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Implicit theories of self-regulation among adults with ADHD

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by

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Abstract

Implicit theories of self-regulation were examined among adults with Attention Deficit/Hyperactivity Disorder (ADHD) in order to determine whether mindsets about self-regulation affect goal-attainment in the context of a self-regulation disorder. We conducted two studies in an effort to develop a deeper understanding of goal-related impairment among adults with ADHD. Study 1 was an exploratory study wherein we investigated general correlations between implicit theories of self-regulation, avoidance, negative emotions, and functional impairment in a community sample of adults with ADHD. Study 2 examined the incremental validity of implicit theories. In Study 2 we also examined whether implicit theories of self-regulation predicted emotions and coping responses following a self-regulation failure, and if implicit theories of self-regulation operate differently for people with ADHD. Our findings show that growth theories of self-regulation may matter even more in the context of a self-regulation disorder and support the consideration of an implicit theories approach within current therapeutic models for adult ADHD.

Implicit Theories of Self-Regulation among Adults with ADHD

Attention Deficit/Hyperactivity Disorder (ADHD) is a chronic psychological disorder characterized by abnormal levels of inattention and/or hyperactivity-impulsivity that often persists into adulthood (Barkley, Murphy, & Fischer, 2008). Many adults with ADHD experience more difficulty achieving high levels of psychosocial functioning than individuals without this diagnosis (Rucklidge, Brown, Crawford, & Kaplan, 2007). Adults with ADHD often show significant impairment in multiple domains of psychosocial functioning compared to individuals without ADHD (Biederman et al., 2008). Additionally, they are more likely to be diagnosed with a comorbid psychiatric disorder such as major depressive disorder and anxiety disorders compared to those without ADHD (Barkley, Murphy, & Kwasnik, 1996; Biederman et al., 2008; Sobanski et al., 2007). Comorbid disorders notwithstanding, poor psychosocial outcomes have been directly linked to ADHD (Sobanski et al., 2007; Faraone, Biederman, & Mick, 2006). Self-identified difficulties attaining goals can be linked to the core deficits of self-regulation and self-control that characterize the disorder (Barkley, 1997). Self-regulation is defined as using information about the present in order to change current behavior in service of a desired end goal (Vohs & Baumeister, 2004; Carver & Scheier, 2004). Importantly, self-regulation differs from self-control, or overriding an action in service of achieving a particular goal (Carver & Scheier, 2004). Both self-regulation and self-control are critical components in goal-attainment and in turn are associated with higher levels of psychosocial functioning.

Hypotheses generated from prior qualitative research regarding difficulties with goal attainment in adults with ADHD support the application of goal theory in understanding the connection between ADHD, functional impairment, and comorbidity (Oddo, Knouse, & Safren, 2014). According to goal theory, individuals maintain particular types of goals that affect the

methods by which they pursue them (Ames, 1992; Nicholls, 1984; Elliot & Harackiewicz, 1996). In prior qualitative work, Oddo, Knouse & Safren (2014) examined possible predictors of ADHD-depression comorbidity through transcribing and analyzing clinical interviews of adults with ADHD. Analyses of these data revealed that participants reported difficulty in breaking down and effectively self-regulating to meet their relationship, professional, and academic goals. According these participants, chronic goal-related setbacks and failures contributed to their current or past depression. Results from this exploratory research showed that inability to attain goals was a self-identified process contributing to depression. While preliminary, this work supports further research on the particular mechanisms that underlie functional impairments, such as self-regulation processes and responses in the face of goal-related setbacks, among adults with ADHD.

Individuals who successfully self-regulate engage in goal setting, goal operating, and goal monitoring (Carver and Scheier, 1982; Burnette, O'Boyle, VanEpps, Pollack, & Finkel, 2013; Mann, de Ridder, & Kentaro, 2013). Moreover, those who set concrete and realistic goals are more likely to achieve those goals (Locke & Latham, 2006). Successful goal attainment is characterized by effective response to feedback from the environment throughout the goal-attainment process. In other words, achieving a goal depends largely on one's ability to restructure and reevaluate it, modifying the goal to be more attainable and appropriate in light of one's strengths and weaknesses. This means that successfully attaining a desired outcome and achieving subjective wellbeing involves flexibility in the goal-attainment process (Wrosch, Scheier, Miller, Schulz, & Carver, 2003). Moreover, goal attainment depends on one's ability to recognize the discrepancy in a current circumstance and a desired end state. The hope in achieving a desirable end is to reduce the discrepancy between current circumstance and future

goal (Soman & Cheema, 2004). Inherent in the goal attainment process is self-regulation, and so it is no wonder that impairment in this domain results in chronic failure. Finally, while goals are useful, working toward them often results in setbacks and failures. One's response to a goal-related failure predicts future goal attainment (Mann et al., 2013). Importantly, the way individuals conceptualize their personal traits and ability to self-regulate has been linked to either maladaptive or adaptive response patterns following failure experiences (Burnette et al., 2013).

Extensive work demonstrates that one's *lay theories* regarding whether a particular trait is stable or malleable affect one's emotions, cognitions, and behaviors when attempting to attain a given goal associated with that trait (Dweck, 2006). Dweck's (2006) findings suggest that implicit theories, which are general assumptions about the stability of human qualities (Dweck, 1986; Veilleux et al., 2015), affect the way individuals self-regulate in order to achieve goals. Researchers have conceptualized our lay theories regarding particular human traits and attributes as either fixed or growth oriented. These implicit beliefs either support the notion that human attributes can be improved or developed (i.e. a growth orientation) or, conversely, that human attributes are fixed and cannot be changed with effort (i.e. a fixed orientation). A person's implicit belief framework influences his or her self-regulatory responses (Dweck & Leggett, 1988). For example, following a failure, a fixed theorist would likely ignore useful negative feedback, view others' success as threatening, and choose not to continue to pursue the original goal. Conversely, a growth theorist would be more likely to seek out useful negative feedback, see others' success as motivating, and re-evaluate strategies to attain the goal. Examples such as these demonstrate that implicit beliefs affect how individuals respond to goal failure and setback. In their meta-analysis of implicit theories and self-regulation, Burnette and colleagues (2013) found that a fixed orientation was associated with more intense negative emotions regarding

goal-attainment processes and a helpless orientation toward a goal pursuit (e.g. procrastination), which in turn impacted goal achievement. Taken together, this research shows that self-regulation is critical in the process of attaining goals, and implicit theories are critical in self-regulatory processes (Robins & Pals, 2002).

Implicit theories are associated with outcomes in specific domains following goal-related setbacks. For instance, Burnette (2010) examined whether fixed theorists, who believe that body weight is more stable, are more likely to ineffectually self-regulate following a dieting setback compared to growth theorists, who believe weight is malleable. She found that fixed theorists described more avoidant coping when faced with a dieting setback compared to growth theorists. These results also showed that avoidant coping predicted difficulty realizing weight loss (Burnette, 2010). That is, Burnette (2010) found that weight loss could be conceptualized as a trait such that implicit theories of weight loss impacted self-regulation towards a weight loss goal. Finally, Burnette (2010) found that implicit theory and self-regulation was mediated by participants' expectations about future goal attainment. These findings suggest that individuals' implicit beliefs affect coping responses, which in turn predict self-regulation towards a goal.

Importantly from the perspective of clinical psychology, implicit theories have been targeted in interventions, such as those in academic performance and conflict resolution. Findings from implicit theories interventions show effective change in people's functioning and wellbeing. For example, Aronson, Fried, & Good (2002) found that college students who were told that intellectual skills can improve (i.e. a growth theory) employed more effective self-regulation strategies. Results indicated that students who were taught growth theories improved their grades and standardized test scores compared to those who were only educated on study skills. Similar implicit theories interventions have been conducted among adolescents. For

instance, Blackwell, Trzesniewski, & Dweck (2005) developed an intervention to teach a growth theory of intelligence to adolescent students. They found that following the intervention, teachers found students more willing to invest effort in their academic work. Aronson, & Inzlicht (2004) showed similar results in a sample of African American students, indicating that the benefits of growth mindsets endure even among a disadvantaged and stereotyped population. Similar findings in the field of conflict resolution and prejudice suggest that people's theories about the malleability of human qualities predict judgments of others (Dweck & Ehrlinger, 2006; Chiu, Dweck, Hong, & Fu, 1997; Erdley & Dweck, 1993). Nassbaum and Dweck (2005) show that teaching a growth theory of ability helped participants address their flaws, and made them less likely to look for flaws in others in order to boost their own egos.

Finally, an implicit belief framework has been applied to psychopathology. Hawkinson and colleauges (2015) developed an intervention targeting individuals with high levels of social anxiety and shyness. Their findings revealed that an audiovisual presentation to facilitate a growth mindset led to reduced shyness mindset and less social anxiety. Here, Hawkinson et al. (2015) suggest that implicit theories are valuable in interventions for psychological disorders. Taken together, interventions show real promise in the application of implicit theories to other domains, such as self-regulation in the context of a self-regulation disorder – ADHD.

While implicit theories have been examined in several additional areas, such as personality (Chiu, Hong, & Dweck, 1997), shyness (Beer, 2002), interpersonal relationships (Knee, 1998), and morality (Chiu, Dweck, Tong, & Fu, 1997), the current study examines implicit theories *of self-regulation itself* in the presence ADHD. While prior research has not conceptualized self-regulation as a trait itself, some research has shown an effect of implicit theories of willpower *on* self-regulation. Job, Dweck and Walton (2010) proposed that depletion

of self-control depends on one's belief about the nature of willpower. Job and colleagues (2010) found that people who conceptualized willpower as not limited did not display reduced self-control following a depleting experience. Moreover, results from a longitudinal field study indicated that implicit theories of willpower predicted change in subsequent eating habits, procrastination, and self-regulated goal motivation *even in* depleting conditions. The results of Job et al. (2010) support the extension of an implicit theories framework to self-regulation itself, and rouse the related question of whether a person's implicit theory about their ability to self-regulate prompts similar behavioral change.

Preliminary research shows that implicit theories of self-regulation predict emotions and coping response following a self-reported self-regulatory failure (Knouse, Burnette, & Oddo, 2015). Using a Mechanical Turk sample (N = 204) Knouse et al. (2015) asked participants to report their implicit theories of self-regulation and describe a recent time they failed to meet a goal. Participants then reported their emotional and coping responses to their failure experience (Knouse et al., 2015). Among this sample, growth theories predicted less negative emotion and less avoidant coping. Lastly, emotion mediated the relationship between theories and coping. Knouse et al. (2015) found that implicit theories of self-regulation itself can be measured as a trait about which individuals have an implicit theory. Their results are consistent with findings suggesting that growth mindsets are more adaptive.

The current study applies implicit theories of self-regulation to adult ADHD, a disorder characterized by deficits in this domain (Barkley & Murphy, 2010). Implicit theories of self-regulation among this population are worthy of investigation because it is unclear whether results would support extant research conducted on individuals without the disorder. It may be the case that adults with ADHD who maintain a growth orientation toward self-regulation do not reap the

known benefits of this mindset because it taps into a real impairment. For example, if a person with a disorder believes that he or she can wholly change a hallmark of their disorder, would this reduce negative affect following personal self-regulation failures? It is plausible that a growth mindset of self-regulation could prompt more self-blame and feelings of despair. Here, we present a compelling case for applying an implicit theories of self-regulation framework to adult ADHD. We investigate whether growth mindsets predict fewer negative emotions and less functional impairment following a self-regulation failure in the context of a self-regulation disorder, since self-regulatory abilities are essential in pursuing and attaining personal goals.

In sum, while research indicates that implicit theories may affect self-regulatory processes, the particular belief systems that underlie goal-attainment impairments among adults with ADHD have been largely understudied. In developing a deeper understanding of goal-related impairment among adults with ADHD, it is necessary to examine whether one's implicit belief about their ability to self-regulate will have an effect on goal-attainment. Even more, we want to know how those beliefs interact with the very real self-regulation issues characteristic of the disorder.

The current research is especially important in light of empirically supported psychosocial treatments for ADHD. Cognitive Behavioral Therapy (CBT) for adult ADHD has been developed to target deficits in self-regulation, and is identified as a "probably efficacious" treatment for adult ADHD (Knouse, 2015). A client's implicit belief about her ability to self-regulate seems highly likely to affect the course of CBT, since through the course of therapy, the client and therapist work together to develop self-regulatory and organizational strategies. For example, in order to remember appointments a client may develop a planner system. If the client

maintains a fixed mindset about her ability to self-regulate, it would be likely that CBT would not be as effective, since its foundation depends on changing self-regulation.

Knowing that mindsets may impact the outcome of psychosocial treatment, it is worthwhile to investigate whether individuals with ADHD maintain particular implicit theories that in turn predict maladaptive responses and functional impairment related to goal failure. Moreover, we need to investigate whether growth mindsets operate similarly for people with a disorder of self-regulation. It is also important to know whether adults with ADHD uphold fixed beliefs about their ability to self-regulate that, in turn, result in ineffective strategies to monitor goal attainment processes, helpless-oriented orientations toward goals, and negative emotions following a failure experience. Results may support more comprehensive psychoeducation that targets effective belief constructs as they relate to goal-attainment among adults with ADHD who already experience impairments in executive functioning and self-regulation.

In light of our research questions, we conducted two studies. Study 1 was an exploratory study in which we investigated general correlations between implicit theories of self-regulation, avoidance, negative emotions, and functional impairment in a community sample of adults with ADHD. Study 2 investigated whether implicit theories predicated coping and goal attainment above and beyond general life impairment. In Study 2, we also sought to replicate the mediation pattern found in Knouse, Burnette, & Oddo (2015) among our sample of adults with ADHD and test whether ADHD status moderated relationships between implicit theories and coping.

Study 1: The RVADHD Project

The purpose of Study 1 was to investigate implicit theories of self-regulation among a community sample of adults with ADHD in order to understand how implicit theories of self-

regulation may relate to functional impairment, deficits in executive functioning, and responses to self-regulatory failures. Correlation analyses were conducted in order to discern relationships between implicit theories of self-regulation and coping style among a population of adults with ADHD.

Method

Participants. Participants who were 18 years of age and older who met the following eligibility criteria were included in the study: (1) reported recent diagnosis of ADHD by a healthcare professional (M.D., Ph.D. psychologist, psychiatric nurse practitioner, etc.), (2) scored above the clinical cutoff (93rd percentile using age-appropriate norms) on EITHER the inattentive (score of 21 or above) or combined subscale (score of 39 or above) of the Barkley Adult ADHD Rating Scale (BAARS-IV; Barkley, 2011), (3) endorsed onset of some symptoms before age 12 on the BAARS, and (4) endorsed impairment related to ADHD symptoms in at least two domains of functioning on the BAARS. Exclusion criteria were past or current schizophrenia spectrum disorder, bipolar disorder, pervasive developmental disorder (i.e., autism spectrum disorder such as Asperger's), seizure disorder, traumatic brain injury, other major neurological condition. Thirteen total participants (10 females), including 1 pilot participant who did not endorse childhood onset, completed the study. The average age of the sample was 35.8 years (*SD* =13.4).

Measures.

Note that the measures described in this section include those that were analyzed for the purposes of the current study.

Barkley Adult ADHD Rating Scale (BAARS; Barkley 2011). (20 items) This measure obtains self-reported current ADHD symptoms including hyperactivity and inattention based on *DSM IV* diagnostic criteria. Participants indicate on a 4 point scale (1 = never or rarely, 4 = very often) how accurate the statements describe participants' behavior during the past six months. *"Can't seem to hold in mind things I need to remember to do"*

Barkley Functional Impairment Scale. (15 items) This measure captures self-reported functional impairment in physical, cognitive-behavioral, and psychosocial domains. Participants are asked to rate on a 10 point scale (0 = not at all, 9 = severe) to what extent they see themselves as being impaired in several life domains. *"How much difficulty do you have functioning effectively in your relationships with friends?"*

Implicit Theories of Self-Regulation Scale. (6 items; α=.74) This measure is a self-report questionnaire of implicit theories of self-regulation developed for the purposes of the current study. Participants are given a seven point scale (7 = strongly agree, 1 = strongly disagree) to indicate how much they agree or disagree with six statements regarding their beliefs about self-regulation. *"With enough effort you can learn skills that can improve your ability to self-regulate."* Refer to the Appendix for complete measure.

Emotion and Coping Responses to Failure. (7 items; α=.85) This measure consists of self-reported emotions in response to reported goal failure. Participants are asked to indicate on a 5 point scale (1 = not at all true, 5 = very true) their emotions to their goal-failure experience. They were also asked to rate on a seven point scale (1 = strongly disagree, 7 = strongly agree) their coping response following the reported goal failure. *"When you did not meet the goal that*

you described, what feelings and emotions did you have?-Helpless." Refer to the Appendix for complete measure.

Procedure.

Summer fellowship and Institutional Review Board approval. Three student research assistants who were upper level undergraduate psychology majors and who had completed an advanced psychopathology course and averaged 1.5 years of research with the study's Primary Investigator, Dr. Laura Knouse, applied for undergraduate Arts and Sciences research fellowships. All three were granted the fellowship to work with the PI in the psychology department for eight weeks during the summer of 2014. Research assistants completed an IRB for the Richmond, VA, Attention Deficit Hyperactivity (RVADHD) study, which was approved.

Student researcher training. Three student research assistants were trained to administer the structured interviews and cognitive tests employed in this study. The research assistants read and discussed the training protocols for these interviews and tests. The research assistants observed the PI administer these tests in a simulated study visit. The research assistants practiced administering these instruments on each other, while the PI observed and provided feedback. Reliability scores were obtained during training, and each researcher's independent score was cross-checked with each other's scores and the PI's scores. The PI trained the research assistants to handle unlikely but challenging scenarios that were possible to arise during study visits. These hypothetical scenarios were critically evaluated in discussion with the PI and the research assistants.

Recruitment. Participants were recruited using flyers, advertisements on Craigslist, Facebook, and in Style Weekly, a local entertainment newspaper. Flyers with study information

and links to the online screening were posted in practitioners' office and in the local community (e.g. Starbuck's and Panera bulletins). Participants contacted the study directly to participate via phone or completed the online screening. Study descriptions were posted on Craigslist in the volunteer section and on Facebook. Participants who clicked on the link were directed to the online screening. Finally, newspaper advertisements were placed in local papers. These ads contained content similar to flyers and directed participants to complete the online screening.

Screening. Upon contacting the study by email or phone, participants were asked to complete a brief screening to ascertain eligibility. Participants were also able to contact the screening directly using the link provided on the study's advertisements. The screening included prior ADHD diagnosis, the 18 *DSM-IV* ADHD symptoms, age of onset, and impairment as a result of symptoms. The screening also assessed study rule-out conditions. Participants who called were read the consent statement and their consent was obtained prior to completing the screening. Participants who were eligible were then contacted by email no later than one week following their screening in order to schedule the in-person study visit at the University of Richmond. The study staff informed participants who did not meet eligibility criteria.

Study session procedures. Participants were scheduled for a 2-3 hour study visit in the psychology department at the University of Richmond. They received directions, a campus map, and GPS coordinates via email from the study staff. The participants were notified by email their study appointment time, and were sent reminders the day before and the day of their study visit. Upon arriving at Richmond Hall, participants were greeted in the parking lot by a research assistant, who then gave the participant a parking pass and escorted them into the building.

The PI guided the participant through the informed consent procedures. The PI and the participant discussed the risks and benefits of participation in the study, and the participant was given the opportunity to ask any questions regarding the study. The PI completed a risk screening in order to ascertain whether the participant was appropriate for the study. The goal of this risk screening was to assess suicidality risk. The PI used the *Columbia-Suicide Severity Rating Scale* to determine suicidal ideation and behavior in the past week.

Based on the C-SSRS, the PI used her clinical judgment to determine if imminent suicide risk was present. If this risk was present, the PI would have taken appropriate action to ensure the participant's safety. This contingency plan also accounted for protocol for removing the participant from the study, should that be necessary. The data collected by the PI during the initial risk screening was not used in subsequent analyses.

Data collection. After the initial risk screening was conducted, a research assistant joined the PI to administer modules from the *MINI International Neuropsychiatric Interview*, which asses past and current major depressive episodes. Following the depression inventory, the PI left the study room, and another researcher joined the researcher already in the room. The first research assistant (who was already in the study room) administered all study interviews and recoded participants' responses on an IPad using Qualtrics. The second research assistant (who entered the study room following the initial risk screening and MINI depression inventory) "coded along" with the interview using a paper version of the interviews.

The team of two research assistants who were previously trained (see training protocol above) guided the participant through the remaining procedures. First, participants completed the *Adult ADHD Investigator Symptom Rating Scale* (AISRS), which included questions about age

of onset for each symptom. Participants then completed a semi-structured interview about their ADHD diagnosis and treatment history. Next, participants completed modules from the MINI International Neuropsychiatric Interview, which assessed past and present major depressive episodes, dysthymia, PTSD, generalized anxiety disorder, social phobia, and bulimia nervosa. The second researcher then left the study room.

The first researcher then administered to the participants three subtests from the *Wechsler Adult Intelligence Scales – Fourth Edition*: matrix reasoning, similarities, and digit-symbol coding. Matrix reasoning required participants to choose a picture to complete a series of patterns, while Similarities required them to determine how various words and concepts were similar. Digit-Symbol coding was used to measure processing speed, requiring participants to copy a series of symbols according to a code as quickly and accurately as possible.

Participants then completed a ten-minute activity on self-regulation and goal attainment on a laptop computer with data collected on Qualtrics. The first research assistant stayed in the study room while the participants completed this activity. Participants were first asked to write a few sentences about a recent time when they did not attain a goal they set from themselves. They were asked to answer questions on their self-regulatory responses to the setback they initially described. Affect, commitment, expectations, and regulatory behavioral intentions were reported. Upon completing the self-regulation activities, the research assistant offered the opportunity for a break.

Lastly, participants completed a series of online self-report questionnaires on the Qualtrics platform, which were included in the following order: *Demographic Questionnaire (11 items), Barkley Adult ADHD Rating Scale (BAARS; 25 items), Barkley Deficits in Executive Functioning*

Scale - Short Form (20 items), Barkley Functional Impairment Scale (BFIS; 14 items), ADHD Cognitions Test (20 items), GAD-7 (anxiety symptoms; 8 items),Center for Epidemiologic Studies - Depression Scale (CES-D; 20 items), Insomnia Severity Index (ISI; 7 items), Pittsburgh Sleep Quality Index (PSQI; 24 items),Alcohol Use Disorders Identification Test (AUDIT; 10 items; administered to participants age 21 and up only), Cognitive-Behavioral Avoidance Scale (31 items), PTSD Checklist (PCL-5; 20 items) Life Event Checklist (LEC-5; 17 items), Social Support Questionnaire (SSQ; 27 items), Perfectionism Inventory (27 items),Short Grit Scale (8 items)

Debriefing. Once the participants completed the study or wished to discontinue participation, the research assistant notified the PI, who then conducted debriefings. The participants were thanked for their time, provided with a brief statement about the purpose of the study, and given a copy of the book "Taking Charge of Adult ADHD." They were also paid $30.00. The participants were also asked if they wished to be contacted in the future about additional ADHD studies in the lab. If they said yes, the PI kept their contact information in a secure file that was not associated with the participant's ID number or any other data from the study. The PI instructed participants to direct any questions about their diagnosis or treatment to their healthcare provider.

Reliability coding. Once the study visit was over, recordings were downloaded from the audio recorders and stored on a hard drive kept in a locked file cabinet so as NOT to store interview recordings on a device with internet access. A third research assistant who was not present for the live interview then listened to the recording and "coded along" with the interview. Her responses were then compared with the interview rating made by the live interviewers

(researchers one and two). Inter-rater reliability statistics were calculated using Kappa coefficient in order to ensure reliability of clinical interviews.

Online follow up at 4 months. Four months after participating in the study, 9 participants completed an online follow-up survey. Participants were emailed a $5 Amazon gift card along with a personalized and confidential survey link via Qualtrics to complete a brief set of follow-up measures. The email notified participants that the survey would take approximately 15-20 minutes to complete. Participants completed the Implicit Theories of Self-Regulation scale and then were asked to indicate a recent goal they failed to attain, and write about their responses following the goal failure. The survey included the following measures: *Barkley Adult ADHD Rating Scale (BAARS; 25 items), Barkley Deficits in Executive Functioning Scale - Short Form (20 items), Barkley Functional Impairment Scale (BFIS; 14 items), GAD-7 (anxiety symptoms; 8 items), Center for Epidemiologic Studies - Depression Scale (CES-D; 20 items), Insomnia Severity Index (ISI; 7 items), Cognitive-Behavioral Avoidance Scale (31 items), Questions about recent goal failure and response as described above including Implicit Theories of Self-Regulation scale (6 items).*

After completing these questionnaires, participants read a statement, which included information about mental health resources. Similar debriefing information was also provided. Participants were also given the PI's contact information to use if they had any questions or concerns.

Results.

Only data from Time 2 were analyzed because the Implicit Theories of Self-Regulation Scale was not collected at Time 1. Correlation analyses were employed in order to explore the

relationship between implicit theory of self-regulation, functional impairment, and deficits in executive functioning. As shown in Table 1, correlation analyses showed that there was a significant correlation between impairment (BFIS) and deficits in self-regulation (BDEFS) (.84, $p < .01$). A marginally significant correlation was found between general behavioral avoidance (CBAS) and implicit theory of self-regulation (.68, $p = .07$). (Note that higher scores on the implicit theories measure indicated a more growth oriented mindset.) There was no significant correlation observed between implicit theory and negative emotion following a self-regulation failure (-.27, $p = .48$). Likewise, no significant relationship was observed between implicit theory and avoidant coping following goal failure (.26, $p = .50$).

Discussion.

Study 1 examined implicit theories of self-regulation among a community sample of adults with ADHD in order to understand how implicit theories of self-regulation may relate to functional impairment, deficits in executive functioning, and negative emotion and avoidant coping following a self-regulatory failure. Analyses revealed that functional impairment was positively correlated with deficits in executive functioning, such that higher levels of reported impairment corresponded to more deficits in executive functioning. The finding that implicit theories of self-regulation are modestly correlated with general cognitive behavioral avoidance was surprising, since it indicates that growth mindsets marginally predicted cognitive behavioral avoidance. We observed no significant relationship between implicit theory and avoidant coping following a goal failure. This result runs contrary to extant implicit theories research, which generally finds that growth mindsets predict less avoidance following a goal-related failure. Finally, no significant correlation between implicit theory and negative emotion following a goal failure was found. Our preliminary findings support further analysis of implicit theories of self-

regulation as they predict avoidant coping and negative emotions among this population in a larger sample. Importantly, this sample was obtained from adults with an average age of 35, and so future research is needed to discern the effect of age on implicit theory and coping and negative emotion.

Study 2: Implicit Theories of Self-Regulation

Initial findings from Study 1 incite additional questions about whether implicit theories of self-regulation operate differently in adults with ADHD who maintain deficits in this domain. To develop a more nuanced understanding of implicit theories among this population, Study 2 recruited a sample of college students reporting a diagnosis of ADHD and compared them to students without ADHD. Initially, we investigated whether implicit theories of self-regulation predicted coping above and beyond general life impairment. The current study hypothesized that implicit theory may not predict coping and negative emotion beyond impairment characteristic of the disorder. That is, perhaps a fixed mindset is simply a reflection of participants' very real experiences with ADHD-related impairment. In performing a rigorous test of incremental validity, we first tested whether implicit theories were meaningful predictors of coping and goal related outcomes above and beyond participants' report of general impairment.

Next, we sought to replicate the mediation pattern found in Knouse, Burnette, & Oddo (2015) among our sample of adults with and without ADHD. We hypothesized that negative emotion would mediate the relationship between implicit theory and avoidant coping such that more growth mindset would predict less avoidant coping. Finally, we examined the conditional (moderation) effect of ADHD on the direct relationship between implicit theory and coping. We

employed PROCESS for SPSS (Hayes, 2014) in our mediation (Model 4) and moderation (Models 1 and 3) analyses.

Method

Participants. Participants were recruited from Spider Bytes, the University of Richmond student listserv, and the Introduction to Psychology course at University of Richmond. Participants in the Spider Bytes version of Study 2 were University of Richmond students who contacted the study with interest in participating. Participants in the SONA version of Study 2 were University of Richmond Introduction to Psychology students completing the survey for course credit. Overall, our sample included 65 females, 26 males, and 1 transgender participant, averaging 20.26 years of age (*SD* = 7.25). Self-reported race break down was 8.7% African American, 17.4% Asian/Pacific Islander, 1.1% Native American, 66.3% Caucasian, and 6.5% other. Our ADHD group (*n* =15) consisted of 60% females and 40% males, with an average age of 26 years (*SD* = 17.11). Our non-ADHD group (*n* = 77) included 72.7% females and 26% males who averaged 19.14 years of age (*SD* = 1.01). There was no significant difference in gender distribution between the ADHD and non-ADHD groups, X^2 (2) = 1.36, p = 0.51, but the group with ADHD was significantly older, F (1, 90) = 12.68, p = .001. As a result, we examined our mediation and moderation analyses with and without age as a covariate.

Measures.

The measures for this study included the following scales. Refer to complete measure descriptions above in the Methods for Study 1 and to the Appendix. *Barkley Adult ADHD Rating Scale (BAARS; Barkley 2011), Barkley Functional Impairment Scale, Implicit Theories of Self-Regulation Scale* (α=.74), *Emotion (*α=.85*) and Avoidant coping following a failure* (α=.80).

Procedure.

Spider Bytes. The survey was developed using the Qualtrics survey platform and an advertisement for the study was distributed through Spider Bytes to all University of Richmond students. Those interested in participating in the survey were asked to contact the Principle Investigator, Dr. Laura Knouse. Once interested students contacted the PI, she forwarded their email address to the research assistant. The research assistant then sent the participant the survey link along with a code for their Amazon gift card. The code was used to match participants who had completed the study in order to subsequently compensate their time.

Upon providing consent, participants completed demographic information on their age, gender, race/ethnicity, and level of education. Participants then rated six statements describing their beliefs about self-regulation; specifically, whether self-regulation is fixed or changeable. Participants were given a scale to indicate how much they agreed or disagreed with the six statements provided. Participants next completed the Barkley Deficits in Executive Functioning Scale (BDEFS; Barkley, 2011). After completing this scale, participants were asked whether they had ever received an ADHD diagnosis or are currently diagnose. They then completed the Barkley Adult ADHD Rating Scale (BAARS; Barkley, 2011).

After completing these questionnaires, participants were prompted to write approximately five sentences about a recent time when they did not meet a significant goal. They were asked to think about what happened and how they felt what they thought, and what they did after their failure experience. Upon completing the goal paragraph, participants were prompted to rate how much they agreed with four statements assessing how important the goal was to them and to others. Participants were then given a scale to rate what feelings and emotions they had

following their experience not meeting the goal they wrote about. Participants next rated how committed they were to attaining the goal. Participants were asked to evaluate three statements regarding their coping response to their experience not meeting the goal. Their expectations for meeting their goal in the future were also reported. Participants next described whether their reaction to not meeting the goal they wrote about was a typical response. They next reported the level of impairment they experienced in functional domains using the Barkley Functional Impairment Scale (BFIS; Barkley, 2011).

Participants were asked to provide their unique 5-digit code at the conclusion of the study. Finally, they were debriefed by reading the debriefing statement attached to the online survey. Upon completing the survey, the research assistant matched the unique code each participant entered and sent $5.00 Amazon gift card via email.

SONA. Any University of Richmond Introduction to Psychology students were eligible to participate in the current study. Participants accessed the survey link directly via the online experiment system (SONA) and also received one credit through that system. Upon providing consent, participants completed demographic information on their age, gender, race/ethnicity, and level of education. Participants completed procedures identical to the Spiderbytes recruits but received course credit instead of an Amazon gift card.

Results.

Preliminary analyses. In order to evaluate the validity of our ADHD group, we compared BAARS scores between participants who reported never being diagnosed with ADHD vs. those who reported that they had been diagnosed. A one-way between subjects ANOVA showed that there was a significant effect of ADHD status on BAARS, F (1, 90) = 44.50, $p <$

.001, indicating that participants who reported a history of ADHD (M = 2.44, SD = 0.61), had higher mean scores on the BAARS than participants without a history of the disorder (M = 1.60, SD = 4.10). A correlation analysis was also run for all of the study's variables, as shown in Table 2. Finally, a comparison of implicit theory across groups showed a significant difference in mean implicit theory scores such that participants with ADHD reported more fixed mindsets (M = 4.74, SD = 0.84) than participants without ADHD (M = 5.52, SD = 0.08), F (1, 90) = 52.19, p < .001.

Incremental validity of implicit theory. A multiple regression was conducted to determine if implicit theories of self-regulation predicted avoidant coping above and beyond general impairment. In Step 1, we entered impairment score as measured by BFIS and then entered implicit theory at Step 2 to predict avoidant coping. As Table 3 illustrates, impairment significantly predicted avoidant coping, F(1, 88) = 11.57, p < .01, R^2 = .12, $R^2_{adjusted}$ = .11; however, implicit theory did not predict avoidant coping above and beyond impairment, F(2, 87) = 6.10, p < .05, R^2 = .12, $R^2_{adjusted}$ = .10. A second multiple regression analysis was used to determine if implicit theories of self-regulation predicted whether participants reported eventually meeting the goal they wrote about (higher = no) above and beyond general impairment. In Step 1, we entered impairment score as measured by BFIS. In Step 2 we entered implicit theory to predict goal-attainment. As shown in Table 4, impairment did not significantly predict goal-attainment, (F(1, 88) = 2.45, p = .12, R^2 = .03, $R^2_{adjusted}$ = .16; moreover, implicit theory marginally predicted goal attainment above and beyond impairment (F(2, 87) = 2.7, p = .07, R^2 = .58, $R^2_{adjusted}$ = .04.

Mediation analysis. As shown in Figure 1, negative emotion was examined as a mediator of the relation between implicit theory of self-regulation and avoidant coping following

a goal-related failure (PROCESS Model 4). The relationship between implicit theory and negative emotion was not statistically significant (-.01, p = .92), whereas the relationship between negative emotion and avoidant coping was significant (.69, p < .01). The direct effect of implicit theory and avoidant coping approached significance (-.34, p = .08). Using bootstrap analysis with 10,000 resamples to evaluate the indirect effect, the overall indirect effect of theory on coping via negative emotion was not significant (-.008; 95% *CI: -.18, .18*). Results were comparable when including age as a covariate.

Moderation Analysis. ADHD status was examined as a moderator of the direct effect of implicit theory of self-regulation on avoidant coping following a goal-related failure (PROCESS Model 3). As shown in Figure 2, there was a marginally significant interaction effect of ADHD on the direct relationship between implicit theory and coping (-.92, p = .07). In addition there were two significant main effects of implicit theory (-1.93, p = .04) and ADHD on avoidant coping (-5.11, p =.05). Finally, a conditional effect of ADHD on implicit theories and coping was observed such that the effect of theory on coping for participants with ADHD was significant (-1.00, p = .03), whereas the effect of theory on coping for non-ADHD participants was not (-.08, p = .72). Figure 3 illustrates these relationships.

Because preliminary analyses showed that the ADHD and non-ADHD groups differed on mean age, we conducted the moderation analysis including age as a covariate (PROCESS Model 1). The covariate was not significant and the overall pattern of effect sizes was similar—however, significance values were marginally different. Results show that the moderation effect of ADHD on the direct relationship between implicit theory and coping fell below significance (.87, p = .13). In addition the two main effects were marginally significant: implicit theory (-1.80, p = .09) and ADHD on avoidant coping (-5.06, p =.07). Finally, the conditional effect of

ADHD on implicit theories and coping for participants with ADHD was marginally significant (-.94, $p = .07$), whereas the effect of theory on coping for non-ADHD participants was not (-.07, $p = .77$).

Discussion.

Our findings from the multiple regression analysis show that implicit theories of self-regulation marginally predicted final goal attainment above and beyond impairment, yet this pattern was not observed in predicting coping response. Goal attainment itself may be a more important indicator of the impact of implicit theories, when accounting for impairment. For instance, it could be the case that most people engage in avoidant coping to some extent following a setback, yet the growth theorists are less likely to *maintain* an avoidant coping strategy than fixed theorist. Results from exploratory analyses may support this hypothesis, and provide additional merit for exploratory research to unpack participants' descriptions of goal-related setbacks and subsequent coping strategies.

Results from our mediation analysis show that negative emotion did not mediate the relationship between implicit theory and coping. We did see an expected significant relationship between negative emotion and avoidant coping, a pattern supported in extant research. We saw the direct relationship between implicit theory and coping approach significance. Since we hypothesized *a priori* that ADHD may moderate the relationship between implicit theory and coping, we proceeded with a moderation analysis.

Our moderation analysis showed a main effect of theory on coping and a main effect of ADHD status on coping. This finding is intriguing because it shows that even when ADHD was accounted for in the model, implicit theories still significantly predicted coping. We also found a

significant conditional effect of ADHD status on the direct relationship between implicit theories and coping, indicating that participants with ADHD seemed to be driving this relationship. It may be the case that implicit theory is more important in predicting avoidant coping after failure among adults with ADHD, since the effect was stronger than for participants without the disorder. Finally, although the inclusion of age as a covariate changed the pattern of significance obtained in the moderation analysis, the direction and size of effects were similar suggesting that the relationships observed with ADHD status cannot be accounted for by age.

General Discussion

Our findings show promise in examining implicit theories of self-regulation *as a trait itself*, particularly among adults with ADHD who maintain deficits in this area. Study 1 found no significant correlations between implicit theory and negative emotions and avoidant coping, a pattern contrary to current research in the field. However, due to our sample size and age breakdown, these preliminary results should be interpreted with reservation. Results from Study 2 confirmed a link between implicit theory and avoidant coping, particularly among adults with ADHD. Importantly, unlike Knouse et al. (2015), negative emotion was not a significant mediator. The conditional effects observed suggest that a growth theory of self-regulation may matter *more* in the context of a self-regulation disorder. In other words, our results suggest that implicit theories of self-regulation may be more meaningful in predicting outcomes associated with self-regulation when it is impaired or particularly challenging.

Notable factors may have limited our results. For the purposes of the current analyses, we assumed that all reported goals were equivalent in importance, since they were identified as personal goals. Yet, preliminary qualitative analyses of goal content indicate that the types of

goals reported varied in importance – goals ranged from doing laundry to quitting drinking due to an alcohol problem. Another limitation is that groups were not matched on age; ideally, we would have been able to recruit a broader range of participants for both groups. Finally, participants were asked to report on a recent goal failure; accordingly, it is difficult to discern the accuracy of reported emotions and coping retrospectively. A more accurate report of goal related coping and emotions would likely come from daily diary methodology.

Contradictory findings from Study 1 and 2 regarding implicit theories and avoidance inspire questions about the operation of implicit theories of self-regulation among this population. As mentioned, age differences among groups may contribute to the observed pattern of results; it may be the case that older adults have accumulated more self-regulatory failures which in turn foster a more fixed mindset in this domain. Future research would be wise to examine the effect of age on implicit theories of self-regulation, in doing so taking a more nuanced approach to this subject matter. Moreover, our study exposes the need for qualitative research aimed at unpacking the type of goals participants report, specifically looking at the relationship between goal type and subsequent coping styles. Current research in this field has largely disregarded the specific content of reported goals and failure responses and in doing so has likely missed critical components of goal content that effect subsequent coping responses, emotions, and goal attainment. To address this conceptual limitation, we have begun qualitative analyses using the current data, and have uncovered striking differences in goal content and coping descriptions that vary between ADHD and non-ADHD groups.

An exciting application of this research is in skills-based treatments for adult ADHD, such as cognitive behavioral therapy. CBT rests heavily on the premise that individuals with ADHD can change their ability to self-regulate and attain goals. As such, one prominent CBT

treatment package includes motivational interviewing, repetition and review of learned skills, and continuing practice (Safren, Otto, Sprich, Winett, Wilens, Biederman, 2005). The first module emphasizes psychoeducation about the disorder. In this initial module, the clinician works with the patient in organization and problem-solving skills such as breaking a large and overwhelming goal or task into manageable steps. Clinicians may wish to augment such skills modules with an implicit theories approach whereby the client and therapist nurture a growth mindset about self-regulation. Per our results, a growth mindset may *matter more* when applied to a trait (e.g. self-regulation) that is already limited.

Implicit theories research is needed to address additional populations, including those with other forms of psychopathology. While extant research has conceptualized self-regulation as the link between implicit theory of a given trait and subsequent trait-related outcomes, our results indicate that implicit theories can be extended to self-regulation *itself*. Specifically, implicit theories of self-regulation predicted meaningful outcomes in negative emotion, coping response, and goal-attainment following a reported self-regulatory failure. Moreover, implicit theories of self-regulation were stronger predictors of avoidant coping among adults with a disorder characterized by deficits in this domain. Our findings that implicit theories of self-regulation may matter more in the context of a self-regulation disorder support current therapeutic models for adult ADHD. Finally, implicit theories research at large points to an emerging understanding that our mindsets may be vital in predicting how we overcome inevitable life setbacks, challenges, and failures.

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Table 1

Correlations from Study 1: RVADHD

	Negative Emotion	CBASS	BFIS	BDEFS	Implicit Theories	Avoidance
Negative Emotion	.90					
CBASS	0.25	0.89				
BFIS	0.53	0.60	0.90			
BDEFS	0.62	0.35	0.84**	0.86		
Implicit Theories	-0.27	0.67	-0.02	-0.14	0.58	
Avoidance	-0.46	-0.00	-0.24	-0.46	0.26	0.77
n	9	8	9	8	11	9

**Correlation is significant at the 0.01 level

Note. Cronbach's alpha (internal consistency) for each measure appears on the diagonal.

Table 2

Correlations from Study 2: Implicit Theories of Self-Regulation

	Avoidance	Implicit Theory	Impairment	Negative Emotion	ADHD symptoms
Avoidance	0.79				
Implicit Theories	0.17	0.74			
Impairment	0.34**	-0.31**	0.94		
Negative Emotion	0.39**	-0.01	0.29**	0.84	
ADHD Symptoms	0.32**	-1.77	0.56**	0.12	0.92
n	90	90	90	90	90
M	3.33	5.39	2.31	3.01	1.74
SD	1.59	0.81	1.76	0.91	0.55

**Correlation is significant at the 0.01 level

Note. Cronbach's alpha (internal consistency) for each measure appears on the diagonal.

Table 3

Multiple Regression: Does Growth Mindset Predict Avoidant Coping above and beyond Impairment?

	B	**SE**	**Beta**
Step 1			
Impairment	.32*	.09	.34*
Step 2			
Impairment	.30*	.10	.32*
Implicit Theory	-.17	.21	-.09

*$p < .05$

Table 4

Multiple Regression: Does Growth Mindset Predict Goal Attainment above and beyond Impairment?

	B	**SE**	**Beta**
Step 1 Impairment	.05	.03	.17
Step 2 Impairment	.03	.03	.11
Implicit Theory	-.11 (p = .09)	.06	-.19 (p = .09)

Note. Growth mindset marginally predicted goal attainment above and beyond impairment

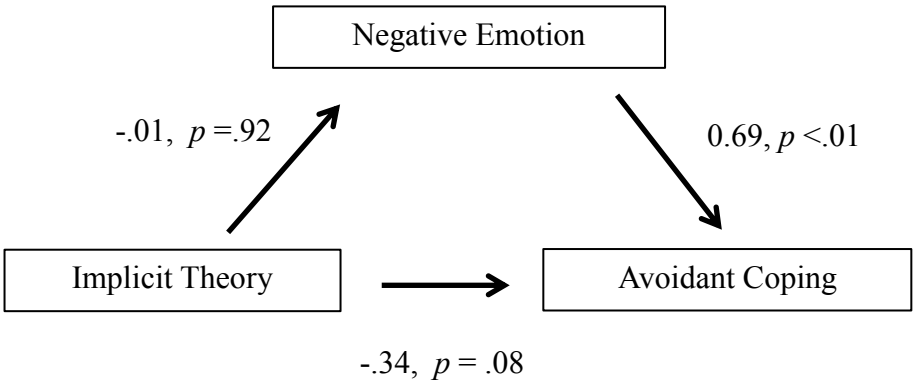

Figure 1. Negative emotion was examined as a mediator of the relation between implicit theory of self-regulation and avoidant coping following a goal-related failure. No significant indirect effect via negative emotion was observed. An expected significant relationship between negative emotion and avoidant coping was found. The direct effect approached significance.

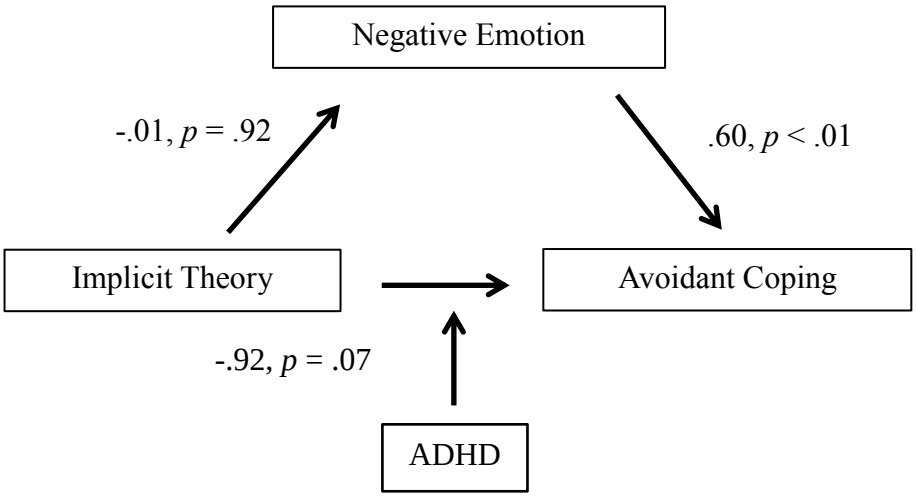

Figure 2. ADHD status was examined as a moderator of the direct relationship between implicit theory and coping response to a goal failure. There was a marginally significant interaction effect of ADHD on the direct relationship between implicit theory and coping. The main effect of implicit theory (-1.93, p =.04) and the main effect of ADHD (-5.11, p = .05) were also significant.

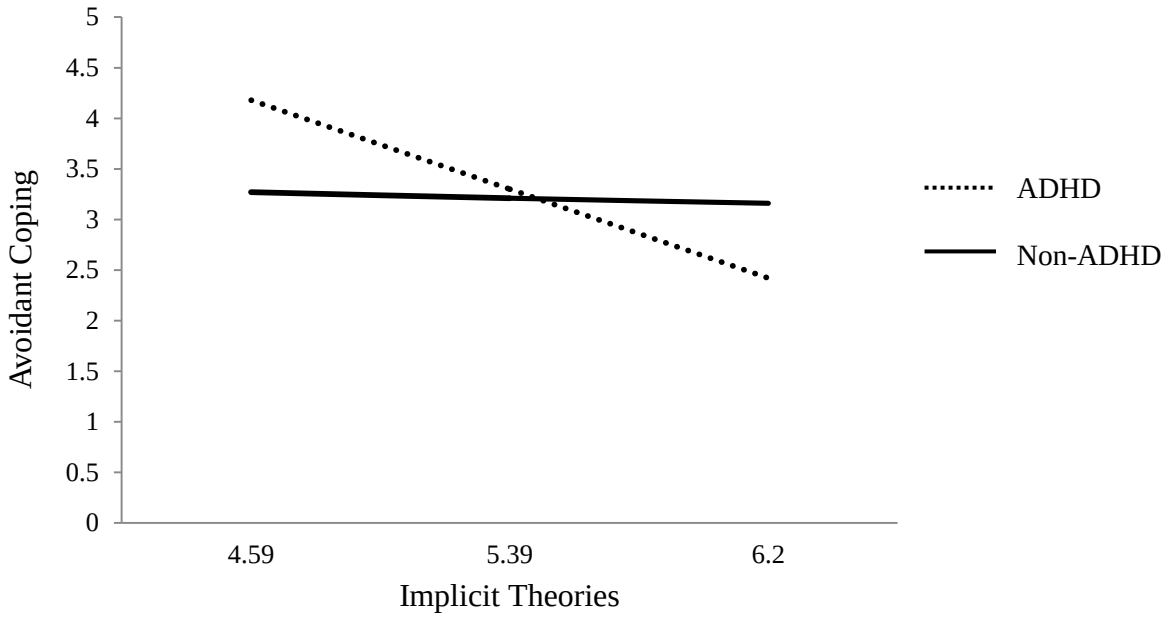

Figure 3. Conditional effect of ADHD on implicit theories and coping shows that for adults with ADHD, implicit theory is a stronger predictor of avoidant coping than it is for adults without the disorder with an effect of theory on coping for ADHD at -1.00, $p = .03$ and an effect of theory on coping for non-ADHD at -.08, $p = .72$.

Appendix

All measures included here are listed as they appeared in the study's questionnaires.

Implicit Theories of Self-Regulation

Self-regulation ability **is the ability to control one's actions and thoughts to meet goals.**

Please answer the following questions using the scale provided to indicate if you disagree or agree with each of the following statements.

Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree
1	2	3	4	5	6	7

1. Self-regulation ability is something you cannot really change.
2. The ability to self-regulate is something that is relatively fixed and stable.
3. No matter who you are you can significantly change your ability to self-regulate.
4. To be honest, you can't really change your ability to self-regulate.
5. With enough effort you can learn skills that can improve your ability to self-regulate.
6. You can change your basic ability to self-regulate considerably.

Goal Paragraph and Description

Please think of a recent time when you **did not** meet a significant goal that you set for yourself. Take a moment and reflect on what happened and how you felt, what you thought, and what you did. Next, write about 5 sentences describing the situation and your experience.

Please indicate how much you agree with the following statements, using the scale below. THE MORE YOU AGREE, THE HIGHER NUMBER YOU WILL SELECT

1	2	3	4	5	6	7
Strongly Disagree	Disagree	Slightly Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree

This was a goal I set for myself.

I felt pressured by others to achieve this goal.

This goal was important to me.

This goal was important to someone else in my life.

Affect

When you did not meet the goal that you described, what feelings and emotions did you have? Please decide to what extent the words below describe how you felt using the following scale.

1 = not at all true 2 = slightly true 3 = somewhat true 4 = true 5 = very true

1 2 3 4 5 helpless	**1 2 3 4 5** vulnerable	**1 2 3 4 5** depressed
1 2 3 4 5 frustrated	**1 2 3 4 5** angry	**1 2 3 4 5** anxious
1 2 3 4 5 bad	**1 2 3 4 5** ashamed	**1 2 3 4 5** guilty

Commitment

Did you eventually meet the goal that you wrote about?

Yes/No

(if NO)

Using the following scale, how committed are you now to meeting the goal that you described above?

0 1 2 3 4 5 6 7 8 9 10

Not at all committed Moderately committed Totally committed

Coping

Please continue to reflect on the goal you set and the setback you wrote about. When you did not meet the goal that you described, how did you respond? Please read the statements below and indicate the degree to which you agree or disagree, using the scale provided:

1	2	3	4	5	6	7
Strongly Disagree	Moderately Disagree	Slightly Disagree	Neither Disagree nor Agree	Slightly Agree	Moderately Agree	Strongly Agree

1. I gave up on the goal altogether.

2. I avoided thinking about the goal for quite some time.

3. I put off doing anything more about the situation.

4. I gave up on my goal altogether.

Expectations:

(If participant met goal that they wrote about, survey branches to version indicated below.)

Please continue to reflect on the goal you did not meet that you wrote about. Please indicate how much you would agree with the following questions.

____ 1. I will be able to reach this goal

____ 2. I will likely succeed in meeting similar goals in the future

____ 3. I feel confident that, in the future, I can meet goals like this

____ 4. I feel positively about eventually reaching the goal that I set

(If participant has already met goal:)

Please continue to reflect on the goal you did not meet that you wrote about. Please indicate how much you would agree with the following questions.

____ 1. I will likely succeed in meeting similar goals in the future.

____ 2. I feel confident that, in the future, I can meet goals like this.

Representativeness of Situation:

The situation I described is pretty typical of how I usually respond when not meeting goals.