

ADHD Symptomatology Across Adulthood:
Stability and the Impacts on Important Life Outcomes

A Thesis Submitted to the Committee on Graduate Studies in Partial Fulfillment of the
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Abstract

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Objective: To improve on several methodological issues and research gaps regarding current literature investigating the stability of ADHD symptomatology across adulthood and relationships between the two core ADHD symptom dimensions (i.e., inattention and hyperactivity-impulsivity) and multiple life outcomes in adults. **Method:** A large sample of post-secondary students were initially assessed for ADHD symptomatology using the Conners' Adult ADHD Rating Scale (CAARS). Six years later, academic success was assessed using students' official academic records (e.g., final GPAs and degree completion status), and fifteen years later, participants were re-assessed using the CAARS and several measures of life success (e.g., relationship satisfaction, career satisfaction, and stress levels). **Results:** Inattention and hyperactivity-impulsivity symptoms showed strong stability across the 15-year period. Additionally, greater inattention symptoms during emerging adulthood and early middle adulthood were consistently associated with poorer life success (e.g., lower GPAs, poorer relationship and career satisfaction), particularly for men. Associations for hyperactivity-impulsivity symptoms were less consistent. **Conclusion:** ADHD symptomatology can be conceptualized as a stable, dimensional trait across adulthood, with robust associations with measures of life success.

Key words: academic success, ADHD, adults, job satisfaction, persistence, relationship satisfaction, stability, stress.

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Chapter 1: An Introduction to Current Research on Adult ADHD and its Limitations

Problems with focusing on one's daily tasks without distraction, organizing ones' life activities, restlessness, and engaging in impulsive actions is a normal part of life for many individuals. However, when these problems are persistent and pervasive, they can be a significant impediment to normal daily functioning and contribute to a variety of negative life consequences. In the fields of clinical psychology and psychiatry, this collection of problems is encapsulated by Attention-Deficit Hyperactivity Disorder (ADHD), a psychiatric disorder characterized by symptoms along two core dimensions: inattention (e.g., difficulty focusing on a task at hand) and hyperactivity-impulsivity (e.g., restlessness and an inability to wait; American Psychiatric Association [APA], 2013). Known as a neurodevelopmental disorder, or a disorder of childhood, ADHD is thought to originate in early childhood (Nigg et al., 2020) with formal diagnosis of the disorder requiring symptoms to be present before the age of 12 in multiple settings (e.g., at home, school; APA, 2013).

Two meta-analyses estimate the global prevalence of ADHD to be 0.7 to 2.2% among children and adolescents (Erskine et al., 2013), and 1.5 to 4.5% among adults (Song et al., 2021). A recent study with Canadian participants found that approximately 2.9% of adults were diagnosed with ADHD (Hesson & Fowler, 2018). This level of prevalence suggests that ADHD is a disorder of significant burden both globally and within Canada. However, ADHD has remained a largely underappreciated disorder, with many long-term life outcomes of the disorder appearing largely unchanged despite the wide availability of treatment and intervention (Nigg et al., 2020).

Underlying this relatively high prevalence of ADHD and the persistence of long-term life outcomes for adults with ADHD is the consistent finding that a majority of adults diagnosed with

ADHD as children continue to experience persistent ADHD symptoms well into adulthood. Indeed, despite previous assumptions that ADHD was a disorder limited to childhood, recent studies estimate 60-90% of children diagnosed with ADHD continue to experience significant symptom persistence into emerging adulthood (i.e., 18-25 years old), with approximately 41.1% of adults continuing to experience significant functional impairment (Sibley et al., 2017). In fact, a recent study by Sibley et al. (2022) found only 9.1% of children diagnosed with ADHD attained full, sustained remission or recovery from ADHD by the end of emerging adulthood.

Instead of fully recovering from childhood ADHD symptoms and attaining normal daily functioning, research has consistently demonstrated that ADHD symptoms persist for many adults and contribute to a multitude of negative life outcomes. For instance, greater ADHD symptoms have been associated with poorer overall relationship quality and satisfaction, lower career satisfaction, and a greater likelihood of being fired (Bodalski et al., 2019; Hechtman et al., 2016; Knies et al., 2021; Painter et al., 2008). ADHD symptoms have also been associated with a greater likelihood of comorbid psychiatric disorders (e.g., depression, anxiety, substance use) and poorer academic outcomes, including lower GPAs and higher dropout rates (Vogel et al., 2018; DuPaul et al., 2021).

Limitations of the Current Literature

Despite these consistent findings, however, the current adult ADHD literature continues to suffer from a variety of persistent methodological shortcomings. Firstly, a majority of the current research literature relies on cross-sectional designs that limit our understanding of the impacts of ADHD symptoms across time (DuPaul et al., 2021; Knies et al., 2021), as well as our understanding of the persistence of ADHD across time. Relatedly, current literature on the persistence of ADHD tends to focus on the persistence of ADHD symptoms from childhood or

adolescence to emerging adulthood (Sibley et al., 2022), with no studies to our knowledge examining the persistence or stability of ADHD symptoms beyond emerging adulthood (e.g., into middle or older adulthood).

In addition, studies on the impacts of ADHD symptoms on life outcomes in adulthood have tended to examine only global ADHD symptoms (i.e., total ADHD symptom scores), rather than examining the relative contributions of the two core ADHD symptom dimensions (i.e., inattention and hyperactivity-impulsivity) to life outcomes. This limitation is significant as it restricts the ability of mental health professionals to identify and target the most salient aspects of ADHD linked with specific life outcomes. Finally, despite consistent findings regarding gender differences in the symptom presentation of ADHD and related life outcomes among youth and adults (Young et al., 2020), most studies in the adult ADHD literature fail to examine gender differences in their studied effects.

The purpose of this thesis was to address these shortcomings of the current adult ADHD literature by using a longitudinal design and a latent variable data analytic strategy to examine the impacts of the two core ADHD symptom dimensions on several life outcomes among men and women both during emerging adulthood and later in early middle adulthood. In particular, using different models of ADHD symptomatology, Study 1 examined the impacts of ADHD symptoms on multiple academic outcomes following a 6-year period, with analyses conducted separately for men and women. Study 2, on the other hand, goes beyond this 6-year period to examine the stability of ADHD symptomatology and the impacts of ADHD symptoms on multiple life outcomes across a 15-year period.

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Chapter 2: ADHD and Academic Success in University Students: The Important Role of Impaired Attention

Abstract

Objective: To improve on several methodological issues regarding current literature investigating the relationship between ADHD symptomatology and academic success in adults and examine the relative contributions of specific dimensions of ADHD symptomatology (i.e., inattention, hyperactivity, and impulsivity) to post-secondary academic success. **Method:** A large sample of 3688 post-secondary students were examined using a longitudinal design. The Conners' Adult ADHD Rating Scale (CAARS) was used to assess adult ADHD symptoms and academic success was assessed using students' official academic records (e.g., final GPAs and degree completion status). **Results:** Students with greater inattention symptomatology at the start of their academic program showed consistently poorer long-term academic success (i.e., lower GPAs, higher dropout rates), regardless of gender. **Conclusion:** Inattention symptoms are the primary driver of the relationship between ADHD symptomatology and academic underachievement in adults. Post-secondary education institutions should target and prioritize educational programming for inattention symptoms of ADHD in at-risk post-secondary students.

Keywords: ADHD, post-secondary success, academic success

Attention-Deficit Hyperactivity Disorder (ADHD) is defined in the DSM-5 as a persistent pattern of inattention and/or hyperactivity-impulsivity that shows clear evidence of interference with social, academic, or occupational functioning in two or more settings (e.g., in the home, at school; American Psychiatric Association [APA], 2013). ADHD is primarily characterized by a set of core symptoms along two related dimensions: inattention (e.g., difficulty focusing on a task at hand) and hyperactivity-impulsivity (e.g., restlessness and inability to wait). ADHD symptomatology has been consistently associated with several adverse life outcomes, including academic underachievement, higher rates of unemployment and precarious employment, increased rates of substance use disorders, and reduced quality of life (Cherkasova et al., 2013; Erskine et al., 2016; Kuriyan et al., 2013).

ADHD and Academic Achievement

Perhaps the most extensively studied of these adverse outcomes of ADHD is its impact on a person's ability to succeed in educational settings (Kent et al., 2011; Lawrence et al., 2020). Indeed, in a study examining the academic achievement of children and adolescents, Lawrence et al. (2020) found that children with ADHD were, on average, a year behind their non-ADHD peers on standardized tests for reading and math by their third year of schooling, and adolescents with ADHD were, on average, two and a half years behind their non-ADHD peers on standardized tests for reading and 3 years behind on standardized tests of math by their 9th year of schooling. Likewise, Kent et al (2011) found that secondary school students with ADHD received lower overall grade point averages (GPAs) and lower GPAs in all academic domains compared to their non-ADHD peers, as well as being less likely to hand in completed assignments on time and more likely to fail courses throughout secondary school and drop-out prematurely.

Despite such consistent evidence regarding the academic difficulties of children and adolescents with an ADHD diagnosis, research regarding the academic achievement of adults in post-secondary education has been somewhat less consistent and robust. For instance, Gray et al (2016) found no evidence of impairment in academic performance among adults with diagnosed ADHD on standardized tests of executive functioning and in GPAs. However, this study employed a cross-sectional design that limited its examination of relevant academic outcomes and relied on students' self-reported GPAs which are subject to response biases. Similarly, research by Lewandowski et al (2008) found that reported academic concerns were neither sensitive nor specific to ADHD diagnosis. Unfortunately, this study employed a convenience sample of students ranging in age from 18 to 49, thus the results are likely confounded by the reduction in ADHD symptomatology generally observed over the course of adulthood (Kim et al., 2015).

Prevatt and Young (2014), on the other hand, have reported evidence from several studies that college students with ADHD receive lower grades than their non-ADHD peers, and are more likely to withdraw from classes, have poorer study habits, and experience difficulty completing tests and assignments on time. Consistent with this, DuPaul et al. (2021) found that college students with ADHD received lower GPAs, engaged in fewer study skills strategies, made slower progress in their programs, and tended to persist in their programs for fewer semesters than their non-ADHD peers. Such inconsistencies and methodological issues in the literature reflect findings that a majority of studies investigating ADHD in college students continue to suffer from a number of methodological shortcomings (DuPaul et al., 2009; Green & Rabiner, 2012). Specifically, many studies of post-secondary students rely on cross-sectional designs and small convenience samples, which limit the generalizability of results as well as limiting

conclusions on the developmental course of these deficits throughout post-secondary years. Moreover, a majority of studies in this area have tended to use GPA as the sole measure of academic success in post-secondary (typically over just a term or two) without considering other aspects of academic success (e.g., graduation rates, time to graduate, course withdrawals; DuPaul et al., 2021), as well as relying on self-reported GPAs which are subject to response biases. In order to overcome these methodological limitations, researchers have called for more longitudinal studies on the academic success of post-secondary students with ADHD, using multiple objective academic success indicators, as well as employing larger more representative samples (DuPaul et al, 2009, 2021; Gormley et al., 2019; Green & Rabiner, 2012).

In addition, despite inconsistent findings regarding gender differences in ADHD symptomatology, including various studies finding men may have greater, equal, and sometime less ADHD symptomatology than women (Gomez, 2016; Williamson & Johnston, 2015; Young et al., 2020), few studies have examined the academic effects of ADHD symptomatology in men and women separately. Moreover, few studies have evaluated the relative contributions of specific dimensions of ADHD symptomatology (Schwanz et al., 2007), instead choosing to examine overall ADHD symptomatology by using total symptom scores or not controlling for shared variability in statistical analyses when specific symptom dimensions are separately examined. The potentially unique effects of ADHD symptomatology on academic outcomes for men and women, as well as the relative importance of specific dimensions as predictors of various academic success outcomes (e.g., GPA, graduation rates) clearly warrant further research attention.

Present Study

This study used a longitudinal design to examine the relationship between ADHD symptomatology and academic success in a large sample of post-secondary undergraduate students. Given the limitations of existing research on this topic in this population, the present study had two broad objectives: 1) Examine the relationship between ADHD symptomatology and a variety of objective academic success indicators (e.g., GPA, graduation rates) in a large sample of emerging adults separately for men and women, and 2) evaluate the relative importance of different core symptom dimensions of ADHD (i.e., inattention, hyperactivity, impulsivity) as predictors of academic success indicators separately for men and women.

Method

Participants

Participants were 3688 first-year undergraduate students (1024 men and 2664 women) from three consecutive cohorts of full-time students attending a small liberal arts university in Central Ontario. To control for the effect of age on ADHD symptomatology, only participants between the ages of 18 to 25 years ($M = 19.29$, $SD = 1.18$) at the start of their studies were included. The majority of participants (87%) were Caucasian, with 5% reporting Asian ethnicity, 2% African, 1% Hispanic, 1% Native, and 4% Other. Participants were from a diverse range of academic programs at the university, including the sciences (e.g., biology, environmental sciences), social sciences (e.g., sociology, business administration), and humanities (e.g., cultural studies, history).

Measures

Conners Adult ADHD Rating Scale (CAARS)

The Conners Adult ADHD Rating Scale (CAARS; Conners et al., 1999) is a 66-item self-report measure of adult ADHD symptomatology. Respondents are asked to respond to each item

using a 4-point Likert scale, ranging from zero to three (0 = “*not at all, never,*” 3 = “*very much, very frequently*”). The CAARS consists of nine subscales which assess a variety of ADHD-related symptoms. For the present study, only data for the 9-item inattention and 9-item hyperactivity-impulsivity scales (adapted from DSM-IV criteria for ADHD) were used. Furthermore, to allow for examinations of the unique contributions of the hyperactivity and impulsivity dimensions, the 9 hyperactivity-impulsivity items were also used to create two separate subscales for these symptoms (6 items for hyperactivity and 3 items for impulsivity). Mean symptom scores for each dimension were used to reduce the effects of the non-normality of the data. High scores on each of the CAARS scales indicates a high level of ADHD symptomatology (Conners et al., 1999). Cronbach’s alphas for each of the inattention, hyperactivity-impulsivity, and total ADHD scales were 0.77, 0.74, and 0.83, respectively.

Academic Success

Academic success was measured objectively using official academic records accessed through the University Registrar’s Office. Academic success variables included cumulative final grade point averages (GPAs) and degree completion status (i.e., complete vs. incomplete).

Procedures

During undergraduate orientation week in the first year of study, participants were recruited for the present study. Participation was voluntary; however, many participants were compensated with randomly drawn prizes. For each cohort, over 95% of students provided informed consent and participated in the study, thus providing a representative sample of the population of university students at the host university. Demographic information (e.g., gender, date of birth, student identification number) was collected using a brief 8-item questionnaire. Participants then completed the 66-item CAARS as part of a larger battery of self-report

measures. Six-years following this initial data collection phase, academic records were matched (using student ID numbers) to each participant's scores on the CAARS. Six-year graduate rates are a common benchmark for monitoring or comparing academic achievement rates in Canada and the United States (Qin & Phillips, 2019). The study was approved by the university's Research Ethics Board (REB).

Statistical Procedures

Effect of ADHD symptoms on degree completion. To assess the effects of ADHD symptoms on university graduation rates and maximize the ease of interpretation, a gender by graduation status by ADHD symptom type mixed ANOVA was conducted with mean-item scores for each of the three ADHD symptom scales as the dependent variable.

Effect of ADHD symptoms on final grade point average. To assess the effects of ADHD symptoms on the final GPAs of students who completed their degrees, several structural equation models were tested. In the first series of structural equation models, a single latent ADHD symptom variable, constructed from scores on the three ADHD subscales, was used to predict final GPAs separately by gender. In a second series of structural equation models, three correlated latent variables for inattention, hyperactivity, and impulsivity symptoms, constructed from items on each of the three ADHD subscales, were used to predict final GPAs, separately by gender.

Estimation of each model was done using the Asymptotic Distribution-Free Gramian (ADFG) estimation method in order to account for the ordinal nature of the indicator variables. The following goodness-of-fit indices were used to evaluate model fit: the McDonald Fit Index (MFI), the Standardized Root Mean-Squared Residual (SRMR), and the Root Mean-Square Error of Approximation (RMSEA). Given the lack of universally accepted "gold standards" for

interpreting goodness-of fit indices (Kline, 2011), the following graded fit criteria were used based on previously recommended cut-offs (Browne & Cudeck, 1993; Hu & Bentler, 1999, Sivo et al., 2006): $MFI \geq .90$, $SRMR \leq .08$, $RMSEA \leq .05$ for good fit; $MFI \geq .87$, $SRMR \leq .10$, $RMSEA \leq .08$ for acceptable fit. Additionally, magnitudes of individual parameter estimates (e.g., expected factor loadings $\geq .30$; Brown, 2006) and standardized residuals were examined to identify potential sources of misfit in the models.

Results

Effects of ADHD Symptomatology on University Degree Completion

Table 1 presents means and standard deviations for the ADHD scales for participants who completed their degrees and those who withdrew before completing their degrees. For the mixed ANOVA, there was a main effect for gender, $F(1, 3684) = 19.94, p < 0.001, \eta_p^2 = 0.01$, with men having higher levels of ADHD symptomatology than women. There was a main effect for the type of ADHD symptomatology, $F(2, 7368) = 357.43, p < 0.001, \eta_p^2 = 0.09$, with planned comparisons showing scores to be highest for hyperactivity symptoms, followed by inattention symptoms, and the lowest being for impulsivity symptoms. The interaction between type of ADHD symptomatology and gender was significant, $F(2, 7368) = 39.28, p < 0.001, \eta_p^2 = 0.01$, with planned comparisons showing men to have higher levels of inattention and impulsivity symptoms than women, but no gender difference for hyperactivity symptoms. There was also a significant interaction between type of ADHD symptomatology and graduation status, $F(1, 7368) = 4.09, p = 0.017, \eta_p^2 = 0.001$, with planned comparisons showing that, compared to participants who withdrew before graduating, participants who graduated had lower inattention symptoms ($d = 0.10$), but not hyperactivity or impulsivity symptoms. According to Cohen's (1992) conventions, all significant effects were small.

Effects of ADHD Symptomatology on University Graduates' Final GPAs

Results for the structural equation models are presented in Figure 1. The models for total ADHD symptomatology showed overall good fit for men and women separately. For men, MFI = 0.99, SRMR = 0.04, RMSEA = 0.11, RMSEA 90% CI [0.06, 0.17], and for women, MFI = 0.99, SRMR = 0.03, RMSEA = 0.08, RMSEA 90% CI [0.05, 0.11]. As is evident from Fig. 1 a), results of the models indicated total ADHD symptomatology was a significant, modest predictor (parameter ranging from -0.14 to -0.21) of lower final GPAs.

The models for the three correlated ADHD symptom dimensions similarly showed overall acceptable fit for men and women separately (for all item-factor loadings for each of the structural equation models, see Table 2). For men, MFI = 0.75, SRMR = 0.11, RMSEA = 0.06, RMSEA 90% CI [0.05, 0.07], and for women, MFI = 0.83, SRMR = 0.08, RMSEAS = 0.05, and RMSEA 90% CI [0.05, 0.06]. As is evident from Fig. 1 b), results of the models indicated only the inattention symptom dimension was a significant, modest predictor (parameter ranging from -0.16 to -0.17) of lower final GPAs. Both the hyperactivity and impulsivity dimensions were not significant predictors in any of the models. Moreover, as evident from Fig. 1 b), inter-factor parameter estimates between the hyperactivity and impulsivity dimensions, for both men and women, indicated the two dimensions were redundant with each other. Thus, a two-factor model was tested by combining items from the two dimensions to represent a single hyperactivity-impulsivity factor.

Overall, the two-factor models with two correlated ADHD symptom dimensions showed identical fit to the three-factor models, likewise indicating acceptable fit for men and women separately. For men, MFI = 0.75, SRMR = 0.11, RMSEA = 0.06, RMSEA 90% CI [0.05, 0.07], and for women, MFI = 0.83, SRMR = 0.08, RMSEA = 0.05, RMSEA 90% CI [0.05, 0.06].

Consistent with the three-factor models, as is evident from Fig. 1 c), results for the two-factor models indicated only the inattention symptom dimension was a significant, modest predictor (-0.17) of lower final GPAs.

Discussion

The aim of the present study was to improve on the methodological shortcomings and identified gaps in the current literature on the relationship between ADHD symptomatology and academic success in post-secondary education. We utilized a longitudinal design and robust latent-variable data analytic strategy to examine the relative contributions of different core symptom dimensions of ADHD (i.e., inattention, hyperactivity, impulsivity) as predictors of a variety of academic success indicators in a large sample of students. In general, our findings support the view that individuals with higher levels of ADHD symptomatology at the start of their academic program show poorer long-term academic success, regardless of gender. However, there is a differential impact of specific dimensions of ADHD symptomatology.

The most consistent finding is the important role that inattention symptoms play in the academic success of both men and women, regardless of how academic success is operationalized. For instance, results regarding student degree completion showed that students who withdrew before completing their degrees had significantly greater inattention symptoms, but not different hyperactivity or impulsivity symptoms, than students who completed their degrees. Although there are many reasons for why students may choose to not complete their degrees, these findings are consistent with previous research that has demonstrated an increased likelihood of those with higher levels of ADHD symptoms to withdraw from classes and drop out of post-secondary education completely (DuPaul et al., 2009; Hechtman et al., 2016; Prevatt & Young, 2014). However, our findings highlight the primary role that inattention symptoms

play in this vulnerability to withdrawing from post-secondary education and constitutes a unique finding relative to the current literature on student retention among adults with ADHD. For educators and educational institutions, this finding underscores the importance of assessing inattention problems among students at the start of their post-secondary programs. Early intervention programming (e.g., coaching and/or academic skills training) could help reduce dropout rates and increase student retention for at risk students. Particularly for students with individual education plans (IEPs) and a diagnosis of ADHD with a predominantly inattentive symptom presentation, these results stress the need for educational institutions to focus programming and academic accommodations on students' inattention problems, which appear to be explicitly linked to overall academic success (Kim & Lee, 2016; DuPaul et al., 2017).

Beyond degree completion rates, we were also interested in examining whether ADHD symptomatology, and specific core symptom dimensions, would predict academic success for students who successfully completed their degrees. Results from a series of structural equation models showed that overall ADHD symptomatology is indeed a modest predictor of final GPA, regardless of gender. However, consistent with our findings regarding degree completion, results from both three-factor models (i.e., inattention, hyperactivity, and impulsivity) and two-factor models (i.e., inattention and hyperactivity-impulsivity) of ADHD revealed that only inattention symptoms emerged as a significant (modest) predictor of final GPAs. These findings are consistent with previous research that has pointed to ADHD symptomatology as contributing to a continued impairment in academic achievement from childhood and adolescence to adulthood (DuPaul et al., 2021; Prevatt & Young, 2014). Moreover, our findings are also consistent with previous studies that have similarly examined the relative contributions of different ADHD symptom dimensions to academic outcomes in post-secondary students (Schwanz et al., 2007).

For instance, Schwanz et al. (2007) found that, when differentiating between inattention and hyperactivity-impulsivity symptom dimensions in a hierarchical multiple regression, inattention symptoms contributed the most to the prediction of first year first-semester GPAs. However, like many other studies in the current literature, Schwanz et al. utilized a much smaller sample of students who ranged in ages from 18 to 46 years old and measured academic success over only a single semester.

Despite previous research highlighting inconsistencies in the prevalence of ADHD symptomatology among men and women (Gomez et al., 2016; Williamson & Johnston, 2015), the consistency between our findings from models using men and women separately indicates that the observed pattern of negative impacts of ADHD symptoms, and inattention symptoms specifically, on academic success across the post-secondary experience are not specific to just men or women. At least in part, this lack of gender differences may be a consequence of our use of objective measures of academic success (i.e., official academic records of final GPAs and graduation status), rather than subjective measures (e.g., self-reported GPAs and academic concerns), as objective measures are largely found to demonstrate fewer gender differences due to ADHD (Williamson & Johnston, 2015).

Implications for Educational Programming

Taken together, these findings underscore the important role that inattention symptoms of ADHD can play in the cumulative struggles that many students face over the course of their post-secondary experiences. Consistent with this perspective are the findings of qualitative studies that demonstrate the many ways symptoms of inattention may impact post-secondary students with ADHD on a day-to-day basis (Kwon et al., 2018; Lefler et al., 2016). For instance, Kwon et al. (2018) and Lefler et al. (2016) have both consistently found that students with ADHD report

difficulties with inattention-related academic problems, including organization, planning, and time management skills, as well as procrastination, sustained attention, and distractibility. Each of these academic-related problems would increase the struggle and length of time it may take students with ADHD to complete their coursework and their degrees, if they complete them at all. Indeed, a study by Alder et al. (2017) found inattention symptoms to have considerable overlap with various executive function (EF) difficulties (e.g., time mismanagement, trouble planning ahead, multitasking) which have previously been shown to predict academic underachievement in post-secondary students with or without an ADHD diagnosis (Biederman et al., 2006). In the context of educational institutions, these results suggest that psychoeducational programming might want to specifically target inattention symptoms in those at-risk for academic underachievement, regardless of prior ADHD diagnosis (e.g., test and assignments accommodations and coaching; Kim & Lee, 2016; DuPaul et al., 2017).

A number of recent evaluations of educational programs specifically designed to enhance students' organizational skills have been shown to be effective interventions for students with ADHD (Fabiano & Pyle, 2019). For instance, a recent study conducted by Bettis et al. (2017) found preliminary evidence for the effectiveness of EF training in reducing students' ADHD symptoms as well as symptoms of anxiety and various executive function difficulties (e.g., behavioural inhibition, emotional control, planning, and organization). Similarly, LaCount et al. (2018) found that an organizational skills training intervention was effective in reducing college students' ADHD symptoms, as well as improving their use of EF skills, including organizational, time management, and planning skills. Given the effectiveness of these educational programs, and others such as peer mentoring (Fox et al., 2010), in reducing ADHD symptoms and improving inattention-related problems among college students with ADHD, the results of the

present study overall suggest the potential utility of implementing these programs for at risk students. Although it should be noted that more research is needed to determine whether these reductions in inattention symptoms following educational programs ultimately lead to greater academic success for college students with ADHD.

Strengths, Limitations, and Future Directions

Despite the important implications of the present study, our results should be understood in the context of a number of limitations. Firstly, the present study made use of self-reported ADHD symptoms, which may be subject to response bias. For instance, Millenet et al. (2018) found that adults tended to report fewer ADHD symptoms and less impairment relative to their parent's ratings. Thus, future studies may benefit from using both self-reports and observer reports of ADHD symptomatology in order to reduce bias in reporting. Another limitation of the present study is our use of a non-clinical sample. Although the use of a non-clinical sample when examining post-secondary samples is common in the general ADHD literature, university and college students with diagnosed ADHD have higher levels of ADHD symptomatology than those in the general population of post-secondary students. Thus, future research would benefit from using clinical samples of university students diagnosed with ADHD and longitudinal designs to improve generalizability of their results to clinical populations.

Additionally, analyses in the present study did not control for a number of other variables known to effect academic success in university students, including symptoms of anxiety and depression, learning disorders, substance and medication use, and IQ (DuPaul et al., 2021). Future studies should attempt to replicate our results using models controlling for these other known contributors to academic success outcomes. It should also be noted that our measure of ADHD symptomatology, the CAARS, was developed based on DSM-IV criteria for ADHD

(Conners et al., 1999) and therefore does not take advantage of enhanced wording in the DSM-5 which is thought to better capture ADHD symptoms as presented by adults (Lefler et al., 2020). This limitation may partly explain our findings regarding the lack of an association between the hyperactivity-impulsivity dimension and academic success indicators. However, previous research with the DSM-5 criteria for ADHD has consistently found inattention symptoms to be more central and predictive of ADHD diagnosis and functional impairment in adults than hyperactivity-impulsivity (Matte et al., 2015).

Nonetheless, the results of the present study add to the literature on adult ADHD symptomatology in a number of ways. Firstly, this study made several improvements on the methodological shortcomings of studies in the current literature, including using a large, representative sample of first year undergraduate students, a longitudinal design, and a robust assessment of academic success indicators (e.g., multiple indicators and official academic records), as well as restricting analyses to a homogeneous sample of emerging adults (i.e., ages ranging from 18 to 25 years). These methodological improvements on previous studies allowed for more generalizable conclusions about post-secondary students in general and a more robust examination of the relationships between ADHD symptoms and academic success across the post-secondary experience. The present study also adds to the existing literature by demonstrating the important role that inattention symptoms play as the primary driver of the relationship between ADHD symptomatology and academic success in post-secondary education settings, regardless of gender, suggesting it as a priority focus for intervention programming.

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Table 1.*Means and Standard Deviations for ADHD Scales by Graduation Status and Gender*

	N	ADHD Scale			
		ADHD	INA	HYP	IMP
		M (SD)	M (SD)	M (SD)	M (SD)
Total Sample	3688	1.02 (0.42)	1.03 (0.51) ^b	1.08 (0.50) ^a	0.83 (0.56) ^c
Men	1024	1.07 (0.43) [*]	1.14 (0.52) [*]	1.07 (0.50) [*]	0.87 (0.56) [*]
Women	2664	0.99 (0.42) ^{**}	0.98 (0.50) ^{**}	1.09 (0.51) [*]	0.81 (0.56) ^{**}
Graduated	1621	0.99 (0.42)	1.00 (0.50) [†]	1.07 (0.49) [†]	0.82 (0.55) [†]
Men	432	1.05 (0.43)	1.11 (0.52)	1.06 (0.50)	0.88 (0.55)
Women	1189	0.97 (0.41)	0.95 (0.48)	1.07 (0.49)	0.80 (0.54)
Withdrew	2067	1.03 (0.43)	1.05 (0.51) ^{††}	1.09 (0.51) [†]	0.83 (0.57) [†]
Men	592	1.09 (0.43)	1.17 (0.51)	1.08 (0.50)	0.86 (0.57)
Women	1475	1.01 (0.43)	1.00 (0.51)	1.10 (0.52)	0.82 (0.57)

Note. ADHD = Total ADHD symptomatology; INA = Inattention; HYP = Hyperactivity;

IMP = Impulsivity; Superscripts denote significant mean differences with † and *

indicating mean differences within columns and letters indicating mean differences within rows.

Table 2.

Standardized Parameter Estimates from the Two-Factor and Three-Factor ADHD Structural Equation Models for Men and Women

CAARS Item	Three-Factor Models						Two-Factor Models			
	Men			Women			Men		Women	
	INA	HYP	IMP	INA	HYP	IMP	INA	HYI	INA	HYI
1	0.63			0.53			0.64		0.53	
24	0.69			0.66			0.69		0.66	
29	0.70			0.58			0.70		0.58	
33	0.53			0.52			0.53		0.52	
42	0.62			0.60			0.63		0.60	
48	0.43			0.48			0.44		0.48	
60	0.68			0.66			0.69		0.66	
64	0.65			0.65			0.65		0.65	
65	0.75			0.69			0.76		0.69	
9		0.36			0.44			0.36		0.44
14		0.42			0.57			0.42		0.57
21		0.54			0.58			0.53		0.58
38		0.39			0.29			0.38		0.29
41		0.64			0.59			0.64		0.58
50		0.75			0.73			0.75		0.73
22			0.48			0.50		0.49		0.51
58			0.52			0.45		0.53		0.46
62			0.65			0.54		0.66		0.54

Note. All presented parameter estimates were statistically significant ($p < .001$). INA = Inattention; HYP = Hyperactivity; IMP = Impulsivity; HYI = Hyperactivity-Impulsivity

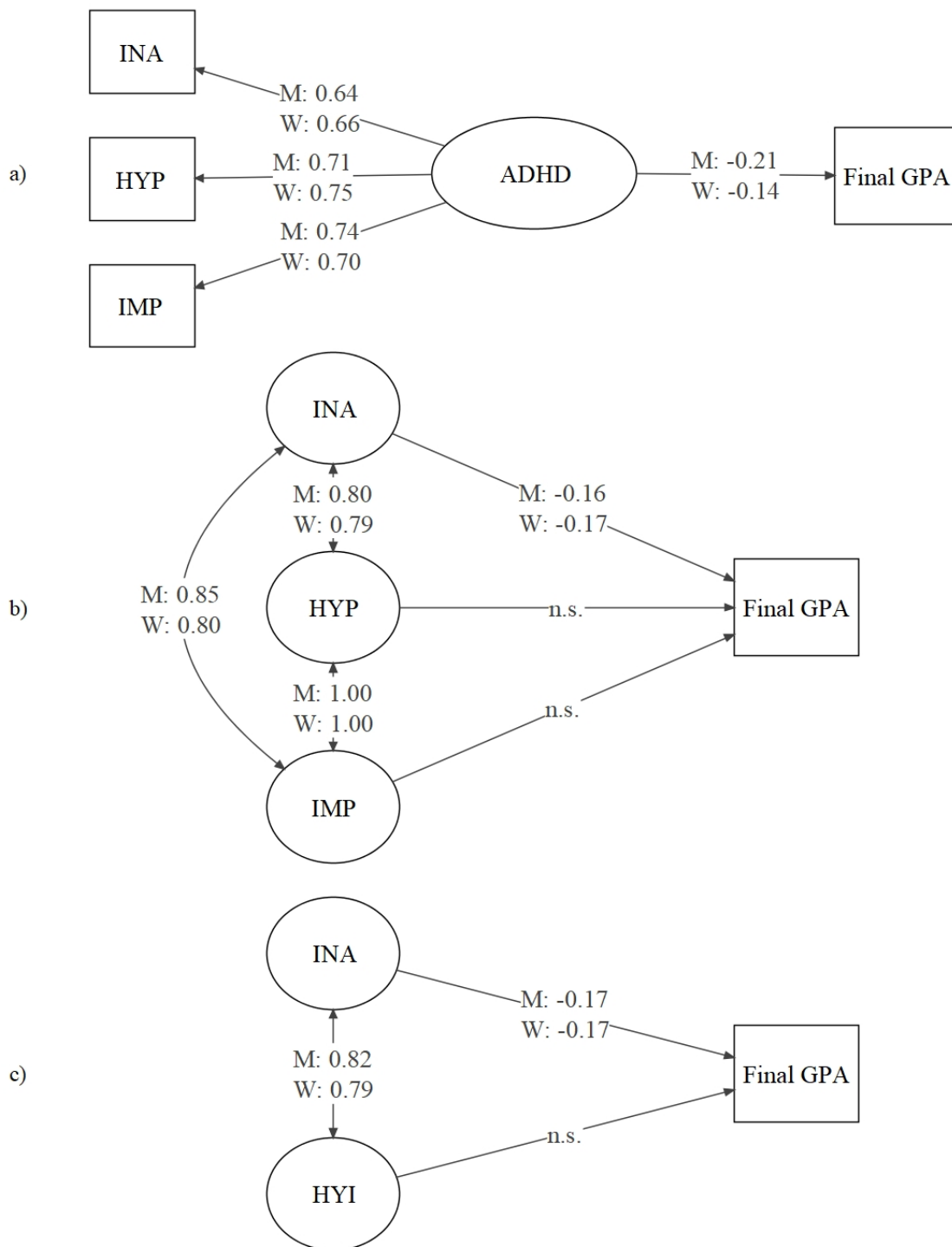


Fig 1. Structural equation models for the relationship between final GPA and a) a single latent variable for ADHD, b) three latent variables for inattention, hyperactivity, and impulsivity symptom dimensions, or c) two latent variables for inattention and hyperactivity-impulsivity for men and women. Item factor loadings are not presented for simplicity. *Note.* INA = Inattention; HYP = Hyperactivity; IMP = Impulsivity; HYI = Hyperactivity-Impulsivity; M = Men; W = Women; all parameters presented are significant at $p < .001$ unless otherwise indicated. n.s. = Not significant

Chapter 3: Longitudinal Associations Between ADHD Symptomatology and Life Success from Emerging Adulthood to Early Middle Adulthood

Abstract

Objective: To expand on current adult ADHD literature by investigating the stability of ADHD symptomatology (i.e., inattention, hyperactivity-impulsivity) across a 15-year period (from emerging adulthood to early middle adulthood) and the relative contributions of ADHD symptomatology to life success. **Method:** A sample of 320 post-secondary students were initially assessed for ADHD symptomatology using the Conners' Adult ADHD Rating Scale (CAARS). Fifteen years later, participants were re-assessed using the CAARS and several measures of life success (e.g., relationship satisfaction, career satisfaction, and stress levels).

Results: Inattention and hyperactivity-impulsivity symptoms showed strong stability across the 15-year period. Additionally, greater inattention symptoms during emerging adulthood and early middle adulthood were consistently associated with poorer life success (i.e., lower relationship and career satisfaction), particularly for men. Associations for hyperactivity-impulsivity symptoms were less consistent. **Conclusion:** ADHD symptomatology can be conceptualized as a stable, dimensional trait across adulthood, with important impacts on life success.

Key Words: ADHD, adults, life success, stability

Attention-deficit hyperactivity disorder (ADHD) is a psychiatric disorder primarily characterized by symptoms of inattention (e.g., difficulty with the task at hand) and hyperactivity-impulsivity (e.g., restlessness, inability to wait). Despite being one of the earliest emerging mental health conditions in childhood and being associated with numerous adverse outcomes, ADHD is an often-underappreciated psychiatric disorder (Nigg et al., 2020). Studies estimate the global prevalence of ADHD to be approximately 1-2.6% (Erskine et al., 2013; Song et al., 2021), and despite once being considered a disorder limited to childhood, ADHD is now widely understood to persist into adulthood in a majority of cases (Roy et al., 2016). Indeed, most studies find the hyperactivity-impulsivity symptoms of ADHD tend to decline from childhood through adolescence, while inattention symptoms tend to remain relatively stable overtime (Kim et al., 2015). Despite the observed declines in hyperactivity-impulsivity symptoms, however, research has consistently linked ADHD to greater peer-rejection and psychiatric comorbidity, as well as poorer academic achievement and executive, social, and emotional functioning in youth (Graziano & Garcia, 2016; Lawrence et al., 2020; May et al., 2021; Noordermeer et al., 2020; Ros & Graziano, 2018; Xia et al., 2015).

ADHD in Adulthood

Consistent with this research on youth with ADHD, several large, prospective longitudinal studies have shown a majority of individuals diagnosed with ADHD as children continue to experience significant ADHD symptomatology in emerging adulthood (i.e., adults approximately 18-to-25-year-old; Biederman et al., 2011; Gao et al., 2015; Karam et al., 2015; Roy et al., 2016; Sibley et al., 2017). In particular, current best estimates suggest 60% of children diagnosed with ADHD continue to experience significant symptom persistence into emerging adulthood, with 41% continuing to meet both symptom and impairment criteria for ADHD

(Sibley et al., 2017). Given this level of symptom persistence, it is not surprising that adults with persistent ADHD continue to experience adverse outcomes in various life domains, including in interpersonal relationships, employment, and health – three life domains that are key indicators of life success (Rojas, 2006).

In the domain of interpersonal relationships, studies have repeatedly found greater ADHD symptomatology to be associated with poorer relationship quality (Bodalski et al., 2019; Bruner et al., 2015; Knies et al., 2021). In particular, a recent study by Knies et al. (2021) found that overall ADHD symptoms were negatively associated with overall relationship satisfaction and positively associated with perceived partner neglect and threat. Similarly, Bruner et al. (2015) found that adults with clinically significant levels of overall ADHD symptoms had poorer relationship quality than adults without clinically significant ADHD symptoms.

Comparatively, in the domain of employment, Painter et al. (2008) found overall ADHD symptoms were both negatively associated with career satisfaction and positively associated with dysfunctional career decision-making. A growing number of studies have also found associations between ADHD and precarious employment, as measured by shorter job lengths, less stable forms of employment (e.g., casual and self-employment), and greater reliance on government social supports (Hechtman et al., 2016; Kuriyan et al., 2013; Rietveld & Patel, 2019; Verheul et al., 2016). In line with this research, a study by Kuriyan et al. (2013) found adults with a history of childhood ADHD were 11 times more likely to be unemployed and 3 times more likely to be in the lowest occupational attainment level (i.e., unskilled occupations vs. clerical or professional occupations).

In the domain of health, ADHD has been linked a variety of adverse mental health outcomes (Combs et al., 2015; Friedrichs et al., 2012; Vogel et al., 2018). Using a population-

based sample from the Netherlands, Vogel et al. (2018) found a dose-response relationship between the number of ADHD symptoms experienced by adults and the likelihood of having comorbid psychiatric disorders, including generalized anxiety disorder, major depression, and substance use disorders. Likewise, using a population-based sample of adult twins in Sweden, Friedrichs et al. (2012) found that ADHD was associated with a greater likelihood of experiencing various stressful life events, including divorce, family problems, financial and job losses, and taking sick leave for more than 12 months.

Limitations of the Current Adult ADHD Literature

Taken together, these findings from multiple life domains point to a consistent pattern of adverse life outcomes among adults with greater ADHD symptoms. Despite these findings, however, current research in this area is limited by several persistent methodological shortcomings. Firstly, most studies in the current literature rely heavily on cross-sectional designs which limit examinations of the associations between ADHD and relevant outcomes overtime (Bodalski et al., 2019; Combs et al., 2015; Knies et al., 2021; Painter et al., 2008; Verheul et al., 2016). Additionally, most published studies on the persistence of ADHD symptoms only include data from individuals in the transition from youth to emerging adulthood (Das et al., 2012; Gao et al., 2015; Karam et al., 2015; Roy et al., 2016; Sibley et al., 2017). This limits our understanding of the stability of ADHD symptoms across adulthood, including to what extent ADHD symptoms persist into middle and older adulthood (Nigg et al., 2020). This lack of attention to middle and older adulthood, however, is not limited to studies on the stability of ADHD.

Current literature examining the effects of ADHD on life outcomes in adulthood also suffers from this problem, with few studies examining the effects of ADHD on life outcomes in

adults above the age of 30 (e.g., Bodalski et al., 2019; Das et al., 2012; Rietveld et al., 2019; Verheul et al., 2016), and even fewer examining whether ADHD symptoms in emerging adulthood predict life outcomes later in adulthood. The current literature on ADHD and life outcomes is further limited by a lack of attention to both gender differences and differences in the patterns of association between the two core symptom dimensions of ADHD (i.e., inattention and hyperactivity-impulsivity) and life outcomes (Henning et al., 2022). Indeed, despite consistent evidence of gender differences in the symptom presentation of ADHD in both adults and youth (Young et al., 2020), as well as differences in the developmental trajectories and outcomes associated with the two core symptom dimensions of ADHD in youth (Kim et al., 2015; Salla et al., 2016), a majority of studies on ADHD in adults fail to examine differences in their studied effects across gender and the two core ADHD symptom dimensions. These limitations are significant as they limit the ability of mental health professionals to effectively identify and design programming that targets the specific aspects of ADHD that are most salient for preventing and reducing particular outcomes of ADHD in adults (Henning et al., 2022).

Present Study

To address limitations in the current literature the present study had two broad objectives: 1) Examine the stability of ADHD symptomatology across a 15-year follow-up period from emerging adulthood (i.e., 18 to 25 years old) to early middle adulthood (i.e., 33 to 40 years old) separately for men and women; and 2) evaluate the relative importance of inattention and hyperactivity-impulsivity symptoms as predictors of a variety of life outcomes (e.g., relationship quality, employment outcomes, and mental health outcomes) separately for men and women.

Method

Participants

The sample consisted of 320 adults (111 men and 209 women) who had been enrolled at Time 1 in a four-year degree program at a medium sized university in Central Ontario, Canada. Participants at Time 1 ranged in age from 17 to 46 (Men: $M = 19.66$, $SD = 2.02$; Women: $M = 20.17$, $SD = 4.23$). The majority of the participants (87.6%) identified their ethnicity as White/Caucasian, 4.6% as Asian, and the remaining 7.8% represented a mix of other ethnic groups. All participants provided written informed consent to the procedures, as approved by the university's Ethics Review Board. As an incentive, participants were enrolled in a lottery for prizes valued at \$100 or less.

Procedure

Time 1

During their first week of university classes, participants completed a questionnaire package that included a consent form, demographic information, the Conners Adult ADHD Rating Scale (CAARS), and several other questionnaires not relevant to the present study. A total of 2629 students completed the measures at Time 1 (which involved several consecutive cohorts between 2000 and 2002). For all cohorts, measures in the questionnaire package were randomly ordered.

Time 2

Approximately 15 years after Time 1, a subset of participants (mean age of 34.99 ± 3.60 years) were recruited to take part in a follow-up study via email or telephone addresses obtained through the University Alumni Office, publicly available information on Facebook and/or LinkedIn, as well as via referrals from other participants. For Time 2, participants completed a short version of the CAARS, the Relationship Assessment Scale (RAS; Hendrick, 1988), and the Career Satisfaction Scale (CSS; Greenhaus et al., 1990), as well as a broad set of questions

adapted from Statistics Canada's National Longitudinal Survey of Children and Youth Questionnaire (NLSCY; Statistics Canada, 2010). All Time 2 measures were completed online.

Matching Cases

Time 1 and Time 2 data were matched for all cases using official student ID numbers assigned by the University at Time 1, as well as using key demographic information (i.e., gender, date of birth, and ethnicity) collected at both Time 1 and Time 2. Participants who did not participate in the study at Time 2 did not significantly differ from their peers on any of the studied variables at Time 1, thus indicating our present sample is representative of the larger sample measured at only Time 1 (Henning et al., 2022).

Measures

Conners Adult ADHD Rating Scale (CAARS)

The CAARS (Conners et al., 1999) is a 66-item self-report measure of adult ADHD symptomatology. Respondents are asked to respond to each item using a 4-point Likert scale (0 = "not at all, never"; 3 = "very much, very frequently"). The CAARS consists of nine subscales which assess a variety of ADHD-related symptoms. For the present study, Time 1 data for only the 9-item inattention and 9-item hyperactivity-impulsivity scales (adapted from DSM-IV criteria for ADHD) were used. For time 2, participants only completed the 18-items for the same inattention and hyperactivity-impulsivity scales on the CAARS. Mean symptom scores for each dimension were used to reduce the effects of the non-normality of the data. Higher scores on each of the CAARS scales indicates a higher level of ADHD symptomatology (Conners et al., 1999). Cronbach's alphas for each of the inattention, hyperactivity-impulsivity, and total ADHD scales were .84, .72, and .86, respectively at Time 1, and .83, .69, and .84, respectively at Time 2.

Relationship Assessment Scale (RAS)

The RAS (Hendrick, 1988) is a 7-item self-report measure assessing overall relationship satisfaction. For the RAS, respondents use 5-point Likert scales to rate the extent to which each statement applies to them. Higher scores reflect higher relationship satisfaction levels. The Cronbach's alpha for the RAS in the current sample at Time 2 was .90.

Career Satisfaction Scale (CSS)

The CSS (Greenhaus et al., 1990) is a 5-item self-report measure assessing overall career satisfaction. For the CSS, respondents use 5-point Likert scales to rate the extent to which they agree with each statement. Higher scores on the CSS reflect higher career satisfaction. The Cronbach's alpha for the CSS in the current sample at Time 2 was .92.

Adapted Questions from the NLSCY at Time 2

Demographic questions adapted from the NLSCY (Statistics Canada, 2010) and completed by participants pertained to living arrangements (7 questions), relationships (9 questions), family dynamics (5 questions), education (9 questions), employment (12 questions), and health (12 questions). In particular, health questions adapted from the NLSCY included measures of the presence of specific mental health problems (e.g., major depression, generalized anxiety disorder) in the past 5 years, as well as three measures of stress, namely perceived and objective stress in the past 12 months, and objective stress in the past 5 years. Perceived stress was measured via the Perceived Stress Scale and objective stress was measured via checklists of objectively stressful life events. Higher scores on each of the perceived and objective stress measures indicate higher stress levels.

Statistical Procedures

Several latent variables were created to explore core research questions. Using data collected at Time 1 and Time 2, latent variables for inattention and hyperactivity-impulsivity at

Time 1 and Time 2 were created using corresponding items for each construct on the CAARS. Latent variables for relationship satisfaction, career satisfaction, and stress were also created using the 7-items on the RAS, the 5-items on the CSS, and the three stress measures, respectively.

To control for measurement error and account for non-normality of the ADHD data, a series of structural equation models were used to examine associations between the latent variables for Inattention and Hyperactivity-Impulsivity at Time 1 and the latent variables for Inattention and Hyperactivity-Impulsivity at Time 2, as well as their relationships with the latent variables for relationship satisfaction, career satisfaction, and stress at Time 2. The models were tested using JASP Version 0.16 (JASP Team, 2022) and conducted separately by gender. Estimation of the models was done using the Diagonally Weighted Least Squares (DWLS) estimator to account for the non-normality of the data. Model fit was evaluated using the following goodness-of-fit indices: the comparative fit index (CFI), the root-mean-square error of approximation (RMSEA) with its 90% confidence interval (90% CI), and the standardized root-mean-square residual (SRMR). Given the lack of universally accepted “gold standards” for interpreting goodness-of-fit indices (Kline, 2011), the following graded fit criteria were used based on previously recommended cut-offs to evaluate the quality of each model (Browne & Cudeck, 1993; Hu & Bentler, 1999): $CFI \geq 0.95$, $RMSEA \leq 0.05$, and $SRMR \leq 0.08$ for good fit; $CFI \geq 0.90$, $RMSEA \leq 0.08$, and $SRMR \leq 0.10$ for acceptable fit. Magnitudes of individual parameter estimates (e.g., expected factor loadings ≥ 0.30 ; Brown, 2006) and standardized residuals were subsequently examined to identify potential sources of misfit in the model.

Additionally, using the detailed set of questions from the NLSCY (Statistics Canada, 2010) along with RAS scores collected at Time 2, we examined differences between two

relationship quality groups characterized by objective differences in the quality of their current romantic relationship(s) (see Parker et al., 2020 for more details on the procedures used to identify these two relationship quality groups). Furthermore, since there is no consensus regarding a definition, or gold standard measure, of precarious employment (Benach et al., 2014), a dichotomous precariousness group variable was created (i.e., precarious vs. non-precarious employment) under the notion that the central feature underlying most definitions of precarious employment is involuntary employment instability (Benach et al., 2014; Garcia et al., 2017). Using the detailed set of employment questions adapted from the NLSCY, participants were classified as *non-precarious* if they reported being employed full-time or part-time at Time 2. Meanwhile, participants were classified as *precarious* if they reported either (1) being unemployed for more than a month or (2) having major changes to their work hours and were looking for employment in the past five years. Health questions adapted from the NLSCY pertaining to the presence of specific mental health problems were used to create a dichotomous mental health status variable (i.e., at least one mental health problem present or no mental health problem present). Mixed model ANOVAs were then used to examine mean group differences in ADHD symptom levels across relationship quality, precarious employment, and mental health status groups by gender for each time period.

Results

Stability of ADHD Symptomatology

Correlations between the Time 1 and Time 2 variables, along with means and standard deviations, are presented in Table 1 for men and Table 2 for women. Overall, 15-year test-retest correlations for the total ADHD scale were moderate ($r = 0.47$ for both men and women), as were the Inattention ($r = 0.51$ for men and $r = 0.44$ for women) and Hyperactivity-Impulsivity

subscales ($r = 0.46$ for men and $r = 0.44$ for women). Correlations among Time 1 variables are presented in Table 3 (separately for men and women) and correlations among Time 2 variables are presented in Table 4 (separately for men and women). Relationships among the ADHD scales at Time 1 and Time 2 were generally strong (ranging from 0.55 to 0.91 for men and 0.56 to 0.90 for women).

To examine changes in mean ADHD symptomatology over the 15-year period, a series of time by gender ANOVAs were conducted for the total ADHD scale and both the Inattention and Hyperactivity-Impulsivity subscales. For total ADHD, symptoms were significantly higher at Time 1, $F(1, 318) = 18.43, p < .001, \eta_p^2 = 0.06$, and there was a significant interaction, $F(1, 318) = 8.31, p = .004, \eta_p^2 = 0.03$. Bonferroni-corrected post hoc tests showed that total ADHD symptoms decreased in men over the 15-year period ($d = 0.50$), but total ADHD symptoms in women did not change significantly over time. For Inattention, symptoms were significantly higher at Time 1, $F(1, 318) = 45.58, p < .001, \eta_p^2 = .13$, and there was a significant interaction, $F(1, 318) = 4.94, p = .027, \eta_p^2 = 0.02$. Bonferroni-corrected post hoc tests showed that Inattention symptoms decreased over the 15-year period in both men ($d = 0.56$) and women ($d = 0.36$), and that while men had significantly higher Inattention symptoms than women at Time 1 ($d = 0.30$), there was no significant gender difference in Inattention symptom levels at Time 2. For Hyperactivity-Impulsivity, there was a significant interaction, $F(1, 318) = 6.95, \eta_p^2 = 0.02$. Separate univariate analyses showed that Hyperactivity-Impulsivity symptoms significantly decreased in men over the 15-year period ($d = 0.32$), but Hyperactivity-Impulsivity symptoms in women did not change significantly over time. All other main effects were not significant.

ADHD Symptomatology and Relationship Satisfaction

Correlations between Time 1 CAARS ADHD scales and relationship satisfaction at Time 2 were not significant and low for both men and women. At Time 2, CAARS ADHD scales were also not significantly correlated with relationship satisfaction for both men and women.

Relationship satisfaction was not significantly associated with career satisfaction, nor was relationship satisfaction associated with objective stress in the past 12 months and the past five years. There was a significant association between relationship satisfaction and perceived stress in the past 12 months.

The latent variable model with relationship satisfaction was found to have good fit to the data: model fit results and standardized parameter estimates are presented in Fig. 1 (among latent variables only). For men, there were significant associations between both Inattention and Hyperactivity-Impulsivity with relationship satisfaction for ADHD at Time 1, with estimates of -0.30 and 0.24, respectively. However, for women, there were no significant associations between Inattention and Hyperactivity-Impulsivity with relationship satisfaction for ADHD at Time 1. For ADHD at Time 2, associations between both Inattention and Hyperactivity-Impulsivity with relationship satisfaction at Time 2 were significant for men, with estimates of -0.17 and -0.28, respectively. However, for women, there were no significant associations between Inattention and Hyperactivity-Impulsivity with relationship satisfaction for ADHD at Time 2. As shown in Fig. 1, the estimates between Inattention and Hyperactivity-Impulsivity latent variables for Time 1 and Time 2 were high for both men and women, as were estimates between latent variables for Inattention and Hyperactivity-Impulsivity at Time 1 and at Time 2.

ADHD Symptomatology and Relationship Quality

Means and standard deviations for the CAARS scales are presented in Table 5 by relationship quality group (low vs. high quality), time period, and gender. For each time period,

we conducted a type of ADHD symptomatology (Inattention, Hyperactivity-Impulsivity) by gender by relationship quality group (low vs. high quality) ANOVA, with the level of ADHD symptomatology as the dependent variable. For the concurrent Time 2 data, there were no significant main effects or interactions.

For the Time 1 ADHD data (i.e., the longitudinal analysis), the interaction between type of ADHD and relationship quality was significant, $F(1, 215) = 9.22, p = .003, \eta_p^2 = 0.04$. Separate univariate analyses showed that individuals in the low relationship quality group at Time 2 had significantly higher Inattention symptom levels at Time 1 compared to their peers in the high relationship quality group ($d = 0.34$), but Hyperactivity-Impulsivity symptoms were not significantly different between the relationship quality groups. All other main effects and interactions were not significant.

ADHD Symptomatology and Career Satisfaction

Correlations between Time 1 CAARS ADHD scales and career satisfaction at Time 2 were not significant and low for both men and women. At Time 2, CAARS ADHD scales generally correlated higher and significantly with career satisfaction for men and women, where correlations generally ranged from -0.16 to -0.24 (the only exception being a non-significant correlation between Hyperactivity-Impulsivity and the CSS in women). For men, career satisfaction was significantly associated with both perceived stress ($r = -0.53$) and objective stress ($r = -0.27$) in the past 12 months. For women, career satisfaction was significantly association with both perceived stress in the past 12 months ($r = -0.47$) and objective stress in the past five years ($r = -0.40$).

The latent variable model with career satisfaction was found to have good fit to the data: model fit results and standardized parameter estimates are presented in Fig. 2 (among latent

variables only). For men, there was a significant association between Inattention and career satisfaction for Time 1 ADHD (-0.32), but there was only a trend towards a significant association between Hyperactivity-Impulsivity and career satisfaction for Time 1 ADHD (estimate = 0.16, $p = .053$). For women, both Inattention and Hyperactivity-Impulsivity were significantly associated with career satisfaction for Time 1 ADHD, with estimates of -0.33 and 0.27, respectively. For Time 2 ADHD, there were significant associations between both Inattention and Hyperactivity-Impulsivity with career satisfaction at Time 2 for men and women, with estimates of -0.19 and -0.43 for men and -0.22 and -0.18 for women, respectively.

ADHD Symptomatology and Precarious Employment

Means and standard deviations for the CAARS scales are presented in Table 6 by precariousness group (precarious vs. non-precarious), time period, and gender. For each time period, we conducted a type of ADHD (Inattention, Hyperactivity-Impulsivity) by gender by precariousness group (precarious vs. non-precarious) ANOVA, with the level of ADHD symptomatology as the dependent variable. For the concurrent Time 2 data, there was a significant main effect for precariousness group, $F(1, 311) = 4.71, p = .031, \eta_p^2 = 0.02$, with precariously employed individuals having higher global ADHD symptom levels at Time 2 than non-precariously employed individuals. All other main effects and interactions were not significant.

For the Time 1 ADHD data (i.e., the longitudinal analysis), the main effects for type of ADHD [$F(1, 308) = 17.95, p < .001, \eta_p^2 = 0.06$], gender [$F(1, 308) = 6.70, p = .010, \eta_p^2 = 0.02$], and precariousness group [$F(1, 308) = 9.25, p = .003, \eta_p^2 = 0.03$] were significant, as were the interactions between type of ADHD and gender [$F(1, 308) = 4.24, p = .040, \eta_p^2 = 0.01$], and type of ADHD and precariousness group [$F(1, 308) = 5.44, p = .020, \eta_p^2 = 0.02$]. Separate

univariate analyses showed that men had higher Inattention symptoms ($d = 0.31$), but not different Hyperactivity-Impulsivity symptoms, than women, and that men had higher Inattention symptoms than Hyperactivity-Impulsivity symptoms ($d = 0.17$) while women had no differences in the types of ADHD symptoms. Additionally, precariously employed individuals had higher Inattention symptoms ($d = 0.45$), but not different Hyperactivity-Impulsivity symptoms, than non-precariouly employed individuals. All other interactions were not significant.

ADHD Symptomatology and Stress

At Time 1, correlations between CAARS ADHD scales and both perceived and objective stress measures at Time 2 ranged from not significant to significant and low for both men and women. At Time 2, CAARS ADHD scales generally correlated higher with perceived and objective stress measures for men and women, where significant correlations ranged from 0.20 to 0.35 for men and 0.18 to 0.30 for women. For both men and women, objective stress in the past 12 months was significantly associated with perceived stress in the past 12 months (0.22 for men and 0.26 for women) and objective stress in the past five years (0.54 for men and 0.45 for women). However, objective stress in the past five years and perceived stress in the past 12 months were only significantly associated in women ($r = 0.47$).

The latent variable model with stress was found to have good fit to the data: model fit results and standardized parameter estimates are presented in Fig. 3 (among latent variables only). There was a significant association between Inattention and Hyperactivity-Impulsivity with stress for Time 2 ADHD, with parameter estimates of 0.26 and 0.47 for men and 0.39 and 0.32 for women, respectively. However, there were no significant associations between Inattention and Hyperactivity-Impulsivity with stress for Time 1 ADHD.

ADHD Symptomatology and Mental Health Status

Means and standard deviations for the CAARS scales are presented in Table 7 by mental health status (problem present vs. absent), time period, and gender. For each time period, we conducted a type of ADHD (Inattention, Hyperactivity-Impulsivity) by gender by mental health status (problem present vs. absent) ANOVA, with the level of ADHD symptomatology as the dependent variable. For the concurrent Time 2 data, there was a significant main effect for type of ADHD, $F(1, 311) = 6.25, p = .013, \eta_p^2 = 0.02$, with Hyperactivity-Impulsivity symptoms being higher than Inattention symptoms at Time 2. There was also a significant main effect for mental health status, $F(1, 311) = 5.97, p = .015, \eta_p^2 = 0.02$, with individuals reporting a mental health problem in the last five years having higher total ADHD symptoms than those reporting no mental health problem. No other main effects and interactions were significant.

For the Time 1 ADHD data (i.e., the longitudinal analysis), there was a significant main effect for type of ADHD, $F(1, 308) = 9.96, p = .002, \eta_p^2 = 0.03$, with Inattention symptoms being higher than Hyperactivity-Impulsivity symptoms at Time 1. There was also a significant main effect for gender, $F(1, 308) = 4.81, p = .029, \eta_p^2 = 0.02$, with men having higher total ADHD symptoms than women. No other main effects and interactions were significant.

Discussion

The aim of the present study was to extend current literature on the stability of ADHD symptomatology beyond emerging adulthood, and to examine what impacts ADHD symptoms have on life outcomes later in adulthood (i.e., early middle adulthood). To achieve these goals, we utilized a longitudinal design and a robust latent-variable data analytic strategy to (1) examine changes in ADHD symptoms across a 15-year period and (2) examine the relative contributions of the two ADHD symptom dimensions as predictors of multiple life outcomes (e.g., relationship satisfaction, career satisfaction, stress) in both men and women. Overall, our

findings support the notion that ADHD symptoms are relatively stable, or persistent, across the lifespan, with analyses showing strong stability for inattention and hyperactivity-impulsivity symptoms from emerging adulthood into early middle adulthood among both men and women. In particular, using structural equation models, we found the stability of inattention symptoms ranged from 0.52 to 0.56 among men and 0.50 to 0.52 among women, while the stability of hyperactivity-impulsivity symptoms ranged from 0.62 to 0.65 among men and 0.56 to 0.57 among women.

This evidence of strong stability for ADHD symptomatology over a 15-year period is significant as it is in line with previous research on the stability of personality traits across similar time periods (Costa et al., 2019). Such strong stability supports the notion that ADHD symptoms can be conceptualized as a dimensional trait in the general population, with diagnosable ADHD residing somewhere along the extreme high end of the trait (Panagiotidi et al., 2018; Nigg et al., 2020; Vogel et al., 2018). This conceptualization of ADHD as a dimensional trait has been repeatedly supported by epidemiological, factor analytic, and neural imaging studies (Mohamed et al., 2015; Nigg et al., 2020; Vogel et al., 2018), and is in line with recent efforts to take a more dimensional approach to psychopathology and psychiatric nosology (e.g., in the HiTOP model; Kotov et al., 2017). In this way, our findings extend this literature by uniquely demonstrating the trait-like temporal stability of both the inattention and hyperactivity-impulsivity symptom dimensions across the transition from emerging to early middle adulthood.

Nonetheless, with respect to mean changes in ADHD symptoms, our results showed that ADHD symptoms did decrease over the 15-year period, with inattention symptoms decreasing in both men and women and hyperactivity-impulsivity symptoms decreasing in only men. The effect sizes for these symptom decreases ranged from moderate to large and are consistent with

previous research showing global ADHD symptoms, and hyperactivity-impulsivity symptoms in particular, tend to decrease from childhood to adolescence (Kim et al., 2015). However, contrary to previous findings that inattention symptoms remain stable across time in youth (Kim et al., 2015), our findings uniquely show that inattention symptoms also begin to decline from emerging adulthood into early middle adulthood.

Also, worth noting is our unique finding that the association between the two core ADHD symptom dimensions appears to get stronger from emerging adulthood (0.71 to 0.74 for men; 0.75 to 0.76 for women) to early middle adulthood (0.92 to 0.97 for men; 0.78 to 0.81). This signals an increase in the co-occurrence of the two symptom dimensions in individuals across adulthood and suggests the two symptom dimensions become less well-differentiated as individuals age. This finding is novel in the research literature on adult ADHD, however it is in line with previous research showing the combined ADHD subtype is more stable than either of the inattentive or the hyperactive-impulsive subtypes from youth to emerging adulthood (Kaye et al., 2019), as well as with previous research showing that, among emerging adults who transition from one ADHD subtype to another from youth to adulthood, a majority transition from either the inattentive or hyperactive-impulsive subtype to the combined subtype (Kaye et al., 2019).

Impacts of ADHD Symptoms on Life Outcomes in Early Middle Adulthood

Beyond our findings regarding the stability of ADHD symptoms, our findings also highlight the impacts of the two core symptom dimensions of ADHD on multiple indicators of life success in early middle adulthood. Indeed, across all three life domains studied (i.e., interpersonal relationships, employment, and mental health), we found that ADHD symptoms were a robust predictor of life outcomes among men and women in early middle adulthood. In particular, consistent with previous research (Combs et al., 2015; Knies et al., 2021; Painter et

al., 2008), we found that inattention and hyperactivity-impulsivity symptoms were robust predictors of life success when symptoms were measured both concurrently during middle adulthood and longitudinally during emerging adulthood.

In addition to this consistency in our findings, our results add to the current literature by uniquely demonstrating the relative contributions of inattention and hyperactivity-impulsivity symptoms to the prediction of life outcomes. Specifically, we found that many of our longitudinal effects of emerging adult ADHD symptoms on life outcomes in middle adulthood differed when comparing the effects of inattention and hyperactivity-impulsivity. For instance, our analysis of the effects of ADHD symptoms on objectively defined relationship quality groups and precarious employment showed that individuals who were in poor quality relationships or precariously employed during early middle adulthood had higher inattention symptoms, but not different hyperactivity-impulsivity symptoms, during emerging adulthood than individuals who had good quality relationships or were not precariously employed. Similarly, using structural equation modelling, we found that higher inattention symptoms during emerging adulthood were associated with poorer relationship satisfaction and career satisfaction during early middle adulthood, while higher hyperactivity-impulsivity symptoms were associated with higher relationship satisfaction and career satisfaction.

Taken together, this pattern of findings suggests that while greater inattention symptoms consistently predict negative life outcomes in middle adulthood, the story for hyperactivity-impulsivity is much more complex. In particular, our findings indicate that hyperactivity-impulsivity symptoms experienced during emerging adulthood, if limited to this period of adulthood, may not be harmful, and instead be beneficial for relationship and career satisfaction in middle adulthood. This finding is novel in the adult ADHD literature and appears contrary to

previous research on the association between ADHD symptoms and both relationship satisfaction (Bodalski et al., 2019; Bruner et al., 2015) and career satisfaction (Painter et al., 2008). However, previous research has only examined concurrent associations between ADHD symptoms and these life outcomes (Bodalski et al., 2019; Bruner et al., 2015; Painter et al., 2008). Thus, our findings may point to important differences in the effects of inattention and hyperactivity-impulsivity symptoms on the developmental processes that influence later relationship and career satisfaction in early middle adulthood.

Indeed, engaging in more hyperactive and impulsive behaviour (e.g., restlessness, sensation seeking) during emerging adulthood may mean engaging in greater identity exploration, and ultimately lead individuals to foster stronger personal and career identities. This kind of identity exploration and commitment during emerging adulthood has previously been associated with greater relationship quality and career satisfaction (Haibo et al., 2018; Klimstra & van Doeselaar, 2017). Thus, greater engagement in opportunities for identity exploration may, at least in part, explain why greater hyperactivity-impulsivity symptoms during emerging adulthood are associated with more positive life outcomes during early middle adulthood.

The one exception to this pattern of associations was our findings for mental health outcomes. Specifically, we found that both ADHD symptom dimensions during emerging adulthood were not significant predictors of overall stress during middle adulthood. These findings are not surprising, however, given that measures of stress are strongly influenced by the presence of various life stressors which may change significantly over a 15-year period (Combs et al., 2015), thus weakening any long-term associations between previous ADHD symptoms and later life stress. Meanwhile, consistent with previous research (Combs et al., 2015; Friedrichs et

al., 2012), our findings demonstrate that current inattention and hyperactivity-impulsivity symptoms during middle adulthood remain significant predictors of current life stress.

Gender Differences in the Impacts of ADHD Symptoms

In addition to these differences in effects between the two core ADHD symptom dimensions, our results highlight the importance of investigating potential gender differences when examining the impacts of ADHD symptoms on life outcomes. For instance, our models examining the relationships between latent variables for inattention and hyperactivity-impulsivity symptoms and relationship satisfaction showed that both core symptom dimensions at Time 1 and Time 2 were significant predictors of relationship satisfaction during early middle adulthood, but only among men.

These results appear to run contrary to the findings of Bruner et al. (2015) who found that inattention and hyperactivity-impulsivity symptoms of ADHD predicted relationship satisfaction, but only in women. However, Bruner et al. used a cross-sectional design to examine only concurrent associations between ADHD symptoms and relationship satisfaction in emerging adults. Thus, it may be that while ADHD symptoms during emerging adulthood are salient predictors of relationship satisfaction among emerging adult women, symptoms of ADHD may not become salient and impact relationship satisfaction among men until middle adulthood when men are found to invest more strongly in their romantic relationships (Bruner et al., 2015).

Strengths, Limitations, and Future Directions

Taken together, our findings add to the current literature by using a longitudinal design and a latent-variable data analytical strategy to provide important evidence of the strong stability of ADHD symptoms during the transition from emerging to middle adulthood, as well as providing evidence of the impacts of the two core ADHD symptom dimensions on several life

outcomes. Nevertheless, our findings should be understood in the context of a few limitations. Firstly, our analyses did not control for the effects of other comorbid psychiatric symptoms (e.g., substance use, depression, anxiety) as we were more interested in testing whether ADHD symptoms alone could predict later life outcomes, regardless of whether other psychiatric symptoms are present. Nonetheless, future studies would benefit from examining whether ADHD symptoms predict important life outcomes in middle or older adulthood when other psychiatric symptoms are statistically controlled for. Secondly, the present study was unable to collect information to corroborate participants' self-reported ADHD symptoms (e.g., the presence of ADHD diagnoses, treatment for ADHD). Therefore, it is uncertain whether the severity of ADHD symptomatology in our sample is truly representative of the ADHD symptomatology present in the general adult population. It should be noted, however, that 2.5% of the present sample met criteria for probable ADHD (based on cut-off scores for the CAARS; Conners et al., 1999), which is comparable to previous studies examining the prevalence of ADHD in the general adult population from which the sample was collected (i.e., 2.9% in the Canadian adult population; Hesson & Fowler, 2018). Thus, it is likely that our findings are representative of the severity of ADHD symptomatology found in the general adult population. Finally, the vast majority of our sample at Time 2 comprised individuals who were in early middle adulthood (i.e., a median age of 34.99). Future studies should therefore be conducted to examine the stability, or persistence, of ADHD symptoms from emerging adulthood to later life stages (e.g., older adulthood).

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Table 1.*Pearson correlations between Time 1 and Time 2 variables for men and women*

Time 1	Gender	Time 2								
		INA	HYI	ADHD	CSS	RAS	PS1	OS1	OS5	Mean (SD)
INA	Men	0.51*	0.30*	0.46*	-0.19	-0.11	0.25*	-0.02	0.05	1.16 (0.54)
	Women	0.44*	0.28*	0.41*	-0.12	-0.12	0.18*	0.08	0.09	0.98 (0.52)
HYI	Men	0.21	0.46*	0.37*	-0.04	-0.01	0.09	0.07	0.24*	0.98 (0.42)
	Women	0.31*	0.44*	0.42*	-0.01	-0.08	0.16*	0.07	0.17*	0.93 (0.44)
ADHD	Men	0.42*	0.42	0.47*	-0.14	-0.07	0.21*	0.02	0.15	2.14 (0.84)
	Women	0.43*	0.40*	0.47*	-0.08	-0.12	0.19*	0.09	0.14	1.91 (0.84)
Mean (SD)	Men	0.85 (0.42)	0.86 (0.37)	0.85 (0.35)	18.52 (5.01)	29.80 (4.91)	15.36 (2.63)	1.36 (1.68)	2.41 (2.06)	
	Women	0.85 (0.45)	0.91 (0.41)	0.88 (0.38)	18.41 (5.41)	28.70 (5.48)	14.91 (2.91)	1.30 (1.63)	3.11 (2.30)	

Note. INA = CAARS Inattention; HYI = CAARS Hyperactivity-Impulsivity; ADHD = CAARS Total ADHD; CSS = Career Satisfaction Scale; RAS = Relationship Assessment Scale; *PS1* = *Perceived Stress in past 12 months*; *OS1* = *number of objectively stressful events in past 12 months*; *OS5* = *number of objectively stressful events in past 5 years*

* $p < 0.05$

Table 2.*Pearson correlations among Time 1 variables (separately by gender)*

Variables	1	2	3
1. INA	—	0.56	0.90
2. HYI	0.55	—	0.86
3. ADHD	0.91	0.85	—

Note. Men are below the diagonal. All correlations are significant at $p < .05$

Table 3.*Pearson correlations among Time 2 variables (separately by gender)*

Variables	1	2	3	4	5	6	7	8
1. INA	—	0.53*	0.89*	-0.21*	-0.03	0.24*	0.22*	0.27*
2. HYI	0.61*	—	0.86*	-0.06	-0.02	-0.11	0.10	0.25*
3. ADHD	0.91*	0.88*	—	-0.16*	-0.03	0.20*	0.18*	0.30*
4. CSS	-0.21*	-0.22*	-0.24*	—	0.05	-0.47*	-0.19	-0.40*
5. RAS	-0.17	-0.09	-0.15	0.18	—	-0.29*	0.08	0.08
6. PS1	0.27*	0.16	0.24*	-0.53*	-0.33*	—	-0.26*	-0.47*
7. OS1	0.10	0.23*	0.17	-0.27*	0.12	-0.22*	—	0.45*
8. OS5	0.03	0.35*	0.20*	-0.15	0.01	-0.18	0.54*	—

Note. Men are below the diagonal. INA = CAARS Inattention; HYI = CAARS Hyperactivity-

Impulsivity; ADHD = CAARS Total ADHD; CSS = Career Satisfaction Scale; RAS = Relationship

Assessment Scale; PS1 = Perceived Stress in past 12 months; OS1 = number of objectively stressful

events in past 12 months; OS5 = number of objectively stressful events in past 5 years

* $p < .05$.

Table 4.

Means and standard deviations for CAARS scales by relationship quality group, time period, and gender.

CAARS Scale	Gender	Time 1		Time 2	
		Low Quality	High Quality	Low Quality	High Quality
Inattention	Men	1.30 (0.66)	0.87 (0.58)	0.88 (0.44)	0.72 (0.51)
	Women	1.00 (0.65)	0.89 (0.57)	0.79 (0.50)	0.76 (0.57)
	Combined	1.10 (0.67)	0.89 (0.57)	0.82 (0.48)	0.74 (0.54)
Hyperactivity- Impulsivity	Men	1.00 (0.51)	0.97 (0.45)	0.85 (0.41)	0.81 (0.47)
	Women	0.92 (0.56)	0.98 (0.58)	0.97 (0.52)	0.85 (0.52)
	Combined	0.95 (0.55)	0.98 (0.52)	0.93 (0.49)	0.83 (0.49)
Total ADHD	Men	1.13 (0.49)	1.03 (0.38)	0.88 (0.33)	0.83 (0.45)
	Women	1.00 (0.54)	0.98 (0.49)	0.92 (0.47)	0.87 (0.45)
	Combined	1.04 (0.53)	1.00 (0.45)	0.91 (0.43)	0.85 (0.45)

Note. There were 82 individuals in high quality relationships (36 men and 46 women) and 140 individuals in poor quality relationships (48 men and 92 women).

Table 5.

Means and standard deviations for CAARS scales by precariousness group, time period, and gender.

CAARS Scale	Gender	Time 1		Time 2	
		Precarious	Non-Precarious	Precarious	Non-Precarious
Inattention	Men	1.63 (0.50)	1.11 (0.64)	1.00 (0.00)	0.81 (0.51)
	Women	1.16 (0.55)	0.96 (0.62)	0.90 (0.60)	0.80 (0.51)
	Combined	1.30 (0.57)	1.02 (0.47)	0.93 (0.50)	0.80 (0.51)
Hyperactivity- Impulsivity	Men	1.13 (0.62)	0.98 (0.49)	0.94 (0.44)	0.84 (0.45)
	Women	1.00 (0.40)	0.90 (0.56)	1.10 (0.38)	0.92 (0.53)
	Combined	1.04 (0.93)	0.93 (0.54)	1.06 (0.41)	0.89 (0.50)
Total ADHD	Men	1.25 (0.45)	1.10 (0.49)	1.00 (0.00)	0.86 (0.40)
	Women	1.05 (0.46)	0.98 (0.52)	1.08 (0.42)	0.92 (0.46)
	Combined	1.11 (0.46)	1.02 (0.51)	1.06 (0.36)	0.90 (0.44)

Note. There were 260 individuals that were non-precariously employed (94 men and 166 women) and 55 individuals that were precariously employed (16 men and 39 women).

Table 6.

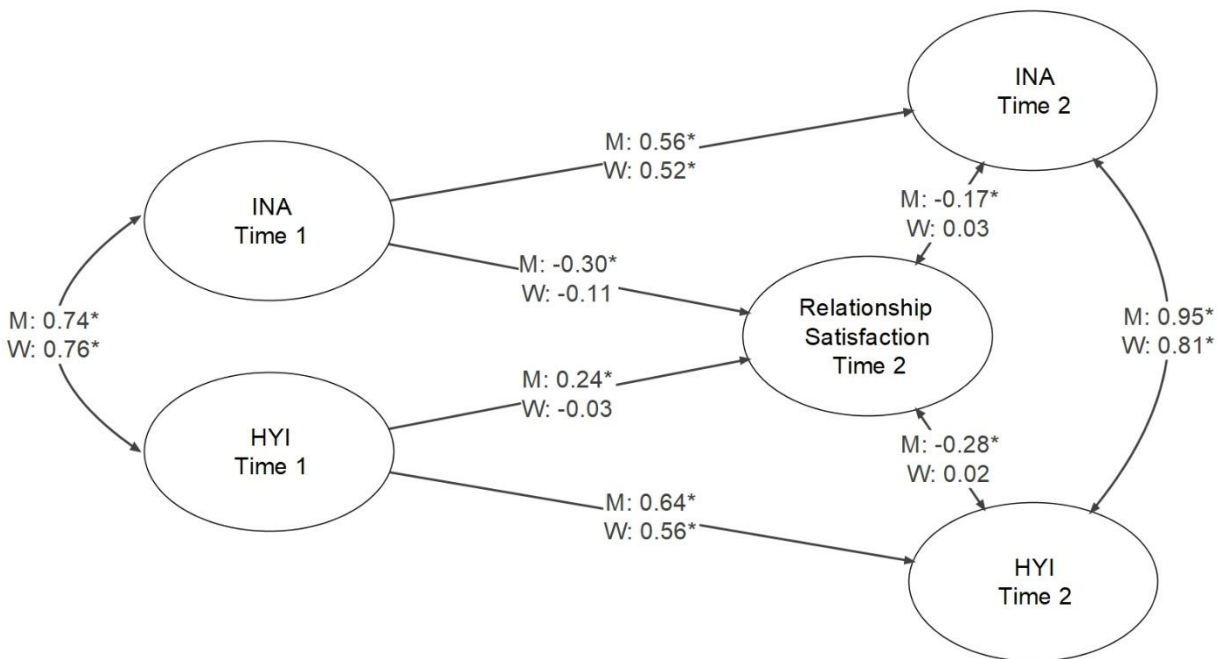
Means and standard deviations for CAARS scales by mental health status, time period, and gender.

CAARS Scale	Gender	Time 1		Time 2	
		Problem	No Problem	Problem	No Problem
Inattention	Men	1.24 (0.56)	1.16 (0.68)	0.88 (0.49)	0.82 (0.48)
	Women	1.03 (0.66)	0.98 (0.59)	0.91 (0.58)	0.76 (0.50)
	Combined	1.09 (0.63)	1.05 (0.63)	0.90 (0.55)	0.78 (0.49)
Hyperactivity- Impulsivity	Men	1.06 (0.56)	0.97 (0.49)	1.00 (0.50)	0.79 (0.41)
	Women	1.01 (0.56)	0.87 (0.52)	1.01 (0.56)	0.92 (0.48)
	Combined	1.03 (0.48)	0.91 (0.51)	1.01 (0.54)	0.87 (0.46)
Total ADHD	Men	1.15 (0.51)	1.11 (0.48)	0.94 (0.43)	0.86 (0.35)
	Women	0.99 (0.56)	0.99 (0.48)	1.03 (0.49)	0.90 (0.43)
	Combined	1.04 (0.55)	1.03 (0.48)	1.00 (0.47)	0.88 (0.40)

Note. There were 204 individuals that reported no mental health problem in the last 5 years (75 men and 129 women) and 108 individuals that reported a mental health problem in the last 5 years (33 men and 75 women).

Figure 1

Structural Equation Model for the Relationships among Inattention and Hyperactivity-Impulsivity at Time 1 and Time 2, and Relationship Satisfaction at Time 2

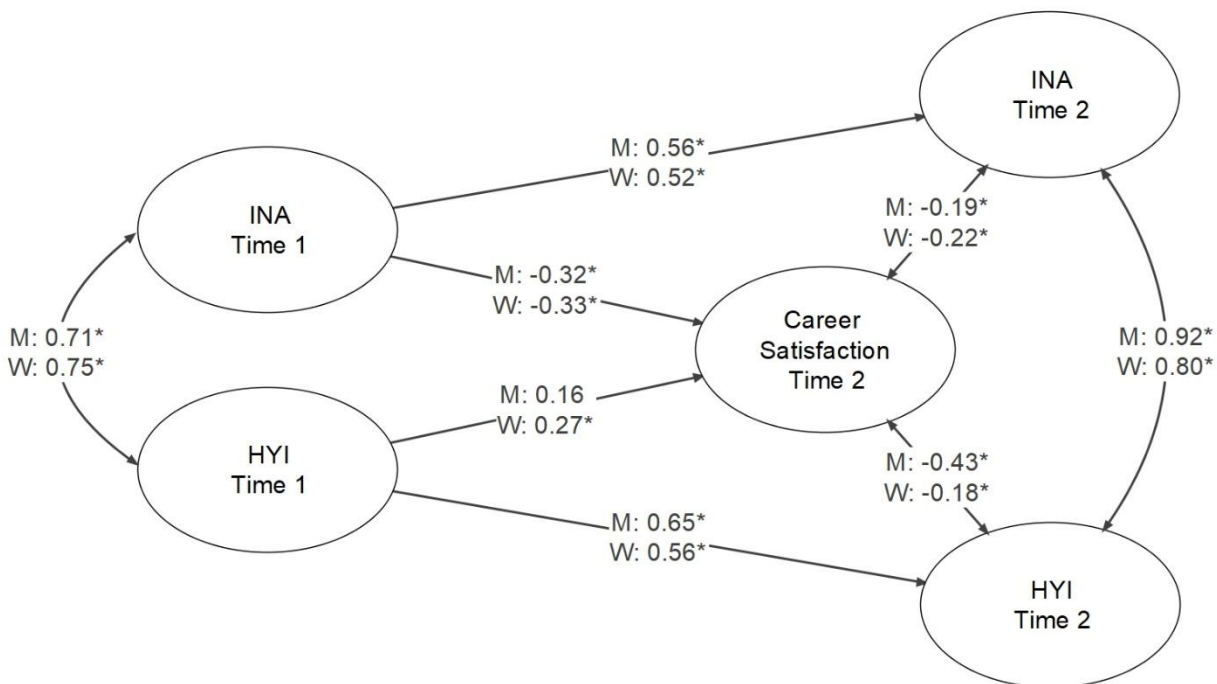


Note. Model fit was CFI = 1.000, RMSEA = .000, 90% CI [.000, .000], SRMR = .093 for men, and CFI = 1.000, RMSEA = .000, 90% CI [.000, .000], SRMR = .075 for women.

* $p < .05$

Figure 2

Structural Equation Model for the Relationships among Inattention and Hyperactivity-Impulsivity at Time 1 and Time 2, and Career Satisfaction at Time 2

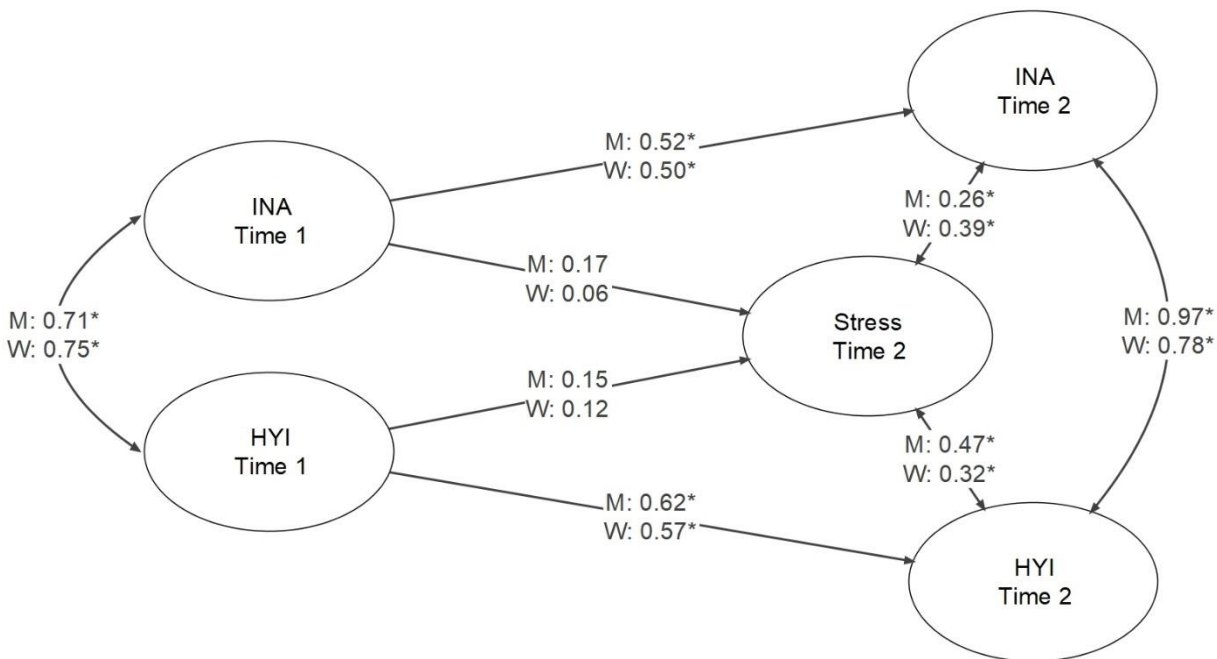


Note. Model fit was CFI = 1.000, RMSEA = .000, 90% CI [.000, .000], SRMR = .084 for men, and CFI = .993, RMSEA = .016, 90% CI [.000, .027], SRMR = .073 for women.

* $p < .05$

Figure 3

Structural Equation Model for the Relationships among Inattention and Hyperactivity-Impulsivity at Time 1 and Time 2, and Stress at Time 2



Note. Model fit was CFI = 1.000, RMSEA = .000, 90% CI [.000, .008], SRMR = .085 for men, and CFI = .984, RMSEA = .024, 90% CI [.011, .033], SRMR = .073 for women.

* $p < .05$

Chapter 4: General Conclusions and Future Directions

The goal of this thesis was to address several limitations of the current adult ADHD literature by using a longitudinal design and a robust latent variable analysis strategy to examine the stability of ADHD symptoms across adulthood and the relative contributions of inattention and hyperactivity-impulsivity symptoms of ADHD to multiple life outcomes in men and women. Study 1 added to the current adult ADHD literature through highlighting the central role that inattention symptoms play in predicting academic success, including predicting lower GPAs and a greater likelihood of academic desistence, in post-secondary education over a 6-year period (Henning et al., 2021). Likewise, Study 2 added to current research through demonstrating the significant roles inattention and hyperactivity-impulsivity symptoms play in predicting both future and current life outcomes, including relationship satisfaction, career satisfaction, and stress, over a 15-year period. These findings add to the current literature by identifying the impacts that ADHD symptoms can have on both current and later life outcomes in adulthood, through showing the impacts of adult ADHD symptoms on life outcomes both concurrently and overtime (i.e., 6 to 15 years later).

Study 2 also uniquely demonstrated the strong, trait-like stability of inattention and hyperactivity-impulsivity symptoms across a 15-year period from emerging adulthood to early middle adulthood, thus contributing to recent efforts in conceptualizing ADHD (and other psychiatric disorders) as dimensional constructs (Kotov et al., 2017). In particular, our findings demonstrate the stability of the two core ADHD symptom dimensions are comparable to those of basic personality dimensions across similar time periods (Costa et al., 2019), with co-occurrence of the two dimensions becoming stronger overtime. Future research will benefit from exploring whether this trend toward greater co-occurrence and stability of the inattention and hyperactivity-

impulsivity symptoms continues through later stages of adulthood (e.g., later middle adulthood, older adulthood), as well as replicating our findings regarding the stability of ADHD symptoms from emerging adulthood to early middle adulthood.

More studies are also needed to replicate our findings regarding the impacts of emerging adulthood ADHD symptoms on later life outcomes, including our novel finding that greater hyperactivity-impulsivity symptoms, when limited to emerging adulthood, predict greater relationship and career satisfaction in early middle adulthood. If these findings can be replicated, they may provide greater insight into the risk factors and development processes that influence relationship and career satisfaction in middle adulthood, as well as contribute to our understanding of the life course, or prognosis, of ADHD in adulthood (Nigg et al., 2020). Relatedly, future research is needed to understand the mediators and moderators of these relationships between ADHD symptoms in emerging adulthood and early middle adulthood.

One potential mediator and/or moderator of particular interest in this regard is emotional intelligence (EI), a construct involving the ability to recognize, understand, express, and manage emotions in oneself and others (Storey et al., 2021). Like ADHD, EI has been associated with a variety of life outcomes, including relationship satisfaction, job performance, health, and well-being (Baudry et al., 2018; O'Boyle et al., 2011; Parker et al., 2021; Sánchez-Álvarez et al., 2016). EI is also closely associated with emotion regulation, both theoretically and empirically (Zysberg & Raz, 2019), and it is this dimension of EI that has recently been proposed as an important mediator and/or moderator of the association between ADHD and various life outcomes (Ben-Dor Cohen et al., 2021; Bodalski et al., 2019; Pollock et al., 2017; van Stralen, 2016). For instance, a study by Pollock et al. (2017) found that individuals with high ADHD symptoms had significantly higher relationship satisfaction if they also had higher EI scores,

compared to those with lower EI scores. Similarly, a recent study by Ben-Dor Cohen et al. (2021) found that difficulties with emotion regulation significantly moderated the association between ADHD and health-related quality of life, with those with lower ADHD symptoms and fewer difficulties with emotion regulation having better health-related quality of life.

In contrast, a study by Mitchell et al. (2012) found that difficulties with emotion regulation mediated the association between ADHD symptoms and self-reported engagement in emotionally impulsive behaviours. Likewise, a recent study by Bodalski et al. (2018) found that difficulties with emotion regulation were a significant mediator of the association between ADHD symptoms and multiple life outcomes, including depression and anxiety symptoms, relationship satisfaction, functional impairment. Taken together, these findings suggest that EI, and in particular the emotion regulation dimension of EI, may be an important mediator and/or moderator of the relationships between ADHD and various life outcomes. However, more research is needed to replicate the findings of these studies, including relevant variables collected over longer time periods using longitudinal designs.

Beyond the emotion regulation component of EI, future studies are also needed to examine whether other dimensions of EI (e.g., emotional understanding, emotional communication) may act as mediators and/or moderators of these associations between ADHD and life outcomes. For instance, in accordance with Hammen's (1991, 2006) stress-generation model of depression, it may be that individuals with higher ADHD symptoms generate their own stress or stressful life events (e.g., divorce, job losses) through engaging in poor emotional communication or being unable to recognize and understand the emotions of others (i.e., low EI). Such behaviour would in turn would elicit negative reactions from others, thus generating interpersonal conflicts (i.e., stressors). Potential for this complex interplay between ADHD

symptoms, dimensions of EI (as moderators), and an individual's environment (e.g., romantic partners, coworkers) is supported by current evidence regarding personality traits and the stress-generation model in depression (e.g., Kushner et al., 2017), as well as our findings regarding ADHD and stress during early middle adulthood. However, future research is needed to confirm whether this process described by the stress-generation model occurs in ADHD and whether EI plays a role in this process.

In addition to mediators and moderators of the associations between ADHD symptoms and life outcomes, future studies will need to examine whether ADHD symptoms incrementally predict life outcomes when other variables known to predict these outcomes are controlled for. For instance, anxiety, depression, and substance use are all commonly comorbid with ADHD (Yoshimasu et al., 2018) and have well-established associations with various negative life outcomes (Meda et al., 2017; Rehman et al., 2015). Thus, future studies will be needed to replicate our findings while controlling for common psychiatric comorbidities of ADHD. Likewise, future studies are needed to replicate our findings while controlling for other potential confounds, including socioeconomic status, the use of treatments for ADHD, and the presence of other psychiatric conditions.

Finally, given that the analyses presented in this thesis are based solely on ADHD data from self-reports, future studies are needed to examine whether our findings can be replicated using either informant-report only or combined informant and self-report data. This is particularly important in the context of predicting life outcomes using ADHD symptom data as individuals with ADHD have consistently been shown to underreport symptoms (Luderer et al., 2019; Molina & Sibley, 2014), with combined informant and self report data considered more optimal than informant or self reports alone (Sibley et al., 2017). Such underreporting of ADHD

symptoms is important as it may attenuate associations between symptomatology and life outcomes (Dhillon et al., 2017), with the result being non-significant associations or reduced effect sizes. It would therefore be beneficial for future studies to collect both self and informant reports of ADHD symptoms when examining the impacts of these symptoms on life outcomes.

In summary, the findings presented in Study 1 and Study 2 of this thesis show robust evidence of the stability of ADHD symptomatology across adulthood, as well as the relative contributions of the two core ADHD symptom dimensions to predicting life outcomes both concurrently and across 6- and 15-year periods. These findings provide novel evidence supporting conceptualizations of ADHD (and its two core symptom dimensions) as a dimensional trait, as well as indicating the need for future research to elucidate the developmental processes that underlie the impacts these ADHD symptoms have on life outcomes for men and women throughout adulthood.

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