD are a growing area of research, with interventions such as targeting growth mindset, self-esteem, and motivation interviewing under consideration (e.g., Eddy et al., 2018; Sibley et al., 2016). Smith et al. (2020) suggest that further research is necessary to understand which type of motivation (i.e., internal or external) is most helpful in enhancing academic achievement goals for adolescents with ADHD. Based on our finding that adolescents have the strategy knowledge to combat emotional costs of goals they are interested in, one avenue to explore could be supporting youth to generalize their strategy-knowledge. More specifically, a strengths-based approach of boosting strategies adolescents already have could be a welcome addition to building their repertoire of strategies academically, as is traditionally done (e.g., building new organizational, planning, and homework skills; Evans et al., 2014; DuPaul et al., 2021).

In contrast to the finding that adolescents with ADHD are able to link high motivational feelings with strategies (e.g., keeping up focus using a strategy of scheduling breaks), they reported fewer instances of experiencing low motivation compared to their TD and emerging adult peers. While their peers described low motivation within various motivational components, and subsequent strategies to regulate these experiences, those with ADHD shared both fewer feelings and associated strategies. For example, adolescents with ADHD demonstrated the ability to link positive feelings with strategies to maintain a promotion value of their goal (e.g., feeling

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hopeful, then engaging in self-talk to remind oneself that the goal opens future doors), while discussion of low-motivation feelings like boredom were not linked to strategies for increasing the promotion value accordingly. Further, adolescents with ADHD reported more feelings of high self-efficacy compared to the other groups, including feeling confident in their ability to carry out their goal and engaging in self-talk to keep up this confidence. As such, emerging adults and TD adolescents shared strategies such as planning and organizing their time or breaking a task down into proximal steps, while those with ADHD did not. Since adolescents with ADHD were mostly describing their intrinsically motivating non-academic goals, one possibility is that when goals are going well, expressing metamotivational monitoring is as demonstrated here.

It has also been established that adolescents with ADHD have more difficulty with future prospection, making decisions based on the immediate rather than distant future (Kostyrka-Allchorne et al., 2020). Since many strategies to regulate motivational states require the ability to link the current task with some goal (e.g., increasing the promotion value of the task), it could be that adolescents with ADHD have more difficulty monitoring low-motivational states due to the difficulty to think long-term. This difficulty with future prospection may also capture the experience of adolescents with ADHD when focusing on the prevention value of a goal – adolescents with ADHD spoke more about past experiences that they hoped to avoid again, as opposed to their peers who shared the risk of losses should they face failure.

All groups shared strategies such as engaging in self-talk to modulate the prevention value, but those with ADHD reflected on failures already experienced as they worked on the goal. Because metamotivation, and many of the motivational constructs introduced here (e.g., promotion/prevention value of goals) have not been studied in ADHD to date, it is difficult to

situate this finding within the broader ADHD literature. Past research suggests that familiarity with a task is not as important to adolescents with ADHD compared to their peers (Morsink et al., 2017), yet when framed within metamotivational theory, our participants seemed to use their feelings toward past failure as a signal for deploying action towards the goal. This may suggest that despite difficulties with looking to the future and increased likelihood of past failure, adolescents with ADHD demonstrate engagement with their goals.

As mentioned, adolescents with ADHD more often discussed their internally motivating goals; although it may be the case that internally motivated goals require fewer strategies to enhance motivational components such as self-efficacy, when asked about an academic goal they had already achieved, only one adolescent with ADHD described low self-efficacy with the strategy of planning to address it. Similarly, participants with ADHD expressed mainly high self-relevant value of their academic goal, with a few citing indifference as a low feeling (without linking it to a strategy). TD adolescents and emerging adults, however, shared that things like monitoring their progress and reminding themselves of their larger goal help to increase the meaningfulness (i.e., self-relevant value) of their work. This could suggest that our sample of youth with ADHD may not demonstrate as much insight into times they feel less motivated (e.g., low self-efficacy, low internal value, low self-relevant value), or the strategy knowledge to handle those situations. It has been suggested that youth with ADHD have a positive bias in their self-reported abilities (Hoza et al., 2004), reporting their academic and social functioning to be more positive than their parents or teachers. It could be the case that this makes insightfully recognizing instances of low motivation and subsequent compensation strategies more challenging; for example, perhaps an individual is not aware of feeling indifference towards a task (versus meaningfulness), and has difficulty linking this state – if felt at all – with the

strategy of connecting the task to a personal goal. However, more recent examination of the positive self-report bias in adolescents with ADHD has questioned how common this phenomenon is, particularly within the academic domain (Bourchtein et al., 2017). Elucidation of the role of insight would be helpful to better understand the finding that adolescents with ADHD endorse less metamotivational monitoring of low motivation.

Further, although it is not an extensive literature, there are some studies of adolescents with ADHD which suggest that youth are generally less motivated than their peers (see Smith & Langberg, 2018 for review), particularly towards cognitively challenging tasks (Morsink et al., 2021). Despite this, youth did describe strategy knowledge for maintaining their motivation, suggesting that youth pursuing goals that are presumably going well can successfully regulate their motivation to continue their efforts, but have a harder time using a strategy when they have a low motivational feeling. It is not the case that adolescents with ADHD are simply unmotivated, as evidenced here. In fact, subjective ratings of interest towards academics are comparable in adolescents with and without ADHD (Sibley et al., 2019), suggesting far more nuance than those with ADHD being simply less motivated. Given that adolescents can recognize how certain strategies support them to stay motivated, this metamotivational awareness can be used in interventions for building motivation towards difficult tasks as well. Supports known to benefit individuals with ADHD, such as scaffolding or coaching (Ahmann et al., 2017), may be further accentuated by efforts to strengthen awareness of instances of metamotivational awareness already occurring, and building up areas such as recognizing low motivational feelings with their associated strategies.

All adolescents with ADHD in the sample discussed effort costs to their goals, most of which were high, suggesting they recognize the experience of feelings such as exhaustion or

fatigue. There is some evidence that individuals with ADHD exert more effort on tasks compared to those without ADHD (Hsu et al., 2017), and that the deployment of such efforts is less optimal, leading to decreases in performance (Mies et al., 2016). It is unknown how internal motivation (or intrinsic value) influences effort generally in ADHD, but internal motivation is linked to improvements such as academic achievement (Birchwood & Daley, 2012). In our sample, adolescents with ADHD reported higher efforts for their intrinsically valuable goals, however their description of strategies was more vague than their peers – this may be a manifestation of difficulty deploying efforts towards tasks.

With regard to strategizing, descriptions of effort costs presented a salient example of the possible difficulties adolescents with ADHD face. For example, when TD adolescents described that they use changes in their schedule to combat fatigue, they did so by describing specific changes in their schedule and the outcome of that strategy. That is, their metamotivational awareness of the feelings and strategies contained rich details. In contrast, adolescents with ADHD tended to describe this strategy by saying that their strategy was for example, "doing homework, actually planning my day." When considering this finding in the context of what we know about ADHD, this aligns with self-regulation research indicating that individuals with ADHD experience more difficulty modulating feelings, such as fatigue, (Shaw et al., 2014; Targum et al., 2014) including responding to them (Steinberg & Drabick, 2015). When considering metamotivation particularly, it may be that this same pattern of difficulties noted in the general self-regulation literature is evident here as well (Sergeant et al., 2003). This is especially significant given that adolescents with ADHD expressed high effort costs despite the goals described being mostly hobbies/personal interests. Goals that are inherently interesting may not necessarily come easily for adolescents with ADHD, as their difficulties seemingly

impact even enjoyable tasks. It has been established that cognitive and motivational difficulties impact daily functioning of those with ADHD (Martel et al., 2007; Smith & Langberg, 2018), and it could be that tasks/goals are challenging to carry out due to difficulty finding targeted strategies in response to feelings (i.e., demonstrating metamotivation). Metamotivation (including the specific ability to choose strategies for a task) is linked to success in multiple goal domains (Miele et al., 2020), and future work can seek to ascertain if task-strategy knowledge is implicated in the goal difficulties of those with ADHD as well. Strategy deployment is a particularly novel area of study in adolescents with ADHD as most current studies of goal achievement focus on outcomes or performance (e.g., test scores, grades, graduation rates; e.g., Arnold et al., 2020) – metamotivational theory could serve our understanding of the underlying mechanisms of achievement difficulties.

An exception to the demonstrated difficulty linking low motivational feelings to a strategy was adolescents with ADHD's endorsement of distraction as an obstacle to goal pursuit, with accompanying detailed strategies targeted at reducing distraction to stay on task. Many adolescents with ADHD described that when they feel tempted to talk to a friend, watch a video, or text instead of remaining focused on their goal, they use strategies such as self-reminders to stay on task, setting timers, or turning off notifications. Descriptions of this type of metamotivation contained the most quantity and variety of strategies for the ADHD group, suggesting their strategy knowledge for dealing with distraction is potentially greater than other motivational feelings. Since distraction is an often-cited experience for individuals with ADHD (Franklin et al., 2017; Reis, 2002), and many interventions focus on ameliorating this difficulty for those with ADHD (e.g., Barnett, 2017; Evans et al., 2014), it may be that increased experience and exposure leads to more opportunities to learn which strategies effectively

regulate the feeling of distractibility. Another consideration is that metamotivational insight is less challenging to demonstrate for a regularly-occurring experience like distraction – where an adolescent may stray from working on a task and must strategize to return to that one task – while regulation of more complex motivational states may not be as accessible to adolescents with ADHD. This might be evidenced by, for example, the fact that the experience of conflict between goals (an opportunity cost) was described by those with ADHD without sharing a strategy to decrease the feeling; their TD peers shared strategies such as taking breaks to reduce feelings of conflict between goals. It is likely that adolescents with ADHD do encounter feelings of conflict regularly, but this frequent experience does not necessarily mean increased strategy knowledge (such as with distraction). While distraction is a feeling that can occur within one goal (i.e., while working on one task, one may feel distracted), conflict between goals is more complex as it requires balancing between motivational desires. Given that difficulties with executive functioning are known in adolescents with ADHD (Seidman, 2006), motivational feelings which require resolution through utilizing strategies with demand on executive processes like inhibition, flexibility, or working memory, could presumably be more challenging. Further study of metamotivational monitoring should consider the influence of processes like executive functioning on adolescents' ability to engage with a complex motivational state and subsequently find the task-strategy fit in response.

This qualitative examination of metamotivational monitoring indicates that adolescents indeed demonstrate knowledge of strategies that regulate various motivational states. Importantly, both TD and ADHD adolescents have not received much attention with regard to metamotivation in experimental examinations to date. Differences between groups show that there is variability in how much insight people hold about their motivational states, such that

those with ADHD tend to have a harder time recognizing and strategizing for feelings of low motivation, and more complex conflicts between goals. Because we made the methodological decision to code metamotivation as it may have naturally occurred in the interviews, this limitation of our study could be addressed with future work which may well find that more individuals endorse metamotivation when provided a more structured opportunity to demonstrate it.

Our study adds to a burgeoning body of work that suggests individuals have the ability to monitor their motivational feelings and select strategies accordingly, and extends this finding into adolescence. We also explored the nuances between the way that youth with and without ADHD discuss the strategies that support their motivation as they strive for their goals. Moving forward, we hope that studies of adolescents, particularly those with ADHD, consider how metamotivational insight influences outcomes for youth.

Study 4: Assessing Adherence and Clinical Utility of Modified Goal Management Training

for Adolescents with ADHD: A Pilot Study

Attention-deficit hyperactivity disorder (ADHD) is a neurodevelopmental disorder with childhood onset, defined by impairing symptoms of inattention and/or hyperactive-impulsive behaviour (DSM-5; APA, 2013). Approximately 7% of school-aged children are affected by ADHD, with most evidencing persistent symptoms and impairment into adolescence and adulthood (Faraone & Biederman, 2005; Thomas et al., 2015). Across the lifespan, individuals with ADHD are at-risk for myriad challenges across academic, occupational, social-emotional, and health-related domains (Faraone et al., 2021). The chronicity of ADHD symptoms and associated impairments contribute to much personal suffering (Lebowitz, 2013) and societal costs that are estimated in the billions of dollars per year (Chorozoglou et al., 2015; Faraone et al., 2021).

In North America, stimulant medications are considered first-line treatment for ADHD management (Greenhill et al., 2001; Spencer et al., 2000). This approach to treatment is clinically effective for most individuals with ADHD, as reflected in temporary improvements in core symptoms coupled with longer-term protective effects for mental and physical health (Boland et al., 2020). Importantly, however, stimulant medication is either not effective or tolerated by a significant percentage of individuals with ADHD (Adler & Nierenberg, 2010; Gajria et al., 2014) and there is a tendency for medication adherence to decline in the adolescent years (Charach & Fernandez, 2013). Other empirically supported treatment options for ADHD include parent management training, which has been shown to shift parent-child dynamics in a more positive direction and reduce child conduct problems (Daley et al., 2014), and educational interventions, which aim to increase educator knowledge and support of ADHD-related

academic difficulties (Ward et al., 2022). There is limited evidence that alternative treatments are

a helpful component of an ADHD treatment plan (e.g., neurofeedback, special diets; Cortese et

al., 2016; Sonuga-Barke et al., 2013). Generally, non-medication treatments of ADHD seek to

improve daily functioning across life domains (e.g., academic, social), with the aim of going

beyond the short-term symptom reductions seen with medications.

Executive functions (EF) are a set of cognitive abilities used to facilitate goal-oriented

behaviour (Goldstein et al., 2014). Examples of specific executive skills include working

memory, response inhibition, and cognitive flexibility, which contribute to more complex EF

behaviours such as planning, organization, and emotion regulation (Miyake & Friedman, 2012).

ADHD is associated with weaknesses in EF, as reflected in performance on tasks assessing

relatively circumscribed skills (Carbonneau et al., 2021; Lipszyc & Schachar, 2010; Martinussen

et al., 2005; Ramos et al., 2020) and rating scales that capture more global challenges using EF

in everyday life (Toplak et al., 2008). Amongst youth with ADHD, weakness in EF are

associated with greater academic and social-emotional challenges (Sibley et al., 2019). EF

interventions have not been widely studied in adolescents, particularly those with ADHD, but

those that train isolated EF skills (e.g., working memory) are not empirically supported (Cortese

et al., 2015; Sala & Gobet, 2020). There is evidence, however, that interventions focusing on

self-regulation and strategy implementation in everyday settings may be helpful for ADHD

adolescents (Lovett & Nelson, 2021).

Goal management training (GMT) is a group-based intervention designed to promote

everyday EF by focusing on improving awareness of EF deficits (metacognitive remediation),

self-monitoring, and learning skills and strategies to successfully complete tasks of daily living

(i.e., goals; Robertson & Garavan, 2000; Levine et al., 2001). One of the most-studied training

programmes of its kind (Stamenova & Levine, 2018), GMT posits that difficulties in EFs have a detrimental downstream effect on goal-striving that is evident across various clinical populations (Duncan et al., 1996; O'Conner et al., 2011). GMT is different from interventions that train specific EF skills because it uses individuals' personalized goals as the primary outcome, ensuring that the intervention targets everyday EF as it relates to participants.

GMT has been used across diverse adult clinical populations (see Stamenova & Levine, 2018 for a meta-analytic review), including adults with ADHD (In de Braek et al., 2017; Jensen et al., 2021). Preliminary studies of adults with ADHD have reported that participation in GMT yields improvement on performance-based measures of inhibition, with effects lasting 6 months post-treatment (Jensen et al., 2021). Subjectively, adults with ADHD have also reported reduced cognitive difficulties, better productivity, and improved management of ADHD in everyday life following GMT participation (Nordby et al., 2021). More generally, GMT has been associated with improvements in memory, mental health, and subjective ratings of everyday EF in other adult clinical populations (e.g., acquired brain injury, substance abuse; Stamenova & Levine, 2018).

A few studies have examined the feasibility and effectiveness of using GMT in developmental populations, such as youth with acquired brain injuries, spina bifida, and self-reported executive dysfunction (Brandt et al., 2021; Krasny-Pacini et al., 2014; Nunes & Seabra, 2021; Stubberud et al., 2021). Modifications to the standard GMT protocol in these studies have included individual rather than group sessions (Krasny-Pacini et al., 2014), fewer sessions (e.g., 8 rather than the standard 9; Nunes & Seabra, 2021), more sessions spread out over a longer time (i.e., 15 sessions over 4 – 6 months; Krasny-Pacini et al., 2014), changing in-session and homework activities to be developmentally-appropriate (e.g., a bookkeeping task was changed to

a gift-buying task or cooking; Nunes & Seabra, 2021; Stubberud et al., 2021), and the medium of homework delivery (e.g., participants filmed themselves completing homework and texted it to researchers, rather than a written log; Nunes & Seabra, 2021). GMT modified for youth has been reported to be enjoyable for participants and associated with improved EF, including performance on tasks of flexibility and inhibition (Nunes & Seabra, 2021) as well as informant report of EF applied in everyday life (Krasny-Pacini et al., 2014; Stubberud et al., 2021).

To our knowledge, no studies have utilized GMT in adolescents with ADHD. The aim of the current study was to pilot a 6-session group-based course of GMT, delivered virtually and modified for use with ADHD adolescents aged 14 – 17 years. We selected this age range because adolescence is developmentally unique in both environmental and cognitive changes (Heckhausen et al., 2010), with goal-striving being more difficult as a result. Firstly, we aimed to assess adherence to and compliance with our modified GMT program and hypothesized that youth would attend most sessions and follow the protocol for between-session work. Secondly, we aimed to examine the clinical utility of the pilot vis-a-vis primary outcome measures reflecting youth's progress toward goal-attainment and everyday application of EF (including reliable change scores on the latter). Consistent with studies that have used GMT with ADHD adults (Jensen et al., 2020; Stubberud et al., 2019), we hypothesized that our adolescents with ADHD would show immediate and sustained improvements on primary outcomes reflecting their personalized goals and everyday EF because these are directly targeted by GMT. To gage potential generalizability of our modified GMT to more distal outcome measures, reliable change scores were also created for youths' performance on tasks assessing relatively circumscribed EF skills coupled with ratings of their mood, anxiety, self-concept, and overall functional impairment. We hypothesized that youth would demonstrate improvement on performance-based

EF skills (i.e., inhibition and switching, measured pre/post training neuropsychologically), as these secondary outcomes are closely related to the skills trained in GMT, and most likely to benefit from the training (Levine et al., 2011). Reductions in functional impairment were also hypothesized, as this is a benefit of GMT frequently cited in other populations, including randomized controlled trials of GMT (Stamenova & Levine, 2018), suggesting that improvement of EF skills trained in GMT could support everyday function in various life domains. Improvement in mood, anxiety, and self-concept were also hypothesized, consistent with previous studies of GMT (Stamenova & Levine, 2018).

Methods

Participants and Recruitment

Potential participants were recruited via letter distributed by email to former clients diagnosed with ADHD at the Centre for Mental Health Research and Treatment at the University of Waterloo, a waitlist of youth with diagnosed ADHD from a previous clinical research study (Sandberg & McAuley, 2022), and an online posting on a Canadian ADHD resource website (i.e., CADDRA). Parents of eight youth 14 – 17 years contacted the first author (M.S.) to schedule an initial phone screen, after which informed consent was obtained from the youth and their parents. Inclusion criteria included current high school attendance, a formal diagnosis of ADHD, and current presentation of at least 6 of 9 symptoms of inattention and/or hyperactivity-impulsivity per parent report using the CADDRA checklist (CADDRA, 2014). Exclusion criteria were inability to access technology requirements (i.e., a computer with internet, a microphone, and camera), comorbidities that precluded group participation (namely, severe social anxiety interfering with being on camera), and auditory or visual impairments due to the nature of group materials used for the study (PowerPoint slides, group discussions, paper-based homework). Two

adolescents were ineligible to participate because they were not comfortable being on camera (*n* = 1) or did not currently meet a clinical threshold of ADHD symptoms (*n* = 1). The final sample included six adolescents (M_{age} = 15 years, *SD* = 1.1; 2 females; 66% taking stimulant medication for ADHD management). To characterize the sample, the Matrix Reasoning subtest from the *Wechsler Intelligence Scale for Children – Fifth Edition* (WISC-V; Wechsler, 2014) was used at baseline testing as this subtest has a high factor loading on general intelligence (e.g., Canivez et al., 2017). The mean standardized score on this subtest in our sample was 99 (*SD* = 17.8), with one participant not included due to an invalid score. This study was approved by the Office of Research Ethics at the University of Waterloo.

Procedure

This study was conducted virtually due to the COVID-19 pandemic, with all assessments and the GMT program provided through Microsoft Teams. Guidelines for virtual therapy were provided by the Ontario Psychological Association (OPA & CAPDA, 2020), as well as consultation with the GMT program creator. Assessments occurred at three time points: baseline (approximately 2-4 weeks prior to GMT), immediately following GMT (within 2 weeks following the last session), and 3 months post-GMT.

At baseline assessment, participants met with the first author (M.S.) on Microsoft Teams for approximately 1 hour. Participants completed four measures (WISC-V Matrix Reasoning and Letter Number Sequencing, DKEFS Color-Word Inhibition, and Goal Attainment Scale) and four questionnaires (Weiss Functional Impairment Scale and ADHD Symptom Rating Scale on Qualtrics, BYI-2 Depression, Anxiety, and Self-Concept scales on Pearson Q-Global, and the BRIEF-2 on PARiConnect). One parent/guardian also received e-mail links to three questionnaires (Weiss Functional Impairment Scale, BRIEF-2, COVID-19 questionnaire). This

battery, other than the WISC-V Matrix Reasoning task, COVID-19 questionnaire, and ADHD Symptom Rating Scale, was re-administered immediately following the 6-week intervention period and again 3 months later. The same parent/guardian informant provided ratings at each time point. All participants were compensated with $50 CAD at the completion of each post-GMT assessment.

GMT

GMT is an interactive, group-based intervention designed for improving adult participants' ability to organize and achieve goals. The original, nine-week program consists of discussions for raising awareness of goal management (i.e., deficits in assessing tasks and behaviour, self-monitoring, task splitting, and mindfulness), tasks designed to demonstrate constructs and practice strategies, as well as homework for putting strategies into effect. The goal of GMT is supporting participants to understand their difficulties and providing techniques for compensation. To make GMT amenable for adolescents with ADHD through a virtual platform, we modified the program such that it consisted of six weekly 1-hour group sessions. We retained all core constructs and discussions from the original protocol, combining ideas across sessions where appropriate (to condense the total number of sessions), and removing some in-session tasks that could not be applied virtually (e.g., replacing raisin task for mindfulness with a breathing exercise). We also retained the PowerPoint slide format and workbooks given to each participant. Discussion questions, vignettes, tasks, and homework were adjusted for the context of ADHD and age-appropriateness as needed (e.g., replacing references to brain injury with ADHD, replacing an example of planning a vacation with preparing for an exam). Table 4 presents descriptions of each modified GMT session, and a complete list of our modifications is provided in Appendix A.

Table 4.

Summary of Modified Goal Management Training Sessions

GMT Module				
Modified	Original	In-Session Focus	In-Session Activities	Assigned Homework
1	1 & 2	• Absent-minded slips	• Use vignette to discuss nature of and reasons for absentmindedness • Discuss simple and complex goals • Use clapping task to induce slips • Volunteer examples of real-world slips from personal life • Provide information about consequences of slips, why they happen, and how we can learn to reduce them using GMT • Normalize the experience of slips	• Track absent-minded slips and consequences
2	2 & 3	• Automatic pilot • Present-mindedness	• Review homework • Use card-sorting task, vignettes, and video to elicit/show absent-minded slips and link to the concept of an automatic pilot • Provide information about present-mindedness and how it is opposite to the automatic pilot • Show video "Why Mindfulness Is a Superpower" • Demonstrate and practice a mindful breathing exercise	• Continue to track absent-minded slips and consequences • Practice mindful breathing

3	4 & 5	• STOP! • FOCUS	• Review homework and previously discussed concepts • Provide information about stopping the automatic pilot (STOP!) • Provide information about focusing on the present moment and using a mental whiteboard to check whether behaviour aligns with one's goal in the moment (FOCUS)	• Continue to track practice mindfulness • Practice STOP! • Track absent-minded slips and also successes using the STOP!-FOCUS strategy
4	5 & 6	• STOP!-FOCUS • STATE	• Provide information about using one's breath to facilitate FOCUS • Provide information about following STOP!-FOCUS with stating one's goal (STATE) • Use a complex task to demonstrate and practice STOP!-FOCUS-STATE	• Continue to practice mindfulness • Practice STOP!-FOCUS-STATE • Track absent-minded slips and successes using STOP!-FOCUS-STATE
5	7 & 8	• STOP!-FOCUS-STATE • SPLIT	• Review homework and previously discussed concepts • Provide information about splitting tasks into smaller and more manageable subtasks (SPLIT) • Introduce to-do lists and organizers	• Continue to practice mindfulness • Use a chart to track times during the week when STOP!-FOCUS-STATE-SPLIT occurred
6	9	• CHECK • Wrap-up	• Review homework and questions • Use vignette to present the idea of checking one's progress toward task/subtask completing and adding this last step to the cycle (CHECK) • Use a complex game to practice and discuss STOP!-FOCUS-STATE-SPLIT-CHECK • Provide a final summary of modified GMT to youth and their parents (invited to join for last 10 minutes)	

Sessions were conducted over six consecutive weeks on a consistent day and time after school hours. The group was comprised of six participants and two facilitators, the latter of whom were doctoral students in clinical psychology. The senior author, a registered PhD-level clinical psychologist (T.M.), attended all sessions with camera and microphone off to observe. Weekly supervision meetings occurred between sessions.

Sessions consisted of short lectures introducing a concept, vignettes or tasks, and discussions intended to increase awareness of attention "slips" in daily life and learn/practice GMT strategies. The latter are designed to increase participants' capacity for self-monitoring and executive control (e.g., "stopping" to check for slips in attention, "stating" the goal) coupled with effective problem-solving when needed (e.g., "splitting" tasks, completing a "check" to monitor behaviour). Participants were encouraged to complete daily mindfulness exercises to promote sustained attention. Weekly homework was assigned to reinforce learning that occurred within sessions and promote generalization of strategies to daily life in an incremental manner (e.g., week one entailed recording "slips," week two added mindfulness practice, and week three involved practising the "stop" technique). Homework reviews were facilitated in 2 break-out rooms, with one facilitator and 2-3 participants present in each, at the beginning of each session. Facilitators recorded attendance and homework completion each week. At the end of each session, parents received an emailed summary of the session, including a session summary and homework review. In the case of missed sessions, participants were offered a separate individual session with a facilitator prior to the next group session.

Measures

ADHD Symptoms

The ADHD Self Report Scale (ASRS; Kessler et al., 2005) and the CADDRA ADHD Checklist (CADDRA, 2014) were completed by youth and their parents, respectively (a = .75 and a = .86, respectively). Both are 18-item checklists assessing youth's experience of the 9 core symptoms of inattention and 9 core symptoms of hyperactivity/impulsivity in a 6-month period. Responses were recorded on a 5-point Likert scale ranging from *never* (0) to *very often* (4), with scores at or above 3 reflecting a symptom that is clinically elevated (i.e., considered to be present).

Impact of COVID-19

The COVID-19 Family Stressor Scale (CoFaSS; Prime et al., 2021) consists of 24 items that identify potential impacts of the pandemic on multiple aspects of family function. An earlier version of this scale was used prior to publication of the final 16-item version, likely resulting in lower reliability of scores (a = .61). Parents responded to each question on a 3-point Likert scale ranging from *not true* (1) to *very true* (3), with responses summed to create a total score. The max score on this scale is 72, with higher scores indicating greater pandemic-related disruption.

Primary Outcome Measures: Everyday Executive Functioning

EF in Daily Life

Parent and youth self-report versions of the Behaviour Rating Inventory of Executive Functioning – Second Edition (BRIEF-2; Gioia et al., 2015) were used to assess subjective ratings of EF in everyday life. This 63-item questionnaire asks respondents to rate various executive functioning skills demonstrated by youth during a 6-month period, with ratings on a 3-point Likert scale ranging from *never* (1) to *often* (3); reliability for self-report ranged a = .60 - .80 (with baseline and time 1 a above .77), and parent report a = .91 - .97. Scores were

aggregated to generate an index of overall executive dysfunction, termed the General Executive

Composite (GEC).

Goal Attainment

We modified the Goal Attainment Scale (GAS) protocol per guidelines suggested by

Turner-Stokes (2009) to assess youths' progress on a personal goal after participation in GMT.

Prior to the program, each youth developed a personal goal with the support of the facilitator.

Participants were encouraged to select a goal that followed S.M.A.R.T principles (specific,

measurable, achievable, realistic, and timely; Rubin, 2002), and were told they could keep this

goal in mind when practising GMT strategies during the intervention period. At each follow-up

assessment, youth rated their progress on the goal, indicating if they achieved the goal (yes/no),

saw any improvement (improved/same/worse), and whether this improvement met their

expectations (less than/as much as/more than expected).

Secondary Outcome Measures

Inhibition and Inhibition/Switching

Inhibitory control was assessed using the Color-Word Interference Test (CWIT) from the

Delis Kaplan Executive Function System (DKEFS; Delis et al., 2001). Two conditions were

administered: an inhibit condition, which required youth to name the ink color of an

incompatible color-word (e.g., RED printed in blue ink) and an inhibit/switch condition, which

required youth to switch between naming the ink colors and reading the color words. Completion

time (in ms) was recorded in both conditions.

Working Memory

The Letter-Number Sequencing (LNS) task from the Wechsler Intelligence Scale for

Children, 5th Edition (WISC-V; Wechsler, 2014) was administered to assess verbal working

memory. Youth heard a series of jumbled numbers and letters read aloud, which they were required to verbally re-sequence with numbers first in increasing order followed by letters next in alphabetical order. Trials began with a string of 2 items and increased by one, until youth incorrectly recalled a string of *n* items on two consecutive trials. Total correct was recorded.

Mood, Anxiety, and Self-Concept

Beck Youth Inventories – Second Edition (BYI-2; Beck et al., 2005) was used to assess youths' mood and anxiety within a 2-week period as well as their general self-concept. Each of the three scales consisted of 20 items ranging from *never* (0) to *always* (3), with a total score derived from the sum of all items within a subscale. The depression subscale asked youth about physical, cognitive, and emotional facets of mood (e.g., feeling sad, feeling empty inside, feeling lonely, having trouble doing things, thinking life is bad) (reliability at each time point ranged from a = .83 - .94) The anxiety subscale asked youth to report upon physical symptoms of anxiety (e.g., difficulties sleeping, heart racing), as well as various fears/worries correlated with anxiety disorders (e.g., worrying about getting sick, being hurt, making mistakes, others' perceptions) (reliability at each time point ranged from a = .83 - .94). The self-concept subscale instructed youth to rate their belief in various statements about their physical, intellectual, and relational self-worth (e.g., feeling strong, smart, or proud, people wanting to spend time with them, and being kind to others) (reliability at each time point ranged from a = .88 - .93).

Functional Impairment

The impact of ADHD on daily functioning in various domains (family, school, life skills, relationships, risky activities) was assessed using self- and parent-report versions of the Weiss Functional Impairment Rating Scale (WFIR-S/WFIRS-P; Weiss et al., 2005). Each version consists of 50 items, with responses recorded on a 4-point Likert Scale ranging from *never* (0) to

very often (3). Mean scores from each version of the WFIR were used (self-report *a* = .79 - .98, parent report *a* = .95 - .97).

Analyses

Descriptive statistics were used to summarize clinical and demographic variables. Raw scores were used for all analyses. Completed questionnaires had no missing data, though some participants or parents did not complete all questionnaires at every time point. Reliable change indices (RCIs) were calculated for each outcome measure, using psychometrics provided by publishers of the measures to calculate standard error and difference scores. The internal consistency of each measure (Cronbach's *a*) along with the standard deviation of scores from the normative sample were used for all but the DKEFS Color-Word Interference Test, for which only test-retest reliability was available and thus used.

Results

Demographic and clinical information for all participants is shown in Table 5. All 6 youth were originally diagnosed with ADHD between 7 and 12 years of age, with three reporting that they were identified with the combined subtype and two reporting they were identified with the primarily inattentive subtype (one was unsure). Based on parent ratings of current ADHD symptoms, all 6 youth evidenced threshold symptoms of inattention and 2 youth evidenced threshold symptoms of hyperactivity/impulsivity. Youth rated their own ADHD symptoms overall lower than their parents, with only one youth indicating threshold symptoms of inattention, and none with hyperactivity/impulsivity. Parents endorsed a moderate level of COVID-19 disruptions such as financial hardship/change, increased conflict at home, changes in routine, emotional distress, loss/bereavement, and reduced access to goods or services (*M* = 38.2 out of 72, *SD* = 5).

Table 5.

Demographic and Clinical Characteristics

| | | | | | | Baseline Rating | | | | |
| | | | | | | Parent | | Self | | |
Participant	Age	Sex	Age at Diagnosis	Diagnosis	Medication	Inattention	Hyperactivity/Impulsivity	Inattention	Hyperactivity/Impulsivity	COVID-19 Impact
01	14	F	8	Combined	No	9/9	9/9	8/9	5/9	47
02	15	M	8	Inattentive	Yes	6/9	3/9	4/9	2/9	38
03	14	M	12	Combined	Yes	8/9	7/9	1/9	1/9	37
04	15	M	7	DK	Yes	7/9	5/9	3/9	2/9	40
05	15	M	9	Inattentive	Yes	7/9	2/9	5/9	1/9	34
06	17	F	8	Combined	No	6/9	4/9	5/9	3/9	33

Attendance and Homework

Four youth participated in all six sessions, with the remaining youth completing four and five of the sessions respectively (i.e., they did not attend the make-up sessions either). Sessions missed included information on splitting a task into smaller subtasks ("SPLIT") and monitoring progress towards the goal ("CHECK"). In every session, all youth actively participated if they were present (see Table 6). To be counted as complete, all components of assigned homework were required to be accomplished (i.e., mindfulness practice, tracking sheet of "absent-minded slips," and any other logging needed that week). None of the youth were successful in completing all the homework, with completion rates varying between one to three of the five assignments. In contrast, four youth tried on four or five of the five assignments. The remaining two youth attempted homework only once (and were not successful in completing it).

Table 6.

Adherence to Goal Management Training

Participant	Sessions Attended	Homework Attempted	Homework Completed
01	4/6	1/5	0/5
02	6/6	5/5	2/5
03	6/6	5/5	3/5
04	5/6	4/5	3/5
05	6/6	5/5	1/5
06	6/6	1/5	0/5

Goal Attainment

Participants were encouraged to create a S.M.A.R.T. goal they could think about when completing the training, derived from a personally meaningful goal they shared. For example, participant 2 shared the goal "improving my ability to do homework," which became the more concrete and specific goal of "completing 5 questions of geography homework every day after school." Three participants selected academic goals (1, 2, 3), while the other three selected self-care, hobby, and chore-related goals. Of our six participants, three indicated at the second follow-up assessment that they achieved their S.M.A.R.T. goal (2, 3, 4). No participants endorsed achieving their goal immediately following GMT, though the three who later achieved their goal endorsed improvement towards their goal at first follow-up and achieved more than they expected. Participants 5 and 6 reported that they achieved less than they expected, one of whom (5) felt they made improvement in their progress while the other did not. Out of the three participants who did not meet their S.M.A.R.T. goal, participant 5 showed improvement in their progress between the first and second post-training assessments. Participants 1 and 6 felt their progress toward their goal remained the same throughout, and participant 1 endorsed that this was about as much progress as they expected. Goals are presented in Table 7.

We also asked participants to comment on their training experience, particularly regarding the GMT skills. Participants 1 and 6 reported that they did not remember the skills. Participants 2 and 3 endorsed using mindful breathing in their day-to-day life, such as before bed or when stressed about school, and both participants also reported using the "SPLIT" skill to break down tasks into steps. Participants 4 and 5 described their use of GMT skills more generally, feeling more aware of when they are off-task and using "STOP-STATE" to return to

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their task. Participant 4 shared that they have certain times of the day where they will use "STOP-STATE."

Reliable Change

Mean scores and reliable change indices for each measure at baseline and follow-up are presented for each youth in Table 8. Across ratings provided by youth and their parents, there was at least partial agreement that 3 youth evidenced a decline in their everyday executive dysfunction (i.e., GEC) following participation in GMT that was maintained 3 months later (participants 2, 4, and 6). One youth (participant 5) endorsed improvement at the time of the second follow-up, but reliable change could not be calculated for their parent owing to missing ratings at baseline. Another youth (participant 1) did not provide ratings at either follow-up and their parent did not do so at the final assessment. Hence, it is unclear whether these 2 youth demonstrated a similar benefit from GMT vis-à-vis their EF in daily life as others in the group.

Moreover, there were some notable changes on secondary outcome measures consisting of objective performance on EF tasks. Four youth evidenced improvement on a task of inhibition – a core GMT skill – at either both follow-ups (participants 1, 5, 6) or just the second follow-up (participants 3). Four youth also evidenced improvement on a similar task that entailed inhibition with a switching component (first follow-up only: participant 4; second follow-up only: participants 2, 3; both follow-ups: participant 5), an EF skill central to many daily tasks. In contrast, performance on a working memory task remained consistent for most youth across both follow-up time points (an exception being an improvement for participants 5 at the second follow-up).

Table 7.

Goal Attainment Scale (GAS) Based on S.M.A.R.T. Goals Selected Prior to Training

Participant	S.M.A.R.T. Goal	Time 1 Follow-up			Time 2 Follow-up		
		Achieved	Degree of Change	Change Relative to Expectation	Achieved	Degree of Change	Change Relative to Expectation
01	Complete 15 minutes of schoolwork each weekday morning	No	None	As much	No	None	As much
02	Complete 5 questions of geography homework everyday after school	No	Improved	More	Yes	Improved	More
03	Open planner and record assignments at the end of every class	No	Improved	More	Yes	Improved	More
04	Clean-up after dinner with fewer than 5 instances of pacing beforehand	No	None	Much less	Yes	Improved	More
05	Practise guitar for 10 minutes each day	No	Improved	As much	No	Improved	Less
06	Spend 5 minutes outside on the trampoline every other day	No	None	Less	No	None	Less

Other notable changes were observed on secondary outcome measures consisting of youth and parent ratings. All parents endorsed improvement in their teens' functional impairment after GMT that was maintained at the 3-month follow-up. Converging reports were provided by half of our youth – including two youth who identified a reduction in impairment at both follow-ups (participants 2 and 4) and one who did so at the second follow-up (participant 5). Several youth identified improvements in their mood and/or anxiety following GMT (participants 2, 4, and 6) and one demonstrated improved self-concept (participant 1).

Table 8.

Reliable Change (RC) on Outcome Measures Pre-Training, Immediately Post-Training, and at 3-Month Follow-Up

	Participant					
Outcome	1	2	3	4	5	6
EF in Daily Life (Self)						
Baseline	104	97	79	99	95	109
Post 1	-	84	95	91	99	108
RC	-	5.42*	6.67	3.34*	1.67	0.42
Post 2	-	80	90	95	85	99
RC	-	7.09*	4.59	1.67	4.17*	4.17*
EF in Daily Life (Parent)						
Baseline	165	161	143	136	-	144
Post 1	171	108	135	112	112	127
RC	2.21	19.49*	2.94*	8.83*	-	6.25*
Post 2	-	79	142	93	104	128
RC	-	30.16*	0.37	15.82*	-	5.88*
Inhibition						
Baseline	78	49	70	52	45	97
Post 1	62	58	72	64	39	79

RC	11.89*	6.69	1.49	8.91	4.46*	13.37*
Post 2	68	51	54	53	37	91
RC	7.43*	1.49	11.89*	0.74	5.94*	4.46*
Inhibition/Switching						
Baseline	79	58	65	59	68	86
Post 1	77	58	61	50	58	86
RC	1.08	0	2.15	4.84*	5.3*	0
Post 2	75	51	53	52	50	105
RC	2.15	3.76*	6.45*	3.76	9.68*	10.23
Working Memory						
Baseline	18	19	22	17	19	12
Post 1	14	18	19	18	21	15
RC	2.86	0.63	2.14	0.63	1.26	1.67
Post 2	18	19	21	18	22	13
RC	0	0	0.71	0.63	1.89*	0.55
Functional Impairment (Self)						
Baseline	1.34	0.64	0.35	0.52	0.31	0.75
Post 1	1.58	0.35	0.44	0.21	0.20	0.62
RC	3.03	3.64*	1.15	3.83*	1.40	1.64
Post 2	1.17	0.29	0.38	0.24	0.18	0.86
RC	2.15*	4.41*	0.38	3.47*	1.60*	1.39
Functional Impairment (Parent)						
Baseline	2.71	1.61	1.91	1.20	0.93	1.93
Post 1	2.26	0.60	0.96	0.40	0.38	0.76
RC	1.97*	4.37*	4.13*	3.46*	2.38*	5.07*
Post 2	2.42	0.5	0.88	0.38	0.28	0.78
RC	1.28*	4.81*	4.47*	3.54*	2.38*	4.99*
Mood						
Baseline	23	21	7	18	11	29

Post 1	24	9	7	13	15	25
RC	0.60	3.47*	0	1.58	1.27	0.63
Post 2	-	9	9	4	11	20
RC	-	3.47*	2.09	4.42*	0	2.21*
Anxiety						
Baseline	25	17	9	15	15	29
Post 1	28	10	13	12	13	26
RC	0.77	1.99*	1.02	0.99	0.50	0.75
Post 2	-	8	14	7	18	36
RC	-	2.75*	2.31	2.25*	0.75	1.74
Self Concept						
Baseline	35	27	47	35	38	31
Post 1	26	31	42	37	39	25
RC	2.17*	1.18	1.18	0.47	0.24	1.50
Post 2	-	29	44	35	34	33
RC	-	0.47	0.47	0	0.94	0.50

reliable positive change based on standard difference calculated from each measure

Discussion

This pilot study presents preliminary evidence supporting use of modified GMT as an EF intervention for adolescents with ADHD. Though there is no consensus definition of adherence in the GMT literature, all the youth in our study attended at least four sessions and actively participated in each session they attended. Our online GMT was scheduled on the same weekday afternoon immediately after-school during a time when students were in virtual school due to the pandemic, which likely made it easier for them to join the sessions consistently and on time. Further confidence in adherence to our modified GMT could be established in future work with

the inclusion of a psychometrically valid tool similar to what has been used in other clinical interventions (Vitolins et al., 2000; Williams et al., 2012).

Homework attempts also were high, though completion was low. During homework reviews, most youth discussed ways in which they had applied session concepts and utilized specific strategies between sessions (e.g., noting instances of absent-minded slips, using the STOP!-FOCUS-STATE strategy to stay on-task); however, they usually forgot to record this information in their homework logs which resulted in their homework being marked as incomplete. Youth offered insights into barriers to logging their homework, including forgetting to open the electronic file on their computer, losing the hard copy of their workbook, or feeling too busy with schoolwork. Difficulties with homework completion are commonly experienced by youth with ADHD in an academic context (e.g., DuPaul & Langberg, 2015). Because the rationale for assigning homework in GMT is encouraging generalization of in-session work to everyday life, a more informative metric of homework adherence may be recording the frequency with which ADHD youth thought about core ideas and/or practiced skills in their everyday lives. Additionally, given widespread use and preference for digital technology amongst adolescents today (Vogels et al., 2022), changing the format of homework may be a helpful adaptation of GMT for adolescents with ADHD. Indeed, when using GMT with Spanish adolescents who had self-reported EF challenges, researchers facilitated homework completion by requesting that youth submit video recordings of their daily GMT skill use (Nunes & Seabra, 2021). Lastly, developing a strong therapeutic relationship with youth and engaging parents in providing their youth with homework support have been shown to increase homework compliance in adolescents with ADHD (Breaux et al., 2018). Although we believe that a good working alliance was established with adolescents in our pilot, parent engagement was difficult

to assess given the online format of our modified GMT and the challenging social context of pandemic lockdowns.

Training in mindfulness is a component of GMT that was retained in our modified version of the program. Mindfulness-based interventions have been shown to reduce ADHD symptoms and associated difficulties with attention, EF, and emotion regulation in individuals with the disorder – including youth (Al-Yagon & Borenstein, 2022; Lee et al., 2022; van de Wieger-Bergsma et al., 2012; Virone, 2021). Half the youth in our pilot endorsed practising mindfulness between sessions (e.g., breathing exercises, sleep meditations), though this component of GMT was least likely to be completed regularly by participants. Nonetheless, youth in our pilot reported that learning about and practicing the 'breath focus' strategy with clinicians in-session was helpful (i.e., pausing to take a deep breath before beginning a task). This suggests that the brief mindful pause incorporated into GMT was utilized by even those who were not formally practicing mindfulness as homework. Notably, positive findings reported in association with mindfulness training are derived from interventions in which mindfulness is the primary focus (Davis & Mitchell, 2020). In our pilot, mindful breathing and a body scan were introduced and then practised in-session; however, the short and virtual nature of our group impeded upon our ability to sit for longer guided practices or offer alternative exercises for youth to try. It may be particularly beneficial for adolescents with ADHD to find ways of increasing time for mindfulness in GMT to further support their engagement with this component of the intervention.

Our pilot demonstrated reliable change in several outcome measures following youths' participation in modified GMT. Consistent with our hypothesis, there was converging evidence from several youth and their parents that youth showed a reduction in challenges using their EF

skills in everyday life. Our findings align with those of other studies that have found everyday EF to improve in various groups of youth (Brandt et al., 2021; Krasny-Pacini et al., 2014; Nunes & Seabra, 2021; Stubberud et al., 2021) and adults with ADHD (In de Braek et al., 2017; Jensen et al., 2021) after completing a GMT intervention. GMT is posited to improve inhibition through increasing meta-cognitive awareness to stay on task, which in turn creates the mental space necessary for developing and practising other important EF skills like planning and organizing (Levine et al., 2001). Half of our participants demonstrated improved performance on a task of inhibition, which is one of the most reliably demonstrated changes associated with GMT (e.g., Cuberos-Urbano, 2018; Nunes & Seabra, 2021). This finding is particularly notable given that inhibitory deficits are common in ADHD and tend to persist even amongst youth who appear to 'outgrow' the disorder (Lipszyc & Schachar, 2010; McAuley et al., 2014). Other foundational EF skills, like cognitive flexibility and working memory, have also been implicated in ADHD (e.g., Carbonneau et al., 2021). In our pilot, several youth demonstrated improvement on a task assessing the former but there was no evidence of post-GMT change on a task assessing the latter. Based on the aims of GMT, meta-cognitive awareness targeted at improving inhibition and flexibility is explicitly trained while compensatory strategies for skills like working memory are provided (e.g., using a "mental whiteboard," external lists to off-load, monitoring tasks) – as such, working memory is not a direct focus of the skills taught. However, a meta-analysis of GMT studies suggests significant effects on working memory (Stamenova & Levine, 2018), thus it is a secondary outcome that is likely worth further investigation.

All parents reported a reduction in their youth's level of functional impairment following completion of GMT, with consensus provided by a few adolescents themselves. Our measure of functional impairment spanned several domains, including social domains, school, life skills and

risky activities. Parent-reported ratings of subscales for family functioning (i.e., reduced conflict), life skills (i.e., hygiene, sleep, chores), and school behaviour (i.e., attendance, detention, conflict) showed the most improvement, and youth ratings of their life skills and family functioning demonstrated improvement as well. Most GMT studies that have reported an improvement in participants' everyday function have also found that participants demonstrate improved inhibitory task performance (Stamenova & Levine, 2018). In our pilot, all youth evidenced reliable change on tasks assessing inhibition and/or cognitive flexibility. This could suggest that the meta-cognitive awareness promoted by GMT leads to EF improvement as designed by the program, which in turn supports daily functioning.

We obtained more equivocal support for our hypothesis that mood, anxiety, and self-concept would improve post-GMT. This is counter to studies of GMT in adults (e.g., Stubberud et al., 2014), including those with ADHD (In de Braek et al., 2017). To our knowledge, one study to date has included mental health outcomes post-GMT for youth with spina bifida and acquired brain injury (Stubberud et al., 2021) and found that participants with improvements in informant ratings of EF showed reductions in depression ratings as well. Measurement of mental health outcomes is a noted area of need in the adolescent GMT literature, and although our small sample pilot can make no definitive suggestion, it is possible that demonstrating mental health improvements would require more explicit intervention for emotional health. When a cognitive-behavioural module for emotion regulation is added to GMT, it appears to improve emotion regulation (Tornas et al., 2016), though this addition does not seem to address mood or anxiety symptoms specifically. It is recommended that larger-scale studies with adolescents continue to measure these outcomes to better determine GMT's effects on mood, anxiety, and self-concept.

Lastly, half of the youth in our pilot indicated that they had progressed toward the goal they had identified at the outset of GMT by the time of their 3-month post-GMT follow-up assessment. Prior to the intervention, all youth were encouraged to identify personally meaningful goals that followed S.M.A.R.T principles. Although this resulted in varied goal content, we believed that providing flexibility in goal selection would increase the likelihood that youth would apply GMT skills to their daily lives. The three youth that endorsed goal success frequently discussed their goals in-session and described ways in which they used GMT strategies in the service of goal-pursuit between sessions. After the intervention, they also reported that they had continued to use the core "STOP-STATE" strategy coupled with other tools, such as mindful breathing or splitting tasks, as needed. The two youth who indicated they achieved less than they had expected completed no homework, made the fewest homework attempts, and reported that they did not utilize the GMT skills or remember them after training. One of these youth also missed two sessions. We also note that these youth had the highest self-reported ratings of ADHD symptoms, EF challenges, and functional impairment, suggesting that they viewed their difficulties as more severe compared to those of other participants. Consistent with our observations, In de Braek and colleagues (2017) suggested that heterogeneity in ADHD severity may moderate benefits that are associated with GMT training among adults with the disorder (see also Hinshaw, 2007). Severity of symptoms and related functional challenges may prohibit adolescents with ADHD from engaging with the intervention as much as their peers, leading to less clinically significant change in measures of EF. In future work, it will be important to ascertain what factors may limit ADHD adolescents' engagement with GMT and whether there are means available to mitigate these factors prior to the intervention.

Although promising, our findings should be considered preliminary and interpreted within the context of several caveats. Because this was a pilot, our sample size was limited to six youth and we lacked a comparison control group. We explored reliable change indices for most of our measures; however, this metric did not account for potential practice effects, regression to the mean, or control for parents' awareness of their child's involvement in our modified GMT intervention when completing their ratings (i.e., they were not blind). Whilst the virtual format increased opportunities for youth to participate across a much larger geographical area, cognitive and resource demands likely influenced the type of individual who was interested in and available for the study (i.e., having access to a quiet space, parental support, and the attentional ability to engage for an hour online). Parental involvement also was limited to the completion of pre- and post-GMT questionnaires, weekly email summaries of session content, and a 10-minute feedback at the end of the final GMT session. Creating a larger role for parents should be considered in future iterations of GMT for adolescents with ADHD. For example, having weekly parallel parent sessions or parent check-ins may increase youths' engagement with and orientation to GMT materials, making contextual generalization of sessions more likely. Parents and teachers have been included in versions of GMT for youth with acquired brain injuries (Stubberud et al., 2019) and parent involvement in existing psychosocial ADHD interventions has been shown to be beneficial (Corcoran & Dattalo, 2006).

In sum, our pilot demonstrates the feasibility of using modified GMT for adolescents with ADHD. It also provides preliminary evidence that participation in modified GMT facilitates improvement in EF, goal-related behaviour, and everyday function among youth with this disorder. Our modified version of GMT lays the groundwork for a new direction in ADHD

treatment and we hope that the modifications we have outlined in our pilot will provide a

framework for future larger-scale replications with this clinical population.

General Discussion

The ability to set and work toward goals (i.e., goal-striving) is integral to all facets of life – including the lives of adolescents (Deci & Ryan, 2008). Adolescents set goals that reflect various life domains, such as passing specific courses required for their post-secondary interests, pursuing non-academic goals such as athletic endeavours, social pursuits like maintaining friendships, and part-time work or volunteering. Adolescents with ADHD are more likely than their peers to experience challenges across academic, occupational, and social-emotional domains (Barkley, 2002). Although these challenges may represent downstream sequelae of ineffective goal-striving, goal-striving in ADHD youth remains relatively unexplored and thus poorly understood. Literature on adolescent goal-striving – including that of youth with ADHD – has occurred in parallel across social, clinical, and cognitive psychology without much 'cross talk' or integration across subdisciplines. Additionally, extant work has tended to focus on relatively circumscribed aspects of goal-striving, such as goal content (Massey et al., 2008), future orientation (Kostyrka-Allchorne et al., 2020), motivation (Morsink et al., 2022; Smith & Langberg, 2018), and executive functioning (e.g., Molitor et al., 2019; Toplak et al., 2008). The three studies that comprise my doctoral work arguably provide one of the most comprehensive examinations of goal-striving in adolescents with ADHD to date. My work highlights both similarities and differences in the kinds of goals that youth with ADHD tend to prioritize compared with their peers. My work also demonstrates the EF challenges and limits to metamotivational awareness that are experienced by ADHD youth even while working on goals that are intrinsically motivating. Taken together, these findings underscore the pressing need for interventions that are tailored to supporting adolescents with ADHD in pursuit of their goals. In my final study, I provide an example of how Goal Management Training (GMT) can be modified

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for use with ADHD youth and provide preliminary evidence that this intervention is both feasible and potentially clinically beneficial.

Antecedents and Correlates of Goal-Striving in ADHD

Chapters 2 – 4 examined goal-striving, and constructs relevant to goal-striving, in adolescents with ADHD compared to their typically developing peers and emerging adults. Both groups of adolescents were recruited from the community and were required to be enrolled in high school (our clinical group was also required to have a diagnosis of ADHD). Emerging adults were university students recruited from undergraduate psychology courses. All participants completed semi-structured interviews regarding current and recently completed goals, along with questionnaires assessing their motivation, executive functions, and grit. The same sample is represented across all three chapters.

Chapter 2 presents a qualitative thematic analysis of themes relevant to goal-striving. Adolescents without ADHD and emerging adults described current academic goals most often, while adolescents with ADHD shared non-academic goals such as hobbies or personal interests. Recently achieved goals were more similarly distributed in all groups, with academic goals discussed most often. Interest towards academic goals varied across groups: unlike their peers and emerging adults, adolescents with ADHD did not identify internal motivation to achieve academic goals, even when they were successful in achieving them (see also Gottfried et al., 2001; Zendarski et al., 2017). Coupled with the finding that adolescents with ADHD had difficulty linking their current goals to future aspirations, perhaps some were less internally motivated to pursue academic goals because they are hard to carry out and lack perceived relevance. Even when identified as inherently interesting, however, youth with ADHD described needing to apply considerable effort or make multiple attempts whilst pursuing their goals (see

also Hsu et al., 2017). They did not endorse using fewer strategies than the other groups, which suggests that their goal-striving difficulties may reflect using strategies that are ineffective or deployed less effectively. Indeed, adolescents with ADHD did not endorse using strategies requiring flexibility (e.g., adjusting the goal, trying novel solutions) whereas the other groups explicitly identified a stance of flexibility as essential for goal attainment (further addressed in Chapters 3 and 4). Finally, all groups identified validation (including from others) as a reason for pursuing their goal and using their social networks to support their goal pursuit. This finding aligns with research showing that social context is particularly motivating in adolescence (Bureau et al., 2021) and that positive social support improves outcomes for youth with ADHD (Dvorsky & Langberg, 2016).

Chapter 3 quantitatively examined relationships amongst motivation, EFs, and grit in the context of personally relevant goals discussed in Chapter 2. Consistent with prior work (Gray et al., 2015; Silverstein et al., 2018), adolescents with ADHD reported more EF challenges and less grit than both comparison groups. Thus, for our ADHD youth, task persistence decreased in the presence of executive dysfunction. Consistent with qualitative findings described above (Chapter 2), adolescents with ADHD also rated themselves as less internally motivated than the other groups in relation to a past academic goal (though endorsed internal motivation in relation to a current goal, which tended to reflect hobbies and personal interests). Taken together, these findings suggest that our adolescents with ADHD had EF challenges that likely exacerbated the difficulty of academic goals, resulting in less persistence toward the completion of academic tasks and perhaps greater reliance on external reinforcers to 'get the job done' (vs. inherent interest or enjoyment). Other work has also demonstrated that external motivation is more predictive of objective task outcomes, such as grades (Burton et al., 2006).

In Chapter 4, qualitative directed content analysis was used to examine ADHD youths'

expression of metamotivation (i.e., the process of creating an ideal fit between the demands of a

task and one's motivational style). All groups reported experiencing high or low motivational

feelings (e.g., boredom, frustration, hopelessness) coupled with strategies to bolster their goal

striving in the face of those feelings. Compared with the other groups, however, adolescents with

ADHD seemed to have less insight about some of their motivational states. One example is

having a harder time both recognizing *and* responding to feelings of low motivation and complex

goal conflict. Experiencing conflict between goals was described by adolescents with ADHD but

without a strategy, perhaps because doing so places demand on EFs (e.g., inhibition, flexibility,

working memory; Kim, 2013). Adolescents with ADHD endorsed difficult feelings such as

exhaustion or fatigue, similar to previous studies showing that individuals with ADHD exert high

effort towards tasks but may deploy strategies less effectively (Mies et al., 2016). As noted in

Chapter 3, adolescents with ADHD also endorsed high internal motivation towards their non-

academic goals coupled with mostly low emotional costs (e.g., feeling focused rather than bored)

and strategies to maintain their motivation (e.g., adjusting the time needed for a task, breaking it

down into subtasks, and taking breaks to maintain focus). This finding suggests that there may be

strategies they can utilize non-academically to support their engagement with goals they are less

interested in as well (such as academics, Smith et al., 2020).

Findings across Chapters 2 – 4 supported further investigation of the feasibility of GMT,

as several components of the intervention address the difficulties adolescents with ADHD

described. For example, one direct purpose of the GMT intervention is supporting EF skills,

leading to more effective utilization of strategies for goal pursuit. In Chapter 2 I found that

adolescents with ADHD may not be deploying strategies as effectively towards their goals, and

in Chapter 3 they reported their EF as an area of need. GMT also requires individuals to focus on a specific goal and learn to inhibit other competing tasks or goals. Given that adolescents with ADHD provided more vague descriptions of goals which were not connected to future aspirations or oriented to the future generally, this component of GMT may support adolescents to link their goals to larger meaningful ones, while breaking them down into manageable components. Social context also emerged as important for both setting a goal and pursuing it in Chapter 2, and GMT embeds autonomy support within the provided group format and parent psychoeducation on skills. Further, adolescents with ADHD seemed to experience their goals as more taxing, and in Chapter 3 they reported lower persistence towards their goals as well. Many strategies taught in GMT overarchingly lessen the burden of goal-pursuit by improving EF and supplying strategies to compensate for challenges, which may speak to adolescents' ability to stay persistent in their pursuits. GMT also does not require adolescents to be internally motivated towards their goal, but rather increases meta-cognitive awareness around what is to be gained from goals and how best to pursue them; this is important considering the finding that adolescents with ADHD are less internally motivated towards their academic goals, which they very likely find more challenging. Finally, given the differences in metamotivational capacity noted in Chapter 4, GMT may serve to reduce some of the challenges with which adolescents with ADHD contend. The intervention should enable adolescents to more easily and mindfully break down goals and use targeted strategies, making the ability to create task-motivation fit more accessible (e.g., reducing goal conflict by breaking down a complex goal, building insight into difficulties, increasing both their repertoire and deployment of strategies).

Implementation of Modified GMT in ADHD

Chapter 5 presents findings from a pilot study of Goal Management Training for six adolescents with ADHD aged 14 – 17 years. Prior to my pilot, the feasibility and effectiveness of GMT had not yet been examined in this clinical population; however, it would appear to hold promise as an intervention for ADHD youth for at least two reasons. First, GMT builds awareness of EF deficits and how these deficits impact goals. Second, GMT provides strategies to improve upon and workaround EF deficits to increase goal success in everyday life. Other empirically supported treatments for ADHD provide temporary alleviation of ADHD symptoms (e.g., medication), improve parent-child dynamics (e.g., parent management training), and increase educator knowledge and support of ADHD-related academic difficulties (e.g., education interventions). None directly effect change in EF skills, despite indication that training everyday EF skills supports life functioning (Sonuga-Barke et al., 2013).

Following from findings presented in Chapters 2 – 4, GMT was modified in several ways. During interviews, adolescents with ADHD spoke of their goals more vaguely and with less detail compared to their peers, and knowing this I guided adolescents to set specific, measurable goals (S.M.A.R.T.) to ensure clarity of their chosen goal. Interviews also demonstrated the importance of social support, thus I incorporated weekly parent updates to facilitate their understanding of each session and associated homework, as well as parent attendance at the final session. During the first session of GMT, discussion of both individual differences and challenges common to ADHD was included, pertaining to goal attainment (e.g., difficulties with attention, planning, and goal pursuit strategies), informed by findings from thematic analyses and correlations in Chapters 2 and 3. Specifically, conversation regarding the impact of EF difficulties on goals was facilitated (e.g., EF difficulties can make it harder to persist at a goal), and examples provided were based on those given by adolescents in Chapter 2.

This modification served to normalize the difficulties adolescents experienced, and began the process of understanding how information within upcoming sessions supports goal pursuit. Based on the content analysis in Chapter 4, I also modified GMT to concretely address complex goal conflict using relatable examples. Although the core GMT strategies are aimed at reducing goal conflict, Chapter 4 demonstrated that adolescents with ADHD could benefit from explication of motivational cues and context for using the strategies. For example, adolescents engaged in practice tasks that required resolution of goal conflict (e.g., an online game, a card-sorting task), and we specifically discussed feelings associated with conflict ("signs" it is time to use the strategies such as frustration, distraction, fatigue), thus building metamotivational awareness in service of the goal. Examples provided during discussions of goal conflict throughout training were also derived from examples of goal conflict provided in Chapter 4, such as balancing academic and social needs. These modifications ensured that my pilot version of GMT reflected areas of need that adolescents would most benefit from.

In my pilot, youth attended most or all sessions, all participated in the sessions they attended, and most attempted homework and provided examples of using GMT strategies during in-session homework reviews. Homework completion itself was low, as it often is with ADHD youth (e.g., DuPaul & Langberg, 2015) – although similar challenges have been reported in other iterations of GMT undertaken with adolescents (e.g., acquired brain injuries: Krasny-Pacini et al., 2014). In the pilot, half of the participants' goal for the intervention involved completing homework for school. Taken together, it seems to be that the demands of homework completion are difficult for adolescents with ADHD across contexts. Information gleaned from previous chapters of this dissertation may provide some guidance on supporting homework compliance. For GMT specifically, parent involvement and encouragement could provide the support that

adolescents described benefitting from so greatly in their goals. As well, embedding homework expectations within tasks adolescents are completing regardless of GMT may promote skills practise more than homework logs (that is, having adolescents demonstrate the skills while they work on personal goals without completing logs which adds to their homework burden). This also reduces the complexity of goals adolescents face while training in GMT, allowing for more strategy development. This finding highlights the importance of scaffolding the GMT skills for utilization within personal goals as opposed to additionally burdening adolescents with homework for the intervention. Some of the findings from Chapter 4 speak to homework support both within GMT and in a more general context; adolescents with ADHD had the awareness and strategies for maintaining the self-relevance and promotion value of their goals in Chapter 4. For example, additional discussion around benefits of homework completion (i.e., it promotes getting more out of GMT, which ultimately reduces difficulties with important goals) can help adolescents access the strategies they already possess for maintaining these motivational states, and thus working towards homework completion.

Results of my pilot suggest that modified GMT may be a clinically beneficial intervention for adolescents with ADHD, extending prior work with adults who have the disorder (Jensen et al., 2021). Half of participants in my study achieved a personal goal they had selected prior to the intervention, all evidenced an improvement in functional impairment, and most had a reduction in everyday EF challenges coupled with better performance on tasks assessing more circumscribed executive skills (e.g., response inhibition, cognitive flexibility). In addition, several youth endorsed positive change in their mood and anxiety and one reported better self-concept following participation in GMT. Similar results have been reported in a meta-analytic review of GMT, suggesting transdiagnostic applicability of this EF intervention across different

clinical groups (Stamenova & Levine, 2018). Nonetheless, in my pilot there were two youth who appeared to have minimal engagement with the intervention. These adolescents completed little to no between-session work, reported that they did not utilize or remember GMT skills, and struggled to meet their stated goals. They also had the highest self-reported ratings of ADHD symptoms and EF difficulties, which suggests that ADHD severity may moderate benefits derived from GMT (In De Braek et al., 2017) as it does with other treatment outcomes (Hinshaw, 2007). Further study of the relationship between ADHD symptoms and engagement with GMT would support efforts to make GMT accessible to these high-severity participants for whom intervention is needed most.

GMT addresses several of the difficulties with goal setting and pursuit that were raised by adolescents with ADHD in Chapters 2-4. As mentioned, adolescents with ADHD had difficulty describing their goals with detail or future orientation, which was addressed at the outset of the pilot by developing specific, measurable goals with youth. Flexibility, an EF skill allowing individuals to adjust behaviour with changing demands and regulate task-motivation fit, was an unutilized skill for adolescents with ADHD despite their peers describing it as a strategy for goal success (Chapter 2). Similarly, addressing conflict between goals was a challenge for ADHD youth though not their peers (Chapter 4). Within GMT, psychoeducation about and practice resolving goal conflict supports participants' ability to maintain pursuit of a goal using their EFs. Core GMT skills include cueing participants to focus (e.g., through mindful breathing, practicing the "stop-focus-check" component of the GMT skills), re-orienting to the goal at hand and thus inhibiting competing motivational states or distractions (i.e., "stop-focus-state your goal-check your progress"), and building up capacity to address conflicts with strategies to prioritize or organize tasks. The pilot study demonstrated reliable change for some participants on measures

of inhibition and cognitive flexibility as well as their application of EF skills in everyday life (Chapter 5). Clinician observations in-session and comments from ADHD youth post-GMT further indicate that most participants used GMT skills to maintain their progress towards a goal, thus resolving goal conflict. Resolving complex goal-pursuit challenges like conflict may require EF skills which GMT targets (Kim et al., 2020; Miyake & Friedman, 2012).

Limitations and Future Directions

This dissertation integrated qualitative and quantitative approaches to further understand the nature of goal-striving in adolescents with ADHD. A strength but also limitation of my work is that youth self-identified their goals, which allowed for idiographic representation of their personal ambitions but precluded direct comparison of the same goals across groups (e.g., their pursuit of current academic goals vis-à-vis typically developing adolescents and emerging adults). Although adolescence is a developmental period in which youth begin to assume more autonomy in goal setting and pursuit (Heckhausen et al., 2010), some goals are nevertheless required of them and not necessarily of personal interest or relevance, such as the general pursuit of academics. Previous work with ADHD youth experiencing academic difficulties suggested low feelings of agency – defined as control over goal-pursuit behaviours – were common (Wiener & Daniels, 2015), dissimilar to my finding that adolescents with ADHD maintained their sense of control even when less inherently interested in academic goals and despite EF difficulties. An avenue for future work could be understanding if lessened autonomy in selecting a goal (i.e., lower internal motivation/interest) is separable from control over its pursuit (i.e., agency; Deci & Ryan, 2000). Past studies suggest that adolescents with ADHD find implementing even those strategies they are familiar with more difficult in the academic context (DuPaul & Langberg, 2015; Wiener & Daniels, 2015), which I could not directly address as most

youth described academic goals which were already completed successfully. My findings demonstrated that adolescents with ADHD can use strategies that rely on EFs (e.g., planning or organizing), and demonstrate metamotivational awareness of those strategies' utility in regulating motivation; considering their ratings of EF difficulties were high, this is particularly notable as it shows the potential for adolescents to demonstrate goal-pursuit skills emergent from even those areas of functioning they find challenging. However, more investigation of currently-pursued academic goals is needed to draw meaningful conclusions about this finding.

The paucity of research examining metamotivation in adolescents made the richness of qualitative data a priority for Chapter 4. However, past experimental studies of metamotivation have distinguished between *task knowledge* (beliefs about which motivational states fit a particular task) and *strategy knowledge* (awareness of strategies to modulate the motivational state)(Scholer & Miele, 2016). The descriptions of metamotivation provided here lay a foundational understanding of strategy knowledge, while individual beliefs about which motivational states fit a task were not captured by the qualitative study. Notably, a study of metamotivation in children found that strategy knowledge was more difficult for them compared to task knowledge (i.e., they understood how different states fit with different tasks, but not how to modulate the states with strategies; Hubley et al., 2023), potentially representing a developmental change occurring for adolescents such that they indeed understand strategy knowledge by the time they are in high school. Continued work to understand the developmental and clinical implications of metamotivation, such as through experimental paradigms with task and strategy manipulations, may address the gaps in this burgeoning literature. In fact, enhancement of metamotivation and executive functioning in severe mental illness has already been posed a direction for clinical research (Hansen et al., 2022).

Further studies of the modified GMT protocol are necessary to establish the effectiveness of the intervention, particularly for adolescents with ADHD, given how symptom severity seemed to impact change in our sample of participants. Despite finding reliable change on outcome measures, conclusions must be made with great caution given the limitations of the study discussed in Chapter 5, including the sample size and possibility of regression to the mean. Future comparison of GMT to a no-treatment control group could speak to the effectiveness of the intervention. As well, a limitation of pilot studies is the inability to address questions necessary for establishing efficacy, such as understanding which components lead to meaningful change. Future work could answer if particular parts of GMT drive change, such as building meta-cognitive awareness through monitoring and cueing strategies, mindfulness, or the specific goal pursuit strategies taught. Other more "common factors" components of the intervention such as the therapeutic alliance, group rapport, normalization and validation of difficulties, as well as parent involvement could certainly be effectual as well.

Understanding these components of GMT would allow for further modification as needed; for example, one limitation of this pilot iteration was that parent involvement was somewhat limited. Generally, caregiver attachment and involvement efforts are posited to involve reward circuitry and learning (Bartels & Zeki, 2004). Studies of parent involvement across therapeutic orientations such as emotion-focused family therapy and cognitive behavioural therapy show increased gains and symptom reduction in youth with various disorders, including ADHD (e.g., Foroughe et al., 2019; Maric et al., 2015), and parental interventions for preschoolers with ADHD appear to enact positive change (Mulqueen et al., 2015). In my GMT study, self- and parent-rated family functioning improvements were demonstrated, with participants indicating reductions in family conflict and reliance on others to

do things. More intensive involvement of the family system could benefit teens, their parents, and the home context generally, through reducing difficulties emergent from daily EF challenges (e.g., keeping to house rules or requests), and potentially increasing understanding for the experience of others in the family system through the GMT psychoeducation components. Future iterations of GMT could provide, for example, weekly parallel parent sessions or parent check-ins to solicit engagement with the program, making contextual generalization of sessions more likely. This format could also support parents' own EF difficulties, perhaps increasing their capacity and confidence to support their child. Parental EF is also associated with parenting behaviours such as parent involvement, scaffolding, and autonomy support (Bernier et al., 2010; Mazursky-Horowitz et al., 2018; Sosic-Vasic et al., 2017), thus more active caregiver involvement in GMT could benefit the family system through both direct (reductions in EF difficulties for adolescents and their parents) and indirect means (EF reductions leading to behavioural changes that benefit the family system and its individual members). For example, parents who are also learning GMT strategies may help their adolescents to set appropriate goals and maintain their long-term pursuits, by engaging in EF-supportive behaviour they learn through the intervention. In turn, both adolescents and their parents could experience reductions in EF and functional living challenges. This is especially important in light of the evidence that children's EF difficulties increase parenting stress and psychological distress (e.g., Fleck et al., 2015; Hutchison et al., 2016). Beyond GMT, future examinations of goal-striving in ADHD could also measure caregiver EF in daily life (e.g., through subjective questionnaires), as well as other relevant family characteristics such as parenting stress. One such avenue may be to assess how parental EF influences metamotivation, given the finding that metamotivation is a skill requiring EF abilities such as inhibition and flexibility. As well, understanding how adolescent

EF, caregiver EF, and caregiver behaviours such as scaffolding, involvement, and stress impact goal pursuit behaviours would make considerable progress in supporting the various goals I found to be important for adolescents.

One avenue for supporting adolescents' ability to demonstrate skills such as impulse control – downstream to the EF of inhibition – is mindfulness practice (Al-Yagon & Borenstein, 2022), which is a suggested intervention for improving academic goal pursuit (Wiener & Daniels, 2015). Mindfulness could increase metamotivational awareness, since metamotivation requires the ability to notice low motivation states, in addition to the improvements in EFs such as inhibition already noted in the literature (Gallant, 2016). Interventions like GMT which incorporate mindfulness seem to address goal-pursuit difficulties through both motivation and EF related processes. GMT also goes beyond goal-pursuit strategies that target specific motivational components (e.g., using external rewards and consequences; Modesto-Lowe et al., 2013) or motivation as a general construct (e.g., ADHD coaching; Kubik, 2010), by targeting awareness-building through not only mindfulness but the monitoring strategies embedded into each module. GMT thus reinforces EF strategies towards goals in addition to benefitting the capacity to regulate motivation towards goals.

Conclusions

In sum, this dissertation focused on goal-striving by integrating various clinical, social, and cognitive psychological constructs, culminating in a pilot executive functioning intervention for adolescents with ADHD. As discussed, individuals with ADHD have difficulties in academic and interpersonal domains of life, with well-documented motivational and executive functioning challenges. The work presented here sought to present a description of how goal-striving difficulties lead to these functional impairments, by describing the motivation and executive

functioning of adolescents with ADHD compared to their peers. Overall, this set of studies demonstrates the novel possibility of studying the constructs of motivation and executive functioning in combination and provides a framework for future larger-scale replications of Goal Management Training.

References

Adler, L.D., Nierenberg, A.A. (2010). Review of medication adherence in children and adults with ADHD. *Postgraduate Medicine, 122*(1), 184 – 191. https://doi.org/10.3810/pgm.2010.01.2112

Ahmann, E., Saviet, M., Tuttle, L.J. (2017). Interventions for ADHD in children and teens: A focus on ADHD coaching. *Pediatric Nursing, 43*(3), 121 – 131.

Albert, E., Petrie, T. A., & Moore, E. W. G. (2019). The relationship of motivational climates, mindsets, and goal orientations to grit in male adolescent soccer players. *International Journal of Sport and Exercise Psychology,* 1–14. https://doi.org/10.1080/1612197x.2019.1655775

Al-Yagon, M., & Borenstein, T. (2022). Adolescents' executive functions: Links to inattention, hyperactivity-impulsivity, trait mindfulness, and attachment relationships with fathers and mothers. *Research in Developmental Disabilities*, *124*, 104212. https://doi.org/10.1016/j.ridd.2022.104212

Aloise-Young, P.A., Hennigan, K.M., Leong, C.W. (2001). Possible selves and negative health behaviours during early adolescence. *The Journal of Early Adolescence, 21*(2), 158 – 181. https://doi.org/10.1177/0272431601021002002

American Psychiatric Association. (2022). *Diagnostic and statistical manual of mental disorders* (5th ed. text rev.). https://doi.org/10.1176/appi.books.9780890425787

Arnold, L. E., Hodgkins, P., Kahle, J., Madhoo, M., & Kewley, G. (2020). Long-term outcomes of ADHD: Academic achievement and performance. *Journal of Attention Disorders*, *24*(1), 73–85. https://doi.org/10.1177/1087054714566076

Baddeley, A. (1992). Working memory. *Science, 255*(5044), 556–

559. https://doi.org/10.1126/science.1736359

Bálint, S., Bitter, I., & Czobor, P. (2015). Neurobiological correlates of cognitive flexibility in

ADHD - A systematic review of the literature. *Psychiatria Hungarica: A Magyar*

Pszichiatriai Tarsasag tudomanyos folyoirata, *30*(4), 363–371.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral

change. *Psychological Review, 84*(2), 191–215. https://doi.org/10.1037/0033-

295X.84.2.191

Barber, B. K., & Olsen, J. A. (2004). Assessing the transitions to middle and high

school. *Journal of Adolescent Research, 19*(1), 3–

30. https://doi.org/10.1177/0743558403258113

Barkley, R. A., Fischer, M., Smallish, L., & Fletcher, K. (2006). Young adult outcome of

hyperactive children: adaptive functioning in major life activities. *Journal of the*

American Academy of Child and Adolescent Psychiatry, *45*(2), 192–202.

https://doi.org/10.1097/01.chi.0000189134.97436.e2

Barkley, R. A. (2002). Major life activity and health outcomes associated with attention-

deficit/hyperactivity disorder. *Journal of Clinical Psychiatry*, *63*, 10-15.

Barkley, R. A. (2011). *Barkley Deficits in Executive Functioning Scale (BDEFS).* Guilford

Press.

Barkley, R. A., & Murphy, K. R. (2011). The nature of executive function (EF) deficits in

daily life activities in adults with ADHD and their relationship to performance on EF

tests. *Journal of Psychopathology and Behavioral Assessment, 33*(2), 137–158.

https://doi.org/10.1007/s10862-011-9217-x

Barnett, J.E.H. (2017). Helping students with ADHD in the age of digital distraction. *Physical*

Disabilities: Education and Related Services, 36(2), 1 – 7.

https://doi.org/10.14434/pders.v36i2.23913

Bartels, A., & Zeki, S. (2004). The neural correlates of maternal and romantic

love. *NeuroImage*, *21*(3), 1155–1166. https://doi.org/10.1016/j.neuroimage.2003.11.003

Beal, S. J., & Crockett, L. J. (2010). Adolescents' occupational and educational aspirations and

expectations: links to high school activities and adult educational

attainment. *Developmental Psychology*, *46*(1), 258–265.

https://doi.org/10.1037/a0017416

Beck, J.S., Beck, A.T., Jolly, J.B. (2005). *Beck Youth Inventories – Second Edition (BYI-2).*

Bloomington, MN: Pearson.

Bell-McGinty, S., Podell, K., Franzen, M., Baird, A.D., Williams, M.J. (2002). Standard

measures of executive function in predicting instrumental activities of daily living in

older adults. *International Journal of Geriatric Psychiatry, 17*(9), 828 – 834.

https://doi.org/10.1002/gps.646

Bernier, A., Carlson, S. M., & Whipple, N. (2010). From external regulation to self-regulation:

early parenting precursors of young children's executive functioning. *Child

Development*, *81*(1), 326–339. https://doi.org/10.1111/j.1467-8624.2009.01397.x

Bertens, D., Kessels, R. P., Fiorenzato, E., Boelen, D. H., & Fasotti, L. (2015). Do old errors

always lead to new truths? A randomized controlled trial of errorless goal management

training in brain-injured patients. *Journal of the International Neuropsychological

Society, 21*, 639–649. https://doi.org/10.1017/S1355617715000764

Biederman, J., Monuteaux, M.C., Spencer, T., Wilens, T.E., Faraone, S.V. (2009). Do stimulants

    protect against psychiatric disorders in youth with ADHD? A 10-year follow-up study.

    Pediatrics, 142(1), 71 – 78. https://doi.org/10.1542/peds.2008-3347

Biederman, J., Faraone, S.V., Spencer, T., Wilens, T., Norman, D., Lapey, K.A., Mick, E.,

    Lehman, B.K., Doyle, A. (1993). Patterns of psychiatric comorbidity, cognition, and

    psychosocial functioning in adults with attention deficit hyperactivity disorder. *American*

    Journal of Psychiatry, 150(12), 1792–1798. https://doi.org/10.1176/ajp.150.12.1792

Birchwood, J., & Daley, D. (2012). Brief report: The impact of Attention Deficit Hyperactivity

    Disorder (ADHD) symptoms on academic performance in an adolescent community

    sample. *Journal of Adolescence, 35*(1), 225–231.

    https://doi.org/10.1016/j.adolescence.2010.08.011

Bittner, J. V., Bruena, M., & Rietzschel, E. F. (2016). Cooperation goals, regulatory focus, and

    their combined effects on creativity. *Thinking Skills and Creativity, 19,* 260-268.

    https://doi.org/10.1016/j.tsc.2015.12.002

Boland, H., DiSalvo, M., Fried, R., Woodworth, K. Y., Wilens, T., Faraone, S. V., & Biederman,

    J. (2020). A literature review and meta-analysis on the effects of ADHD medications on

    functional outcomes. *Journal of Psychiatric Research*, *123*, 21-30.

    https://doi.org/10.1016/j.jpsychires.2020.01.006

Bonanno, G. A., & Burton, C. L. (2013). Regulatory flexibility: An individual differences

    perspective on coping and emotion regulation. *Perspectives on Psychological Science,*

    8(6), 591–612. https://doi.org/10.1177/1745691613504116

Boonstra, M.A., Oosterlaan, J., Sergeant, J. A., & Buitelaar, J. K. (2005). Executive functioning

in adult ADHD: A meta-analytic review. *Psychological Medicine, 35*(8), 1097–1108.

    https://doi.org/10.1017/s003329170500499x

Bourchtein, E., Langberg, J. M., Owens, J. S., Evans, S. W., & Perera, R. A. (2017). Is the

    positive illusory bias common in young adolescents with ADHD? A fresh look at

    prevalence and stability using latent profile and transition analyses. *Journal of Abnormal*

    Child Psychology, *45*(6), 1063–1075. https://doi.org/10.1007/s10802-016-0248-3

Bowman, N. A., Hill, P. L., Denson, N., & Bronkema, R. (2015). Keep on truckin' or stay the

    course? Exploring grit dimensions as differential predictors of educational achievement,

    satisfaction, and intentions. *Social Psychological and Personality Science*, *6*(6), 639–645.

    https://doi.org/10.1177/1948550615574300

Boyer, B.E., Geurts, H.M., Van der Oord, S. (2014). Planning skills of adolescents with ADHD.

    Journal of Attention Disorders, 22(1), 46 – 57.

    https://doi.org/10.1177/1087054714538658

Brandt, A. E., Finnanger, T. G., Hypher, R. E., Rø, T. B., Skovlund, E., Andersson, S., Risnes,

    K., & Stubberud, J. (2021). Rehabilitation of executive function in chronic paediatric

    brain injury: a randomized controlled trial. *BMC medicine*, *19*(1), 253.

    https://doi.org/10.1186/s12916-021-02129-8

Breaux, R. P., Langberg, J. M., McLeod, B. D., Molitor, S. J., Smith, Z. R., Bourchtein, E., &

    Green, C. D. (2018). The importance of therapeutic processes in school-based

    psychosocial treatment of homework problems in adolescents with ADHD. *Journal of*

    Consulting and Clinical Psychology, *86*(5), 427. https://doi.org/10.1037/ccp0000300

Bureau, J. S., Howard, J. L., Chong, J. X., & Guay, F. (2021). Pathways to student motivation: A

meta-analysis of antecedents of autonomous and controlled motivations. *Review of Educational Research*, 00346543211042426. https://doi.org/10.3102/00346543211042426

Burgess, G.C., Depue, B.E., Ruzic, L., Willcutt, E.G., Du, Y.P., Banich, M.T. (2010). Attentional control activation relates to working memory in attention-deficit/hyperactivity disorder. *Biological Psychiatry, 67*(7), 632 – 640. https://doi.org/10.1016/j.biopsych.2009.10.036

Burton, K. D., Lydon, J. E., D'Alessandro, D. U., & Koestner, R. (2006). The differential effects of intrinsic and identified motivation on well-being and performance: Prospective, experimental, and implicit approaches to self-determination theory. *Journal of Personality and Social Psychology, 91*(4), 750–762. https://doi.org/10.1037/0022-3514.91.4.750

Canadian Attention Deficit Hyperactivity Disorder Resource Alliance (CADDRA) (2014). *ADHD Checklist.*

Canivez, G.L., Watkins, M.W., Dombrowski, S.C. (2017). Structural validity of the Weschler Intelligence Scale for Children – Fifth Edition: Confirmatory factor analyses with the 16 primary and secondary subtests. *Psychological Assessment, 29*(4), 458 – 472. https://doi.org/10.1037/pas0000358

Cantor, N., Norem, J. K., Niedenthal, P. M., Langston, C. A., & Brower, A. M. (1987). Life tasks, self-concept ideals, and cognitive strategies in a life transition. *Journal of Personality and Social Psychology*, *53*(6), 1178–1191. https://doi.org/10.1037/0022-3514.53.6.1178

Casey, B.J., Tottenham, N., Liston, C., Durston, S. (2005). Imaging the developing brain: what have we learned about cognitive development? *Trends in Cognitive Sciences, 9*(3), 104 – 110. https://doi.org/10.1016/j.tics.2005.01.011

Carlson, C.L., Booth, J.E., Shin, M., Canu, W.H. (2002). Parent, teacher, and self-rated motivational styles in ADHD subtypes. *Journal of Learning Disabilities, 35*, 104 – 113. https://doi.org/10.1177/002221940203500202

Carroll, A., Hattie, J., Durkin, K., & Houghton, S. (1997). Goal setting among adolescents: A comparison of delinquent, at-risk, and not-at-risk youth. *Journal of Educational Psychology*, *89*(3), 441–450. https://doi.org/10.1037/0022-0663.89.3.441

Carver, C. S., & Scheier, M. F. (1998). *On the Self-Regulation of Behavior.* Cambridge University Press. https://doi.org/10.1017/CBO9781139174794

Carver, C. S., & Scheier, M. F. (1982). Control theory: A useful conceptual framework for personality-social, clinical, and health psychology. *Psychological Bulletin*, *92*(1), 111–135. https://doi.org/10.1037/0033-2909.92.1.111

Castellanos, F. X., & Proal, E. (2012). Large-scale brain systems in ADHD: Beyond the prefrontal-striatal model. *Trends in Cognitive Sciences, 16*(1), 17 - 26. https://doi.org/10.1016/j.tics.2011.11.007

Cerasoli, C. P., Nicklin, J. M., & Ford, M. T. (2014). Intrinsic motivation and extrinsic incentives jointly predict performance: A 40-year meta-analysis. *Psychological Bulletin*, *140*(4), 980–1008. https://doi.org/10.1037/a0035661

Charach, A., & Fernandez, R. (2013). Enhancing ADHD medication adherence: Challenges and opportunities. *Current psychiatry reports*, *15*, 1-8. https://doi.org/10.1007/s11920-013-0371-6

Chorozoglou, M., Smith, E., Koerting, J., Thompson, M. J., Sayal, K., & Sonuga-Barke, E. J. (2015). Preschool hyperactivity is associated with long-term economic burden: Evidence from a longitudinal health economic analysis of costs incurred across childhood, adolescence and young adulthood. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *56*(9), 966–975. https://doi.org/10.1111/jcpp.12437

Cicerone, K. D., Langenbahn, D. M., Braden, C., Malec, J. F., Kalmar, K., Fraas, M., Felicetti, T., Laatsch, L., Harley, J. P., Bergquist, T., Azulay, J., Cantor, J., & Ashman, T. (2011). Evidence-based cognitive rehabilitation: updated review of the literature from 2003 through 2008. *Archives of Physical Medicine and Rehabilitation*, *92*(4), 519–530. https://doi.org/10.1016/j.apmr.2010.11.015

Cooper R. P. (2010). Cognitive control: componential or emergent?. *Topics in Cognitive Science*, *2*(4), 598–613. https://doi.org/10.1111/j.1756-8765.2010.01110.x

Cortese, S., Adamo, N., Del Giovane, C., Mohr-Jensen, C., Hayes, A. J., Carucci, S., Atkinson, L. Z., Tessari, L., Banaschewski, T., Coghill, D., Hollis, C., Simonoff, E., Zuddas, A., Barbui, C., Purgato, M., Steinhausen, H. C., Shokraneh, F., Xia, J., & Cipriani, A. (2018). Comparative efficacy and tolerability of medications for attention-deficit hyperactivity disorder in children, adolescents, and adults: a systematic review and network meta-analysis. *The Lancet Psychiatry*, *5*(9), 727–738. https://doi.org/10.1016/S2215-0366(18)30269-4

Cortese, S., Ferrin, M., Brandeis, D., Holtmann, M., Aggensteiner, P., Daley, D., Santosh, P., Simonoff, E., Stevenson, J., Stringaris, A., Sonuga-Barke, E. J., & European ADHD Guidelines Group (EAGG) (2016). Neurofeedback for Attention-Deficit/Hyperactivity Disorder: Meta-analysis of clinical and neuropsychological outcomes from randomized

controlled trials. *Journal of the American Academy of Child and Adolescent Psychiatry*, *55*(6), 444–455. https://doi.org/10.1016/j.jaac.2016.03.007

Cortese, S., Ferrin, M., Brandeis, D., Buitelaar, J., Daley, D., Dittmann, R. W., ... & European ADHD Guidelines Group. (2015). Cognitive training for attention-deficit/hyperactivity disorder: meta-analysis of clinical and neuropsychological outcomes from randomized controlled trials. *Journal of the American Academy of Child & Adolescent Psychiatry*, *54*(3), 164-174. https://doi.org/10.1016/j.jaac.2014.12.010

Cortese, S., Kelly, C., Chabernaud, C., Proal, E., Di Martino, A., Milham, M.P., Castellanos, F.X. (2012). Toward systems neuroscience of ADHD: a meta-analysis of 55 fMRI studies. *American Journal of Psychiatry, 169*(10), 1038-1055. https://doi.org/10.1176/appi.ajp.2012.11101521

Crede, M., Tynan, M. C., & Harms, P. D. (2017). Much ado about grit: A meta-analytic synthesis of the grit literature. *Journal of Personality and Social Psychology*, *113*(3), 492–511. https://doi.org/10.1093/oxfordjournals.bmb.a072872

Creswell, J.W. (1998). *Qualitative Inquiry and Research Design: Choosing Among Five Traditions* (p. 64). Sage Publications Inc.

Crone, E. A., & Dahl, R. E. (2012). Understanding adolescence as a period of social–affective engagement and goal flexibility. *Nature Reviews Neuroscience*, *13*(9), 636-650. https://doi.org/10.1038/nrn3313

Cuberos-Urbano, G., Caracuel, A., Valls-Serrano, C., García-Mochón, L., Gracey, F., & Verdejo-García, A. (2018). A pilot investigation of the potential for incorporating lifelog technology into executive function rehabilitation for enhanced transfer of self-regulation

skills to everyday life. *Neuropsychological Rehabilitation, 28*(4), 589–601.

https://doi.org/10.1080/09602011.2016.1187630

Cury, F., Elliot, A. J., Da Fonseca, D., & Moller, A. C. (2006). The social-cognitive model of achievement motivation and the 2 × 2 achievement goal framework. *Journal of Personality and Social Psychology, 90*, 666–679. https://doi.org/10.1037/0022-3514.90.4.666

Daley, D., Van der Oord, S., Ferrin, M., Danckaerts, M., Doepfner, M., Cortese, S., ... & European ADHD Guidelines Group. (2014). Behavioral interventions in attention-deficit/hyperactivity disorder: a meta-analysis of randomized controlled trials across multiple outcome domains. *Journal of the American Academy of Child & Adolescent Psychiatry, 53*(8), 835-847. https://doi.org/10.1016/j.jaac.2014.05.013

Daley, D., & Birchwood, J. (2010). ADHD and academic performance: Why does ADHD impact on academic performance and what can be done to support ADHD children in the classroom? *Child: Care, Health, and Development, 36*(4), 455 – 464. https://doi.org/10.1111/j.1365-2214.2009.01046.x

Dahl, R.E. (2001). Affect regulation, brain development, and behavioural/emotional health in adolescence. *CNS Spectrums, 6,* 60 – 72. https://doi.org/10.1017/S1092852900022884

Davis, N. O., & Mitchell, J. T. (2020). Mindfulness meditation training for adolescents with ADHD. In S. P. Becker (Ed.), *ADHD in adolescents: Development, assessment, and treatment* (pp. 369–390). The Guilford Press.

Deci, E.L., Vallerand, R.J., Pelletier, L.G., Ryan, R.M. (2011). Motivation and education: The self-determination perspective. *Educational Psychologist, 26(3),* 325 – 346. https://doi.org/10.1080/00461520.1991.9653137

Deci, E. L., & Ryan, R. M. (2008). Facilitating optimal motivation and psychological well-being across life's domains. *Canadian Psychology*, *49*(1), 14–23. https://doi.org/10.1037/0708-5591.49.1.14

Deci, E. L., & Ryan, R. M. (2000). The" what" and" why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, *11*(4), 227-268. https://doi.org/10.1207/S15327965PLI1104_01

Delis, D. C., Kaplan, E., & Kramer, J. H. (2001). *Delis-Kaplan Executive Function System (D–KEFS)*. San Antonia, TX: The Psychological Corporation.

Diamond, A., & Ling, D. S. (2016). Conclusions about interventions, programs, and approaches for improving executive functions that appear justified and those that, despite much hype, do not. *Developmental Cognitive Neuroscience, 18,* 34–48. https://doi.org/10.1016/j.dcn.2015.11.005

Dietrich, J., Parker, P., & Salmela-Aro, K. (2012). Phase-adequate engagement at the post-school transition. *Developmental Psychology, 48*(6), 1575–1593. https://doi.org/10.1037/a0030188

DiMenichi, B. C., & Richmond, L. L. (2015). Reflecting on past failures leads to increased perseverance and sustained attention. *Journal of Cognitive Psychology, 27*(2), 180–193. https://doi.org/10.1080/20445911.2014.995104

Duckworth, A. L., Quinn, P. D., Lynam, D. R., Loeber, R., & Stouthamer-Loeber, M. (2011). Role of test motivation in intelligence testing. *Proceedings of the National Academy of Sciences of the United States of America*, *108*(19), 7716–7720. https://doi.org/10.1073/pnas.1018601108

Duckworth, A. L., & Quinn, P. D. (2009). Development and validation of the short grit scale (Grit-S). *Journal of Personality Assessment, 91*, 166–174. https://doi.org/10.1080/00223890802634290

Duckworth, A. L., Peterson, C., Matthews, M. D., & Kelly, D. R. (2007). Grit: Perseverance and Passion for Long-Term Goals. *Journal of Personality and Social Psychology*, *92*(6), 1087–1101. https://doi.og/10.1037/0022-3514.92.6.1087

Duncan, J., Emslie, H., Williams, P., Johnson, R., & Freer, C. (1996). Intelligence and the frontal lobe: The organization of goal- directed behavior. *Cognitive Psychology, 30*, 257–303. https://doi.org/10.1006/cogp.1996.0008

DuPaul, G. J., Evans, S. W., Owens, J. S., Cleminshaw, C. L., Kipperman, K., Fu, Q., & Benson, K. (2021). School-based intervention for adolescents with attention-deficit/hyperactivity disorder: Effects on academic functioning. *Journal of School Psychology*, *87*, 48–63. https://doi.org/10.1016/j.jsp.2021.07.001

DuPaul, G.J., Rutherford, L.E., Hosterman, S.J. (2008). Attention-deficit/hyperactivity disorder. In R.J. Morris & N. Mather (Eds), *Evidence-based interventions for students with learning and behavioural challenges.* Routledge.

DuPaul, G.J., & Langberg, J.M. (2015). Educational impairments in children with ADHD. In R. A. Barkley (Ed.), *Attention-deficit/hyperactivity disorder: A handbook for diagnosis and treatment* (4th ed.). New York: Guilford.

Dvorsky, M. R., & Langberg, J.M. (2016). A review of factors that promote resilience in youth with ADHD and ADHD symptoms. *Clinical Child and Family Psychology Review, 19,* 368 – 391. https://doi.org/10.1007/s10567-016-0216-z

Eccles, J. S. (2005). Subjective task value and the Eccles et al. model of achievement-related

choices. In A. J. Elliot & C. S. Dweck (Eds.), *Handbook of competence and motivation* (pp. 105–121). Guilford Publications.

Eccles, J. (1983). Expectancies, values and academic behaviors. In J. T. Spence (Ed.), *Achievement and achievement motives: Psychological and sociological approaches* (pp. 75-146). San Francisco, CA: W.H. Freeman and Company.

Eddy, L.D., Dvorsky, M.R., Molitor, S.J., Bourchtein, E., Smith, Z.R., Oddo, L.E., Eadeh, H-M., Langberg, J.M. (2018). Longitudinal evaluation of the cognitive-behavioral model of ADHD in a sample of college students with ADHD. *Journal of Attention Disorders, 22*, 323-333. https://doi.org/10.1177/1087054715616184

Eskreis-Winkler, L., Shulman, E. P., Beal, S. A., & Duckworth, A. L. (2014). The grit effect: Predicting retention in the military, the workplace, school, and marriage. *Frontiers in Psychology, 5*, 1–12. https://doi.org/10.3389/fpsyg.2014.00036

Espy, K.A., Sheffield, T.D., Wiebe, S.A., Clark, C.A.C., Moehr, M.J. (2011) Executive control and dimensions of problem behaviours in preschool children. *Journal of Child Psychology and Psychiatry, 52*(1), 33 – 46. https://doi.org/10.1111/j.1469-7610.2010.02265.x

Evans, S. W., Langberg, J. M., Egan, T., & Molitor, S. J. (2014). Middle school-based and high school-based interventions for adolescents with ADHD. *Child and Adolescent Psychiatric Clinics of North America, 23*(4), 699–715. https://doi.org/10.1016/j.chc.2014.05.004

Fairchild, G. (2011). The developmental psychopathology of motivation in adolescence. *Developmental Cognitive Neuroscience, 1*(4), 414 – 429. https://doi.org/10.1016/j.dcn.2011.07.009

Faraone, S. V., Banaschewski, T., Coghill, D., Zheng, Y., Biederman, J., Bellgrove, M. A., Newcorn, J. H., Gignac, M., Al Saud, N. M., Manor, I., Rohde, L. A., Yang, L., Cortese, S., Almagor, D., Stein, M. A., Albatti, T. H., Aljoudi, H. F., Alqahtani, M. M. J., Asherson, P., Atwoli, L., … Wang, Y. (2021). The world federation of ADHD international consensus statement: 208 evidence-based conclusions about the disorder. *Neuroscience and Biobehavioral Reviews*, *128*, 789–818. https://doi.org/10.1016/j.neubiorev.2021.01.022

Faraone, S. V., Biederman, J., & Mick, E. (2006). The age-dependent decline of attention deficit hyperactivity disorder: a meta-analysis of follow-up studies. *Psychological Medicine*, *36*(2), 159-165. https://doi.org/10.1017/S003329170500471X

Faraone, S. V., & Biederman, J. (2005). What is the prevalence of adult ADHD? Results of a population screen of 966 adults. *Journal of Attention Disorders*, *9*(2), 384–391. https://doi.org/10.1177/1087054705281478

Fishbach, A., & Ferguson, M. J. (2007). The goal construct in social psychology. In A. W. Kruglanski & E. T. Higgins (Eds.), *Social Psychology: Handbook of basic principles* (pp. 490–515). New York: Guilford Press. https://doi.org/10.1007/bf02333407

Fishbach, A., Friedman, R. S., & Kruglanski, A. W. (2003). Leading us not into temptation: Momentary allurements elicit overriding goal activation. *Journal of Personality and Social Psychology, 84*(2), 296–309. https://doi.org/10.1037/0022-3514.84.2.296

Fitzsimons, G. M., & Finkel, E. J. (2011). Outsourcing self-regulation. *Psychological Science, 22*(3), 369–375. https://doi.org/10.1177/0956797610397955

Fleck, K., Jacob, C., Philipsen, A., Matthies, S., Graf, E., Hennighausen, K., Haack-Dees, B.,

    Weyers, P., Warnke, A., Rösler, M., Retz, W., von Gontard, A., Hänig, S., Freitag, C.,

    Sobanski, E., Schumacher-Stien, M., Poustka, L., Bliznak, L., Becker, K., Holtmann, M.,

    … Jans, T. (2015). Child impact on family functioning: a multivariate analysis in

    multiplex families with children and mothers both affected by attention-

    deficit/hyperactivity disorder (ADHD). *Attention Deficit and Hyperactivity*

    Disorders, *7*(3), 211–223. https://doi.org/10.1007/s12402-014-0164-8

Foroughe, M., Stillar, A., Goldstein, L., Dolhanty, J., Goodcase, E. T., & Lafrance, A. (2019).

    Brief Emotion Focused Family Therapy: An intervention for parents of children and

    adolescents with mental health issues. *Journal of Marital and Family Therapy*, *45*(3),

    410–430. https://doi.org/10.1111/jmft.12351

Franklin, M. S., Mrazek, M. D., Anderson, C. L., Johnston, C., Smallwood, J., Kingstone, A., &

    Schooler, J. W. (2017). Tracking distraction: The relationship between mind-wandering,

    meta-awareness, and ADHD symptomatology. *Journal of Attention Disorders*, *21*(6),

    475–486. https://doi.org/10.1177/1087054714543494

Fried, R., Chan, J., Feinberg, L., Pope, A., Woodworth, K. Y., Faraone, S. V., & Biederman, J.

    (2016). Clinical correlates of working memory deficits in youth with and without ADHD: A

    controlled study. *Journal of Clinical and Experimental Neuropsychology*, *38*(5), 487–496.

    https://doi.org/10.1080/13803395.2015.1127896

Friedman, N. P., & Miyake, A. (2017). Unity and diversity of executive functions: Individual

    differences as a window on cognitive structure. *Cortex, 86*, 186–204.

    https://doi.org/10.1016/j.cortex.2016.04.023

Gajria, K., Lu, M., Sikirica, V., Greven, P., Zhong, Y., Qin, P., Xie, J. (2014). Adherence, persistence, and medication discontinuation in patients with attention-deficit/hyperactivity disorder – a systematic literature review. *Neuropsychiatric Disease and Treatment, 10,* 1543 – 1569. http://dx.doi.org/10.2147/NDT.S65721

Gallant S. N. (2016). Mindfulness meditation practice and executive functioning: Breaking down the benefit. *Consciousness and Cognition*, *40*, 116–130. https://doi.org/10.1016/j.concog.2016.01.005

Gioia, G. A., Isquith, P. K., Guy, S. C., Kenworthy, L. (2015). *Behavior Rating Inventory of Executive Function, Second Edition (BRIEF-2)*. Lutz, FL: PAR Inc.

Gnambs, T., & Hanfstingl, B. (2015). The decline of academic motivation during adolescence: An accelerated longitudinal analysis on the effect of psychological need satisfaction. *Educational Psychology, 36*(9), 1691 – 1705. https://doi.org/10.1080/01443410.2015.1113236

Goldman, L. S., Genel, M., Bezman, R. J., & Slanetz, P. J. (1998). Diagnosis and treatment of Attention-Deficit/Hyperactivity Disorder in children and adolescents. *Journal of the American Medical Association*, *279*(14), 1100–1107. https://doi.org/10.1001/jama.279.14.1100

Goldstein, S., Naglieri, J. A., Princiotta, D., & Otero, T. M. (2014). Introduction: A history of executive functioning as a theoretical and clinical construct. In *Handbook of executive functioning* (pp. 3-12). Springer, New York, NY.

Gollwitzer, P.M. (2015). Setting one's mind on action: planning out goal striving in advance. *Emerging Trends in the Social and Behavioural Sciences.* https://doi.org/10.1002/9781118900772.etrds0298

Gollwitzer, P. M., & Brandstätter, V. (1997). Implementation intentions and effective goal

pursuit. *Journal of Personality and Social Psychology, 73*(1), 186–

199. https://doi.org/10.1037/0022-3514.73.1.186

Gordon, C. T., & Fabiano, G. A. (2019). The transition of youth with ADHD into the workforce:

Review and future directions. *Clinical Child and Family Psychology Review*, *22*, 316-

347. https://doi.org/10.1007/s10567-019-00274-4

Gottfried, A. E., Fleming, J. S., & Gottfried, A. W. (2001). Continuity of academic intrinsic

motivation from childhood through late adolescence: A longitudinal study. *Journal of*

Educational Psychology, 93(1), 3–13. https://doi.org/10.1037/0022-0663.93.1.3

Greenhill, L.L., Pliszka, S., Dulcan, M.K., Bernet, W., Arnold, V., Beitchman, J., Benson, R.S.,

Bukstein, O., Kinlan, K., McClellan, J., Rue, D., Shaw, J.A., Stock, S., Kroeger, K.

(2001). Summary of the practice parameter for the use of stimulant medications in the

treatment of children, adolescents, and adults. *Journal of the American Academy of Child*

and Adolescent Psychiatry, 40, 1352 – 1355. https://doi.org/10.1097/00004583-

200111000-00020

Guest, G., Namey, E., & Chen, M. (2020). A simple method to assess and report thematic

saturation in qualitative research. *PLOS One, 15*(5).

https://doi.org/10.1371/journal.pone.0232076

Gureasko-Moore, S., DuPaul, G. J., & White, G. P. (2007). Self-management of classroom

preparedness and homework: Effects on school functioning of adolescents with Attention

Deficit Hyperactivity Disorder. *School Psychology Review, 36*(4), 647–664.

Grant, H., & Dweck, C. S. (2003). Clarifying achievement goals and their impact. *Journal of Personality and Social Psychology*, *85*(3), 541–553. https://doi.org/10.1037/0022-3514.85.3.541

Gray, S.A., Fettes, P., Woltering, S., Mawjee, K., Tannock, R. (2015). Symptom manifestation and impairments in college students with ADHD. *Journal of Learning Disabilities, 49*(6), 616 – 630. https://doi.org/10.1177/0022219415576523

Greenhill, L. L., Swanson, J. M., Vitiello, B., Davies, M., Clevenger, W., Wu, M., Arnold, L. E., Abikoff, H. B., Bukstein, O. G., Conners, C. K., Elliott, G. R., Hechtman, L., Hinshaw, S. P., Hoza, B., Jensen, P. S., Kraemer, H. C., March, J. S., Newcorn, J. H., Severe, J. B., Wells, K., … Wigal, T. (2001). Impairment and deportment responses to different methylphenidate doses in children with ADHD: the MTA titration trial. *Journal of the American Academy of Child and Adolescent Psychiatry*, *40*(2), 180–187. https://doi.org/10.1097/00004583-200102000-00012

Hansen, M. C., Lynch, D. A., Stefancic, A., & Medalia, A. (2022). Metamotivation in people diagnosed with schizophrenia: A conceptual introduction and qualitative study. *Schizophrenia Research*, *243*, 317–321. https://doi.org/10.1016/j.schres.2021.06.003

Harpin, V., Mazzone, L., Raynaud, J. P., Kahle, J., & Hodgkins, P. (2016). Long-term outcomes of ADHD: A systematic review of self-esteem and social function. *Journal of Attention Disorders*, *20*(4), 295-305. https://doi.org/10.1177/1087054713486516

Heckhausen, J., Wrosch, C., & Schulz, R. (2010). A motivational theory of life-span development. *Psychological Review, 117*(1), 32–60. https://doi.org/10.1037/a0017668

Higgins, E. T. (1997). Beyond pleasure and pain. *American Psychologist, 52*(12), 1280–1300. https://doi.org/10.1037/0003-066X.52.12.1280

Higgins, E.T., & Kruglanski, A.W. (2000). *Motivational science: Social and personality perspectives.* Philadelphia: Psychology Press.

Hill, N. E., & Tyson, D. F. (2009). Parental involvement in middle school: a meta-analytic assessment of the strategies that promote achievement. *Developmental Psychology*, *45*(3), 740–763. https://doi.org/10.1037/a0015362

Hill, N.E., & Chao, R.K. (2009). *Families, schools, and the adolescent: Connecting research, policy, and practice.* New York: Teachers College Press.

Hinshaw S. P. (2007). Moderators and mediators of treatment outcome for youth with ADHD: understanding for whom and how interventions work. *Ambulatory Pediatrics*, *7*(1 Suppl), 91–100. https://doi.org/10.1016/j.ambp.2006.04.012

Hutchison, L., Feder, M., Abar, B., & Winsler, A. (2016). Relations between parenting stress, parenting style, and child executive functioning for children with ADHD or autism. *Journal of Child and Family Studies, 25*(12), 3644–3656. https://doi.org/10.1007/s10826-016-0518-2

Huzinga, M., Dolan, C. V., & van der Molen, M. W. (2006). Age-related change in executive function: Developmental trends and a latent variable analysis. *Neuropsychologia, 44*(11), 2017–2036. https://doi.org/10.1016/j.neuropsychologia.2006.01.010

Howse, R. B., Calkins, S.D., Anastopoulos, A.D., Keane, S. P., & Shelton, T. L. (2003). Regulatory contributors to children's kindergarten achievement. *Early Education and Development, 14*, 101–119. https://doi.org/10.1207/s15566935eed1401_7

Hoza, B., Gerdes, A. C., Hinshaw, S. P., Arnold, L. E., Pelham, W. E., Jr., Molina, B. S. G.,

    Abikoff, H. B., Epstein, J. N., Greenhill, L. L., Hechtman, L., Odbert, C., Swanson, J. M., &

    Wigal, T. (2004). Self-perceptions of competence in children with ADHD and comparison

    children. *Journal of Consulting and Clinical Psychology, 72*(3), 382–

    391. https://doi.org/10.1037/0022-006X.72.3.382

Hsieh, H.-F., Shannon, S.E. (2005). Three approaches to qualitative content analysis. *Qualitative*

    Health Research, 15(9), 1277 – 1288. https://doi.org/10.1177/1049732305276687

Hsu, C. F., Eastwood, J. D., & Toplak, M. E. (2017). Differences in perceived mental effort

    required and discomfort during a working memory task between individuals at-risk and

    not at-risk for ADHD. *Frontiers in Psychology*, *8*, 407.

    https://doi.org/10.3389/fpsyg.2017.00407

Hubley, C., Wilson, M., Hartman, O., Scholer, A.A., & Henderson, H.A. (2023).

    Metamotivational knowledge in children. *In preparation.*

In de Braek, D. M. J. M., Dijkstra, J. B., Ponds, R. W., & Jolles, J. (2017). Goal management

    training in adults with ADHD: An intervention study. *Journal of Attention*

    Disorders, *21*(13), 1130–1137. https://doi.org/10.1177/1087054712468052

Jensen, D.A., Halmoy, A., Stubberud, J., Haavik, J., Lundervold, A.J., Sorensen, L. (2021). An

    exploratory investigation of Goal Management Training in adults with ADHD:

    Improvements in inhibition and everyday functioning. *Frontiers in Psychology, Article*

    659480. https://doi.org/10.3389/fpsyg.2021.659480

Jensen, P. S., Arnold, L. E., Swanson, J. M., Vitiello, B., Abikoff, H. B., Greenhill, L. L.,

    Hechtman, L., Hinshaw, S. P., Pelham, W. E., Wells, K. C., Conners, C. K., Elliott, G.

    R., Epstein, J. N., Hoza, B., March, J. S., Molina, B. S. G., Newcorn, J. H., Severe, J. B.,

Wigal, T., Gibbons, R. D., … Hur, K. (2007). 3-year follow-up of the NIMH MTA study. *Journal of the American Academy of Child and Adolescent Psychiatry*, *46*(8), 989–1002. https://doi.org/10.1097/CHI.0b013e3180686d48

Johnson, S. R., Blum, R. W., & Cheng, T. L. (2014). Future orientation: a construct with implications for adolescent health and wellbeing. *International Journal of Adolescent Medicine and Health*, *26*(4), 459–468. https://doi.org/10.1515/ijamh-2013-0333

Johnson, M. K., Crosnoe, R., & Elder, G. H., Jr (2011). Insights on adolescence from a life course perspective. *Journal of Research on Adolescence*, *21*(1), 273–280. https://doi.org/10.1111/j.1532-7795.2010.00728.x

Keating, D. P. (2004). Cognitive and brain development. In R. M. Lerner & L. Steinberg (Eds.), *Handbook of Adolescent Psychology* (p. 45–84). John Wiley & Sons Inc.

Kennedy, M. R., Coelho, C., Turkstra, L., Ylvisaker, M., Moore Sohlberg, M., Yorkston, K., Chiou, H. H., & Kan, P. F. (2008). Intervention for executive functions after traumatic brain injury: a systematic review, meta-analysis and clinical recommendations. *Neuropsychological rehabilitation*, *18*(3), 257–299. https://doi.org/10.1080/09602010701748644

Kercood, S., Lineweaver, T.T., Frank, C.C., Fromm, E.D. (2017). Cognitive flexibility and its relationship to academic achievement and career choice of college students with and without attention deficit hyperactivity disorder. *Journal of Postsecondary Education and Disability, 30*(4), 329 – 344.

Kessler, R. C., Adler, L., Ames, M., Demler, O., Faraone, S., Hiripi, E., Howes, M. J., Jin, R., Secnik, K., Spencer, T., Ustun, T. B., & Walters, E. E. (2005). The World Health Organization Adult ADHD Self-Report Scale (ASRS): A short screening scale for use in

the general population. *Psychological Medicine*, *35*(2), 245–256.

https://doi.org/10.1017/s0033291704002892

Kim, S.-i. (2013). Neuroscientific model of motivational process. *Frontiers in Psychology, 4,* Article 98. https://doi.org/10.3389/fpsyg.2013.00098

Kim, Y., Brady, A.C., Wolters, C.A. (2020). College students' regulation of cognition, motivation, behaviour, and context: Distinct or overlapping processes? *Learning and Individual Differences, 80,* 101872. https://doi.org/10.1016/j.lindif.2020.101872

Kostyrka-Allchorne, K., Cooper, N. R., Wass, S. V., Fenner, B., Gooding, P., Hussain, S., Rao, V., & Sonuga-Barke, E. J. S. (2020). Future preferences and prospection of future of outcomes: Independent yet specific associations with attention-deficit/hyperactivity disorder. *Journal of Adolescence*, *83*, 31–41.

https://doi.org/10.1016/j.adolescence.2020.07.003

Krasny-Pacini, A., Limond, J., Evans, J., Hiebel, J., Bendjelida, K., & Chevignard, M. (2014). Context-sensitive Goal Management Training for everyday executive dysfunction in children after severe traumatic brain injury. *Journal of Head Trauma Rehabilitation*, *29*(5), E49–E64. https://doi.org/10.1097/HTR.0000000000000015

Kubik J. A. (2010). Efficacy of ADHD coaching for adults with ADHD. *Journal of Attention Disorders*, *13*(5), 442–453. https://doi.org/10.1177/1087054708329960

Langberg, J. M., Smith, Z. R., & Green, C. D. (2020). Addressing homework problems in adolescents with ADHD. In S. P. Becker (Ed.), *ADHD in adolescents: Development, assessment, and treatment* (pp. 330–349). The Guilford Press.

Langberg, J. M., Smith, Z. R., Dvorsky, M. R., Molitor, S. J., Bourchtein, E., Eddy, L. D., Eadeh, H. M., & Oddo, L. E. (2018). Factor structure and predictive validity of a homework

motivation measure for use with middle school students with attention-deficit/hyperactivity

disorder (ADHD). *School Psychology Quarterly*, *33*(3), 390–398.

https://doi.org/10.1037/spq0000219

Lazowski, R., & Hulleman, C. (2016). Motivation interviews in education: A meta-analytic

review. *Review of Educational Research, 86*(2), 602 – 640.

https://doi.org/10.3102/0034654315617832

Lebowitz, M.S. (2013). Stigmatization of ADHD: A developmental review. *Journal of Attention*

Disorders, 20, 199–205. https://doi.org/10.1177/1087054712475211

Lee, Y. C., Chen, C. R., & Lin, K. C. (2022). Effects of mindfulness-based interventions in

children and adolescents with ADHD: A systematic review and meta-analysis of

randomized controlled trials. *International Journal Of Environmental Research and*

Public Health, *19*(22), 15198. https://doi.org/10.3390/ijerph192215198

Levaux, M. N., Larøi, F., Malmedier, M., Offerlin-Meyer, I., Danion, J. M., & Van der Linden,

M. (2012). Rehabilitation of executive functions in a real-life setting: Goal management

training applied to a person with schizophrenia. *Case Reports in Psychiatry, 2012*, Article

ID 503023.

Levine, B., Manly, T., & Robertson, I. H. (2012). *Goal management training, trainer's manual.*

Toronto, ON, Canada: Baycrest Centre for Geriatric Care.

Levine, B., Schweizer, T. A., O'Connor, C., Turner, G., Gillingham, S., Stuss, D.

T., Manly, T., Robertson, I. H. (2011). Rehabilitation of executive functioning in patients

with frontal lobe brain damage with goal management training. *Frontiers Human*

Neuroscience, 5, 9. https://doi.org/10.3389/fnhum.2011.00009

Levine, B., Robertson, I. H., Clare, L., Carter, G., Hong, J., Wilson, B. A., Duncan, J., Stuss, D.

T. (2000). Rehabilitation of executive functioning: An experimental-clinical validation of

goal management training. *Journal of the International Neuropsychological Society*, *6*(3),

299–312. https://doi.org/10.1017/S1355617700633052

Levine, S., Holding, A., Miyavskaya, M., Powers, T.A., Koestner, R. (2021). Collaborative

autonomy: The dynamic relations between personal goal autonomy and perceived

autonomy support in emerging adulthood results in positive affect and goal progress.

Motivation Science, 7(2), 145-152. https://doi.org/10.1037/mot0000209

Lezak, M.D. (1995). *Neuropsychological assessment.* New York, NY: Oxford University Press.

Little, R.J.A. (1988). A test of missing completely at random for multivariate data with missing

values. *Journal of the American Statistical Association, 83*(404), 1198 – 1202.

https://doi.org/10.2307/2290157

Lipszyc, J., & Schachar, R. (2010). Inhibitory control and psychopathology: A meta-analysis of

studies using the stop signal task. *Journal of the International Neuropsychological

Society*, *16*(6), 1064-1076. https://doi.org/10.1017/S1355617710000895

Locke, E. A., & Latham, G. P. (2006). New directions in goal-setting theory. *Current

Directions in Psychological Science, 15*(5), 265–268. https://doi.org/10.1111/j.1467-
8721.2006.00449.x

Loe, I. M., & Feldman, H. M. (2007). Academic and educational outcomes of children with

ADHD. *Journal of Pediatric Psychology*, *32*(6), 643–654.

https://doi.org/10.1093/jpepsy/jsl054

Lovett, B.J., & Nelson, J.M. (2021). Systematic review: Educational accommodations for

children and adolescents with attention-deficit hyperactivity disorder. *Journal of the American Academy of Child and Adolescent Psychiatry, 60*(4), 448 – 457. https://doi.org/10.1016/j.jaac.2020.07.891

Loyer Carbonneau, M., Demers, M., Bigras, M., & Guay, M. C. (2021). Meta-analysis of sex differences in ADHD symptoms and associated cognitive deficits. *Journal of Attention Disorders*, *25*(12), 1640-1656. https://doi.org/10.1177/1087054720923736

Luman, M., Tripp, G., & Scheres, A. (2010). Identifying the neurobiology of altered reinforcement sensitivity in ADHD: A review and research agenda. *Neuroscience and Biobehavioral Reviews*, *34*(5), 744–754. https://doi.org/10.1016/j.neubiorev.2009.11.021

Malka, A., & Covington, M. V. (2005). Perceiving school performance as instrumental to future goal attainment: Effects on graded performance. *Contemporary Educational Psychology, 30*(1), 60–80. https://doi.org/10.1016/j.cedpsych.2004.04.001

Mansfield, C. (2007) Academic and social goals in adolescence: Developments and directions. *Annual Meeting of the Australian Association for Research in Education*. https://researchportal.murdoch.edu.au/esploro/outputs/conferencePaper/Academic-and-social-goals-in-adolescence/991005541957607891/filesAndLinks?index=0

Marcia, J. E. (1983). Some directions for the investigation of ego development in early adolescence. *Journal of Early Adolescence*, *3*(3), 215–223. https://doi.org/10.1177/0272431683033004

Maric, M., van Steensel, F. J. A., & Bögels, S. M. (2018). Parental involvement in CBT for anxiety-disordered youth revisited: Family CBT outperforms child CBT in the long term for children with comorbid ADHD symptoms. *Journal of Attention Disorders*, *22*(5), 506–514. https://doi.org/10.1177/1087054715573991

Marjoribanks, K. (2003). Learning environments, family contexts, educational aspirations and

    attainment: A moderation-mediation model extended. *Learning Environments*

    Research, 6, 247–265. https://doi.org/10.1023/A:1027327707647

Markus, H., & Nurius, P. (1986). Possible selves. *American Psychologist*, *41*(9), 954–969.

    https://doi.org/10.1037/0003-066X.41.9.954

Markus, H., & Wurf, E. (1987). The dynamic self-concept: A social psychological

    perspective. *Annual Review of Psychology, 38,* 299–

    337. https://doi.org/10.1146/annurev.ps.38.020187.001503

Martel, M., Nikolas, M., & Nigg, J. T. (2007). Executive function in adolescents with

    ADHD. *Journal of the American Academy of Child and Adolescent Psychiatry*, *46*(11),

    1437–1444. https://doi.org/10.1097/chi.0b013e31814cf953

Martinussen, R., Hayden, J., Hogg-Johnson, S., & Tannock, R. (2005). A meta-analysis of

    working memory impairments in children with attention-deficit/hyperactivity

    disorder. *Journal of the American Academy of Child & Adolescent Psychiatry*, *44*(4),

    377-384. https://doi.org/10.1097/01.chi.0000153228.72591.73

Massey, E. K., Gebhardt, W. A., & Garnefski, N. (2008). Adolescent goal content and pursuit: A

    review of the literature from the past 16 years. *Developmental Review*, *28*(4), 421–460.

    https://doi.org/10.1016/j.dr.2008.03.002

Masten, A. S., Burt, K. B., Roisman, G. I., Obradović, J., Long, J. D., & Tellegen, A. (2004).

    Resources and resilience in the transition to adulthood: Continuity and

    change. *Development and Psychopathology*, *16*(4), 1071–1094.

    https://doi.org/10.1017/s0954579404040143

Mazursky-Horowitz, H., Thomas, S. R., Woods, K. E., Chrabaszcz, J. S., Deater-Deckard, K., &

Chronis-Tuscano, A. (2018). Maternal executive functioning and scaffolding in families of children with and without parent-reported ADHD. *Journal of Abnormal Child Psychology*, *46*(3), 463–475. https://doi.org/10.1007/s10802-017-0289-2

McAuley, T., Crosbie, J., Charach, A., & Schachar, R. (2014). The persistence of cognitive deficits in remitted and unremitted ADHD: A case for the state-independence of response inhibition. *Journal of Child Psychology and Psychiatry*, *55*(3), 292-300. https://doi.org/10.1111/jcpp.12160

McAuley, T., & White, D.A. (2011). A latent variables examination of processing speed, response inhibition, and working memory during typical development. *Journal of Experimental Child Psychology, 108*(3), 453 – 468. https://doi.org/10.1016/j.jecp.2010.08.009

McCue, R., McCormack, T., McElnay, J., Alto, A., Feeney, A. (2019). The future and me: Imagining the future and the future self in adolescent decision making. *Cognitive Development, 50,* 142 – 156. https://doi.org/10.1016/j.cogdev.2019.04.001

McQuade, J. D., Tomb, M., Hoza, B., Waschbusch, D. A., Hurt, E. A., & Vaughn, A. J. (2011). Cognitive deficits and positively biased self-perceptions in children with ADHD. *Journal of Abnormal Child Psychology*, *39*(2), 307–319. https://doi.org/10.1007/s10802-010-9453-7

Melby-Lervag, M., Redick, T.S., Hulme, C. (2016). Working memory training does not improve performance on measures of intelligence or other measures of "far transfer:" Evidence from a meta-analytic review. *Perspectives in Psychological Science, 11,* 512 – 534. https://doi.org/10.1177/1745691616635612

Miele, D.B., Scholer, A.A., Fujita, K. (2020). Metamotivation: Emerging research on the regulation of motivational states. In A.J. Elliot (Ed.), *Advances in motivational science volume 7* (pp. 1 – 42). Elsevier.

Miele, D. B., & Scholer, A. A. (2018). The role of metamotivational monitoring in motivation regulation. *Educational Psychologist*, *53*(1), 1–21. https://doi.org/10.1080/00461520.2017.1371601

Mies, G.W., Moors, P., Sonuga-Barke, E.J., van der Oord, S., Wiersema, J.R., Scheres, A., Lemiere, J., Danckaerts, M. (2016). Mental effort in adolescents with ADHD. *International Journal of Psychophysiology, 108,* 28. https://doi.org/10.1016/j.ijpsycho.2016.07.088

Miyake, A., & Friedman, N. P. (2012). The nature and organization of individual differences in executive functions: Four general conclusions. *Current Directions in Psychological Science*, *21*(1), 8–14. https://doi.org/10.1177/0963721411429458

Miyake, A., Friedman, N. P., Emerson, M. J., Witzki, A. H., Howerter, A., & Wager, T. D. (2000). The unity and diversity of executive functions and their contributions to complex "frontal lobe" tasks: A latent variable analysis. *Cognitive Psychology*, *41*(1), 49–100. https://doi.org/10.1006/cogp.1999.0734

Modesto-Lowe, V., Chaplin, M., Soovajian, V., & Meyer, A. (2013). Are motivation deficits underestimated in patients with ADHD? A review of the literature. *Postgraduate Medicine*, *125*(4), 47–52. https://doi.org/10.3810/pgm.2013.07.2677

Moffitt, T. E., Arseneault, L., Belsky, D., Dickson, N., Hancox, R., Harrington, H.

L. & Caspi, A. (2011). A gradient of childhood self-control predicts health, wealth, and

    public safety. *Proceedings of the National Academy of Sciences*, *108*(7), 2693–2698.

    https://doi.org/10.1073/pnas.1010076108

Moles, T. A., Auerbach, A. D., & Petrie, T. A. (2017). Grit happens: Moderating effects on

    motivational feedback and sport performance. *Journal of Applied Sport Psychology,*

    29(4), 418–433. https://doi.org/10.1080/10413200.2017.1306729

Molitor, S. J., Oddo, L. E., Eadeh, H.-M., & Langberg, J. M. (2019). Executive function deficits

    in adolescents with ADHD: Untangling possible sources of heterogeneity. *Journal of*

    Emotional and Behavioral Disorders, 27(3), 165 - 177.

    https://doi.org/10.1177/1063426618763125

Morsink, S., Van der Oord, S., Antrop, I., Danckaerts, M., & Scheres, A. (2022). Studying

    motivation in ADHD: The role of internal motives and the relevance of self-

    determination theory. *Journal of Attention Disorders*, *26*(8), 1139–1158.

    https://doi.org/10.1177/10870547211050948

Morsink, S., Van der Oord, S., Antrop, I., Danckaerts, M., Scheres, A. (2021). Studying

    motivation in ADHD: The role of internal motives and the relevance of self-determination

    theory. *Journal of Attention Disorders, 26*(8), 1139 – 1158.

    https://doi.org/10.1177/10870547211050948

Morsink, S., Sonuga-Barke, E., van der Oord, S., Van Dessel, J., Lemiere, J., Danckaerts, M.

    (2021). Task-related motivation and academic achievement in children and adolescents with

    ADHD. *European Child & Adolescent Psychiatry, 30*, 131 – 141.

    https://doi.org/10.1007/s00787-020-01494-8

Morsink, S., Sonuga-Barke, E., Mies, G., Glorie, N., Lemiere, J., Van der Oord, S., &

Danckaerts, M. (2017). What motivates individuals with ADHD? A qualitative analysis

    from the adolescent's point of view. *European Child & Adolescent Psychiatry*, *26*(8),

    923–932. https://doi.org/10.1007/s00787-017-0961-7

Mulqueen, J. M., Bartley, C. A., & Bloch, M. H. (2015). Meta-analysis: Parental interventions

    for preschool ADHD. *Journal of Attention Disorders*, *19*(2), 118–124.

    https://doi.org/10.1177/1087054713504135

Murphy, K., & Barkley, R. A. (1996). Attention deficit hyperactivity disorder adults:

    comorbidities and adaptive impairments. *Comprehensive Psychiatry*, *37*(6), 393–401.

    https://doi.org/10.1016/S0010-440X(96)90022-X

Newcorn, J. H., Halperin, J. M., Jensen, P. S., Abikoff, H. B., Arnold, L. E., Cantwell, D. P.,

    Conners, C. K., Elliott, G. R., Epstein, J. N., Greenhill, L. L., Hechtman, L., Hinshaw, S.

    P., Hoza, B., Kraemer, H. C., Pelham, W. E., Severe, J. B., Swanson, J. M., Wells, K. C.,

    Wigal, T., & Vitiello, B. (2001). Symptom profiles in children with ADHD: Effects of

    comorbidity and gender. *Journal of the American Academy of Child and Adolescent*

    Psychiatry, *40*(2), 137–146. https://doi.org/10.1097/00004583-200102000-00008

Nguyen, T., Carnevale, J. J., Scholer, A. A., Miele, D. B., & Fujita, K. (2019). Metamotivational

    knowledge of the role of high-level and low-level construal in goal-relevant task

    performance. *Journal of Personality and Social Psychology, 117*(5), 876–899.

    https://doi.org/10.1037/pspa0000166

Nigg, J. T. (2000). On inhibition-disinhibition in developmental psychopathology: Views from

    cognitive and personality psychology and a working inhibition taxonomy. *Psychological*

    Bulletin, 126, 220–246. https://doi.org/10.1037/0033-2909.126.2.220

Nigg, J. T., Stavro, G., Ettenhofer, M., Hambrick, D. Z., Miller, T., & Henderson, J. M. (2005).

    Executive functions and ADHD in adults: evidence for selective effects on ADHD

    symptom domains. *Journal of Abnormal Psychology*, *114*(4), 706–717.

    https://doi.org/10.1037/0021-843X.114.3.706

Nordby, E.S., Gilje, S., Jensen, D.A., Sorensen, L., Stige, S. (2021). Goal management training

    for adults with ADHD – clients' experiences with a group-based intervention. *BMC*

    Psychiatry, 21, Article 113. https://doi.org/10.1186/s12888-021-03114-4

Norman, D.A., Shallice, T. (1986). Attention to action. In Davidson, R.J., Schwartz, G.E.,

    Shapiro, D. (Eds)., *Consciousness and Self-Regulation.* Boston, MA: Springer.

    https://doi.org/10.1007/978-1-4757-0629-1_1

Nunes, L.G., & Seabra, A.G. (2021). Development of a program based on Goal Management

    Training for adolescents with executive dysfunction complaints. *The Spanish Journal of*

    Psychology, 24, E20. https://doi.org/10.1017/SJP.2021.17

Nurmi, J.E. (2004). Socialization and self-development: Channeling, selection, adjustment and

    reflection. In R. Lerner & L. Steinberg (Eds.), *Handbook of adolescent psychology* (pp.

    85–124). New York, NY: Wiley.

Nurmi, J. E. (1991). How do adolescents see their future? A review of the development of future

    orientation and planning. *Developmental Review*, *11*(1), 1–59.

    https://doi.org/10.1016/0273-2297(91)90002-6

Nyman, A., Taskinen, T., Gronroos, M., Haataja, L., Lahdetie, Korhonen, T. (2010). Elements of

    working memory as predictors of goal-setting skills in children with attention-deficit

    hyperactivity disorder. *Journal of Learning Disabilities, 43*(6), 553 – 562.

    https://doi.org/10.1177/0022219410375001

O'Connor, C., Robertson, I. H., & Levine, B. (2011). The prosthetics of vigilant attention: Random cuing cuts processing demands. *Neuropsychology, 25,* 535–543. https://doi.org/10.1037/a0022767

Ontario Psychological Association & Canadian Academy of Psychologists in Disability Assessment (2020, August 20). *Guidelines for Best Practices in Psychological Remote Assessments.* https://www.psych.on.ca/getmedia/8d9c5cf3-e4f1-470b-8a51-3d603dbbc219/OPACAPDA-RemoteTele-Assessment-V9-revised.pdf

Oppenheimer, L. (1987). Cognitive and social variables in the plan of action. In S. H. Friedman, E. Kofsky Scholnick, & R. R. Cocking (Eds.), *Blueprints for thinking. The role of planning in cognitive development.* Cambridge: Cambridge University Press.

O'Reilly, M., & Parker, N. (2013). 'Unsatisfactory Saturation': A critical exploration of the notion of saturated sample sizes in qualitative research. *Qualitative Research, 13*(2), 190–197. https://doi.org/10.1177/1468794112446106

O'Reilly, R. C., Frank, M. J. (2006). Making working memory work: A computational model of learning in the frontal cortex and basal ganglia. *Neural Computation*, *18*, 283–328. https://doi.org/10.1162/089976606775093909

Patros, C. H., Alderson, R. M., Kasper, L. J., Tarle, S. J., Lea, S. E., & Hudec, K. L. (2016). Choice-impulsivity in children and adolescents with attention-deficit/hyperactivity disorder (ADHD): A meta-analytic review. *Clinical Psychology Review*, *43*, 162–174. https://doi.org/10.1016/j.cpr.2015.11.001

Pliszka, S., & AACAP Work Group on Quality Issues (2007). Practice parameter for the assessment and treatment of children and adolescents with attention-deficit/hyperactivity

disorder. *Journal of the American Academy of Child and Adolescent Psychiatry*, *46*(7), 894–921. https://doi.org/10.1097/chi.0b013e318054e724

Polanczyk, G. V., Salum, G. A., Sugaya, L. S., Caye, A., & Rohde, L. A. (2015). Annual research review: A meta-analysis of the worldwide prevalence of mental disorders in children and adolescents. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *56*(3), 345–365. https://doi.org/10.1111/jcpp.12381

Polanczyk, G., de Lima, M. S., Horta, B. L., Biederman, J., & Rohde, L. A. (2007). The worldwide prevalence of ADHD: A systematic review and metaregression analysis. *The American Journal of Psychiatry*, *164*(6), 942–948. https://doi.org/10.1176/ajp.2007.164.6.942

Power, T.J., Werba, B.E., Watkins, M.W., Angelucci, J.G., Eiraldi, R.B. (2006). Patterns of parent-reported homework problems among ADHD-referred and non-referred children. *School Psychology Quarterly, 21,* 13 – 33. http://dx.doi.org/10.1521/scpq.2006.21.1.13

Prime, H., Wade, M., May, S. S., Jenkins, J. M., & Browne, D. T. (2021). The COVID-19 family stressor scale: Validation and measurement invariance in female and male caregivers. *Frontiers In Psychiatry*, *12*, 669106. https://doi.org/10.3389/fpsyt.2021.669106

Prevatt, F., & Levrini, A. (2015). *ADHD coaching: A guide for mental health professionals.* American Psychological Association.

Prevatt, F., Smith, S.M., Diers, S., Marshall, D., Coleman, J., Valler, E., Miller, N. (2017). ADHD coaching with college students: Exploring the processes involved in motivation and goal completion. *Journal of College Student Psychotherapy, 31*(2), 93 – 111. https://doi.org/10.1080/87568225.2016.1240597

Ramos, A. A., Hamdan, A. C., & Machado, L. (2020). A meta-analysis on verbal working memory in children and adolescents with ADHD. *The Clinical Neuropsychologist*, *34*(5), 873-898. https://doi.org/10.1080/13854046.2019.1604998

Reis, E.M. (2002). Attention deficit hyperactivity disorder: implications for the classroom teacher. *Journal of Instructional Psychology, 29*, 175-179.

Richardson, M., Abraham, C., Bond, R. (2012). Psychological correlates of university students' academic performance: A systematic review and meta-analysis. *Psychological Bulletin, 138*(2), 353 – 387. https://doi.org/10.1037/a0026838

Robertson-Kraft, C., & Duckworth, A. (2014). True grit: Trait- level perseverance and passion for long-term goals predicts effectiveness and retention among novice teachers. *Teachers College Record, 116*(030302), 1–27.

Robertson, I. H., & Garavan, H. (2000). Vigilant attention. In M. Gazzaniga (Ed.), *The new cognitive neurosciences* (2nd ed., pp. 563–578). Cambridge, Mass: MIT Press.

Rohling ML, Faust ME, Beverly B, Demakis G. (2009). Effectiveness of cognitive rehabilitation following acquired brain injury: A meta-analytic re-examination of Cicerone et al.'s (2000, 2005) systematic reviews. *Neuropsychology, 23,* 20–39. https://doi.org/10.1037/a0013659

Romer D. (2010). Adolescent risk taking, impulsivity, and brain development: implications for prevention. *Developmental Psychobiology*, *52*(3), 263–276. https://doi.org/10.1002/dev.20442

Ros, R., & Graziano, P. A. (2018). Social functioning in children with or at risk for attention deficit/hyperactivity disorder: A meta-analytic review. *Journal of Clinical Child & Adolescent Psychology*, *47*(2), 213-235. https://doi.org/10.1080/15374416.2016.1266644

Rosenzweig, E. Q., & Miele, D. B. (2016). Do you have an opportunity or an obligation to score well? The influence of regulatory focus on academic test performance. *Learning and Individual Differences, 45,* 114–127. https://doi.org/10.1016/j.lindif.2015.12.005

Ryan, R.M., & Connell, J.P. (1989). Perceived locus of causality and internalization: Examining reasons for acting in two domains. *Journal of Personality and Social Psychology, 57,* 749 – 761. https://doi.org/10.1037/0022-3514.57.5.749

Ryan, T.A. (1970). *Intentional Behaviour: An approach to human motivation.* Ronald Press.

Sadeghi, M., McAuley, T., Sandberg, S. (2020). Examining the impact of motivation on working memory training in youth with ADHD. *Journal of the Canadian Academy of Child and Adolescent Psychiatry, 1,* 4 – 14.

Sadeghi, M., Barlow-Krelina, E., Gibbons, C., Shaikh, K., Fung, W.L.A., Meschino, W., Till, C. (2017). Feasibility of computerized working memory training in individuals with Huntington disease. *PLOS One*, *12*(4), e0176429. https://doi.org/10.1371/journal.pone.0176429

Sagvolden, T., Johansen, E. B., Aase, H., & Russell, V. A. (2005). A dynamic developmental theory of attention-deficit/hyperactivity disorder (ADHD) predominantly hyperactive/impulsive and combined subtypes. *The Behavioral and Brain Sciences*, *28*(3), 397–468. https://doi.org/10.1017/S0140525X05000075

Sala G., & Gobet F. (2020). Working memory training in typically developing children: A multilevel meta-analysis. *Psychonomic Bulletin & Review*, 27, 423– 434. https://doi.org/10.3758/s13423-019-01681-y

Sandberg, S., & McAuley, T. (2022). Hospital-based modified cogmed working memory training for youth with ADHD. *Journal of Attention Disorders*, *26*(10), 1283–1292. https://doi.org/10.1177/10870547211066487

Sansone, C., & Thoman, D.B. (2005). Interest as the missing motivator in self-regulation. *European Psychologist, 10*(3), 175 – 186. https://doi.org/10.1027/1016-9040.10.3.175

Scheres, A., Dijkstra, M., Ainslie, E., Balkan, J., Reynolds, B., Sonuga-Barke, E., & Castellanos, F. X. (2006). Temporal and probabilistic discounting of rewards in children and adolescents: effects of age and ADHD symptoms. *Neuropsychologia*, *44*(11), 2092–2103. https://doi.org/10.1016/j.neuropsychologia.2005.10.012

Scholer, A. A., Miele, D. B., Murayama, K., & Fujita, K. (2018). New directions in self-regulation: The role of metamotivational beliefs. *Current Directions in Psychological Science*, *27*(6), 437 – 442. Doi: https://doi.org/10.1177/0963721418790549

Scholer, A. A., & Miele, D. B. (2016). The role of metamotivation in creating task-motivation fit. *Motivation Science, 2*(3), 171–197. https://doi.org/10.1037/mot0000043

Scholer, A. A., & Higgins, E. T. (2012). Too much of a good thing? Trade-offs in promotion and prevention focus. In R. M. Ryan (Ed.), The Oxford handbook of human motivation (pp. 65–84). New York, NY: Oxford University Press.

Schmeichel, B. J., Vohs, K. D., & Duke, S. C. (2011). Self-control at high and low levels of mental construal. *Social Psychological and Personality Science, 2*(2), 182–189. Doi: https://doi.org/10.1177/1948550610385955

Schoon, I., & Parsons, S. (2002). Teenage aspirations for future careers and occupational outcomes. *Journal of Vocational Behavior, 60*, 262–288. https://doi.org/10.1006/jvbe.2001.1867

Schwinger, M., & Otterpohl, N. (2017). Which one works best? Considering the relative importance of motivational regulation strategies. *Learning and Individual Differences, 53*, 122–132. https://doi.org/10.1016/j.lindif.2016.12.003

Schwinger, M., Steinmayr, R., Spinath, B. (2009). How do motivational regulation strategies affect achievement: Mediated by effort management and moderated by intelligence. *Learning and Individual Differences, 19*(4), 621 – 627. https://doi.org/10.1016/j.lindif.2009.08.006

Seibt, B., & Forster, J. (2004). Stereotype threat and performance: How self-stereotypes influence processing by inducing regulatory foci. *Journal of Personality and Social Psychology, 87*(1), 38 – 56. https://doi.org/10.1037/0022-3514.87.1.38

Seidman L. J. (2006). Neuropsychological functioning in people with ADHD across the lifespan. *Clinical Psychology Review*, *26*(4), 466–485. https://doi.org/10.1016/j.cpr.2006.01.004

Sergeant, J. A., Geurts, H., Huijbregts, S., Scheres, A., & Oosterlaan, J. (2003). The top and the bottom of ADHD: A neuropsychological perspective. *Neuroscience and biobehavioral reviews*, *27*(7), 583–592. https://doi.org/10.1016/j.neubiorev.2003.08.004

Shaw, P., Stringaris, A., Nigg, J., & Leibenluft, E. (2014). Emotion dysregulation in attention deficit hyperactivity disorder. *The American Journal Of Psychiatry*, *171*(3), 276–293. https://doi.org/10.1176/appi.ajp.2013.13070966

Sheldon, K. M., & Houser-Marko, L. (2001). Self-concordance, goal attainment, and the pursuit of happiness: Can there be an upward spiral? *Journal of Personality and Social Psychology, 80*(1), 152–165. https://doi.org/10.1037/0022-3514.80.1.152

Sherman, D. K., Hartson, K. A., Binning, K. R., Purdie-Vaughns, V., Garcia, J., Taborsky-Barba, S., Tomassetti, S., Nussbaum, A. D., & Cohen, G. L. (2013). Deflecting the trajectory and changing the narrative: how self-affirmation affects academic performance and motivation under identity threat. *Journal of personality and social psychology*, *104*(4), 591–618. https://doi.org/10.1037/a0031495

Shogren, K.A., & Wehmeyer, M.L. (2017). Goal setting and attainment. In M.L. Wehmeyer, K.A. Shogren, T.D. Little, & S.J. Lopez (Eds.), *Development of Self-Determination Through the Life Course* (pp. 241). Springer.

Sibley, M. H., Graziano, P. A., Ortiz, M., Rodriguez, L., & Coxe, S. (2019). Academic impairment among high school students with ADHD: The role of motivation and goal-directed executive functions. *Journal of School Psychology*, *77*, 67–76. https://doi.org/10.1016/j.jsp.2019.10.005

Sibley, M. H., Graziano, P. A., Kuriyan, A. B., Coxe, S., Pelham, W. E., Rodriguez, L., Sanchez, F., Derefinko, K., Helseth, S., & Ward, A. (2016). Parent-teen behavior therapy + motivational interviewing for adolescents with ADHD. *Journal of Consulting and Clinical Psychology*, *84*(8), 699–712. https://doi.org/10.1037/ccp0000106

Sibley, M.H., Evans, S.W. & Serpell, Z.N. (2010). Social cognition and interpersonal impairment in young adolescents with ADHD. *Journal of Psychopathology and Behavioural Assessment,* 32, 193–202. https://doi.org/10.1007/s10862-009-9152-2

Sibley, M. H., & Yeguez, C. E. (2018). Managing ADHD at the post-secondary transition: A qualitative study of parent and young adult perspectives. *School Mental Health: A Multidisciplinary Research and Practice Journal, 10*(4), 352–371. https://doi.org/10.1007/s12310-018-9273-4

Silverstein, M. J., Faraone, S. V., Leon, T. L., Biederman, J., Spencer, T. J., & Adler, L. A. (2018). The relationship between executive function deficits and DSM-5-defined ADHD symptoms. *Journal of Attention Disorders*. https://doi.org/10.1177/1087054718804347

Simons, J. S., Christopher, M. S., & Mclaury, A. E. (2004). Personal strivings, binge drinking, and alcohol-related problems. *Addictive Behaviors, 29*(4), 773–779. https://doi.org/10.1016/j.addbeh.2004.02.006

Smith, Z. R., Langberg, J. M., Cusick, C. N., Green, C. D., & Becker, S. P. (2020). Academic motivation deficits in adolescents with ADHD and associations with academic functioning. *Journal of Abnormal Child Psychology*, *48*(2), 237–249. https://doi.org/10.1007/s10802-019-00601-x

Smith, Z. R., & Langberg, J. M. (2018). Review of the evidence for motivation deficits in youth with ADHD and their association with functional outcomes. *Clinical Child and Family Psychology Review*, *21*(4), 500–526. https://doi.org/10.1007/s10567-018-0268-3

Smith, B. H., Barkley, R. A., & Shapiro, C. J. (2006). Attention-Deficit/Hyperactivity Disorder. In E. J. Mash & R. A. Barkley (Eds.), *Treatment of childhood disorders* (pp. 65–136). The Guilford Press.

Smith, B. H., Pelham, W. E., Gnagy, E., Molina, B., & Evans, S. (2000). The reliability, validity, and unique contributions of self-report by adolescents receiving treatment for attention-deficit/hyperactivity disorder. *Journal of Consulting and Clinical Psychology*, *68*(3), 489–499. https://doi.org/10.1037/0022-006X.68.3.489

Sonuga-Barke, E. J., Brandeis, D., Cortese, S., Daley, D., Ferrin, M., Holtmann, M., Stevenson, J., Danckaerts, M., van der Oord, S., Döpfner, M., Dittmann, R. W., Simonoff, E., Zuddas, A., Banaschewski, T., Buitelaar, J., Coghill, D., Hollis, C., Konofal, E.,

Lecendreux, M., Wong, I. C., European ADHD Guidelines Group (2013). Nonpharmacological interventions for ADHD: systematic review and meta-analyses of randomized controlled trials of dietary and psychological treatments. *The American Journal of Psychiatry*, *170*(3), 275–289. https://doi.org/10.1176/appi.ajp.2012.12070991

Sosic-Vasic, Z., Kröner, J., Schneider, S., Vasic, N., Spitzer, M., & Streb, J. (2017). The association between parenting behavior and executive functioning in children and young adolescents. *Frontiers in Psychology*, *8*, 472. https://doi.org/10.3389/fpsyg.2017.00472

Spencer, T., Biederman, J., & Wilens, T. (2000). Pharmacotherapy of attention deficit hyperactivity disorder. *Child and Adolescent Psychiatric Clinics of North America*, *9*(1), 77–97.

Stamenova, V., & Levine, B. (2018). Effectiveness of goal management training in improving executive functions: A meta-analysis. *Neuropsychological Rehabilitation*, *29*(10), 1–31. https://doi.org/10.1080/09602011.2018.1438294

Steinberg, L. (2005). Cognitive and affective development in adolescence. *Trends in Cognitive Sciences*, *9*(2), 69–74. https://doi.org/10.1016/j.tics.2004.12.005

Steinberg, E. A., & Drabick, D. A. (2015). A developmental psychopathology perspective on ADHD and comorbid conditions: The role of emotion regulation. *Child Psychiatry and Human Development*, *46*(6), 951–966. https://doi.org/10.1007/s10578-015-0534-2

Steinberg, L., & Morris, A. S. (2001). Adolescent development. *Annual Review of Psychology, 52,* 83–110. https://doi.org/10.1146/annurev.psych.52.1.83

Strayhorn, T. L. (2014). What role does grit play in the academic success of black male collegians at predominantly White institutions? *Journal of African American Studies, 18,* 1–10. https://doi.org/10.1007/s12111-012-9243-0

Stubberud, J., Holthe, I.L., Lovstad, M., Schanke, A-K., Brandt, A., Finnanger, T. (2021). The

    feasibility and acceptability of Goal Management Training of executive functions in

    children with spina bifida and acquired brain injury. *Neuropsychological Rehabilitation,*

    31(4), 601-620. https://doi.org/10.1080/09602011.2020.1723649

Stubberud, J., Edvardsen, E., Schanke, A-K., Lerdal, A., Kjeverud, A., Schillinger, A., Løvstad,

    M. (2019) Description of a multifaceted intervention programme for fatigue after

    acquired brain injury: A pilot study. *Neuropsychological Rehabilitation, 29*(6), 946-

    968. https://doi.org/10.1080/09602011.2017.1344132

Sturman, E. D., & Zappala-Piemme, K. (2017). Development of the grit scale for children and

    adults and its relation to student efficacy, test anxiety, and academic performance.

    Learning and Individual Differences, *59*, 1–10.

    https://doi.org/10.1016/j.lindif.2017.08.004

Takacs, Z. K., & Kassai, R. (2019). The efficacy of different interventions to foster children's

    executive function skills: A series of meta-analyses. *Psychological Bulletin, 145*(7), 653–

    697. https://doi.org/10.1037/bul0000195

Tang, X., Wang, M.-T., Guo, J., & Salmela-Aro, K. (2019). Building grit: The longitudinal

    pathways between mindset, commitment, grit, and academic outcomes*. Journal of Youth*

    and Adolescence, 48(5), 850–863. https://doi.org/10.1007/s10964-019-00998-0

Targum, S.D., Fava, M., Alphs, L.D., Starr, L., Wessel, T.C., & Hilt, D.C. (2014). Fatigue across

    the CNS spectrum: a clinical review. *Fatigue: Biomedicine, Health, & Behaviour, 2*(4),

    231 – 246. https://doi.org/10.1080/21641846.2014.959802

Taylor, S. F., Welsh, R. C., Wager, T. D., Luan Phan, K., Fitzgerald, K. D., & Gehring, W. J.

(2004). A functional neuroimaging study of motivation and executive function. *NeuroImage, 21*(3), 1045–1054. https://doi.org/10.1016/j.neuroimage.2003.10.032

Thomas, R., Sanders, S., Doust, J., Beller, E., & Glasziou, P. (2015). Prevalence of attention-deficit/hyperactivity disorder: A systematic review and meta-analysis. *Pediatrics*, *135*(4), e994-e1001. https://doi.org/10.1542/peds.2014-3482

Toplak, M. E., Bucciarelli, S. M., Jain, U., & Tannock, R. (2008). Executive functions: performance-based measures and the behavior rating inventory of executive function (BRIEF) in adolescents with attention deficit/hyperactivity disorder (ADHD). *Child Neuropsychology*, *15*(1), 53-72. https://doi.org/10.1080/0929704080207092

Toplak, M. E., Jain, U., & Tannock, R. (2005). Executive and motivational processes in adolescents with Attention-Deficit-Hyperactivity Disorder (ADHD). *Behavioral and Brain Functions*, *1*(1), 8. https://doi.org/10.1186/1744-9081-1-8

Tornås, S., Løvstad, M., Solbakk, A. K., Evans, J., Endestad, T., Hol, P. K., Schanke, A. K., & Stubberud, J. (2016). Rehabilitation of executive functions in patients with chronic acquired brain injury with goal management training, external cuing, and emotional regulation: A randomized controlled trial. *Journal of the International Neuropsychological Society: JINS*, *22*(4), 436–452. https://doi.org/10.1017/S1355617715001344

Tripp, G., & Wickens, J. R. (2008). Research review: dopamine transfer deficit: a neurobiological theory of altered reinforcement mechanisms in ADHD. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *49*(7), 691–704. https://doi.org/10.1111/j.1469-7610.2007.01851.x

Turner-Stokes, L. (2009). *Goal Attainment Scaling (GAS) In Rehabilitation: A Practical Guide.* King's College London.

Valls-Serrano, C., Caracuel, A., & Verdejo-Garcia, A. (2016). Goal management training and mindfulness meditation improves executive functions and transfers to ecological tasks of daily life in polysubstance users enrolled in therapeutic community treatment. *Drug and Alcohol Dependence, 165*, 9– 14. https://doi.org/10.1016/j.drugalcdep.2016.04.040

van de Weijer-Bergsma, E., Formsma, A. R., de Bruin, E. I., & Bögels, S. M. (2012). The effectiveness of mindfulness training on behavioral problems and attentional functioning in adolescents with ADHD. *Journal of Child And Family Studies*, *21*(5), 775–787. https://doi.org/10.1007/s10826-011-9531-7

Vesely, S. K., Wyatt, V. H., Oman, R. F., Aspy, C. B., Kegler, M. C., Rodine, S., Marshall, L., & McLeroy, K. R. (2004). The potential protective effects of youth assets from adolescent sexual risk behaviors. *The Journal of Adolescent Health: Official Publication of the Society for Adolescent Medicine*, *34*(5), 356–365. https://doi.org/10.1016/j.jadohealth.2003.08.008

Virone, M.L. (2021). The use of mindfulness to improve emotional regulation and impulse control among adolescents with ADHD. *Journal of Occupational Therapy, Schools, & Early Intervention, 16*(1), 78 – 90. https://doi.org/10.1080/19411243.2021.2009081

Vitolins, M. Z., Rand, C. S., Rapp, S. R., Ribisl, P. M., & Sevick, M. A. (2000). Measuring adherence to behavioral and medical interventions. *Controlled Clinical Trials*, *21*(5 Suppl), 188S–94S. https://doi.org/10.1016/s0197-2456(00)00077-5

Vogels, E., Gelles-Watnick, R., & Massarat, N. (2022). *Teens, social media, and technology.* Pew Research Center. https://www.pewresearch.org/internet/2022/08/10/teens-social-media-and-technology-2022/

Von Culin, K. R., Tsukayama, E., & Duckworth, A. L. (2014). Unpacking grit: Motivational correlates of perseverance and passion for long-term goals. *Journal of Positive Psychology*, *9*(4), 306–312. https://doi.org/10.1080/17439760.2014.898320

Wang, C.K.J., Tan, L., Dairianathan, E.I. (2018). Achievement goals, implicit theories, and intrinsic motivation: A test of domain specificity across music, visual art, and sports. *Journal of Research in Music Education, 66*(3), 320 – 337. https://doi.org/10.1177/0022429418784563

Ward, R. J., Bristow, S. J., Kovshoff, H., Cortese, S., & Kreppner, J. (2022). The effects of ADHD teacher training programs on teachers and pupils: A systematic review and meta-analysis. *Journal of Attention Disorders*, *26*(2), 225–244. https://doi.org/10.1177/1087054720972801

Wechsler, D. (2014). *Wechsler Intelligence Scale for Children – Fifth Edition (WISC-V).* Bloomington, MN: Pearson.

Wehmeier, P.M., Schacht, A., Barkley, R.A. (2010). Social and emotional impairment in children and adolescents with ADHD and the impact on quality of life. *Journal of Adolescent Health, 46*(3), 209 – 217. https://doi.org/10.1016/j.jadohealth.2009.09.009

Weiss, M., Wasdell, M.B., Bomben, M.M. (2011). Weiss Functional Impairment Rating Scale – Self Report (WFIRS-S) and Parent Report (WFIRS-P). University of British Columbia.

Wiener, J., & Daniels, L. (2015). School experiences of adolescents with attention-

deficit/hyperactivity disorder. *Journal of Learning Disabilities, 49*(6), 567 – 581.

https://doi.org/10.1177/0022219415576973

Williams, A. B., Amico, K. R., Bova, C., & Womack, J. A. (2013). A proposal for quality standards

for measuring medication adherence in research. *AIDS and Behavior*, *17*(1), 284–297.

https://doi.org/10.1007/s10461-012-0172-7

Wodrich, D. L., & Spencer, M. L. S. (2007). The other health impairment category and health-

based classroom accommodations: School psychologists' perceptions and

practices. *Journal of Applied School Psychology, 24*(1), 109–

125. https://doi.org/10.1300/J370v24n01_06

Wolters, C. A. (2003). Regulation of motivation: Evaluating an underemphasized aspect of self-

regulated learning. *Educational Psychologist, 38*(4), 189-205.

https://doi.org/10.1207/S15326985EP3804_1

Wolters, C. A. (1998). Self-regulated learning and college students' regulation of

motivation. *Journal of Educational Psychology, 90*(2), 224–

235. https://doi.org/10.1037/0022-0663.90.2.224

Wong, M. M., & Csikszentmihalyi, M. (1991). Motivation and academic achievement: The

effects of personality traits and the quality of experience. *Journal of Personality, 59*(3),

539–574. https://doi.org/10.1111/j.1467-6494.1991.tb00259.x

Zendarski, N., Sciberras, E., Mensah, F., & Hiscock, H. (2017). Early high school engagement in

students with attention/deficit hyperactivity disorder. *The British Journal of Educational

Psychology*, *87*(2), 127–145. https://doi.org/10.1111/bjep.12140

Zhu, G., Burrow, A.L. (2022). Profiles of personal and ecological assets: Adolescents'

motivation and engagement in self-driven learning. *Current Psychology*.

https://doi.org/10.1007/s12144-021-02412-0

Zimmerman, B.J. (2002). Becoming a self-regulated learning: An Overview. *Theory Into*

Practice, 41(2), 64 – 70. https://doi.org/10.1207/s15430421tip4102_2

Appendix A: Summary of Materials Adapted for the Modified Goal Management Training Intervention

Module 1

Modified GMT Slide #	Original GMT Slide #	Description	Notable Changes
1	4	Example of attention lapses using the Professor Fertwinkle scenario	None
2	5		
3	6	Defining goals as simple or complex	Example of complex goal is switched from planning a holidaying to prepping for an exam
4	9	Linking complex goals to the need for planning (references scenario with Professor Fertwinkle)	None
5	10	Linking planning to attention	Psychoeducation re: physical & cognitive challenges associated with acquired brain injury are replaced with psychoeducation re: individual differences in attention, planning, and goal attainment
6-120	12-126	Demonstration of response inhibition using the Clapping Task (clap each time a fruit appears on a slide unless it is a pear)	None
121	127	Discussion about why the seemingly easy Clapping Task is hard to do	None
122	128	Introduction to the concept of a mental lab	None
123	129 + 14 from Mod2	Introduction to the concept of absentmindedness or attention slips	None
124	135	Introducing expectations for GMT	None
125	136	Emphasis on small change	None
126	137	Introduction to homework	None
127	139 Mod2	Going through homework assignment together	None
Modified GMT	Original GMT	Description	Notable Changes

Worksheet #	Worksheet #		
1	4 from Mod1	Examples of absentmindedness	None
2	4 from Mod2	People differ in slips they make & normalization	None
3	5 from Mod2	Consequences of slips	None
4	5 from Mod1	Benefits of GMT	Removing information about brain damage
5	6 from Mod1	Rationale for homework in GMT	None
6	8 from Mod2	Introduction of homework	None
7	10 from Mod1	Session Summary & Homework review	Remove references to present-mindedness and related homework
8– 10	15 – 17 from Mod2	Absentminded tracking chart	None

Module 2

Modified GMT Slide #	Original GMT Slide #	Description	Notable Changes
1	5 from Mod3	Revisiting the mental lab with the Card Sort Task	None
2	21 from Mod3	Introduction to the concept of an automatic pilot	None

Modified GMT Worksheet #	Original GMT Worksheet #	Description	Notable Changes
1 - 2	2 –3 from Mod2	Note-taking space for review of last module and slips	None
3 – 4	4 – 5 from Mod3	Introducing the automatic pilot & listing examples	None

5	6 from Mod3	Rationale for continuing tracking slips homework	None
6 – 7	8 from Mod1 and 8 from Mod3	Rationale for present-mindedness and using breathing as an anchor	None
8	9 from Mod1	Present-mindedness homework	Change reference of "raisin exercise" to breathing exercise. Add option to do breathing exercise as activity.
9	10 from Mod3	Session summary & Homework review	Change wording of present-mindedness homework to focus on breathing exercise and have body scan as alternate option to try
10 - 11	11 – 12 from Mod3	Absentminded tracking charts	None
12 – 13	13 – 15 from Mod3	Present-minded tracking charts	None

Module 3

Modified GMT Slide #	Original GMT Slide #	Description	Notable Changes
1 – 5	8-12 from Mod4	Discussion of how to stop the automatic pilot	Examples of stopping the automatic pilot changed
6	63 from Mod5	Sample slips & successes chart	None

Modified GMT Worksheet #	Original GMT Worksheet #	Description	Notable Changes
1	2 from Mod4	Note-taking space for review of last module and slips	None
2	3 from Mod4	Review of automatic pilot	None

3	4 from Mod4	Note-taking space for discussion of slips from homework	None
4	5 from Mod4	Ways to stop the automatic pilot	None
5	6 from Mod4	Rationale for STOPPING the automatic pilot	None
6 – 7	4 – 5 from Mod5	Introducing mental whiteboard	Change references to blackboard into whiteboard, and remove example of "Gus," replacing with an imagine of Professor Fertwinkle
8	10 from Mod4	Note-taking space for discussion of present-mindedness from homework	None
9	11 from Mod5	Instructions for continuing breathing exercise homework	None
10	8 from Mod4	Rationale and instructions for practicing "stopping"	None
11	9 from Mod4	Summary points learned from session regarding STOP	None
12	12 from Mod5	Rationale and instructions for monitoring slips and successes homework	Change "between-session assignment #3" label
13	15 from Mod4 and 13-14 from Mod5	Summary of session and homework assignment	Blending summaries and homework from two modules and removing references to "breath focus" and "Gus and Myrtle" example
14 – 15	19 – 20 from Mod4	Chart for tracking daily 30 minutes of STOP! practice	None
16 - 18	18 – 20 from Mod5	Chart for tracking daily present-mindedness exercise	None
19 – 25	21 – 27 from Mod5	Instructions and chart for tracking slips and successes	None

Module 4

Modified GMT	Original GMT	Description	Notable Changes

Slide #	Slide #		
1 – 16	52 – 68 from Mod6	Instructions for complex task	None
17	60 from Mod6	Breath focus visual	None
18	61 from Mod6	Summary of complex task, to be left up during exercise	None
19	22 from Mod6	Summary points of getting side-tracked	None
20 – 44	24 – 48 from Mod6	Steps of STOP-FOCUS-STATE cycle	Change examples to represent Professor Fertwinkle, change blackboard to whiteboard

(slides in incorrect order – 1 – 26 in modified PDF are written here as 19 – 44)

Modified GMT Worksheet #	Original GMT Worksheet #	Description	Notable Changes
1	2 from Mod6	Note-taking space for review of last module	None
2 – 3	7 – 8 from Mod5	Description of STOP-FOCUS cycle and steps	Change reference of blackboard to whiteboard
4 – 11	14 – 21 from Mod6	Complex task activity sheets	None
12	9 from Mod6	Space to take notes on real-life examples of being side-tracked from goals, and summary points	Remove graphic representation of example from original GMT, replace with an emoji
13 – 16	10 – 13 from Mod6	Steps and rationale of STOP-FOCUS-STATE	Change examples to represent Professor Fertwinkle
17 – 18	22 – 23 from Mod6	Homework instructions for STOP-STATE tracking	None
19	24 from Mod6	Homework instructions for breathing exercise	None

20	25 from Mod6	Homework instructions for slips and successes sheet	None
21 - 22	26 – 27 from Mod6	Session summary and review of homework	None
23 – 33	28 – 28 from Mod6	Tracking charts for homework assignments	None

Module 5

Modified GMT Slide #	Original GMT Slide #	Description	Notable Changes
1 – 6	18 – 23 from Mod7	Putting together STOP-FOCUS-STATE cycle with To-Do lists	None
7	24 from Mod7	Image of Professor Fertwinkle and To-do lists	None
8 – 16	46 – 54 from Mod7	Describing indecision and decision making using STOP-STATE and acceptance of decision	None
17 – 19	9 – 11 from Mod8	Introducing splitting subtasks	Change example from "moving house" to "selecting course schedule"
20 – 24	19 – 23 from Mod8	Subtasks exercise example	None
25 – 27	25 – 27 from Mod8	STOP-STATE-SPLIT cycle	None
28 – 29	28 – 29 from Mod8	Session Summary	None

Modified GMT Worksheet #	Original GMT	Description	Notable Changes

	Worksheet #		
1	2 from Mod7	Note-taking space for review of last module	None
2 – 3	3 – 4 from Mod7	Conflicting goals & space to jot down real-life examples	Change graphic to Professor Fertwinkle
4 – 5	5 – 6 from Mod7	Summary of feelings that can arise from conflicting goals and space to take notes	Remove dog graphic and insert vector image of stressed human
6 – 7	7 – 8 from Mod7	Tying together Breath Focus and STOP to avoid goal conflict, and summary points	None
8	9 from Mod7	Introduction to to-do lists	None
9	10 from Mod7	Summary and space to take notes on getting organized	None
10	17 from Mod7	Decision making in goal conflicts	None
11 - 12	20 from Mod7	Summary and assigning to-do list homework	None
13	20 from Mod7	Instructions for Everyday STOP-STATE homework	None
14	3from Mod8	Situations that are overwhelming & splitting tasks up	None
15	4 from Mod8	Space to write tasks & subtasks	Change "moving house" example to "selecting course schedule"
16 – 20	5 – 9 from Mod8	Subtasks exercise	None
21 – 22	10 & 13 from Mod8	STOP-STATE-SPLIT cycle	None
23 – 24	18 – 19 from Mod8	Instructions for STOP-STATE-SPLIT homework	Change "assignment number" to "3"
25	21 from Mod8	Instructions for breathing exercise homework	Change "assignment number" to "4"
26 – 27	16 – 17 from Mod8; 23 from Mod7	Session summary and review of homework	Remove "catalogue task" from homework and add to-do lists homework from Module 7. Blend

Modified GMT Slide #	Original GMT Slide #	Description	Notable Changes
			points about goal conflict & To-Do list into summary.
28 – 35	35 – 42 from Mod8	Tracking charts for homework assignments	None

Module 6

Modified GMT Slide #	Original GMT Slide #	Description	Notable Changes
1 - 3	17 – 19 from Mod9	Visual aide for STOP-STATE-SPLIT cycle with addition of CHECK	None
4	20 from Mod9	Summary of why we added CHECK	None
5	21 from Mod9	Introduction to Café Panic Task	Changed to online restaurant game: Café Panic https://www.crazygames.com/game/cafe-panic
6 - 9	25 – 28 from Mod9	Visual reminder of STOP-STATE-SPLIT-CHECK cycle	None
9 - 15	203 – 209 from Mod9	Summary slides of strategies learned in GMT	None

Modified GMT Worksheet #	Original GMT Worksheet #	Description	Notable Changes
1	2 from Mod9	Space to take notes from discussion	None
2	4 from Mod9	Summary of STOP-STATE-SPLIT-CHECK cycle	None
3	7 from Mod9	Space to take notes on discussion	None

4	8 from Mod9	Summary of ways of stopping the automatic pilot, and the full cycle	None
5	9 from Mod9	Summary of information from module	None
6 – end of workbook	12 – end of workbook	Summary of GMT strategies, glossary of terms	None