International Journal of Applied Positive Psychology (2022) 7:227–250
https://doi.org/10.1007/s41042-022-00062-6

RESEARCH PAPER

Flourishing Despite Attention-Deficit Hyperactivity Disorder (ADHD): a Population Based Study of Mental Well-Being

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Accepted: 11 March 2022 / Published online: 12 April 2022

Abstract

Despite the mental health and social challenges of ADHD, many adults with ADHD can achieve complete mental health (CMH), which is defined as, (1) the absence of mental illness, substance dependence, and suicidality; (2) the presence of happiness/life satisfaction; and (3) social/psychological well-being. The objective of this study was to compare the prevalence and odds of achieving CMH among those with and without ADHD, and to identify factors associated with CMH in a nationally representative sample of Canadians who reported they had been diagnosed with ADHD (n = 480) using data from the 2012 Canadian Community Health Survey. Two in five adults (42.0%) with ADHD had achieved CMH, in comparison to 73.8% of those without ADHD. Among those with ADHD, CMH was higher among married and physically active respondents, and those who used spirituality to cope with challenges, and lower among those with adverse childhood experiences, debilitating pain, and a history of depression and anxiety. Implications for supporting mental well-being among adults with ADHD are discussed.

Keywords Attention-deficit/hyperactivity disorder · Mental illness · Well-being · Flourishing

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1 Introduction

Although attention-deficit hyperactivity disorder (ADHD) has often been mischaracterized as primarily afflicting children, a recent systematic review and meta-analysis estimated the global prevalence of symptomatic adult ADHD to be 6.76% (Song et al., 2021), closely aligning with the approximate 5–7% of children with ADHD (Polanczyk et al., 2007; Willcutt, 2012). Symptoms of ADHD such as inattention, impulsivity, and/or hyperactivity can often lead to significant behavioral challenges in home, school, and work environments (American Psychiatric Association, 2013). ADHD is associated with numerous adverse outcomes across the lifetime, including lower academic achievement (Loe & Feldman, 2007; Polderman et al., 2010), lower socioeconomic status (Able et al., 2007), lower self-esteem (Shaw-Zirt et al., 2005), and greater deficits in social relationships (Biederman et al., 2006; Moyá et al., 2014).

Of particular concern, ADHD is also associated with detrimental mental health outcomes, including higher rates of mood, anxiety, and bipolar disorders (Able et al., 2007; Kessler et al., 2006), substance use disorders (Capusan et al., 2019; Wilens et al., 2011), and higher rates of suicidal ideation and behaviours (Chronis-Tuscano et al., 2010; Fuller-Thomson et al., 2020; Hurtig et al., 2012). While these adverse long-term outcomes have been comprehensively studied in the literature (Erskine et al., 2016; Hodgkins et al., 2012), much less attention has been paid to factors associated with optimal well-being among those with ADHD (Lee et al., 2016). Furthermore, the limited body of research examining positive ADHD outcomes has predominantly focused on children and youth (Dvorsky & Langberg, 2016; Freire et al., 2021), emphasizing the need for more research on the well-being of adults with ADHD.

Recently, some mental health research has shifted from a disease-centered perspective on mental illness in favour of a more holistic view on mental health recovery and flourishing (Baiden & Fuller-Thomson, 2016; Fuller-Thomson et al., 2016a; Fuller-Thomson & Ryckman, 2020). Flourishing is a key concept in positive psychology. Individuals who are psychologically flourishing experience high levels of both hedonic and eudaimonic well-being (Huppert & So, 2013). Hedonic well-being refers to happiness achieved through experiences of pleasure and enjoyment, whereas eudaimonic well-being is achieved through experiences of meaning and purpose (Ryan & Deci, 2001). Flourishing balances these two constructs, asserting that a flourishing individual can "feel good about lives in which they are functioning well" (Keyes, 2016 p. 101). This perspective can be conceptualized through Keyes' (2005) framework of complete mental health (CMH), which incorporates measures of hedonic and eudaimonic well-being, in addition to considering the absence of mental illness.

The present study seeks to build upon the existing research on CMH by examining its relationship to ADHD. Shifting away from a deficit-focused approach to ADHD research, this study examines flourishing in adults with ADHD through the application of Keyes' (2005) model of CMH. The model that is applied in the present study is comprised of three components: 1) the absence of any mental

illness in the preceding year (i.e. depressive disorders, anxiety disorders, bipolar disorders, substance dependence, suicidal ideation); 2) the presence of happiness or life satisfaction daily or almost daily in the preceding month; and 3) the presence of social and/or psychological well-being daily or almost daily in the preceding month.

1.1 Factors Potentially Associated with both ADHD and CMH

When examining the relationship between ADHD and CMH in adulthood, there are several factors that are associated with both ADHD and CMH that may confound the association. By including these factors in our analyses, we can minimize the effects of the confounding bias and shed light more accurately on the true nature of the relationship between ADHD and CMH. These confounding factors are described below.

Previous research has highlighted differences in both ADHD and CMH by demographic factors, such as gender and race. For example, men and boys are more likely than women and girls to be diagnosed with ADHD (Pastor & Reuben, 2008; Ramtekkar et al., 2010). However, ADHD is less likely to be recognized and is, thus, more often under-diagnosed in women and girls (Quinn & Madhoo, 2014). In looking at the relationship between gender and CMH, some research has indicated that women are more likely than men to achieve CMH (Baiden & Fuller-Thomson, 2016), while other research has found no gender differences in CMH among white men and women (Keyes, 2007), and a higher prevalence of CMH in Black men when compared to Black women (Keyes, 2007).

In examining racial differences in CMH among both genders, white Canadian adults have been found to be more likely to be in CMH than visible minorities (Baiden & Fuller-Thomson, 2016). Racial differences have also been identified in ADHD. Some research has found that white children are more likely to receive an ADHD diagnosis than Asian, Black, or Hispanic children (Morgan et al., 2013; Shi et al., 2021). Conversely, a recent systematic review and meta-analysis found that Black children and adults were significantly more likely to receive a diagnosis of ADHD when compared to the general US population (Cénat et al., 2021). The authors hypothesize that the higher prevalence among Black individuals may be due to the high number of studies in the meta-analysis that focused on Black youth with low SES. The available research demonstrates the importance of considering demographic factors when examining the relationship between ADHD and CMH.

Beyond demographic factors, there are also numerous forms of adversity that may confound the relationship between ADHD and CMH, such as adverse childhood experiences and low socioeconomic status. ACEs, such as physical abuse, sexual abuse, and witnessing domestic violence, are more prevalent among those with ADHD in comparison to those without ADHD (Fuller-Thomson et al., 2014; Fuller-Thomson et al., 2016b). ACEs are also negatively associated with achieving CMH, as early childhood experiences can have implications for mental health outcomes across the life course (Baiden & Fuller-Thomson, 2016).

Measures of socioeconomic status, such as education and income, also affect both ADHD and CMH. ADHD is associated with poorer academic performance

throughout elementary and post-secondary education, which can create barriers for completing a post-secondary degree (Arnold et al., 2020; Frazier et al., 2007). Those who completed post-secondary school are more likely to achieve CMH than those who have not (Gilmour, 2014). Looking at income specifically, individuals with ADHD often have a lower average income and are less likely to have full-time employment than those without ADHD (Biederman & Faraone, 2006; Pelham et al., 2020). This can act as a barrier to achieving CMH, as adults with higher household incomes are more likely to achieve CMH than those with middle and low incomes (Baiden & Fuller-Thomson, 2016; Gilmour, 2014).

Other relevant factors that may impact both ADHD and CMH include social support, physical health status, coping strategies, and other mental health issues. Social support, via the presence of close interpersonal relationships, can influence both ADHD and CMH. Individuals with ADHD are more likely to be divorced or never married (Michielsen et al., 2015), and to experience marital discord than those without ADHD (Eakin et al., 2004). Being married is strongly associated with CMH compared to being single, divorced, or widowed (Baiden & Fuller-Thomson, 2016; Gilmour, 2014). Beyond romantic relationships, adults with ADHD often experience significant challenges in other social relationships throughout their lifetime (Michielsen et al., 2015; Moyá et al., 2014). They may also be less likely to seek out or maintain supportive relationships in their lives (Young, 2005). Similarly, individuals without at least one close confidant are much less likely to be in CMH (Baiden & Fuller-Thomson, 2016).

ADHD is also associated with poor physical health outcomes, including debilitating pain, functional limitations, and having fair or poor self-rated health (Fuller-Thomson et al., 2016a, b; Landes & London, 2021). Debilitating pain and functional limitations can act as significant barriers to achieving CMH (Baiden & Fuller-Thomson, 2016; Gilmour, 2014).

ADHD and CMH may also be influenced by an individual's engagement in coping strategies, such as religiosity/spirituality and regular physical activity. Those with ADHD have been found to be less likely to utilize religion or spirituality to cope with daily challenges (Dew et al., 2020; Fuller-Thomson et al., 2016b). In the general population, adults who use religion or spirituality to cope with daily challenges are more likely to be in CMH (Baiden & Fuller-Thomson, 2016). Physical activity may help individuals with ADHD reduce some symptom severity and improve their attention (Rassovsky & Alfassi, 2019). Physically inactive individuals have been found to be less likely to be in CMH (Keyes & Simoes, 2012).

Finally, it is important to consider how other mental health factors, such as substance use disorders, depression, and anxiety, can impact both ADHD and CMH. Adults with ADHD have a higher prevalence of substance use disorders, mood disorders, and anxiety disorders than those without ADHD (Able et al., 2007; Fuller-Thomson et al., 2016b; Kessler et al., 2006; Wilens et al., 2011). Experiencing a substance use disorder, depression, and/or anxiety at some point in one's life have all been identified as barriers to achieving CMH when compared to those without a lifetime history of these disorders (Baiden & Fuller-Thomson, 2016; Fuller-Thomson et al., 2016a; Fuller-Thomson & Ryckman, 2020).

The available literature indicates numerous complex and interrelated factors that can influence both ADHD and CMH. As potential confounders, these factors have been incorporated into the current analysis in order for us to minimize confounding bias and elucidate the relationship between ADHD and CMH.

The objectives of the present study were to: 1) compare the prevalence and odds of achieving CMH among individuals with and without ADHD; and 2) identify factors associated with CMH among those with ADHD.

2 Methods

2.1 Sample

As has been described elsewhere (Baiden & Fuller-Thomson, 2016; Fuller-Thomson et al., 2016a), this study was based on secondary analysis of the 2012 Canadian Community Health Survey-Mental Health (CCHS-MH) (Statistics Canada, 2013a). The CCHS-MH is a nationally representative cross-sectional survey that collects data from community-dwelling Canadians on mental health status and related factors using computer-assisted interviews or in-person interviews. It has an overall response rate of 68.9% (Statistics Canada, 2013a).

The present study utilized two sub-samples of the full CCHS-MH. The first subsample was comprised of those respondents with complete data on ADHD and mental health, in addition to each of the independent measures examined in the current study (n = 21,099). This sample was utilized to provide descriptive information on adults with and without ADHD, and to investigate the association between ADHD and CMH. The second subsample was comprised of individuals who reported they had been diagnosed with ADHD (n = 480) and was used to identify factors associated with CMH among those with ADHD.

2.2 Measures

2.2.1 Outcome of Interest: Complete Mental Health

The outcome variable, complete mental health (CMH), was measured as a binary variable comprised of three elements: 1) the absence of mental illness or substance dependence in the past year (i.e., depressive episode, anxiety disorders, bipolar disorders, alcohol or drug dependence, suicidal ideation or attempts); 2) emotional well-being (i.e., happiness or life satisfaction) in the past month; and 3) social well-being and psychological well-being in the past month.

The past year mental illness and substance dependence variables that make up the first element of the CMH variable were derived from the World Health Organization version of the Composite International Diagnostic Interview (WHO-CIDI), a structured diagnostic interview that generated diagnosis according to the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) and

the International Classification of Disease (ICD-10). It is important to note that the DSM-IV and ICD-10 were the most up-to-date version of these documents in 2012 when the CCHS-MH survey was conducted. Since that time, these documents have been revised and updated, and currently the DSM-5 and ICD-11 are now in use. The latter two elements of the CMH (emotional well-being and social/psychological well-being) were assessed using the Mental Health Continuum - Short Form (MHC-SF) (Keyes, 2009). The MHC-SF is a 14-item instrument measuring dimensions of positive mental health, including emotional well-being (e.g., during the past month, how often did you feel: happy and/or satisfied with your own life?), social well-being (e.g., during the past month, how often did you feel that you had something important to contribute to society?), and psychological well-being (e.g., during the past month, how often did you feel that you liked most parts of your personality?) (Keyes et al., 2012; Keyes, 2009). The psychometric properties of the MHC-SF have been well established (Lamers et al., 2011). The internal reliability (Cronbach's alpha) was high for the total MHC-SF (0.89), as well as for the subscales of emotional well-being (0.83), psychological well-being (0.83), and social well-being (0.73) (Lamers et al., 2011).

In keeping with more than a dozen previous publications using Keyes' CMH measure, individuals were classified as being in CMH if they reported at least 1 of the 2 measures of emotional well-being (i.e., happiness and/or life satisfaction in past month) and at least 6 of the 11 measures of psychological and/or social well-being "every day" or "almost every day" during the preceding month in conjunction with the absence of all the above listed forms of mental illness in the preceding year. Our version was slightly modified by removal of one-question from the original 14-item instrument. The original version had included the question "interested in life?" in addition to "happy" and "satisfied with life" in the "emotional well-being" category. We felt that it was possibly to be interested in life without being in optimal mental health and therefore removed it from the measure, which resulted in the instrument now only having 13 items. In this study, the internal reliability (Cronbach's alpha) for the 13-items was high (0.89).

2.2.2 Key Exposure Variable: Attention-Deficit Hyperactivity Disorder (ADHD)

Self-reported ADHD began with the following preamble: "Now I'd like to ask about certain long-term health conditions which you may have. We are interested in 'long-term conditions' which are expected to last or have already lasted 6 months or more and that have been diagnosed by a health professional." Respondents were then asked: "Do you have attention deficit disorder?" Attention deficit disorder (ADD) is no longer used as a classification under DSM-IV criteria. For ease of understanding, we have used the term ADHD to describe the measure throughout this article.

2.2.3 Sociodemographic Characteristics

Sociodemographic covariates included sex (male vs. female), race (Non-Aboriginal White vs. non-White and/or Aboriginal, based on self-report), and age (measured

in decades). Socioeconomic covariates included education, which was dichotomized by post-secondary education completion (post-secondary graduate vs. not), and income, which was grouped into quintiles based on household annual income (<$20,000; $20,000–$39,999; $40,000–$59,999; $60,000–$79,999; ≥$80,000).

2.2.4 Validated Measures

Lifetime Drug or Alcohol Abuse or Dependence Lifetime substance abuse or dependence was measured according to the WHO-CIDI criteria for "Drug Abuse or Dependence (including Cannabis)" and the "Alcohol Abuse or Dependence". These scales have an excellent concordance with clinical interviews (0.83) (Janča et al., 1992) and have a test–retest reliability above 90% (Wittchen, 1994). Due to restrictions on minimum cell sizes for release of bivariate tables, these two variables were combined into one overarching substance abuse or dependence variable (no substance abuse or dependence vs. any substance abuse or dependence).

Mental Health History Lifetime history of Major Depressive Disorder and Generalized Anxiety Disorder were determined by meeting the WHO-CIDI lifetime criteria. These scales are valid and reliable with a concordance between clinical interviews of 0.73 for anxiety disorders and 0.78 for depressive disorders (Wittchen, 1994). The test-retest reliability and inter-rater reliability for these scales exceeds 90% (Wittchen, 1994). For additional details on the scales, please see Statistics Canada (Statistics Canada, 2013b).

2.2.5 Single Item Measures

Adverse Childhood Experiences (ACEs) Three adverse childhood experiences (ACEs) were measured: chronic parental domestic violence, physical abuse, and sexual abuse. Chronic parental domestic violence was measured based on the respondent reporting that before the age of 16 they had seen or heard in their home at least 11 times their "parents, step-parents or guardians hit each other or another adult." Physical abuse was measured based on the respondent reporting that an adult had, at least once "kicked, bit, punch, choked, burned, or physically attacked them." Sexual abuse was measured based on the respondent reporting that an adult had, at least once, "forced you or attempted to force you into any unwanted sexual activity, by threatening you, holding you down or hurting you in some way."

Social Support Marital status was coded into married or living common-law, vs. widowed, separated, divorced, or never married. Availability of a confidant was based upon the question, "I have close relationships that provide me with a sense of emotional security and well-being" (strongly agree/agree vs. disagree/strongly disagree).

Physical Health Debilitating pain was determined based on the extent to which pain prevents the person from performing certain daily activities (pain prevents few/

some/most daily activities vs. no activities prevented by pain). Self-reported health was coded into fair or poor vs. excellent, very good, or good.

Positive Coping Strategies Spiritual or religious coping was measured by asking, "To what extent do your religious or spiritual beliefs give you the strength to face everyday difficulties?" (A lot/somewhat/a little vs. not at all). Physical activity level was based on the number of times participants did vigorous or moderate physical activity for leisure within the previous 7 days (inactive vs. low vs. moderate/high).

2.3 Statistical Analysis

Using chi-square tests and independent t-tests in the full sample of Canadian community dwelling adults (n = 21,099), we compared the profile of those with ADHD (n = 480) to those without ADHD (n = 20,619). We then conducted a set of nine different logistic regression models examining the odds of CMH for adults without a history of ADHD in comparison to those with a history of ADHD (the reference category). Model 1 contained ADHD and demographic variables (sex, race, age). Model 2 added ACEs (childhood physical abuse, childhood sexual abuse, exposure to domestic violence) to ADHD, sex, race, and age. Model 3 added socioeconomic status (education, household income) to ADHD, sex, race, and age. Model 4 added social support (marital status, availability of a confidant) to ADHD, sex, race, and age. Model 5 added physical health (debilitating pain, self-reported health) to ADHD, sex, race, and age. Model 6 added coping strategies (religious/spiritual coping, physical activity) to ADHD, sex, race, and age. Model 7 added lifetime history of drug or alcohol abuse or dependence to ADHD, sex, race, and age. Model 8 added lifetime history of major depressive disorder or generalized anxiety disorder to sex, race, and age. The final model, model 9, includes all the aforementioned data: ADHD, sex, race, age, ACEs, education, income, marital status, confidant availability, debilitating pain, self-reported health, religious coping, physical activity, drug or alcohol abuse or dependence, lifetime history of anxiety, lifetime history of depression.

In the subsample of 480 respondents with ADHD, two logistic regression analyses were conducted to examine the factors associated with CMH among those with ADHD. Model 1 contained all demographics, ACEs, socioeconomic status variables, social support variables, physical health variables, coping strategies, and substance dependence or abuse. Model 2 contained all variables in Model 1 with the addition of lifetime history of major depressive disorder and generalized anxiety disorder. All data were weighted to adjust for the probability of selection and nonresponse. Sample sizes are reported in their original, unweighted form. Analyses were conducted using SPSS statistics version 23.

Table 1 Description of those with ADHD and those without ADHD in a population-based sample of Canadians (n = 21,099)

	No ADHD (n = 20,619)	ADHD (n = 480)	p value
Complete Mental Health			
Not in Complete Mental Health	26.2	58.0	<.001
Complete Mental Health	73.8	42.0	
Demographics			
Sex			
Male	48.8	64.3	<.001
Female	51.2	35.7	
Race			
Visible Minority	22.5	16.5	.002
White only	77.5	83.5	
Age			
20s	17.1	38.6	<.001
30s	17.4	21.3	
40s	19.2	19.8	
50+	46.3	20.2	
Adverse Childhood Experiences			
Witnessed Domestic Violence			
< 11 times	95.7%	91.8%	<.001
≥ 11 times	4.3%	8.2%	
Physical Abuse			
No	73.9%	57.2%	<.001
Yes	26.1%	42.8%	
Sexual Abuse			
No	94.2%	84.5%	<.001
Yes	5.8%	15.5%	
Socioeconomic Status			
Education			
No post-secondary degree	35.6	47.8	<.001
Has post-secondary degree	64.4	52.2	
Household Income			
<$20,000	3.9%	5.9%	<.001
$20,000 to $39,999	11.6%	12.7%	
$40,000 to $59,999	18.1%	18.3%	
$60,000 to $79,999	17.7%	18.2%	
≥$80,000	48.7%	44.9%	
Social Support			
Marital Status			
Singe/Divorced/Widowed	34.0%	48.4%	<.001
Married/Common-Law	66.0%	51.6%	
Physical Health			
Debilitating Pain			

Table 1 (continued)

	No ADHD (n = 20,619)	ADHD (n = 480)	p value
No	85.7	74.4	<.001
Yes	14.3	25.6	
Self-Reported Physical Health			
Fair or Poor	13.7	27.4	<.001
Excellent, Very Good, or Good	86.3	72.6	
Positive Coping Strategies			
Religion or Spirituality Used to Cope			
No	28.0	45.3	<.001
Yes	72.0	54.7	
Physical Activity			
Inactive	27.4	29.8	.034
Low	28.4	23.0	
Moderate/High	44.2	47.1	
Mental Health			
Drug or Alcohol Abuse (Lifetime history)			
No	78.3	53.7	<.001
Yes	21.7	46.3	
Lifetime Generalized Anxiety Disorder			
No	91.6	68.9	<.001
Yes	8.4	31.1	
Lifetime Major Depressive Disorder			
No	89.0	68.7	<.001
Yes	11.0	31.3	

3 Results

Table 1 presents the description of those with and without ADHD in a population-based sample of Canadians. Adults with ADHD had a significantly lower prevalence of CMH than adults without ADHD (42.0% vs. 73.8%; $p < .001$). Respondents with ADHD were significantly more likely to be male (64.3% vs. 48.8%; $p < .001$) and white (83.5% vs. 77.5%; $p = .002$). Respondents with ADHD were also significantly younger than those without ADHD; respondents in their 20s comprised 38.6% of the sample with ADHD and only 17.1% of the sample without ADHD, while respondents aged 50 and older comprised only 20% of respondents with ADHD and 46.3% of respondents without ADHD ($p < .001$). Individuals with ADHD were also more likely to have experienced ACEs, including chronic parental domestic violence (8.2% vs. 4.3%; $p < .001$), physical abuse (42.8% vs. 26.1%; $p < .001$), and sexual abuse (15.5% vs. 5.8%; $p < .001$), to have a household income below $20,000 (5.9% vs. 3.9%; $p < .001$), to have debilitating pain (25.6% vs. 14.3%; $p < .001$), to have a lifetime history of drug or alcohol abuse (46.3% vs. 21.7%; $p < .001$), to have a

lifetime history of generalized anxiety disorder (31.1% vs. 8.4%; $p < .001$), and to have a lifetime history of major depressive disorder (31.3% vs. 11.0%; $p < .001$). In contrast, those with ADHD were less likely to have a post-secondary degree (52.2% vs. 64.4%; $p < .001$), to be married or in a common-law relationship (51.6% vs. 66.0%; $p < .001$), to have good, very good, or excellent self-rated health (72.6% vs. 86.3%; $p < .001$), and to use religion or spirituality to cope with daily challenges (54.7% vs. 72.0%; $p < .001$). Those with ADHD were significantly less likely to have someone to confide in ($p < .001$), but due to Statistics Canada regulations of minimum reportable cell sizes, the exact prevalence is not releasable for the bivariate analyses.

Table 2 provides the results of a series of logistic regression models examining the odds of CMH for those without ADHD compared to those with ADHD. In model 1, adjusting for demographics, including sex, race, and age, the odds of CMH among adults with ADHD was threefold higher compared to those without ADHD (OR = 3.54; 95% CI = 2.94, 4.26). Adjusting for various clusters of variables (i.e., ACEs, socioeconomic status, marital status and presence of a confidant, religious coping and physical activity, drug or alcohol abuse or dependence), resulted in only minor attenuation of the odds of CMH among those without ADHD compared to those with ADHD (ORs range from 3.10 to 3.46). More substantial attenuation of the ADHD-CMH association was apparent when adjustments were made for physical health characteristics (OR = 2.95; 95% CI = 2.44, 3.57) and most substantially, when lifetime history of mental illness was taken into account (OR = 2.37; 95% CI = 1.94, 2.90). In the fully adjusted model, which included all the aforementioned factors in addition to lifetime history of depression and anxiety, individuals without ADHD still had 87% higher odds of being in CMH than those with ADHD (OR = 1.87; 95% CI = 1.52, 2.31).

Table 3 provides the results of two additional logistic regression analyses examining the factors associated with CMH among those with ADHD (n = 480). Model 1 included all demographics, ACEs, socioeconomic status variables, social support variables, physical health variables, coping strategies, and drug or alcohol dependence or abuse. In Model 1, respondents had approximately double the odds of being in CMH if they had not experienced physical abuse during childhood (OR = 2.18; 95% CI = 1.35, 3.53), if they were married or in a common-law relationship (OR = 2.07; 95% CI = 1.27, 3.37), if they did not have debilitating pain (OR = 2.08; 95% CI = 1.15, 3.74), and if they used religion or spirituality to cope with daily challenges (OR = 2.51; 95% CI = 1.58, 3.99). Respondents had approximately triple the odds of being in CMH if they engaged in low physical activity (OR = 3.04; 95% CI = 1.63, 5.66) or moderate/high physical activity (OR = 3.86; 95% CI = 2.24, 6.66) compared to engaging in no physical activity. Female respondents had 41% lower odds of being in CMH compared to male respondents (OR = 0.59; 95% CI = 0.36, 0.97).

Model 2 included all variables from Model 1 with the addition of lifetime history of major depressive disorder and generalized anxiety disorder. In Model 2, debilitating pain was no longer significant in predicting the odds of CMH among those with ADHD. In addition, female respondents were no longer significantly less likely than their male counterparts to be in CMH. In Model 2, factors that remained

Table 2 Odds ratio and 95% confidence intervals of complete mental health for those without ADHD versus those with ADHD before and after adjustment (n = 21,099)

	Demographics[a]	ACEs[b]	Socioeconomic Status[c]	Social Support[d]	Physical Health[e]	Coping Strategies[f]	Substance Dependence/ Abuse[g]	Depression and Anxiety[h]	Fully Adjusted[i]
No ADHD Vs With ADHD (Ref)	3.54 (2.94, 4.26)	3.10 (2.56, 3.74)	3.24 (2.69, 3.91)	3.36 (2.79,4.05)	2.95 (2.44, 3.57)	3.46 (2.87, 4.16)	3.18 (2.63, 3.84)	2.37 (1.94, 2.90)	1.87 (1.52, 2.31)

[a]Adjusted for sex, race, age,

[b]Adjusted for sex, race, age, co-occurring adverse childhood experiences (ACEs): physical abuse, sexual abuse and exposure to parental domestic violence

[c]Adjusted for sex, race, age, education, and income

[d]Adjusted for sex, race, age, marital status, and confidant availability

[e]Adjusted for sex, race, age, debilitating pain, and self-reported health

[f]Adjusted for sex, race, age, religious coping, and physical activity

[g]Adjusted for sex, race, age, drug or alcohol abuse or dependence

[h]Adjusted for sex, race, age, lifetime history of generalized anxiety disorder and major depressive disorder

[i]Fully adjusted = adjusted for sex, race, age, ACEs, education, income, marital status, confidant availability, pain, self-reported health, religious coping, physical activity, drug or alcohol dependence/abuse, anxiety, depression

Table 3 Logistic regression analyses predicting complete mental health in a sample of individuals with a lifetime history of ADHD (n = 480)

	Model 1 Odds Ratio (95% Confidence Interval)	Model 2 Odds Ratio (95% Confidence Interval)
Demographics		
Sex		
Male (Ref)	1.00	1.00
Female	0.59 (0.36, 0.97)	0.81 (0.47, 1.40)
Race		
Visible Minority (Ref)	1.00	1.00
White only	0.76 (0.40, 1.46)	0.50 (0.25, 1.03)
Age		
20s (Ref)	1.00	1.00
30s	0.94 (0.53, 1.66)	1.38 (0.74, 2.59)
40s	0.94 (0.48, 1.85)	1.35 (0.64, 2.84)
50+	0.69 (0.36, 1.34)	0.89 (0.43, 1.80)
Adverse Childhood Experiences		
Witnessed Domestic Violence		
< 11 times	1.44 (0.50, 4.10)	1.05 (0.37, 3.01)
≥ 11 times (Ref.)	1.00	1.00
Physical Abuse		
No	2.18 (1.35, 3.53)	2.18 (1.30, 3.67)
Yes (Ref.)	1.00	1.00
Sexual Abuse		
No	1.60 (0.77, 3.32)	1.38 (0.64, 3.01)
Yes (Ref.)	1.00	1.00
Socioeconomic Status		
Education		
No Post-Secondary Degree (Ref.)	1.00	1.00
Post-Secondary Degree	1.44 (0.92, 2.27)	1.47 (0.91, 2.39)
Household income		
<$20,000 (Ref)	1.00	1.00
$20,000–$39,999	1.12 (0.41, 3.09)	1.00 (0.33, 3.02)

Table 3 (continued)

	Model 1 Odds Ratio (95% Confidence Interval)	Model 2 Odds Ratio (95% Confidence Interval)
$40,000–$59,999	1.44 (0.53, 3.91)	1.21 (0.41, 3.61)
$60,000–$79,999	0.62 (0.22, 1.73)	0.46 (0.15, 1.39)
≥$80,000	1.41 (0.54, 3.65)	1.21 (0.43, 3.41)
Social Support		
Marital Status		
Single/Divorced/Widowed (Ref.)	1.00	1.00
Married/Common-law	2.07 (1.27, 3.37)	1.83 (1.09, 3.08)
Availability of Confidant		
No (Ref.)	1.00	1.00
Yes	2.13 (0.69, 6.64)	1.92 (0.59, 6.24)
Physical Health		
Debilitating Pain		
No	2.08 (1.15, 3.74)	1.67 (0.76, 2.82)
Yes (Ref.)	1.00	1.00
Self-reported Physical Health		
Fair or Poor (Ref.)	1.00	1.00
Excellent, Very Good or Good	1.57 (0.88, 2.78)	1.34 (0.73, 2.47)
Positive Coping Strategies		
Religion or Spirituality Used to Cope		
No (Ref.)	1.00	1.00
Yes	2.51 (1.58, 3.99)	2.83 (1.72, 4.68)
Physical Activity		
Inactive (Ref.)	1.00	1.00
Low	3.04 (1.63, 5.66)	2.77 (1.44, 5.35)
Moderate/High	3.86 (2.24, 6.66)	4.02 (2.26, 7.12)
Mental Health		
Drug or Alcohol Dependence or Abuse		
No	1.39 (0.88, 2.17)	1.22 (0.75, 1.97)
Yes (Ref.)	1.00	1.00
Major Depressive Disorder		

Table 3 (continued)

	Model 1 Odds Ratio (95% Confidence Interval)	Model 2 Odds Ratio (95% Confidence Interval)
No	–	4.36 (2.36, 8.03)
Yes (Ref.)	–	1.00
Generalized Anxiety Disorder		
No	–	2.83 (1.55, 5.20)
Yes (Ref.)	–	1.00
Nagelkerke R Square	0.307	0.407
-2 Log Likelihood	528.62	480.29

significantly associated with higher odds of being in CMH include not experiencing physical abuse during childhood (OR = 2.18; 95% CI = 1.30, 3.67), being married or in a common-law relationship (OR = 1.83; 95% CI = 1.09, 3.08), using religion or spirituality to cope with daily challenges (OR = 2.83; 95% CI = 1.72, 4.68), and engaging in low physical activity (OR = 2.77; 95% CI = 1.44, 5.35) or moderate/high physical activity (OR = 4.02; 95% CI = 2.66, 7.12), rather than no physical activity. Those without a lifetime history of depression had more than four times the odds of CMH (OR = 4.36; 95% CI = 2.36, 8.03), while those without a lifetime history of anxiety had more than double the odds of CMH (OR = 2.83; 95% CI = 1.55, 5.20).

Based on the Nagelkerke pseudo R square, Model 1 explained 30.7% of the variance in CMH. With the addition of lifetime history of major depressive disorder and generalized anxiety disorder, Model 2 explained 40.7% of the variance in CMH.

4 Discussion

The first objective of this study was to compare the prevalence and odds of achieving CMH among those with and without ADHD. This nationally representative Canadian study of adults who have ever been diagnosed with ADHD indicates that more than two in every five (42%) of these individuals had achieved complete mental health in the month preceding the survey, which is significantly lower than the prevalence of CMH among those without ADHD (74%). In the fully adjusted model, which took into account a large number of potentially confounding factors, individuals without ADHD had 87% higher odds of being CMH than those with ADHD. Statistically adjusting for lifetime history of mental illness provided the largest attenuation of the relationship between ADHD and CMH.

The bar for CMH used in this study is extremely high, indicating the individuals were not only free of all mental illness, substance dependence, and suicidal ideation in the preceding year, but that they also reported happiness or life

satisfaction on an almost daily basis in the past month and that they had very high levels of social and psychological well-being in the past month. Previous research (e.g., Fuller-Thomson et al., 2014; Fuller-Thomson et al., 2016b; Fuller-Thomson et al., 2020; Moyá et al., 2014; Wilens et al., 2011) has focused on negative outcomes among those with ADHD, including deficits in interpersonal relationships and elevated rates of anxiety disorders, depressive disorders, suicidality, and substance dependence. Without negating the severity of these problems for those who are struggling with these issues, the finding of this paper suggest that levels of flourishing are remarkably high among adults with ADHD.

The second objective of this study was to identify factors associated with CMH in a nationally representative sample of Canadians adults who reported they had been diagnosed with ADHD. Factors which were associated with higher odds of CMH among those with ADHD included being male, being married, engaging in regular physical activity, and the use of religion or spirituality to cope with challenges, while adults with ADHD who had comorbid mental health conditions (i.e. lifetime history of major depression or generalized anxiety disorders), debilitating chronic pain, and a history of childhood physical abuse had lower odds of CMH.

The present study emphasizes how positive coping strategies may promote optimal mental health outcomes among adults with ADHD. After controlling for all covariates, the use of religion or spirituality to cope with daily challenges more than doubled the odds of being in CMH. This is consistent with findings in the general population (Baiden & Fuller-Thomson, 2016). There are numerous hypothesized mechanisms by which religiosity and spirituality may improve mental health outcomes. One explanation is that religious involvement fosters the development of a supportive social network and a sense of belonging in one's community, which is an integral component of mental well-being (George et al., 2002; Weber & Pargament, 2014). Another explanation is that religious involvement may nurture the development of psychosocial resources that are important for mental health and coping with adversity, such as self-esteem, self-efficacy, and mastery (George et al., 2002). Religiosity and spirituality may also promote positive mental health outcomes because it can help individuals find meaning in their lives and achieve a sense of peace, even in periods of adversity uncertainty, ultimately improving one's coping mechanisms and sense of well-being (Peres et al., 2018). Although there is a lack of research examining the effects of religiosity on those with ADHD specifically, these hypothesized mechanisms emphasize the potential for religiosity to support the social, emotional, and psychological dimensions of CMH.

Physical activity is another positive coping strategy that may promote flourishing mental health among people with ADHD. After controlling for all covariates, individuals who engaged in low physical activity had more than double the odds of CMH, while those who engaged in moderate or high physical activity had four times the odds of CMH when compared to inactive individuals. This finding supports other research that has found that physical activity can reduce ADHD symptoms by improving attention (Rassovsky & Alfassi, 2019). In addition, a recent systematic review and meta-analysis on non-pharmacological interventions for ADHD found that physical exercise had the greatest average effect size on improving ADHD

symptoms (Lambez et al., 2020). Physical activity has also been found to reduce symptoms of depression and anxiety in both clinical and nonclinical adult populations (Cooney et al., 2013; Rebar et al., 2015; Wipfli et al., 2008), emphasizing its potential therapeutic value in helping individuals achieve flourishing mental health.

The presence of comorbid mental health conditions may act as substantial barrier to those with ADHD achieving CMH. In the current study, having a lifetime history of major depressive disorder or generalized anxiety disorder substantially reduced the odds of achieving CMH among adults with ADHD. There is a high comorbidity between ADHD, depression, and anxiety (Anastopoulos et al., 2018; Kessler et al., 2006). The overlap of various symptoms among these disorders can create significant challenges for diagnosis and treatment (Katzman et al., 2017). Recommendations for supporting individuals with ADHD and co-occurring depression and anxiety emphasize focusing on the most severe disorder and its accompanying symptoms to improve functional outcomes and quality of life among this population (Katzman et al., 2017). Cognitive behavioral therapy (CBT) is a promising intervention to support individuals with ADHD who have co-occurring depression and/or anxiety. Two randomized controlled trials of medication-treated adults with ADHD found that a CBT intervention was associated with reduced symptoms of depression and anxiety when compared to psychopharmacology alone (Emilsson et al., 2011; Safren et al., 2005).

In order to support the mental well-being of those with ADHD, it is also important to consider the role of debilitating pain, an often-neglected issue in research on ADHD. Adults with ADHD who were without debilitating pain had more than twice the odds of being in CMH compared to those with debilitating pain when considering all relevant covariates, except for lifetime history of depression and anxiety. When depression and anxiety were included in the analysis, debilitating pain was no longer a significant factor in predicting CMH, suggesting this might be an important pathway. Previous research has highlighted that debilitating pain is often associated with psychiatric comorbidities, such as depression and anxiety (Gormsen et al., 2010). Our study indicated that one in four adults with ADHD had debilitating pain, in comparison to one in seven of those without ADHD, suggesting unmet treatment needs. Future research is warranted into the mental health impact of assessing and treating pain issues among those with ADHD.

The current study also highlights a gender gap in mental flourishing; women with ADHD were significantly less likely than men to reach CMH. This is consistent with other research that has highlighted the high vulnerability to adverse mental health outcomes among women with ADHD, such as depression and suicidal ideation (Fuller-Thomson et al., 2016b; Swanson et al., 2014). Women with ADHD also have a high proclivity to experiencing symptoms of anxiety in conjunction with their ADHD (Fuller-Thomson et al., 2016b; Quinn, 2005, 2008; Waite, 2010). Notably, when lifetime history of depression and anxiety were included in the analysis, gender was no longer a significant factor in predicting CMH. This suggests that the link between lower CMH and ADHD status among women may be largely driven by women's higher lifetime history of depression or anxiety. This further emphasizes the need to address these comorbidities when providing support to women with ADHD.

Adults with ADHD who did not experience physical abuse during childhood had more than double the odds of being in CMH when compared to those with ADHD that did experience physical abuse. This relationship persisted even after controlling for all relevant covariates. This is consistent with other research that has found various forms of child maltreatment, including physical abuse, to be greatly elevated among those with ADHD (Fuller-Thomson et al., 2014; Fuller-Thomson & Lewis, 2015; Sugaya et al., 2012). This relationship may also be bidirectional, in which the early onset of ADHD symptoms may cause considerable stress for parents, leading to more use of hostile parenting styles and physical discipline (Cussen et al., 2012; Sugaya et al., 2012). These findings underline the importance of strategies to promote primary prevention of physical abuse for children with ADHD.

Marital status may also play an important role in promoting better mental health outcomes among people with ADHD. After controlling for all covariates, people with ADHD that were married or in a common-law relationship had 83% higher odds of being in CMH than their single, divorced, or widowed counterparts. In the general population, being married or in a common-law relationship has also been identified as a significant predictor of CMH (Baiden & Fuller-Thomson, 2016). People with ADHD frequently report difficulties in interpersonal relationships (Eakin et al., 2004; Moyá et al., 2014). These relationship challenges can have harmful effects across the lifetime. A population-based study of older adults found that ADHD diagnosis was significantly associated with being divorced or never married, and higher rates of loneliness (Michielsen et al., 2015). In our current study, those with ADHD were significantly less likely to have even one confidant or to be married in comparison to their peers without ADHD. Being married may promote better mental health outcomes among people with ADHD because their spouses often engage in compensation strategies, such as managing finances, keeping track of appointments, and maintaining the home (Eakin et al., 2004).

While our study indicated substantial levels of flourishing among adults with ADHD (42%), it is important to note that those without ADHD had a much higher prevalence (74%) and fourfold the odds of CMH (OR = 3.90). When a range of relevant covariates, including demographics, ACEs, socioeconomic status, social support, physical health, coping strategies, drug or alcohol dependence, lifetime history of depression, and lifetime history of anxiety were taken into account in the analysis, the discrepancy between those with and without ADHD remained statistically signficant but declined by more than half (OR = 1.87). Many of these factors are amenable to improvement through interventions, such as those that promote physical activity, or offer effective treatment for mental illness. The gap in CMH between those with and without ADHD highlights the need for better targeted outreach and treatment to the most vulnerable adults with ADHD, including women, individuals who are single, widowed or divorced, those in debilitating pain, those with a history of physical abuse, and those with depression or anxiety.

4.1 Limitations

The present study has several limitations that should be considered when interpreting the findings. First, this study's measure of ADHD diagnosis was based on self-report of a health professional's diagnosis of "attention deficit disorder", rather than a clinical interview or a review of the respondent's medical history. Since many adults with ADHD have never been diagnosed (Ginsberg et al., 2014), this suggests that many adults who would have been classified as having ADHD if there was a clinical exam component in the current study would be incorrectly classified as not having ADHD, since they had not been diagnosed by a health professional prior to the study. If those with ADHD have a lower prevalence of CMH than those without ADHD, such a systematic misclassification of those with ADHD who had not been diagnosed by a health profession into the "non-ADHD" group in the current study would make it less likely that there would be a statistically significant difference observed between the two groups. This is called a "bias towards the null". Second, the reliance on a self-report diagnosis means there is no way to verify that these respondents actually met diagnostic criteria for ADHD. Third, the CCHS-MH survey that was utilized in the current study is now a decade old, and thus some of the mental health measurements that are utilized from the DSM-IV and ICD-10 have been revised since the DSM-5 and ICD-11 are now in use. Fourth, the use of the term "attention deficit disorder" could mean that some participants may have not responded affirmatively to this question if they thought they were being asked about a distinct diagnosis from ADHD. This would result in a bias towards the null. Fifth, there were no questions asked about the severity of their symptoms, nor their age of diagnosis, which we anticipate would have been very informative in enhancing our understanding of the pathways between ADHD and CMH. It is possible that those with the most severe ADHD symptoms may have a harder time achieving CMH. It is also possible that those who received a diagnosis at an older age may have had a harder time managing their ADHD, if they lacked access to treatment and other supports that could potentially help them reach CMH. Fifth, given the cross-sectional nature of the data set, it is not possible to analyze the temporal relationship of ADHD and relevant covariates, such as lifetime history of depression or anxiety. Finally, there was no distinction between participants who received or are receiving treatment for ADHD and/or mental illness, compared to those that are not, which may influence mental health outcomes.

Research on positive mental health outcomes among ADHD and positive mental health outcomes is limited. This area of research would benefit from future studies to address the identified limitations of the currents study. Specifically, there is a need for longitudinal studies to better understand the temporal relationship between ADHD and common comorbidities, such as depression and anxiety. In addition, this area of research would be strengthened by additional studies that can examine important factors related to an individual's ADHD diagnosis, including the severity of their symptoms, the age of their diagnosis, and their use of various treatment options. Intervention research on CBT and other promising therapies are also needed to determine best strategies for increasing the prevalence of CMH among adults with ADHD.

4.2 Conclusion

Despite these limitations, the present study makes a significant contribution to the literature on adults with ADHD by identifying factors associated with flourishing in this population, shifting away from the deficit-focused perspective that is frequently used in ADHD research. Further, the present study points out several promising factors that may promote or inhibit better mental health outcomes among adults with ADHD. The use of nationally representative data provides greater confidence that the findings are relevant for the wider group of Canadians with ADHD, not just those who are already receiving treatment for the disorder. This can help guide clinicians towards modifiable factors for improving mental health among those with ADHD, such as improving physical activity and social support, and treating symptoms of comorbidities, such as chronic pain, depression and anxiety. Additionally, this study highlights those with ADHD who may be most vulnerable to worse mental health outcomes, such as women and those with a history of physical abuse. Although there is a gap in mental flourishing between those with and without ADHD, the current study seeks to provide information for health professionals and adults with ADHD in order to support the design and implementation of interventions to reduce this discrepancy, and ultimately promote the attainment of complete mental health among those with ADHD.

Data Availability The 2012 Canadian Community Survey- Mental Health is a publicly available data set. For information on access, please contact Statistics Canada through their website at www.statcan.gc.ca.

Code Availability N/A

Declarations

The views expressed in this article are those of the authors.

Ethics Approval Institutional Review Board Approval was not required from the University of Toronto because this paper was based upon analysis of the CCHS-MH, which is a public use data set in which all information has been anonymized. Statistics Canada (the Canadian equivalent of the US Census Bureau) conducted the original data collection, and they obtained informed consent from all participants at the time the original data were collected.

Consent to Participate Statistics Canada (the Canadian equivalent of the US Census Bureau) conducted the original data collection, and they obtained informed consent from all participants at the time the original data were collected.

Consent for Publication Statistics Canada (the Canadian equivalent of the US Census Bureau) conducted the original data collection, and they obtained informed consent from all participants at the time the original data were collected.

Conflicts of Interest/Competing Interests On behalf of all authors, the corresponding author states that there is no conflict of interest.

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