

Master thesis

Associations Between ADHD Symptoms, Self-Control, Emotion Regulation, Self-Esteem,  
and Their Interactions: A Comprehensive Perspective

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## **Abstract**

ADHD is a prevalent condition with increasing diagnosis rates globally. The National Institute of Mental Health (NIMH) emphasizes functional characteristics over traditional diagnostic criteria, while the Research Domain Criteria (RDoC) framework focuses on dysfunctions within domains. Self-control, emotional regulation, and self-esteem are prevalent correlates of ADHD, with impairments in executive functioning underlying these factors, causing individuals with ADHD to exhibit diminished self-control, emotion regulation, and low self-esteem. Understanding the interplay between self-control, emotion regulation, and self-esteem can enhance diagnostic frameworks and interventions for ADHD. The findings reveal strong negative associations between self-control, emotional regulation, and ADHD symptoms, indicating that lower levels of self-control and emotional regulation are linked to higher ADHD scores. However, no significant relationship was observed between self-esteem and ADHD. The results suggest that self-control and emotional regulation play crucial roles in ADHD symptoms, highlighting the complex interplay between ADHD's cognitive and emotional aspects. Employing self-esteem measures alongside assessing diagnostic status and incorporating clinical and control groups could provide a comprehensive assessment of self-esteem in ADHD patients. Further investigation is warranted to explore the effectiveness of emotion regulation therapy and other interventions in improving self-control and emotional regulation among ADHD individuals.

## INTRODUCTION

The diagnosis of ADHD has shown a steady increase over the course of several decades, indicating a growing prevalence of the condition. A comprehensive review conducted by Polanczyk and colleagues examined ADHD research from various regions and estimated a global prevalence of 5.3% (Polanczyk et al., 2007). More recent statistics suggest that approximately 6.8% of adults worldwide experience symptomatic ADHD, regardless of the age of onset (Song et al., 2021). The review by Polanczyk and colleagues also highlighted the significant variability in ADHD rates across different populations (Polanczyk et al., 2007). According to Song's article in 2021, actual prevalence rates vary considerably due to differences in diagnostic criteria, cultural influences, and other relevant factors (Song et al., 2021).

Recognizing the increasing prevalence of ADHD, the National Institute of Mental Health (NIMH) has developed an innovative classification method. Instead of relying solely on traditional diagnostic criteria, the NIMH increasingly focuses on functional characteristics derived from behavioural research (Levy, 2014). While the Diagnostic and Statistical Manual of Mental Disorders (DSM) has improved communication among clinicians and researchers, it has had limited success in accurately predicting the course of ADHD and its response to treatment (Levy, 2014). On the other hand, the International Classification of Diseases (ICD), although similar to the DSM in many aspects, sometimes includes correlations with functional impairments, such as poor self-esteem and emotional dysregulation, as proposed by the National Institute of Mental Health (Bach & First, 2018). Additionally, the National Institute of Mental Health has introduced the Research Domain Criteria (RDoC) framework, which departs from strict diagnostic criteria and focuses on exploring specific dysfunctions within different domains and their underlying brain processes (Cuthbert, 2022). By examining multiple areas of functioning, including cognition, emotion, and social behaviour, this model provides a more comprehensive approach to studying psychological conditions like ADHD (Cuthbert, 2022). Investigating functional impairments in ADHD can contribute to early diagnosis and the development of effective interventions.

Emotion dysregulation, poor self-control, and low self-esteem are all prevalent correlates of Attention-Deficit/Hyperactivity Disorder, and each of these aspects is connected to underlying deficiencies in executive functioning (Barkley, 2015; Bolden & Fillauer, 2019;

Kolubinski et al., 2019). For a clinical diagnosis of ADHD, symptoms must result in significant functional impairment, as defined by the DSM-5. When describing a mental condition, the International Classification of Functioning, Disability, and Health emphasizes the importance of identifying specific functional areas that are likely to be affected by various psychological factors. These functional areas include behavioral processes such as self-control and emotional regulation, as well as limitations in participation due to self-esteem issues. Several psychological dimensions have been linked to ADHD, including self-control, emotion management, and self-esteem. However, the extent to which these components are utilized as diagnostic criteria varies among assessment tools. Given the critical role of self-control, emotion regulation, and self-esteem in the cognitive and social functioning of individuals with ADHD, it is crucial to examine their connection with ADHD in current research. Further investigation into these concepts is needed to gain a deeper understanding and potentially prevent challenges associated with ADHD in the future.

### **Self-control**

Self-control is the ability to respond to various events consciously and willingly in a manner that ensures the accomplishment of a goal or produces the most favorable outcome. The capacity for self-control relies on an individual's executive functioning (Barkley, 2015). Executive functioning refers to the cognitive processes that enable people to override innate or automatic reactions actively and intentionally to stimuli. Individuals with ADHD often struggle to generate self-regulated responses to achieve desired objectives. In other words, exercising self-control requires individuals to pause, direct their attention inwardly, block out distractions, process and interpret information, and choose an appropriate course of action (Barkley, 2015).

Due to impaired executive function, adults with ADHD are more prone to directly respond to triggers, depriving themselves of the opportunity to pause and engage in the self-directed steps necessary for self-control, as previously mentioned (Barkley, 2015). Consequently, individuals with ADHD may exhibit impulsive behaviour without considering the consequences of their actions and struggle with delaying gratification. For example, adults with ADHD may unintentionally interrupt others, be vulnerable to emotional outbursts, and have difficulty meeting social or occupational expectations (Barkley, 2015). Key components of these challenges include poor time management and behavioural inhibition (Alderson et al.,

2007; Engelhardt et al., 2008; Nigg, 2000). Neuroscientific data suggests that individuals with ADHD exhibit physiological deviations in brain systems, leading to a diminished capacity for self-control. This supports the significant involvement of genetic and biological factors in ADHD (Eme, 2016). Therefore, reduced self-control appears to be a prominent aspect of ADHD.

In summary, the current understanding of ADHD highlights poor behavioral and emotional self-control as fundamental aspects of the condition (Barkley, 2015). According to Barkley, individuals with ADHD experience fundamental impairments in their self-regulation abilities, which hinder their ability to fully utilize their executive functions (Barkley, 2015).

### **Emotion regulation**

Emotional regulation refers to the ability to effectively manage and control one's emotional experiences, expressions, and responses. When individuals struggle with emotion regulation, they find it challenging to effectively handle their emotional reactions, behaviours, and physical responses, as well as the activation, display, or deactivation of emotions (Bunford et al., 2015). Emotion regulation encompasses a broad range of functions that occur throughout a person's lifetime and relates to the various emotions they experience, the intensity of those emotions, and how they are perceived and expressed (Gross & Thompson, 2007). The primary purpose of emotion regulation is to modify emotional responses to facilitate optimal, goal-directed actions in different situations. It requires individuals to be able to identify their emotions to employ relevant strategies for control (Shaw et al., 2014). Shaw et al. (2014) contributed to the understanding of emotion regulation in the context of ADHD by defining it as a distinct trait that interacts with ADHD, emphasizing its significance. Minde (1998) found that impairments in top-down inhibitory control, which are a central feature of ADHD, extend into the domain of emotional regulation as well. Beheshti et al. (2020) estimated that over 70 percent of individuals diagnosed with ADHD experience difficulties with emotion control. These findings suggest that the lack of emotional control is a fundamental aspect of the disorder or a significant component within a subset of ADHD (Hirsch et al., 2018). Christiansen and colleagues (2019) identified a correlation between impairments in self-control and challenges in effectively managing and regulating emotions at both cognitive and physiological levels. This suggests that the difficulties individuals with ADHD face in controlling impulsive behaviours and maintaining emotional regulation may be

interconnected.

Although emotion regulation plays a crucial role in ADHD, it is not included as a specific diagnostic criterion within the DSM-5, the diagnostic tool used for identifying and categorizing mental health conditions. This is because emotion regulation is considered a transdiagnostic construct that extends beyond ADHD, encompassing elements of psychopathology in other disorders as well (Kring & Sloan, 2010). However, focusing on emotion regulation may provide insights into underlying pathological processes and offer a novel understanding of the disorder (Shushakova et al., 2018). Nevertheless, it is important to establish a more precise distinction between symptoms and conditions to ensure accurate diagnostic practices.

### **Self-esteem**

ADHD can have a significant negative impact on the overall well-being of individuals, affecting various aspects of their lives such as social relationships, professional achievement, and the development of social skills (Mazzone et al., 2013). One important consequence of ADHD is its association with low self-esteem, which refers to a person's emotional and mental perception of themselves. Self-esteem encompasses multiple dimensions, including feelings of competency, success, and self-appraisal (Mazzone et al., 2013).

The relationship between low self-esteem and ADHD has been consistently observed in research (Newark et al., 2016; Dan & Raz, 2015). Cross-sectional studies have further supported this relationship, demonstrating that individuals with ADHD often experience poor self-esteem (Sawyer et al., 2002; Treuting & Hinshaw, 2001; Shaw-Zirt et al., 2005). Self-esteem is influenced by social factors, as proposed by the sociometer theory (Loomis & Pepinsky, 1948). According to this theory, self-esteem is shaped by individuals' perception of their social status, acceptance, and inclusion within their social groups. Positive social interactions and being valued by others contribute to higher self-esteem, while social rejection or exclusion can lead to lower self-esteem (Loomis & Pepinsky, 1948). In the context of ADHD, difficulties in emotion regulation can contribute to low self-esteem because individuals may struggle to effectively manage their emotions, resulting in negative self-perceptions. For instance, someone with ADHD who frequently experiences impulsivity and impulsive outbursts may feel ashamed or embarrassed by their lack of control over their

emotions, leading to diminished self-esteem.

Individuals with ADHD often describe feelings of underperformance in social situations, which can further contribute to a negative perception of their abilities when compared to their peers (Newark et al., 2016; Dan & Raz, 2015). It is possible that repeated experiences of underperformance, combined with negative feedback or reminders of their perceived shortcomings, impact their self-esteem. Throughout their lives, individuals with ADHD often receive negative signals regarding their capabilities due to their struggles, which can have a detrimental effect on their self-esteem (Cook et al., 2014). Knouse and Safren (2010) suggest that individuals with ADHD may adopt maladaptive coping strategies such as denial and procrastination as a response to unpleasant environmental feedback. As a result, their poor self-esteem is reinforced, as they continue to demonstrate an inability to cope effectively, leading to ongoing frustration (Newark & Stieglitz, 2010).

Children with ADHD often exhibit deficits in social well-being, which can negatively impact their self-esteem (Bussing et al., 2000). Regardless of their objective abilities in other areas, self-esteem tends to be significantly lower in children with ADHD compared to their peers without the condition (Foley-Nicpon et al., 2012). Longitudinal studies have found that adolescents with ADHD report lower self-esteem compared to their unaffected counterparts (Edbom et al., 2006; Mazzone et al., 2013). Co-occurring conditions, such as social anxiety disorder, can also contribute to low self-esteem during early adolescence (Kita & Inoue, 2017). Recent qualitative research suggests that adults with ADHD may experience lower self-esteem than those without ADHD, primarily due to stigma, criticism, and sensitivity to rejection (Beaton et al., 2022). Undiagnosed ADHD further exacerbates self-esteem problems, as highlighted in a Japanese study examining psychosocial functioning (Okumura et al., 2021).

## **Interactions**

In the current study, the primary objective was to determine the highest predictive value for ADHD symptoms among the three factors, including self-control, emotion regulation, and self-esteem. Acknowledging the documented comorbidity, it was necessary to investigate potential interactions between these aspects. Due to the limited number of research examining these variables in relation to ADHD, our approach was exploratory in nature, focusing on

studying potential correlations instead of testing specific hypotheses. The objective of the study was to make a valuable contribution to the existing research, enrich diagnostic frameworks, and potentially uncover meaningful interactions that could enhance our understanding of the experiences of individuals with ADHD.

### **Research question and hypotheses**

The primary objective of the current study is to delve into the potential interplay among self-control, emotional regulation, self-esteem, and ADHD. By exploring this relationship, the researchers aim to address the central research question: "To what extent are ADHD symptoms predominantly associated with self-control, emotional regulation, or self-esteem?"

Drawing insights from the existing body of literature, the study puts forth several hypotheses:

- Self-control, emotional regulation, and self-esteem are expected to be negatively correlated with ADHD.
- Self-control is expected to be a stronger predictor of ADHD than self-esteem or emotional regulation.
- Emotional regulation is expected to be a stronger predictor of higher ADHD scores than self-esteem.

## **METHODS**

### **Design**

The study employed a cross-sectional design, which allowed for data collection at a single point in time to examine the relationships between variables. With multiple linear regression, we estimated the correlations and interactions between the independent variables (self-esteem, self-control, emotional regulation) and the dependent variable of ADHD symptom scores. This quantitative approach provided a statistical framework to assess the associations and predictive value of these variables, contributing to a deeper understanding of the interplay between self-esteem, self-control, emotional regulation, and ADHD symptoms.



## **Participants**

A total of 418 participants, all aged 18 years or older, completed the study. The recruitment process involved reaching out to participants through social media platforms, specifically targeting men ( $n = 135$ ), women ( $n = 248$ ), individuals identifying as another gender ( $n = 32$ ), and those who preferred not to disclose their gender ( $n = 3$ ). The recruitment was conducted online, utilizing a Reddit subforum that catered to English speakers worldwide. This approach resulted in a diverse sample that encompassed individuals from various cultures and backgrounds, thereby enhancing the generalizability of the study's findings. However, it was acknowledged that cultural differences could potentially introduce limitations to the study.

Prior to advertising the study on the Reddit platform, explicit permission was sought and obtained. The researchers took ethical considerations seriously, and thus, they contacted the administrators of the respective subreddits to inform them about the study's objectives, procedures, and intended use of the subreddits for recruitment purposes. Following the administrators' approval, the study was advertised within the approved subreddits, ensuring transparency and adherence to ethical standards.

The participants' ages ranged from 18 to 67, with a mean age of 33.05 ( $SD = 9.33$ ). It is important to note that the study received approval from the Faculty Ethical Review Board, as indicated by the assigned case number 23-0558. This approval underscored the researchers' commitment to conducting the study in an ethically sound manner, safeguarding the well-being and rights of the participants throughout the research process.

## **Procedure and Materials**

The study was conducted in English, and as such, only English-speaking individuals participated. Participants were directed to the questionnaire through a link provided on Reddit, which served as the platform for data collection. Detailed information regarding the specific scales used to measure self-control, self-esteem, emotion regulation, and ADHD can be found in the appendix of this research study (see Appendix E, F, G, H).

To recruit participants, an information page was created to invite volunteers to take part in the investigation. This page outlined the study's objectives, eligibility criteria (participants had to be 18 years or older), provided an overview of the study procedures,

described data management and protection measures in compliance with GDPR regulations, and included contact details for individuals seeking further information.

Once participants provided their informed consent, they were directed to answer a series of demographic questions, including age and gender. This was followed by the administration of standardized measures. To mitigate any potential bias due to survey fatigue, the order of measures and the arrangement of items within each measure were randomized. Completing the survey typically required an average of 10 to 15 minutes of participants' time. This time estimate was provided to ensure that participants were aware of the expected duration and could allocate the necessary time to complete the questionnaire accurately and thoughtfully.

### ***Emotion Regulation***

The Difficulties in Emotion Regulation Scale (ERS-16; Bjureberg et al., 2016), a self-report 16-item tool, was used to measure people's average ability to control their emotions. To generate scores on the ERS-16 scale, respondents assign a numerical value to each item based on their level of agreement or frequency of experiencing the described emotional state or behaviour. The respondents rated the extent to which each statement relates to them using a scale of 1 to 5, with 1 representing rarely and 5 representing almost always. The scores for individual items were then summed to calculate a total score, representing the overall level of emotional regulation. The scores in the emotional regulation questionnaire were reversed to ensure that higher scores indicated a greater ability to regulate one's emotions, while lower scores represented a lower ability to regulate emotions, creating a more intuitive interpretation of the results. Lower scores indicated lower emotional regulation. The higher the score, the stronger the participant's emotional regulation. In this study, the ERS-16 had excellent internal consistency, Cronbach's alpha = 0.93.

### ***Self-Control***

The Brief Self-Control Scale (BSCS; Tangney et al., 2004) consists of 13 items. All items have a 5-point rating system with 1 (rarely) and 5 as anchors (almost always). Some items were reverse coded, meaning that the scoring direction was reversed for those items. For example, if a higher score on an item reflected lower self-control, the scoring would be reversed so that a higher score indicates higher self-control. Once any necessary reverse coding had been

applied, the scores for all items were summed together to obtain a total score. Higher total scores indicate higher levels of self-control, while lower scores suggest lower self-control. Self-control was also reverse coded with higher scores representing higher self-control and vice versa. The BSCS had excellent internal consistency, Cronbach's alpha = 0.69. Example statements include "Sometimes I can't stop myself from doing something, even if I know it is wrong" (low self-control) and "I am able to work effectively toward long-term goals" (high self-control).

### ***Self-Esteem***

As a substitute for the Rosenberg Self-Esteem Scale (Robins et al., 2001), the Single-Item Self-Esteem Scale (SISES) was utilized in this study. The SISES involves participants rating their overall self-esteem on a 7-point Likert scale, ranging from 1 (indicating "not very true of me") to 7 (indicating "very true of me"), based on a single item. Although more concise than the original scale, the SISES has been shown to exhibit significant convergent validity with the Rosenberg Self-Esteem Scale and comparable predictive validity (Robins et al., 2001). Assessing self-esteem using this abbreviated measure allowed for efficient data collection while still capturing the essence of individuals' self-evaluations. Notably, the SISES demonstrated excellent internal consistency in this study, with a Cronbach's alpha coefficient of 0.76, indicating strong reliability.

### ***ADHD***

To assess ADHD symptoms among adults, the Adult ADHD Self-Report Scale (ASRS-v1.1; Kessler et al., 2005) was employed in this study. This self-report instrument consists of six items, each rated on a scale of 1 to 5, based on the participant's frequency of experiencing the symptoms described in the "never, rarely, sometimes, often, very often" response options. The combined scores across the six items yield a total score ranging from 6 to 30, with higher scores indicating a higher likelihood of ADHD symptoms. An example item from the ASRS-v1.1 is "How often do you fidget or squirm with your hands or feet when you have to sit down for a long time?". By utilizing the ASRS-v1.1, the study aimed to capture the presence and severity of ADHD symptoms in the adult population, enabling a comprehensive understanding of the participants' experiences and potential ADHD-related challenges.

## RESULTS

First, the data for the main variables were screened and assumptions were checked. Multicollinearity was not a concern (Emotional regulation, Tolerance = .65, VIF = 1.54; Self-control, Tolerance = .79, VIF = 1.26; Self-esteem, Tolerance = .79, VIF = 1.27). All residuals followed a normal distribution, with skewness and kurtosis of the data being within the acceptable range, indicating symmetrical skewness and light-tailed distribution (See Appendix A, Table 1). The median and standard deviation values for the variables of emotional regulation, self-control, and self-esteem fell within the moderate range. As the sample size is sufficiently large (>200), the normality assumption was presumed to be met through the Central Limit Theorem. There was a significant positive correlation between self-control and emotion regulation ( $\tau_b(417) = .32, p < .001$ ) and self-control and self-esteem ( $\tau_b(417) = .16, p < .001$ ). There was also a significant positive correlation between emotion regulation and self-esteem ( $\tau_b(417) = .34, p < .001$ ).

First, associations between gender and the primary variables were tested. Univariate ANOVAs revealed that gender was not significantly associated with ADHD ( $F(3,414) = 1.50, p = .213, \eta^2 = .01$ ), self-control ( $F(3,414) = .67, p = .565, \eta^2 = .01$ ), or self-esteem ( $F(3,414) = 1.54, p = .204, \eta^2 = .01$ ). Gender was significantly associated with emotional regulation ( $F(3,414) = 3.94, p = .009, \eta^2 = .03$ ). Post-hoc tests revealed that male participants ( $M = 46.13$ ) reported significantly higher emotion regulation ( $p = .002$ ) compared to female participants ( $M = 41.12$ ). Next, associations between age and the primary variables were tested. Due to the non-normal distribution of age ( $W = 0.961, p < .001$ ), Spearman's correlations were used. Age was significantly negatively correlated with ADHD ( $r_s(417) = -.11, p = .113$ ). Older participants had lower ADHD scores while younger participants scored higher on the ADHD spectrum. Emotional regulation scores ( $r_s(417) = .16, p < .001$ ) and Self-control scores ( $r_s(417) = .18, p < .001$ ) were significantly, positively correlated with age. Higher scores in emotion regulation and self-control indicated better control over one's emotions and ability to control one's behaviour, suggesting that the older the participants, the better the individual self-control and emotional regulation ability. Lastly, self-esteem was significantly, positively correlated with participants' age ( $r_s(417) = .13, p = .010$ ). Older participants reported higher self-esteem compared to younger respondents.

Finally, the extent to which self-control, emotional regulation and self-esteem predict ADHD was explored. There was a significant negative association between emotion regulation

and ADHD ( $B = -.09$ ,  $SE = .01$ ,  $p < .001$ ). Self-control was also in significantly negative association with ADHD ( $B = -.21$ ,  $SE = .04$ ,  $p < .001$ ). Self-esteem was not significantly associated with ADHD ( $B = -.21$ ,  $SE = .04$ ,  $p < .001$ ). The standardized beta value for self-control in relation to ADHD was  $-0.258$  ( $p < .05$ ). Additionally, the standardized beta value for emotion regulation in relation to ADHD was  $-0.319$  ( $p < .05$ ). Comparing the, it appears that emotion regulation has a slightly stronger negative association with ADHD symptoms than self-control. However, the difference between the two beta values is relatively small, suggesting that both variables are important predictors of ADHD symptoms.

Lastly, the model was broken down into two parts, to control for gender and age, and see how much variance our main variables self-esteem, self-control and emotion regulation predict. Age and gender in step one predicted a significant amount of variance in ADHD, which is approximately 3% ( $R^s\text{-change} = .03$ ,  $F\text{-change} (2,415) = 6.14$ ,  $p = .002$ ). We then controlled for the effect of gender and age on ADHD. The overall model was highly significant and predicted 24% of the variance observed in the target ADHD variable ( $R^2_{\text{adj}} = .24$ ,  $F (5,412) = 26.64$ ,  $p < .001$ ). Self-esteem, self-control, and emotional regulation in step two predicted an additional 22% of the variance, and this is statistically significant ( $R^s\text{-change} = .22$ ,  $F\text{-change} (5,412) = 26.64$ ,  $p < .001$ ).

## **DISCUSSION**

This study was conducted using an online self-report questionnaire and explored the relationships between self-control, emotional regulation, self-esteem, and ADHD symptoms, hypothesizing that lower levels of self-control, emotional regulation, and self-esteem would be associated with higher ADHD scores. It was also expected that self-control would be the strongest predictor of ADHD and that emotional regulation would be a better indicator of ADHD than self-esteem.

Keeping with the reviewed research (Barkley, 2015; Dan & Raz, 2015) and the initial prediction, self-control and emotional regulation revealed strong negative associations with ADHD symptoms, implying that the lower individuals' self-control and emotional regulation, the higher their ADHD scores. Despite prior studies demonstrating an effect in this expected direction (Newark et al., 2016; Dan & Raz, 2015), the current investigation revealed no significant relationship between self-esteem and ADHD. One potential explanation for this outcome is that the participants in our study may have displayed a range of ADHD symptoms, with some individuals having received a formal diagnosis, while others may have had ADHD but remained undiagnosed. Individuals with ADHD are more susceptible to poor self-esteem than the general population but having ADHD without a diagnosis can leave an individual less secure. Pawasker et al. (2020) compared individuals with diagnosed ADHD to adults with ADHD symptoms but no diagnosis. Respondents without a medical diagnosis scored lower on the Rosenberg Self-Esteem Scale than those with diagnoses. This is because, without an explanation, individuals may feel they are inherently disorganised or unfocused compared to their friends. Recognizing that an individual has an undiagnosed psychological condition may help them refrain from blaming and denouncing themselves (Pawaskar et al., 2020). Thus, if the current sample included both diagnosed and undiagnosed ADHD participants, their levels of self-esteem may have differed due to varying levels of awareness and understanding of their condition. It is worth noting that the present study utilized a single-item test to assess self-esteem. Using a concise measure allowed the efficient capture of a general sense of self-esteem without placing excessive demands on individuals with ADHD who may struggle with sustained attention or concentration. To further validate and assess self-esteem measure reliability, it may be necessary to reproduce the experiment using two distinct surveys, one with a 10-item scale and the other with a one-item scale.

The second hypothesis stated that self-control would be a greater predictor of ADHD than emotional regulation or self-esteem. Self-esteem was not a significant predictor, and therefore weaker than the two significant predictors emotion regulation and self-control. Decreases in self-control and emotion regulation were associated with a higher likelihood of experiencing symptoms of ADHD. The significance of self-control and emotion regulation in predicting ADHD symptoms suggests that both factors play crucial roles in ADHD manifestation. The shared significance of self-control and emotion regulation implies that impaired self-control in ADHD may be linked to underlying abnormalities in emotion regulation processes, indicating a complex interplay between cognitive and emotional aspects in the development and expression of ADHD symptoms. This aligns with a previous study by Christiansen and colleagues (2019), further supporting the association between self-control deficits, emotion regulation abnormalities, and ADHD. Shaw et al. (2014) addressed the debate over how to conceptualize emotional control in ADHD by characterizing emotional regulation as a crucial yet distinct quality that interacts with ADHD. While there are some parallels between self-control and emotional regulation, including the need to moderate certain impulses, they are distinct in their focus. Self-control is focused on regulating conduct and thinking, whereas emotional regulation is concerned with managing feelings.

### **Limitations and future research**

There are various limitations to the present research that must be considered. Minor sampling bias occurred due to the gender sample of participants being unequally distributed. Moreover, the sample exhibited a high ADHD score on average, indicating strong ADHD symptoms among all participants. This might be due to the selective sampling of specific groups within the study population. Future research should strive to recruit a more balanced representative population when it comes to gender and ADHD symptomology to enable improved generalizability of the investigation results.

Participant bias possibly occurred due to respondents' awareness of the research's objectives or assumptions and altering their replies specifically, explaining the high ADHD average of the sample. Respondents received information about the study's ADHD component via several Reddit groups, with some being devoted to the topic of ADHD. This might have

resulted in inflated ADHD ratings and less precise data, compromising the investigation's validity. To achieve more accurate measurements, future research could declare the objective of the research after the questionnaire in the form of a debrief.

Furthermore, confounding variables, including a possible ADHD diagnosis, were considered in the investigation, potentially influencing the study's conclusion. When surveying a worldwide online sample, it may not be advisable to inquire about participants' diagnosis, because it is not possible to verify the accuracy and reliability of self-reported diagnoses in such a diverse and geographically dispersed sample. The validity of the reported information could be compromised due to varying diagnostic criteria, cultural differences, and potential misinterpretation of symptoms, making it difficult to draw meaningful conclusions about ADHD prevalence and characteristics across different regions. As mentioned above, having a diagnosis or not may influence self-esteem, making it challenging to discern the underlying association between self-esteem and ADHD. Future research on ADHD and self-control could collaborate with qualified healthcare providers who can verify participants' ADHD diagnoses based on medical records or diagnostic assessments. Furthermore, researchers could conduct structured or semi-structured interviews with participants to gather more detailed information about their ADHD symptoms, functioning, and potential diagnosis.

Finally, the limits of available data collection techniques, which include self-report questionnaires, may have compromised the present investigation's validity and accuracy. This is due to potential biases and limitations inherent in self-report measures. Specifically, this could potentially lead to an overestimation of self-control and emotion regulation abilities, as individuals may have a social desirability bias to report higher levels of these traits, which could impact the generalizability and reliability of the results. Selecting and contrasting controls and diagnosed ADHD samples of individuals could produce more accurate findings than utilizing self-reported measures. Multiple assessment methods could be employed, including self-report questionnaires, diagnostic interviews, and cross-validation with collateral information (e.g., reports from family members or teachers) to enhance the accuracy and reliability of each reported diagnosis.

Moreover, future research could incorporate the principles of the Research Domain Criteria (RDoC) framework into the investigation of emotionally charged comorbid conditions in individuals with ADHD, we can enhance our understanding of the interplay between different domains of functioning and their impact on mental health. RDoC emphasizes the importance



of studying dimensional constructs, such as cognitive processes, social functioning, and negative valence systems, which are relevant to both ADHD and comorbid conditions like depression and anxiety (Cuthbert, 2022). Applying the RDoC framework to the study of emotionally based comorbidities in ADHD can provide a more comprehensive and nuanced perspective on the underlying mechanisms. Furthermore, RDoC encourages the investigation of transdiagnostic processes encompassing multiple mental health conditions (Cuthbert, 2022). We could identify shared underlying mechanisms that contribute to both ADHD and these concurrent conditions by exploring the pathogenic links and possible treatments linked to emotionally based concurrent conditions. This method has the potential to identify innovative therapy targets that address similar processes, resulting in improved treatment options for ADHD patients.

## **Conclusion**

The current investigation concluded that the overall model was highly significant. In contrast to earlier studies (Newark et al., 2016; Dan & Raz, 2015), it was found that self-esteem does not predict ADHD. It remains to be evaluated whether this detection is the result of diagnosed and undiagnosed ADHD. The findings of this study suggest that there may not be a direct connection between self-esteem and ADHD. Previous research on ADHD, self-esteem, and diagnostic awareness provides important context to interpret these results. It is worth noting that our sample was recruited from ADHD subreddits, where individuals may have already received a diagnosis. This could have positively influenced their self-esteem, as having a diagnosis may provide understanding and validation. However, it is also possible that self-esteem and ADHD are not directly correlated. Other factors, such as diagnostic awareness or unexplored correlates, may play a more significant role in determining the relationship between ADHD and self-esteem. Further studies are needed to delve into these factors and provide a more comprehensive understanding of the complex interplay between ADHD, self-perception, and related factors. Furthermore, upcoming studies should also explore methodologies for incorporating longer self-esteem measures when surveying individuals with ADHD, enabling a comprehensive assessment of self-esteem in this population, and facilitating comparisons between clinical and control groups to gain deeper insights into the relationship between ADHD and self-esteem. The study demonstrated that self-control and emotional regulation were both significantly associated with the symptoms of ADHD. Mindfulness, cognitive-behavioural therapy, and other behavioural therapies may

help people with ADHD gain the skills they need to notice and control their emotions successfully (Bachmann et al., 2016; Cassone, 2015). Positive reinforcement may motivate ADHD patients (Bubnik et al., 2015). Individuals with ADHD who are rewarded for positive actions such as finishing assignments or staying on target might prevent lapses in emotion regulation, improve self-confidence, and enhance their ability to focus. Emotion-focused treatment is a form of psychotherapy aimed at assisting people with ADHD in understanding their feelings and creating effective methods of coping (Di Giuseppe et al., 2020). To gain a deeper understanding of the connection between emotional regulation and self-control, as well as the efficacy of emotion regulation therapy in the treatment of ADHD, additional research is needed.

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## Appendix A

### Descriptive Statistics

	Age	Gender	ADHD	EMO	SC	SE_item
Valid	418	418	418	418	418	418
Missing	0	0	0	0	0	0
Mean	33.038	1.768	23.342	42.890	36.053	3.144
Std. Deviation	9.382	0.613	3.659	13.819	4.422	1.619
Skewness	0.730	0.369	-1.026	0.311	-0.138	0.420
Std. Error of Skewness	0.119	0.119	0.119	0.119	0.119	0.119
Kurtosis	0.331	0.362	1.511	-0.585	0.162	-0.868
Std. Error of Kurtosis	0.238	0.238	0.238	0.238	0.238	0.238
Shapiro-Wilk	0.961	0.758	0.937	0.981	0.993	0.915
P-value of Shapiro-Wilk	< .001	< .001	< .001	< .001	0.042	< .001
Minimum	18.000	1.000	9.000	16.000	20.000	1.000
Maximum	67.000	4.000	30.000	78.000	48.000	7.000

Table 1

### Coefficients

Model		Unstandardized	Standard Error	Standardized	t	p	Collinearity Statistics	
							Tolerance	VIF
Ho	(Intercept)	23.342	0.179		130.413	< .001		
Hi	(Intercept)	34.183	1.407		24.290	< .001		
	Gender	0.338	0.260	0.057	1.299	0.195	0.966	1.036
	Age	-0.013	0.017	-0.033	-0.733	0.464	0.931	1.074
	EMO	-0.085	0.014	-0.319	-5.925	< .001	0.631	1.584
	SC	-0.213	0.040	-0.258	-5.282	< .001	0.771	1.298
	SE_item	0.094	0.109	0.042	0.865	0.388	0.786	1.272

Table 2

### Assumption Checks

#### Test of Normality (Shapiro-Wilk)

	W	p
Gender	0.758	< .001
Age	0.961	< .001
ADHD	0.937	< .001
SC	0.993	0.042
SE_item	0.915	< .001

*Note.* Significant results suggest a deviation from normality.

Table 3

**ANOVA - ADHD**

Cases	Sum of Squares	df	Mean Square	F	p	$\eta^2$
Gender	60.155	3	20.052	1.503	0.213	0.011
Residuals	5523.924	414	13.343			

*Note.* Type III Sum of Squares

Table 4

**Assumption Checks****Test for Equality of Variances (Levene's)**

F	df1	df2	p
2.045	3.000	414.000	0.107

Table 5

**ANOVA - SC**

Cases	Sum of Squares	df	Mean Square	F	p	$\eta^2$
Gender	39.930	3	13.310	0.679	0.565	0.005
Residuals	8112.912	414	19.596			

*Note.* Type III Sum of Squares

Table 5

**Assumption Checks****Test for Equality of Variances (Levene's)**

F	df1	df2	p
0.964	3.000	414.000	0.410

Table 6

**ANOVA - SE\_item**

Cases	Sum of Squares	df	Mean Square	F	p	$\eta^2$
Gender	12.055	3	4.018	1.538	0.204	0.011
Residuals	1081.333	414	2.612			

*Note.* Type III Sum of Squares

Table 7

**Assumption Checks****Test for Equality of Variances (Levene's)**

F	df1	df2	p
0.926	3.000	414.000	0.428

Table 8

## ANOVA - EMO

Cases	Sum of Squares	df	Mean Square	F	p	$\eta^2$
Gender	2212.166	3	737.389	3.943	0.009	0.028
Residuals	77424.772	414	187.016			

Note. Type III Sum of Squares

Table 9

## Assumption Checks

### Test for Equality of Variances (Levene's)

F	df1	df2	p
1.479	3.000	414.000	0.220

Table 10

## Post Hoc Tests

### Dunn

#### Dunn's Post Hoc Comparisons - Gender

Comparison	z	W <sub>i</sub>	W <sub>j</sub>	p	p <sub>bonf</sub>	p <sub>holm</sub>
1 - 2	3.135	235.870	195.367	0.002	0.010	0.010
1 - 3	1.103	235.870	209.672	0.270	1.000	1.000
1 - 4	0.660	235.870	189.333	0.509	1.000	1.000
2 - 3	-0.631	195.367	209.672	0.528	1.000	1.000
2 - 4	0.086	195.367	189.333	0.931	1.000	1.000
3 - 4	0.279	209.672	189.333	0.780	1.000	1.000

Table 11

## Descriptive Statistics

	EMO			
	1	2	3	4
Valid	135	248	32	3
Missing	0	0	0	0
Mean	46.126	41.121	43.188	40.333
Std. Deviation	14.665	13.113	13.899	8.505
Minimum	16.000	17.000	21.000	34.000
Maximum	77.000	76.000	78.000	50.000

1 = male, 2 = female, 3 = other, 4 = did not disclose

Table 12

## Linear Regression

### Model Summary - ADHD

Model	R	R <sup>2</sup>	Adjusted R <sup>2</sup>	RMSE
H <sub>0</sub>	0.170	0.029	0.024	3.615
H <sub>1</sub>	0.494	0.244	0.235	3.200

*Note.* Null model includes Gender, Age  
Table 13

### ANOVA

Model		Sum of Squares	df	Mean Square	F	p
H <sub>0</sub>	Regression	160.539	2	80.270	6.142	0.002
	Residual	5423.540	415	13.069		
	Total	5584.079	417			
H <sub>1</sub>	Regression	1364.323	5	272.865	26.641	< .001
	Residual	4219.756	412	10.242		
	Total	5584.079	417			

*Note.* Null model includes Gender, Age  
Table 14

### Coefficients

Model		Unstandardized	Standard Error	Standardized	t	p	95% CI		Collinearity Statistics	
							Lower	Upper	Tolerance	VIF
H <sub>0</sub>	(Intercept)	24.372	0.875		27.845	< .001	22.651	26.093		
	Gender	0.457	0.291	0.076	1.570	0.117	-0.115	1.029	0.986	1.014
	Age	-0.056	0.019	-0.143	-2.927	0.004	-0.093	-0.018	0.986	1.014
H <sub>1</sub>	(Intercept)	34.183	1.407		24.290	< .001	31.417	36.949		
	Gender	0.338	0.260	0.057	1.299	0.195	-0.173	0.850	0.966	1.036
	Age	-0.013	0.017	-0.033	-0.733	0.464	-0.047	0.021	0.931	1.074
	EMO	-0.085	0.014	-0.319	-5.925	< .001	-0.113	-0.057	0.631	1.584
	SC	-0.213	0.040	-0.258	-5.282	< .001	-0.293	-0.134	0.771	1.298
	SE_item	0.094	0.109	0.042	0.865	0.388	-0.120	0.309	0.786	1.272

Table 15

### Descriptives

	N	Mean	SD	SE
ADHD	418	23.342	3.659	0.179
Gender	418	1.768	0.613	0.030
Age	418	33.038	9.382	0.459
EMO	418	42.890	13.819	0.676
SC	418	36.053	4.422	0.216
SE_item	418	3.144	1.619	0.079

Table 16

### Collinearity Diagnostics

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions					
				(Intercept)	Gender	Age	EMO	SC	SE_item
H <sub>0</sub>	1	2.871	1.000	0.005	0.012	0.008			
	2	0.103	5.289	0.004	0.588	0.299			
	3	0.027	10.377	0.991	0.400	0.693			
H <sub>1</sub>	1	5.612	1.000	0.000	0.003	0.002	0.002	0.000	0.005
	2	0.188	5.463	0.002	0.144	0.006	0.013	0.001	0.547
	3	0.104	7.360	0.001	0.464	0.187	0.046	0.002	0.237
	4	0.059	9.720	0.000	0.000	0.440	0.536	0.003	0.196
	5	0.031	13.552	0.129	0.377	0.363	0.311	0.092	0.011
	6	0.007	29.106	0.867	0.012	0.003	0.092	0.901	0.005

Table 17

## Appendix B

### PARTICIPANT INFORMATION SHEET

**Study title:** ADHD associations with emotion regulation, self-control, and self-esteem

**Researchers:** Miss Alexandra Guothová and Dr Leslie van der Leer (principal investigator).

You are invited to participate in the current research. Before you decide whether to participate, it is important for you to understand why the study is being conducted and what it involves. Please read this information sheet carefully and feel free to discuss anything with family, friends or the researchers, if you wish to do so. Participation is on a voluntary basis.

#### **Purpose of study**

This study investigates how ADHD symptoms are associated with self-control, emotion regulation, and/or self-esteem.

#### **Who can take part?**

People with different characteristics, aged 18 or older can take part. Participants voluntarily take part and you are free to withdraw at any time during the experiment without giving a reason.

#### **What happens if I take part?**

You will be asked to provide demographic information (e.g., gender and age) and complete a series of questionnaires by selecting statements which best describe your personal beliefs and feelings. It takes approximately 1 minutes to complete this study.

#### **How will my data be handled?**

Your data will be treated in line with the General Data Protection Regulation (GDPR). All data we collect from you are anonymous and treated confidentially. Only the researchers will have access to the data, which will be stored on a secure drive of Utrecht University for 10 years. Only averages of data will be presented in research reports and scientific presentations. If you withdraw participation before the end of the study, all data submitted until that point will be deleted; once completed, your data cannot be removed as there are no personal identifiers.

#### **Who can I contact for more information or concerns?**

Please feel free to contact Alexandra Guothová (a.guothova@students.uu.nl) in the first instance. Otherwise, contact Dr Leslie van der Leer (l.vanderleer@uu.nl). Please provide a description of the study when contacting us.

## Appendix C

### PARTICIPANT CONSENT FORM

**Title of the research project: ADHD association with emotion regulation, self-control, and self-esteem**

**Name of the researcher(s): Miss Alexandra Guothová, Dr Leslie van der Leer**

I confirm that I have read and understood the information sheet for the above study.

I have had the opportunity to consider the information, ask questions and have these answered satisfactorily.

I am 18 years old or older.

I understand that my participation is voluntary and that I am free to stop taking part and can withdraw from the study at any time without giving any reason and without my rights being affected.

I understand that following the submission of the questionnaire, I will no longer be able to request access to or withdrawal of the information I provide.

I understand that the information I provide will be held securely and in line with data protection requirements at Utrecht University.

I agree to take part in the above study.

## Appendix D

### DEMOGRAPHIC INFORMATION

**Please answer the following questions:**

Gender (Please select):

- Male
- Female
- Other
- Do not want to say

Age:

-----



## Appendix E

### Adult ADHD Self-Report Scale (ASRS-v1.1) Symptom Checklist

Please answer the questions below, rating yourself on each of the criteria shown using the scale on the right side of the page. As you answer each question, select an option that best describes how you have felt and conducted yourself over the past 6 months.

1. How often do you have trouble wrapping up the final details of a project, once the challenging parts have been done?

**Never**      **Rarely**                      **Sometimes**                      **Often**                      **Very often**

2. How often do you have difficulty getting things in order when you have to do a task that requires organization?

**Never**      **Rarely**                      **Sometimes**                      **Often**                      **Very often**

3. How often do you have problems remembering appointments or obligations?

**Never**      **Rarely**                      **Sometimes**                      **Often**                      **Very often**

4. When you have a task that requires a lot of thought, how often do you avoid or delay getting started?

**Never**      **Rarely**                      **Sometimes**                      **Often**                      **Very often**

5. How often do you fidget or squirm with your hands or feet when you have to sit down for a long time?

**Never**      **Rarely**                      **Sometimes**                      **Often**                      **Very often**

6. How often do you feel overly active and compelled to do things, like you were driven by a motor?

**Never**      **Rarely**                      **Sometimes**                      **Often**                      **Very often**

## Appendix F

### DERS-16

Please indicate how often the following statements apply to you by writing the appropriate number from the scale above (1–5) on the line beside each item.

1) I have difficulty making sense of my feelings.

**Rarely    Sometimes    About half the time    Most of the time    Almost always**

2) I am confused about how I feel.

**Rarely    Sometimes    About half the time    Most of the time    Almost always**

3) When I am upset, I have difficulty getting work done.

**Rarely    Sometimes    About half the time    Most of the time    Almost always**

4) When I am upset, I become out of control.

**Rarely    Sometimes    About half the time    Most of the time    Almost always**

5) When I am upset, I believe that I will remain that way for a long time.

**Rarely    Sometimes    About half the time    Most of the time    Almost always**

6) When I am upset, I believe that I'll end up feeling very depressed.

**Rarely    Sometimes    About half the time    Most of the time    Almost always**

7) When I am upset, I have difficulty focusing on other things.

**Rarely    Sometimes    About half the time    Most of the time    Almost always**

8) When I am upset, I feel out of control.

**Rarely    Sometimes    About half the time    Most of the time    Almost always**

9) When I am upset, I feel ashamed of myself for feeling that way.

**Rarely    Sometimes    About half the time    Most of the time    Almost always**

10) When I am upset, I feel like I am weak.

**Rarely   Sometimes   About half the time   Most of the time   Almost always**

11) When I am upset, I have difficulty controlling my behaviours.

**Rarely   Sometimes   About half the time   Most of the time   Almost always**

12) When I am upset, I believe that there is nothing I can do to make myself feel better.

**Rarely   Sometimes   About half the time   Most of the time   Almost always**

13) When I am upset, I become irritated with myself for feeling that way.

**Rarely   Sometimes   About half the time   Most of the time   Almost always**

14) When I am upset, I start to feel very bad about myself.

**Rarely   Sometimes   About half the time   Most of the time   Almost always**

15) When I am upset, I have difficulty thinking about anything else.

**Rarely   Sometimes   About half the time   Most of the time   Almost always**

16) When I am upset, my emotions feel overwhelming.

**Rarely   Sometimes   About half the time   Most of the time   Almost always**

## Appendix G

### Self-Control Scale items

Read each statement and indicate how much you agree with it using the following scale: 1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree.

1. I am good at resisting temptation.

**Rarely    Sometimes    About half the time    Most of the time    Almost always**

2. I have a hard time breaking bad habits.

**Rarely    Sometimes    About half the time    Most of the time    Almost always**

3. I am lazy.

**Rarely    Sometimes    About half the time    Most of the time    Almost always**

4. I say inappropriate things.

**Rarely    Sometimes    About half the time    Most of the time    Almost always**

5. I do certain things that are bad for me if they are fun.

**Rarely    Sometimes    About half the time    Most of the time    Almost always**

6. I refuse things that are bad for me.

**Rarely    Sometimes    About half the time    Most of the time    Almost always**

7. I wish I had more self-discipline.

**Rarely    Sometimes    About half the time    Most of the time    Almost always**

8. People would say that I have iron self-discipline.

**Rarely    Sometimes    About half the time    Most of the time    Almost always**

9. Pleasure and fun sometimes keep me from getting work done.

**Rarely    Sometimes    About half the time    Most of the time    Almost always**

10. I have trouble concentrating.

**Rarely   Sometimes   About half the time   Most of the time   Almost always**

11. I am able to work effectively toward long-term goals.

**Rarely   Sometimes   About half the time   Most of the time   Almost always**

12. Sometimes I can't stop myself from doing something, even if I know it is wrong.

**Rarely   Sometimes   About half the time   Most of the time   Almost always**

13. I often act without thinking through all the alternatives.

**Rarely   Sometimes   About half the time   Most of the time   Almost always**

## Appendix H

### SINGLE-ITEM SELF-ESTEEM SCALE

1. I have high self-esteem.

Not very true of me 1 ----2 ----3 ----4 ----5 ----6 ----7 Very true of me