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Article

Association Between Autistic and ADHD Traits and the Wellbeing and Mental Health of Secondary School Students with a Focus on Anxiety and Depression

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Abstract: There has been a significant increase in the prevalence and estimates of neurodevelopmental disorders, especially autism spectrum disorders, in the last decade. The literature has seen increasing research on understanding wellbeing and mental health. To understand the association and interaction of well-being and mental health with autism and ADHD, a survey was given to 560 secondary school students. The survey used the wellbeing process questionnaire, the autism spectrum quotient, the ADHD self-report scale, and the strengths and difficulties questionnaire. The analysis conducted using SPSS showed that there was a significant correlation between anxiety, depression, AQ, and ADHD. Anxiety and depression were also significantly correlated with all well-being and SDQ variables. The regression analysis showed that anxiety was significantly associated with positive well-being, negative well-being, emotional problems, and prosocial behaviour. In contrast, depression was significantly associated with positive well-being, negative well-being, physical health, flourishing, conduct problems, emotional problems and peer problems. The associations between anxiety, depression and the outcomes were stronger than with either AQ or ADHD

Keywords: ADHD traits; anxiety; autistic traits; depression; secondary school students

1. Introduction

Autism spectrum disorders have been classified as neurodevelopmental disorders and have seen an increase in prevalence in recent years. It has increased from 1 in 5000 in the 1970s to 1 in 36 in 2023 [Matthew et al, 2023]. The rise in prevalence has also seen research being widened to understand different aspects of autism and the impact it has in various fields. Autism was first described in 1943, and since then, the understanding of autism has constantly evolved, which has led to a change and growth in research as well. Autism Spectrum disorders are identified and evaluated over specific characteristics, with the main categories being social impairments and repetitive behaviour as per DSM-5 [APA, 2013]. Population studies [Maj-Britt, Astri & Christopher, 2006] found that many individuals exhibit subthreshold or autistic-like traits, which means that they exhibit social communication traits and repetitive behaviour. Still, these are not significant enough for a formal diagnosis [John & Richard, 2003]. This has strengthened the research belief that autistic traits exist throughout the population. This also leads to defining autistic characteristics.

A longitudinal study found that children aged 8,10, and 13 years who scored higher on autistic traits had a greater prevalence of bullying. The study also found that children aged ten who had autistic traits also scored higher than average on depressive symptoms [Marie et al, 2018]. A study [Katie et al, 2021] found a correlation between autistic traits and positive psychotic traits. A consistent finding has been a correlation between autistic traits and negative psychotic traits [Annelies & Saskia,

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2010]. A study saw the presence of autistic-like traits in people diagnosed with MDD and schizophrenia [Junko et al, 2015]. A study also found an association of autism-like traits with conduct problems, ADHD, anxiety, and depression [Sebastian et al, 2011]. Research has shown that older adults with higher/elevated autistic traits are more prone to poorer mental health, especially later in life [Gavin et al, 2020]. A study also found that patients with borderline personality disorder had higher autistic traits [Liliana et al, 2018]. In a survey conducted on U.K. students, high levels of autistic traits were associated with increased social anxiety [Megan, Tom & Elizabeth, 2013].

The WHO has said that mental health disorders are now the leading cause of disability worldwide. Over the last decade, the research focus on mental health disorders in children and adolescents has significantly increased. The World Health Organization formulated a new definition of well-being: "a state of well-being in which the individual realises his or her abilities, can cope with the normal stresses of life, can work productively and fruitfully, and can contribute to his or her community" [World health organization, 2004]. Emotional, social, and psychological well-being are three components of well-being. Instead of updates and inclusivity, an all-inclusive definition of mental health was devised: "Mental health is a dynamic state of internal equilibrium which enables individuals to use their abilities in harmony with universal values of society. Basic cognitive and social skills, ability to recognise, express and modulate one's own emotions, as well as empathise with others, flexibility and ability to cope with adverse life events and function in social roles, and a harmonious relationship between body and mind represent important components of mental health which contribute, to varying degrees, to the state of internal equilibrium." [US department of health and human services, 1999].

Research has shown that autistic traits are significant predictors of well-being; however, there are other links and predictors of well-being, especially in the context of autism [David et al, 2018]. There is a need for research to dive into it further to understand the correlation and factors involved in the association of autistic traits and well-being. This also led to the need to understand autism spectrum disorders and wellbeing in all aspects and not just a single aspect. The general aim of research is to investigate autistic traits with and without associated mental health problems. The existing literature also focuses on parent reports of well-being, which vary from students'/children's self-reports. Hence, there is a need to conduct research where students have a say in their feelings of well-being. The previous research also lacks research with children and students as subjects. Most of the well-being research in autism has been focused on adult women and how well-being impacts the family members of individuals with autism spectrum disorders.

1.1. The Wellbeing Process Approach

A. The Wellbeing Process Model

The need to understand wellbeing and autism spectrum disorders from all aspects pointed towards a holistic approach to understanding wellbeing. This led to using the wellbeing process model as it uses a holistic approach. The Wellbeing Process model attempted to do more than measure the subjective well-being outcomes such as happiness, life satisfaction and positive affect. It also included adverse outcomes such as perceived stress, anxiety and depression because research has shown that positive and negative emotions do not reflect end points of a single continuum.

The Wellbeing Process Questionnaire [Gareth & Andrew, 2012] was developed from the DRIVE (Demands Resources Individual Effects) model [George & Andrew, 2008]. This model was developed for use in occupational settings but can also be applied to education. The DRIVE model was designed to allow for additional predictor and outcome variables. It focused on different factors which predict mental health mediators and outcomes. The Wellbeing Process Questionnaire (WPQ) incorporated a broader range of predictor variables, including factors like psychological capital and positive outcomes like happiness. Key elements examined include demands, available resources (such as support and control), and personal factors like coping styles, life satisfaction and positive affect). Extensive literature uses the Wellbeing Process Questionnaires with students (10-21). This research has broadly confirmed the impact of known established predictors and then gone on to the addition

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of newer predictors (e.g. workload, work-life balance, flow and daytime sleepiness) and also newer outcomes (flourishing and physical health)[George & Andrew, 2012a].

1.2. Previous Literature on Autistic Traits and Wellbeing

The research has focused on autism and its impact and interaction with other mental health disorders. High rates of anxiety disorders have been found in individuals with autism spectrum disorders [Bonnie, Vicki & Patricia, 2009]. Research has also found high rates of autistic traits in individuals with diagnosed anxiety disorders but without autism spectrum disorders diagnosis [Susan et al, 2013]. The student samples in which there were higher reported autistic traits also reported more anxiety and depressive symptoms [Aline et al, 2014]. A nonclinical sample study showed that mental well-being was negatively correlated with overall autistic traits [Nikolas, Laura & William, 2021]. Research has also found associations of autistic traits with both depression and anxiety [Michela, Roberto, Lisa & Phil, 2014]. A Japanese study on the adult population found the lifetime prevalence of depression diagnosis in autistic individuals is 40% [Chloe, Layla & Kate, 2018]. The most common co-occurring mental health condition with autism is depression [Anne & Hilde, 2016]. Research has shown that people with more autistic traits exhibit more depressive symptoms as compared to those with fewer autistic symptoms and traits [Stephen, Shawn & Angela, 2009]. Research on 98 Canadian university students found significant correlations between self-reported depression, anxiety and stress and ADHD symptoms [Allyson, Sadra & Ian, 2013]. A study was conducted in which the autism and Asperger syndrome sample was compared with a community sample, and it was found that the autism and Asperger syndrome group had a higher rate of depression as compared to the community sample group [Peter et al, 2000]. Studies have identified relationships between Autism Quotient (AQ) scores and quality of life, correlated with all quality of life domains [Wojciech, Andrzej, Rafal & Ewa, 2015]. Researchers found that children with autism traits scored lower on subjective well-being as compared to typically developing children [Sander et al, 2017]. A study on OCD found that a higher score on the AQ was associated with a lower well-being score [Satomi et al, 2021]. Recent research studies have found that ASD trait severity in adults with ASD predicted elements of adverse mental health, especially depression and anxiety [Mirko et al, 2017 & Mirko et al, 2018]. A few studies conducted in the last decade used AQ. They identified trait severity in the non-ASD population as a predictor of negative mental health, including suicide [Mirabel & Sarah, 2017], lower quality of life, poor coping [Wojciech, Andrzej, Rafal & Ewa, 2015], social anxiety [Dustin & Kimberly, 2014] and depression [Einabad, Nasiri, Samria & Rasoul, 2017]. It has been seen that individuals with autism experience report increased stress [Tatja & My, 2015]. Research also found that students with an ASD experience have more mental health problems [Judith & Neil, 2014]. Research on autistic traits also found lower quality of life for adults with autism [Barbara & Hilde, 2015].

The literature on autism and wellbeing has grown fast but lacks a focus when it comes to autistic traits and wellbeing. The studies that are there have only focused on autistic adults with diagnosis or well-being in parents or caregivers of those with autism. Very few studies have looked at AQ and wellbeing outcomes, and there have been no studies looking at AQ and wellbeing outcomes while controlling for established predictors. The present research is the only one that does so. Our previous study was conducted on associations between autistic and ADHD traits and mental health and well-being in university students. The study paved the way to understand the association between autistic and ADHD traits and mental health and well-being in secondary school students.

1.3. Autistic Traits and Happiness, Positive Affect and Life Satisfaction

Recent research suggests positive psychological traits are associated with fewer mental health problems [Gabrielle & David, 2019]. Research conducted in the last decade has shown that happiness behaviours are considered indicators of well-being and essential for social interactions [Ivana & Emily, 2013]. Recent research also found that individuals with autism spectrum disorders scored significantly lower on components of humour, which in turn relate to happiness [Andrea & Yovanni,

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2013]. A study found that students with higher autistic traits showed less life satisfaction. This study also found a significant association between autistic traits and life satisfaction [Karis et al, 2020]. Studies have found that ASD symptoms do not directly relate to life satisfaction. They also found that ASD symptom severity has a direct influence on psychological well-being, which in turn impacts life satisfaction [Marie et al, 2018].

1.4. The Well-Being Process Approach and Autistic Traits

Our previous study examined the association between well-being and traits common to autism. The study utilised the Process and Strengths and Difficulties Questionnaire to assess autistic and ADHD traits among secondary school students. The primary objective was to explore the relationships between autistic and ADHD traits in this group, while the secondary objective was to investigate the connections between well-being outcomes, strength and difficulties outcomes, and these traits.[Andrew, Japnoor & Arwell, 2023] The SDQ is a behavioural screening questionnaire developed for children and adolescents and measures behavioural and emotional problems and prosocial behaviour. Finally, analyses controlling for established predictors of well-being examined whether associations between autism and ADHD traits and well-being outcomes remained significant. An online survey was administered to 155 secondary school students in Wales. [Andrew, Japnoor & Awell, 2023] These students were from different year groups. Two main sets of analyses were carried out to check how the variables are related: correlation and regressions. The results found that there were significant associations between autistic and ADHD traits. These traits were also found to be significantly associated with well-being outcomes. Both ADHD and autistic traits were analysed together in the same regression model; it was found that ADHD had associations with most of the outcomes. However, autistic traits were only associated with a limited number of outcomes, namely hyperactivity, peer problems and lower prosocial behaviour. It was also seen that when established predictors of well-being were added to the model, then ADHD traits had associations with only one variable, which was hyperactivity, and autistic traits were associated with only two variables, which were prosocial behaviour and hyperactivity. There were no notable effects on physical health. Overall, this study highlighted an overlap between autistic and ADHD traits. The initial analysis demonstrated significant associations between these traits and well-being. However, when accounting for known well-being predictors, only hyperactivity and reduced prosocial behaviour remained significantly associated with autistic and ADHD traits.

Our second study extended the approach to university students. An online survey using the Qualtrics platform was given to a sample of university students, and then SPSS was used for correlational and regression analyses. The results showed a high correlation between anxiety, depression, and autistic and ADHD traits. These variables were also correlated with the well-being and SDQ outcomes and predictors. The regression analysis conducted [Japnoor & Andrew, 2023] revealed significant relationships between well-being outcomes and predictor variables, particularly with anxiety and depression. In contrast, it was observed that the influence of autistic and ADHD traits was only mainly observed in SDQ outcomes, such as hyperactivity, conduct issues and peer problems. Further analysis was performed to check whether a combined variable, which consisted of scores of autistic traits, ADHD, anxiety and depression, could effectively predict well-being and SDQ outcomes. This combined variable was then found to be associated with all outcomes except prosocial behaviour.

1.5. Comorbidity of Autistic Traits and ADHD and Mental Health Problems

It is essential to examine the associations of ADHD and mental health problems with autistic traits. In our previous research conducted on university students in South Wales, it was seen that anxiety and depression were significantly associated with autistic traits. Anxiety and depression represent the most common mental health problems faced worldwide. ADHD was also found to be significantly associated with autistic traits. It was seen that autistic traits were significantly associated with all well-being outcomes except prosocial behaviour. Autistic characteristics were also

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significantly associated with all predictors of well-being except rumination. The research also showed that when mental health problems, i.e. anxiety and depression, were added to the analysis as predictor variables, there was a change in associations of autistic traits. It was seen that autistic traits were associated with all the SDQ outcomes, namely conduct problems, emotional problems, hyperactivity, peer problems and prosocial behaviour.

1.6. Do the Effects of Autistic Traits Combined with ADHD or Mental Health Show Greater Effects than ADHD or Mental Health Alone?

It was seen that individual autistic traits, ADHD and mental health problems had significant associations. It was further essential to understand whether the combined effects would be larger than the individual ones. A new variable, 'the combined variable', was generated as a combination of autistic traits, ADHD, anxiety and depression. This variable was significantly correlated with all outcome variables, thus concluding that the combined variable is the strongest predictor of outcomes.

The above studies lead to the following hypotheses:

1. The first was that autistic and ADHD traits would be significantly correlated.
2. The second was that the associations between wellbeing predictors, wellbeing outcomes, strengths and difficulties, AQ, ADHD and mental health traits would be significant.
3. The next was that on controlling for established correlates of well-being, the associations between autism, ADHD, anxiety and depression traits and well-being and strengths and difficulties would remain consistent and significant.
4. The final was that when established predictors are covaried, some outcomes will remain associated with AQ and ADHD.

2. Materials and Methods

Consent

The research was carried out with the informed consent of the participants and the approval of the Ethics Committee, School of Psychology, Cardiff University.

Participants & Sample Size

The participants were all students studying in a secondary school in South Wales. Five hundred and fifty-six students took part in the study. There were 276 males and 280 females. The year groups they belonged to are as follows:- Year 5 = 1

Year 6 = 90
Year 7 = 124
Year 8 = 87
Year 9 = 96
Year 10 = 97
Year 11 = 27
Year 12 = 20
Year 13 = 3
And 13 students did not fill out their year in the survey.

Questionnaires

1. AQ-10

Simon Baron-Cohen designed the autism spectrum quotient [4Simon et al, 2001] using a self-report scale. The original questionnaire was a 50-item questionnaire; over time, shorter versions have been created, and the 10-item version was used. It measures the autistic traits in an individual. The scores range from 0-10 and are based on a 4-point Likert scale ranging between 'definitely agree' to 'definitely disagree'. Total scores were used as a measure of AQ.

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2. ADHQ

The ADHQ [Ronald et al, 2005] is a self-report scale known as the adult ADHD self-report scale (ASRS), which was designed and formulated in collaboration with the WHO. It consists of 18 questions and uses a five-point rating scale from never to very often. It has been constantly used as a diagnostic measure. The scale is divided into two parts, with the first having six questions that are most predictive of ADHD.

3. SDQ

The strengths and difficulties questionnaire was designed by Goodman [Robert, 1997]. It comprised 25 items spread over five subscales: conduct problems, emotional symptoms, hyperactivity/inattention, peer problems and prosocial behaviour. A short form with single items for each sub-scale was used here. Responses were made on a 10-point scale. The short form of the strengths and difficulties questionnaire is shown in the appendix.

4. Short Form Student WPQ

The short-form student WPQ [Andrew & Arwell, 2023] was adapted from the wellbeing process questionnaire. The short form includes single-item questions on anxiety and depression. The questionnaire contains predictor variables: student stressors, negative coping, workload, work-life balance, daytime sleepiness, psychological capital, social support, positive coping, and flow. The dependent variables were positive well-being, negative well-being, physical health, and the extent to which the person was flourishing.

Procedure

An online survey was conducted using the Qualtrics platform.

Analysis

The study used different analysis strategies using the SPSS software version 27. The various analyses helped in understanding in detail the associations between all the variables. The first analysis was the descriptive analysis that was applied to all variables. Then, Pearson's correlation analysis was done to see the associations between autism and ADHD. A set of linear regressions was also carried out where the first set had AQ and ADHD as predictor variables. This was followed by the second set, which had predictors from the well-being process questionnaire. The third set had AQ, ADHD and established predictors. The final set of regression analysis was to see the association between AQ, ADHD, wellbeing, and mental health and the associations between wellbeing, strengths and difficulties, and mental health.

3. Results

1. Descriptive Statistics

Table 1 shows the descriptive statistics for both outcomes and predictor variables. There was considerable variation between each of the measures. Very little data was missing, and all scores were comparable to previous findings. 6 participants left a significant part of the questionnaire blank and were not included in the analysis.

Table 1. Descriptive Statistics (possible range 1-10 unless indicated). . .

Groups	Variable	N	Mean	Std Deviation

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WPQ Variables	Positive Wellbeing	578	6.52	2.191
	Negative Wellbeing	577	5.08	2.597
	Stress	559	5.11	2.861
	Social Support	560	6.24	2.794
	Positive Coping	557	5.71	2.595
	Negative Coping	556	5.84	2.663
	Psychological Capital	561	6.12	2.454
	Work-Life Balance	558	4.92	2.960
	Workload	554	5.04	2.672
	Sleepy	554	6.35	2.694
	Flow	540	5.67	2.076
	Rumination	551	4.61	2.438
SDQ Outcomes	Hyperactivity	550	6.48	2.742
	Conduct Problems	552	4.01	2.568
	Peer Problems	552	7.04	2.434
	Emotional Problems	552	5.25	2.788
	Prosocial Behaviour	553	7.54	2.096
Other variables	Anxiety	549	5.35	2.703
	Depression	552	3.66	2.742
	Total AQ	532	4.6861	1.82398
	Total ADHD	613	3.5742	1.74515
	Physical Health	552	6.13	2.087
	Flourishing	553	6.07	

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2. Associations Between AQ, ADHD, Mental Health and Outcome Variables

The correlations between AQ and ADHD are shown in Table 2. AQ and ADHD were significantly correlated with all outcome variables. The outcome variables included variables from the WPQ, namely positive and negative well-being, physical health, flourishing, and the SDQ outcomes of conduct, hyperactivity, emotional, peer, and prosocial behaviour.

Table 2. Correlations between anxiety, depression, autism and.*ADHD with outcome variables* .

	Total AQ	Total ADHD
Total AQ	1	.310**
Total ADHD	.310**	1
Conduct	.180**	.344**
Hyperactivity	.330**	.524**
Emotional	.187**	.300**
Peer	.164**	.150**
Prosocial	.131**	.124**
Positive Well Being	-.196**	-.282**
Negative Well Being	.178**	.299**
Physical Health	-.166**	-.255**
Flourishing	-.227**	-.289**

**. Correlation is significant at the 0.01 level (2-tailed).

3. Association Between AQ, ADHD, Mental Health and Predictors of Wellbeing

Table 3 shows the correlations with the established predictors of well-being, variables on the WPQ that have repeatedly been associated with the outcomes in the previous literature. Each independent variable was correlated against a dependent variable to see the correlation and internal associations. AQ was significantly correlated with all variables except work-life balance and rumination. ADHD was significantly correlated with all variables. AQ and ADHD were also significantly correlated. Stress was significantly correlated with all variables. Social support was significantly correlated with all variables except work-life balance. Positive coping was significantly correlated with all variables except work-life balance. Negative coping was significantly correlated with all variables. Psychological capital was significantly correlated with all variables. Work-life balance was significantly correlated with all variables except AQ, social support, positive coping, flow and rumination. Workload was significantly correlated with all variables. Sleepiness was

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significantly correlated with all variables except rumination. Flow was significantly correlated with all variables except work-life balance. Rumination was significantly correlated with all variables except AQ, work-life balance and sleepiness.

Table 3. Correlations between Anxiety, Depression, AQ and ADHD and the Predictors of Wellbeing.

	Anxiety	Depression	Total A.Q	Total ADHD
Anxiety	1	.593**	.181**	.296**
Depression	.593** 1		163**	312**
Total AQ	.181**	.163**	1	.310**
Total ADHD	.296**	.312**	.310**	1
Stress	.538**	.525**	.150**	.315**
Social Support	-.096*	-.162**	-.149**	-.217**
Positive Coping	-.239**	-.274**	-.203**	-.245**
Negative Coping	.503**	.424**	.148**	.216**
Psychological Capital	-.419**	-.473**	-.232**	-.273**
Work-Life Balance	.263**	.283**	.068	.245**
Workload	.380**	.390**	.201**	.332**
Sleepy	.396**	.324**	.141**	.304**
Flow	-.133**	-.188**	-.149**	-.236**
Rumination	-.132**	-.160**	-.073	-.120**

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

Regression Analysis with AQ and Established Predictors

The regression analysis with autistic traits (AQ) and established predictors of wellbeing was run to see which established predictors remove the effects of AQ. It was seen that AQ had no significant associations with any of the established predictors.

4. Regression with AQ, ADHD, Anxiety and Depression as the Predictor Variables

The regression analysis aimed to examine associations between variables. The results for regression are shown in table 4 below. Each outcome and the established predictor had separate regression analyses. Positive well-being and negative well-being were predicted by anxiety and depression. Anxiety also predicted emotional problems and prosocial behaviour. Depression

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predicted physical health, flourishing, conduct problems, emotional problems and peer problems. Autism only predicted hyperactivity, and ADHD predicted hyperactivity and conduct problems.

Table 4. Regression with AQ, ADHD, Anxiety and Depression and the predictor variables and outcomes.

Outcome	Predictor	Beta	P-value
Positive Well Being	Anxiety	.173	<.001
	Depression	.406	<.001
Negative Well Being	Anxiety	.287	<.001
	Depression	.371	<.001
Physical Health	Depression	.242	<.001
	ADHD	.120	.007
Flourishing	Depression	.452	<.001
	AQ	.112	.003
Hyperactivity	Depression	.135	.003
	AQ	.177	<.001
	ADHD	.406	<.001
Conduct	Depression	.222	<.001
	ADHD	.267	<.001
Emotional	Anxiety	.475	<.001
	Depression	.345	<.001
Peer Problems		.229	<.001
	Depression	.116	.009
	AQ		
Prosocial Behaviour	Anxiety	.175	<.001
	AQ	.113	.013

It was essential to see the associations between AQ and ADHD when the established predictors were covaried and compare this association with previous studies conducted on secondary school and university students.

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5. Regression with AQ, ADHD, and Established WPQ Predictors

Separate regressions were carried out for each outcome, which are shown in Table 5 below. The established predictors of WPQ have been generated based on previous research studies that used WPQ. AQ predicted the outcome only as positive coping. ADHD predicted stress, social support, positive coping, work-life balance, workload, sleepiness and flow. It was seen in the previous studies with university students that AQ and ADHD were associated with three SDQ outcomes, namely hyperactivity, peer problems and conduct problems when established predictors were covaried. The secondary school study associated AQ with conduct problems and prosocial behaviour. ADHD scores were associated with hyperactivity.

Table 5. Regression with AQ, ADHD, Anxiety and.Depression and established Predictors .

Outcome	Predictor	Beta	P-value
Stress	ADHD	.121	.002
Social Support	ADHD	.155	<.001
Positive Coping	AQ ADHD	.133 .141	.003 .002
Work-life Balance	ADHD	.190	<.001
Workload	ADHD	.200	<.001
Sleepiness	ADHD	.187	<.001
Flow	ADHD	.163	<.001

6. Regression with AQ, ADHD, Anxiety, Depression and Established WPQ Predictors as Predictors

Separate regressions were carried out for each outcome, which are shown in Table 6 below. Positive well-being was predicted by depression, social support and psychological capital. Negative well-being was predicted by depression, stress, psychological capital and sleepiness. Physical health was predicted by psychological capital. Flourishing was predicted by depression, psychological capital, flow and rumination. AQ, ADHD, and workload predicted hyperactivity. ADHD predicted conduct problems. Emotional problems were predicted: anxiety, depression, stress, negative coping, and sleep. Peer problems were predicted by stress and psychological capital. Prosocial behaviour was predicted by positive coping and flow.

Table 6. Regression with AQ, ADHD, Anxiety, Depression and established Predictors .

Outcome	Predictors	Beta	p-value
Positive Wellbeing	Depression Social Support Psychological Capital	-.280 .104 .219	<.001 .009 <.001

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Negative Wellbeing	Depression	.233	<.001
	Stress	.229	<.001
	Psychological Capital	-.125	.005
	Sleepiness	.106	.005
Physical Health	Psychological Capital	.216	<.001
Flourishing	Depression	-.269	<.001
	Psychological Capital	.327	<.001
	Flow	.192	<.001
	Rumination	.090	.007
Hyperactivity	AQ	.154	<.001
	ADHD	.328	<.001
	Workload	.184	<.001
Conduct Problems	ADHD	.194	<.001
Emotional Problems	Anxiety	.319	<.001
	Depression	.254	<.001
	Stress	.110	<.001
	Negative Coping	.155	<.001
	Sleepy	.097	<.001
Peer Problems	Stress	-.195	<.001
	Psychological Capital	.214	<.001
Prosocial Behaviour	Positive Coping	.156	.002
	Flow	.187	<.001

4. Discussion

The present study examined the association between autistic and ADHD traits with well-being and mental health in secondary school students. The research on students or children with autism and ADHD diagnosis is ongoing. However, not enough consideration is given to students exhibiting autistic and ADHD symptoms without a diagnosis due to the symptoms not being severe enough for a diagnosis. In today's day and age, students are increasingly facing issues that impact them and also lead to mental health disorders. Mental health is increasing in importance every day. According to WHO, in 2019, every 1 in 8 people was living with a mental health disorder, with anxiety and depression the most common disorders. The present study examined both the individual and combined effects of autism, ADHD traits, mental health and well-being. The previous study with university and secondary school students showed insight into the associations between AQ and ADHD. The profile of results from the three studies is presented below in Table 7.

Table 7. Profile of results in comparison with previous studies.

Secondary School Students for Well-Being	**University Students for Well-Being and Mental Health**	**Secondary School Students for Well-Being and Mental Health**
Autistic and ADHD traits were significantly correlated.	Significant correlation between autistic and ADHD traits.	Autistic and ADHD characteristics were correlated to a considerable degree.

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ADHD traits were correlated with all outcomes except the prosocial variable. AQ was correlated with only hyperactivity, peer problems and prosocial scores.	ADHD was correlated with all outcome variables except prosocial behaviour, and AQ was only associated with hyperactivity, peer problems and prosocial behaviour when both were included in the same analysis.	A.Q. was significantly correlated with all variables except work-life balance and rumination. ADHD was significantly correlated with all variables
AQ and ADHD traits were associated with factors that predicted well-being and SDQ outcomes.	AQ and ADHD were associated with anxiety and depression (mental health).	A.Q., ADHD, anxiety and depression were all significantly correlated.

Variables except work-life balance and rumination. ADHD was significantly correlated with all variables. Further regression analysis with the outcome and predictor variables revealed some significant associations. AQ only had associations with hyperactivity, and ADHD only had associations with hyperactivity and conduct problems. Anxiety had substantial associations with positive well-being, negative well-being, emotional issues and prosocial behaviour. Depression had significant associations with positive well-being, negative well-being, physical health, flourishing, conduct problems, emotional problems and peer problems. Indeed, anxiety and depression had stronger associations with the outcomes than either AQ or ADHD. This study forms the basis for devising future research to understand further and look at the experiences of those with autistic and ADHD traits. The research can also look at differences and compare results for those diagnosed with autism and those without to see the difference in experiences. This will lead to the creation of holistic well-being practices for students. It is also essential to see the combined effect of autism, ADHD, anxiety and depression, as they all were significantly correlated. This also leads to a crucial question as to what the differences will be when AQ is combined with ADHD from ADHD or with AQ combined with mental health from mental health alone (which includes anxiety and depression). Future research must also use moderation and mediation analysis to see if mental health is predicted. This analysis will provide a robust outlook of the results. The research also has limitations, such as AQ being associated with conditions other than autism, which leads to overlapping traits, so there is a need to use another measure for AQ. The current study did not have any people with diagnosed autism, so to further understand this, the research can be replicated using other samples which have a clinical diagnosis.

To further understand the results by looking at the results from previous studies, it was seen that the first study conducted on secondary school students in Wales in 2022 showed that on including established predictors in the regression analysis, there were no significant effects of AQ and ADHD on well-being outcomes. The second study conducted with university students on well-being and mental health found that anxiety and depression as mental health variables were significantly correlated with AQ, ADHD, conduct, hyperactivity, emotional, peer, positive well-being, negative well-being, physical health, and flourishing. Further analysis of AQ, ADHD, and established predictors revealed that some associations remained significant.

Based on the study with university students, the present study extended the research with secondary students. Initial correlation analysis with outcomes and predictors of wellbeing revealed that anxiety and depression were correlated and that they were correlated with all variables except prosocial behaviour. AQ and ADHD were significantly associated with all outcome variables. AQ

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was significantly correlated with all mental health problems in two nationwide twin cohorts of children and adults.

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Institutional Review Board Statement: This research study was conducted with the informed consent of the participants and approval from the Ethics Committee, School of Psychology, Cardiff University (Ethics number EC20.03.10.5987R2A3). The questionnaire also included a consent form at the beginning, which described this study and informed the participants that the decision to participate was voluntary and that all the data would be anonymous. This study was conducted in a secondary school. This study used a self-report survey which the students were given to complete. The survey took around 15 minutes to complete for each participant. The study included the use of SPSS software version 27 for the analysis.

Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available due to privacy guidelines as the data was collected through the university.

Conflicts of Interest: The authors declare no conflicts of interest.

Abbreviations

The following abbreviations are used in this manuscript:

AQ	Autism Quotient
ADHD	Attention Deficit Hyperactivity Disorder

Appendix A

SHORT FORM STRENGTHS AND DIFFICULTIES QUESTIONNAIRE

All responded on a 10-point scale – 1= Not at all to 10 = Very much so

1. To what extent are you hyperactive and impulsive and have problems maintaining attention (restless, fidgeting, easily distracted, acting before thinking, not finishing things)?
2. To what extent do you get angry, are disobedient, fight with others, tell lies or cheat, and take things which are not yours?
3. To what extent do you have emotional problems (worry a lot, often unhappy or downhearted, nervous in new situations, and easily scared)?
4. do others your age generally like you (have good friends, are not often alone or get picked on by others)?
5. To what extent do you consider other people's feelings, share with others, be kind to others, and be helpful if someone is hurt?

References

1. American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (5th ed.).* https://doi.org/10.1176/appi.books.9780890425596
2. Baron-Cohen, S., Wheelwright, S., Skinner, R., Martin, J., & Clubley, E. (2001). The autism-spectrum quotient (AQ): evidence from Asperger syndrome/high-functioning autism, males and females, scientists and mathematicians. Journal of autism and developmental disorders, 31(1), 5–17. https://doi.org/10.1023/a:1005653411471.
3. Begeer, S., Ma, Y., Koot, H. M., Wierda, M., van Beijsterveldt, C. T., Boomsma, D. I., et al. (2017). Brief Report: Influence of gender and age on parent reported subjective wellbeing in children with and without autism. Research in Autism Spectrum Disorders, 35, 86–91.
4. Casagrande, K., Frost, K. M., Bailey, K. M., & Ingersoll, B. R. (2020). Positive Predictors of Life Satisfaction for Autistic College Students and Their Neurotypical Peers. Autism in adulthood: challenges and management, 2(2), 163–170. https://doi.org/10.1089/aut.2019.0050.
5. Constantino, J. N., & Todd, R. D. (2003). Autistic traits in the general population: A twin study. *Archives of General Psychiatry, 60*(5), 524–530. https://doi.org/10.1001/archpsyc.60.5.524

6. Dell'Osso, L., Cremone, I., Carpita, B., Fagiolini, A., Massimetti, G., Bossini, L., Vita, A., Barlati, S., Carmassi, C., & Gesi, C. (2018). Correlates of autistic traits among patients with borderline personality disorder. https://doi.org/10.1016/j.comppsych.2018.01.002.
7. Deserno, M. K., Borsboom, D., Begeer, S., & Geurts, H. M. (2018). Relating ASD symptoms to wellbeing: moving across different construct levels. Psychological Medicine, 48(7), 1179–1189. doi:10.1017/S0033291717002616.
8. Doi, S., Kobayashi, Y., Takebayashi, Y., Mizokawa, E., Nakagawa, A., Mimura, M., & Horikoshi, M. (2021). Associations of Autism Traits with Obsessive-Compulsive Symptoms and Wellbeing in Patients with Obsessive Compulsive Disorder: A Cross-Sectional Study. Frontiers in Psychology, 12, 697717. https://doi.org/10.3389/fpsyg.2021.697717
9. Freeth, M., Bullock, T., & Milne, E. (2013). The distribution of and relationship between autistic traits and social anxiety in a UK student population. Autism, 17(5),571-581. https://doi-org.abc.cardiff.ac.uk/10.1177/1362361312445511.
10. Garcha, J., & Smith, A. P. (2023). Associations between autistic and ADHD traits and well-being and mental health of university students. https://doi.org/10.3390/healthcare12010014.
11. Goodman, R. (1997). Strengths and Difficulties Questionnaire (SDQ) [Database record]. APA PsycTests. https://doi.org/10.1037/t00540-000.
12. Harrison, A. G., Alexander, S. J., & Armstrong, I. T. (2013). Higher reported levels of depression, stress, and anxiety are associated with increased endorsement of ADHD symptoms by postsecondary students. Canadian Journal of School Psychology, 28, 243-260.
13. Hebron, J., & Humphrey, N. (2014). Mental health difficulties among young people on the autistic spectrum in mainstream secondary schools: A comparative study. Journal of Research in Special Educational Needs, 14, 22–32. doi:10.1111/j.1471-3802.2012.01246.x
14. Hirvikoski, T., & Blomqvist, M. (2015). High selfperceived stress and poor coping in intellectually able adults with autism spectrum disorder. Autism, 19(6), 752–757. https://doi- org.abc. Cardiff.ac.uk/10.1177/1362361314543.
15. Hudson, C. C., Hall, L., & Harkness, K. L. (2018). Prevalence of depressive disorders in individuals with autism spectrum disorder: A meta-analysis. Journal of Abnormal Child Psychology, 47, 165–175.
16. Kanne, S. M., Christ, S. E., & Reiersen, A. M. (2009). Psychiatric symptoms and psychosocial difficulties in young adults with autistic traits. Journal of Autism and Developmental Disorders, 39, 827–833.
17. Kessler, R. C., Adler, L., Ames, M., Demler, O., Faraone, S., Hiripi, E., Howes, M. J., Jin, R., Secnik, K., Spencer, T., Ustun, T. B., & Walters, E. E. (2005).The World Health Organization Adult ADHD Self-Report Scale (ASRS) is a short screening scale for the general population. Psychological Medicine, 35(2), 245– 256. https://doi.org/10.1017/s0033291704002892
18. Kim, J. A., Szatmari, P., Bryson, S. E., Streiner, D. L., & Wilson, F. J. (2000). The prevalence of anxiety and mood problems among children with autism and Asperger syndrome. Autism, 4(2), 117-132. https://doi.org/10.1177/1362361300004002002.
19. Krstovska-Guerrero, I., & Jones, E. A. (2013). Joint attention in autism: Teaching smiling coordinated with gaze to respond to joint attention bids. Research in Autism Spectrum Disorders, 7, 93-108.
20. Lamport, D., & Zlomke, K. R. (2014). The broader autism phenotype, social interaction anxiety, and loneliness: Implications for social functioning. Current Psychology, 33, 246–255.
21. Lever, A. G., & Geurts, H. M. (2016). Psychiatric cooccurring symptoms and disorders in young, middle aged, and older adults with autism spectrum disorder. Journal of Autism and Developmental Disorders, 46, 1916–1930.
22. Lundström, S., Chang, Z., Kerekes, N., Gumpert, C. H., Råstam, M., Gillberg, C., ... & Anckarsäter, H. (2011). Autistic-like traits and their association with mental health problems in two nationwide twin cohorts of children and adults. Psychological Medicine, 41(11), 2423–2433. https://doi.org/10.1017/S0033291711000377.
23. MacNeil, B. M., Lopes, V. A., & Minnes, P. M. (2009). Anxiety in children and adolescents with autism spectrum disorders. Research in Autism Spectrum Disorders, 3(1), 1–21.
24. Maenner, M. J., Warren, Z., Williams, A. R., et al. (2023). Prevalence and characteristics of autism spectrum disorder among children aged 8 years — Autism and Developmental Disabilities Monitoring Network, 11

 doi:10.20944/preprints202503.0854.v1

sites, United States, 2020. *MMWR Surveillance Summaries, 72*(2), 1–14. https://doi.org/10.15585/mmwr.ss7202a1

25. Mark, G. M., & Smith, A. P. (2008). Stress Models: A Review and Suggested New Direction. In J. Houdmont, & S. Leka (Eds.), Occupational Health Psychology, European Perspectives on Research, Education and Practice (Vol. 3, pp. 111-144). Nottingham: Nottingham University Press.
26. Mark, G., & Smith, A. P. (2012a). Effects of Occupational Stress, Job Characteristics, Coping, and Attributional Style on the Mental Health and Job Satisfaction of University Employees. Anxiety, Stress & Coping, 25, 63-78. https://doi.org/10.1080/10615806.2010.548088.
27. Mason, D., McConachie, H., Garland, D., Petrou, A., Rodgers, J., & Parr, J. R. (2018). Predictors of quality of life for autistic adults. Autism Research, 11(8), 1138–1147. org.abc.Cardiff.ac.uk/10.1002/aur.1965
28. Matsuo, J., Kamio, Y., Takahashi, H., Ota, M., Teraishi, T., Hori, H., ... & Kunugi, H. (2015). Autistic-like traits in adult patients with mood disorders and schizophrenia. PLoS One, 10(4), e0122711.
29. Pelton, M. K., & Cassidy, S. A. (2017). Are autistic traits associated with suicidality? A test of the interpersonal-psychological theory of suicide in a nonclinical young adult sample. Autism Research, 10, 1891–1904.
30. Pisula, E., Danielewicz, D., Kawa, R., & Pisula, W. (2015). Autism spectrum quotient, coping with stress and quality of life in a nonclinical sample - an exploratory report. Health and quality of life outcomes, 13, 173. https://doi- org.abc. Cardiff.ac.uk/10.1186/s12955-015-0370-x.
31. Posserud, M. B., Lundervold, A. J., & Gillberg, C. (2006). Autistic features in a total population of 7–9-year-old children assessed by the ASSQ (Autism Spectrum Screening Questionnaire). *Journal of Child Psychology and Psychiatry, 47*(2), 167–175. https://doi.org/10.1111/j.1469-7610.2005.01462.x
32. Romano, M., Truzoli, R., Osborne, L. A., & Reed, P. (2014). The relationship between autism quotient, anxiety, and internet addiction. Research in Autism Spectrum Disorders, 8(11), 1521-1526. https://doi.org/10.1016/j.rasd.2014.08.002.
33. Samson, A. C., & Antonelli, Y. (2013). DE GRUYTER MOUTON. Humor, 26(3), 477-491. https://doi.org/10.1515/humor-2013-0031
34. Sampson, K. N., Upthegrove, R., Abu-Akel, A., Haque, S., Wood, S. J., & Reniers, R. (2021). Cooccurrence of autistic and psychotic traits: implications for depression, self-harm and suicidality. Psychological Medicine, 51(8), 1364–1372. doi:10.1017/S0033291720000124.
35. Salehzadeh, E. Z., Nasiri, M., Barin, S., & Roshan, R. (2017). The relationship between depression and broader autism phenotype in nonclinical population. Zahedan Journal of Research in Medical Sciences, 19, e11552.
36. Scherff, A., Taylor, M., Eley, T. C., Happe', F., Charman, T., & Ronald, A. (2014). What causes internalising traits and autistic traits to co-occur in adolescence? A community-based twin study. Journal of Abnormal Child Psychology, 42, 601–610.
37. Smith, A. P., Garcha, J., & James, A. (2023). The Associations between Autistic and ADHD Traits and Well-being of Secondary School Students in South Wales. Journal of Education, Society and Behavioural Science.
38. Smith, A. P., & James, A. (2023). Diet and other health-related behaviors: Associations with the Wellbeing of Secondary School Students. World Journal of Pharmaceutical and Medical Research, 9(6), 220-228. https://www.wjpmr.com/home/article_abstract/4899. ISSN 2455-3301.
39. Spek, A. A., & Wouters, S. G. M. (2010). Autism and schizophrenia in high functioning adults: Behavioral differences and overlap. Research in Autism Spectrum Disorders, 4(4), 709–717. doi:10.1016/j.rasd.2010.01.009.
40. Stewart, G., Corbett, A., Ballard, C., Creese, B., Aarsland, D., Hampshire, A., Charlton, R., & Happé, F. (2020). The mental and physical health profiles of older adults who endorse elevated autistic traits. The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences. https://doi.org/10.1093/geronb/gbaa112.
41. Stimpson, N. J., Hull, L., & Mandy, W. (2021). The Association Between Autistic Traits and Mental Wellbeing. Journal of Happiness Studies, 22(1), 287- 304. https://doiorg.abc.cardiff.ac.uk/10.1007/s10902-020-00229-5.

 doi:10.20944/preprints202503.0854.v1

42. Teensma, F. J. A., Bogels, S. M., & Wood, J. J. (2013). Autism spectrum traits in children with anxiety disorders. Journal of Autism and Developmental Disorders, 43, 361–370.
43. Uljarević, M., Richdale, A. L., McConachie, H., Hedley, D., Cai, R. Y., Merrick, H., … Le Couteur, A. (2017). The Hospital Anxiety and Depression scale: Factor structure and psychometric properties in older adolescents and young adults with autism spectrum disorder. Autism Research, 11, 258–269.
44. Uljarević, M., Hedley, D., Foley, K.-R., Magiati, I., Cai, R. Y., Dissanayake, C., … Trollor, J. (2018). Anxiety and depression from adolescence to old age in Autism Spectrum Disorder. Manuscript submitted for publication.
45. U.S. Department of Health and Human Services. (1999). Mental health: A report of the Surgeon General. Rockville: U.S. Public Health Service.
46. van Heijst B. F., Geurts H. M. (2015). Quality of life in autism across the lifespan: A meta-analysis. Autism: The International Journal of Research and Practice, 19(2), 158–167. https://doiorg.abc.cardiff.ac.uk/10.1177/1362361313517053.
47. Wilcox, G., & Nordstokke, D. (2019). Predictors of university student satisfaction with life, academic self-efficacy, and achievement in the first year. Canadian Journal of Higher Education, 49(1), 104–124.
48. Williams, G. M., & Smith, A. P. (2012). A Holistic Approach to Stress and Wellbeing. Part 6: The Wellbeing Process Questionnaire (WPQ Short Form). Occupational Health (At Work), 9, 29-31.
49. World Health Organization. (2004). Promoting mental health: Concepts, emerging evidence, practice (Summary Report). Geneva: World Health Organization.