Examination of the Potential Moderating Role of Psychological Wellbeing in the

Relationship Between Depression and Thoughts of Self-harm in Autistic Adolescents and

Adults: A Two-year Longitudinal Study

Darren Hedley, PhD[1]; Mirko Uljarević, MD, PhD[2]; Simon M. Bury, PhD[3]; Alexandra

Haschek[4]; Amanda L. Richdale, PhD[5]; Julian N. Trollor, MD[6]; Mark A. Stokes, PhD[7]

[1]Olga Tennison Autism Research Centre, La Trobe University, Melbourne, VIC, Australia;

https://orcid.org/0000-0002-6256-7104; [2]Stanford University, Stanford, CA, United States of

America; https://orcid.org/0000-0002-7481-3923; [3]Olga Tennison Autism Research Centre,

La Trobe University, Melbourne, VIC, Australia; https://orcid.org/0000-0003-1273-9091;

[4]Olga Tennison Autism Research Centre, La Trobe University, Melbourne, VIC, Australia;

https://orcid.org/0000-0003-2154-216X; [5]Olga Tennison Autism Research Centre, La Trobe

University, Melbourne, VIC, Australia; https://orcid.org/0000-0003-1273-9091; [6]Department

of Developmental Disability Neuropsychiatry, School of Clinical Medicine, UNSW Sydney,

NSW, Australia; Cooperative Research Centre for Living with Autism (Autism CRC),

Brisbane, QLD, Australia; https://orcid.org/0000-0002-7685-2977; [7]Deakin University,

Melbourne, VIC, Australia; https://orcid.org/0000-0001-6488-4544

Correspondence concerning this article should be addressed to:

Darren Hedley, PhD

Olga Tennison Autism Research Centre, School of Psychology and Public Health

La Trobe University, Melbourne, Victoria 3086, Australia

Phone: +61 03 9479 3704, Email: D.Hedley@latrobe.edu.au

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Author Contributions

DH, MU, and MAS conceived of and designed study. DH completed the literature review. DH, AH and MAS completed the data analysis and interpretation. JNT (ALSAA) and ALR (SASLA) led the study design and data collection for the respective longitudinal cohorts from which data are derived and provided comment. DH wrote the report, incorporating comments from all authors. All authors reviewed and approved the final submitted version.

Competing Interests

Pre-registration and Data Access

This study was pre-registered on the Open Science Foundation (OSF) website on November 23, 2020, prior to receiving raw data files (https://doi.org/10.17605/OSF.IO/DHNW8). These data are available from the Autism CRC under license and so cannot be made freely available. Requests for access to these data should be made to the Autism CRC.

Ethics Statement

The research was approved by University of New South Wales Human Research Ethics Committee HC15001 and La Trobe University Human Research Ethics Committee HEC14095 and HEC20235. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from participants after the nature of the study was explained.

Abstract

Purpose. Autistic people have a significantly increased risk of death by suicide relative to the general population. In non-autistic samples, psychological wellbeing has been shown to moderate the relationship between depression and suicidal thoughts and behavior. Thoughts of self-harm may provide a useful indicator of suicidal risk. In this longitudinal study we examined (a) the potential role for psychological wellbeing to moderate the relationship between depressive symptoms and thoughts of self-harm and (b) the contribution of autistic traits to thoughts of self-harm.

Methods. Participants were 209 autistic adolescents and adults aged 15 to 80 years (M_{age} = 34.20, SD = 15.38 years).

Results. At both baseline and 2-year follow-up, 35% of participants reported recent thoughts of self-harm. Wellbeing was associated with autistic traits (r = –0.350 to –0.404) and depression (r = –0.480 to –0.759). Thoughts of self-harm were positively associated with autistic traits and depression (r = 0.242 to 0.659), and negatively associated with wellbeing (r = –0.287 to –0.609). Controlling for baseline thoughts of self-harm, depression (β = 0.254, p = .001) and autistic traits (β = 0.162, p = .007) significantly predicted thoughts of self-harm at 2-year follow-up.

Conclusion. Despite a lack of support for the hypothesis that wellbeing would moderate the relationship between depression and thoughts of self-harm, correlational data demonstrated significant associations between wellbeing and both depression and thoughts of self-harm. Future research considering psychological wellbeing as a potential protective factor for self-harm in autistic people is warranted.

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Suicide accounts for 1.4% of deaths worldwide, is ranked as the 14th leading cause of death across all ages, the second leading cause of death among 15 to 29-year-olds, and significantly impacts individuals, families, and society (Casey et al., 2008; GBD 2017 Causes of Death Collaborators, 2018). Findings across multiple international studies in autistic samples found that rates of self-harm, suicide behavior, including death, ideation, and attempts, are significantly elevated compared to the general population (Cassidy et al., 2014; Hedley & Uljarević, 2018; Hirvikoski et al., 2016; Huntjens et al., 2023; Kirby et al., 2019; Kõlves et al., 2021; Newell et al., 2023). Thoughts of self-harm, which can be assessed with instruments such as the Patient Health Questionnaire-9 (PHQ-9) (Kroenke & Spitzer, 2002; Kroenke et al., 2001), indicate emotional distress and have been found to be associated with significant mental distress, major depression, and suicidality (Evans et al., 2004; Klonsky, 2011; Pfaff & Almeida, 2004; Pratt & Brody, 2014). Responses to the self-harm item of the PHQ-9 (which assesses whether the respondent has had recent thoughts that they would be better off dead, or of hurting themself) are commonly used to screen for suicidality; positive responses may indicate passive suicidal ideation, thinking or engaging in non-suicidal self-injury (NSSI), or thinking or engaging in suicidal behavior (Pratt & Brody, 2014). Although this specific item of the PHQ-9 is used in clinical settings to assess the presence and duration of suicidal ideation (i.e., thoughts of suicide) (Kim et al., 2021), because it is not possible to ascertain intentionality from the item, for clarity in this study we use the term 'self-harm' rather than suicidal ideation. Mechanisms underpinning thoughts of self-harm in autistic people may, therefore, offer insights into the high rate of suicidality within this vulnerable population.

Risk Factors

Risk factors for self-harm and suicidality in autism that have been examined in the literature include thwarted belongingness, perceived burdensomeness (i.e., Joiner's Interpersonal Theory of Suicide; 2005) (Moseley et al., 2023; Pelton & Cassidy, 2017; Pelton et al., 2020), increased loneliness (Hedley, Uljarević, Foley, et al., 2018; Hedley, Uljarević, Wilmot, et al., 2018), co-occurring psychopathology, behavior problems (Jokiranta-Olkoniemi et al., 2021; McDonnell et al., 2020), and intelligence—co-occurring intellectual disability was associated with greater risk of suicide attempt (Hand et al., 2020) but lower risk of death by suicide (Hirvikoski et al., 2016). Several studies have examined potential associations between autistic traits and suicidality predicting a positive association, although findings are mixed (Cassidy, Bradley, Shaw, et al., 2018; Hedley, Uljarević, Foley, et al., 2018; Hunsche et al., 2020; McDonnell et al., 2020; Pelton & Cassidy, 2017; Pelton et al., 2020).

Affective disorders are by far the most significant psychiatric factors associated with self-harm and suicidality in non-autistic populations (Franklin et al., 2017; Nock et al., 2009). Similarly, the association between depression and suicidal behavior is relatively well established in studies involving autistic participants (Cassidy et al., 2014; Hedley, Uljarević, Foley, et al., 2018; South et al., 2020). For example, in a Finnish birth cohort study, non-affective psychoses, childhood disorders and affective and anxiety disorders explained the increased rate of intentional self-harm including suicide attempts in autistic compared to matched non-autistic controls, suggesting the presence of co-occurring psychiatric conditions can partially explain increased suicide risk in autism (Jokiranta-Olkoniemi et al., 2020). Currently, there is limited understanding of the mechanisms that link mental health conditions to suicidal behavior in the autistic population (South et al., 2020). Better understanding of factors that might moderate or mediate the relationship between affective

disorders and thoughts of self-harm or suicidality is likely to be helpful for understanding, and ultimately reducing the rate of suicide deaths among the autistic population.

Protective Factors

Studies on poor mental health, self-harm, and suicidality within the general population tend to focus on risk rather than protective factors. Specific protective factors for thoughts of self-harm or suicidality identified in studies with non-autistic samples include greater task-oriented coping, higher self-perception/competency, higher physical activity, purpose-in-life, resilience, positive relationships, life satisfaction, wellbeing, and connectedness (Bakken et al., 2024; Ki et al., 2024; Kleiman & Riskind, 2013; Sharaf et al., 2009). There are, however, few studies utilizing autistic samples. One study found that engagement in recreational, educational or vocational activities was associated with lower depressive symptoms in autistic adults (and family history of depression and anxiety was associated with increased likelihood of self-harm on the PHQ-9) (Radoeva et al., 2022). Similarly, increased social support and social connection may serve as a protective factor for suicidality (Hedley, Uljarević, Foley, et al., 2018; Hedley et al., 2017; Mournet et al., 2023). Nonetheless, protective factors that might moderate the relationship between co-occurring mental health symptoms, thoughts of self-harm, and suicidality within the autistic population remain poorly understood.

When considering mechanisms underpinning poor mental health, psychological wellbeing is one candidate that has received attention in the non-autistic literature. Psychological wellbeing encompasses constructs such as subjective happiness, life satisfaction, psychological functioning, and self-realization (Keyes, 2005; Keyes et al., 2002; Ryff & Keyes, 1995; Tennant et al., 2007; Waterman, 1993; Westerhof & Keyes, 2010). Psychological wellbeing can be indexed by cognitive, emotional, and psychological factors, with higher levels of wellbeing associated with, for example, better coping with stress,

productivity, and inter-personal relationships (Huppert, 2009; Tennant et al., 2007), including in autistic adults (Muniandy et al., 2023). Importantly, psychological wellbeing may provide a buffer against negative mental health outcomes (Wilhelm et al., 2010), including suicidality (Teismann, Brailovskaia, et al., 2018; Teismann, Forkmann, et al., 2018).

Several findings suggest the importance of psychological wellbeing in autistic people. Wellbeing moderated the relationship between depression and suicidal ideation in a German longitudinal study of risk and protective factors underlying mental health outcomes in non-autistic adults (Teismann, Forkmann, et al., 2018), and there was a reduced risk of suicide attempts in clinical inpatients who experienced suicidal ideation in the presence of moderate to high levels of positive mental health (Teismann, Brailovskaia, et al., 2018). In autistic adults, wellbeing was related to improved quality of life both cross-sectionally and two years later (Lawson et al., 2020), and moderated the relationship between baseline and 12-month follow-up depressive symptoms in employed autistic adults (Hedley et al., 2019). To date, the hypothesis that psychological wellbeing may moderate the relationship between depression and thoughts of self-harm or suicidality has not been studied in an autistic sample.

Study Aims

In the present study we adopted a longitudinal design to examine the potential role of psychological wellbeing as a buffer for the relationship between depressive symptoms and thoughts of self-harm in autism. Our aim was two-fold. First, to address limitations of cross-sectional studies, and second, to replicate and extend research findings from the non-autistic literature (e.g., Teismann, Forkmann, et al., 2018). Given mixed findings of a significant relationship between autistic traits and self-harm or suicidality in autistic and non-autistic samples (Hedley, Uljarević, Foley, et al., 2018; Hedley et al., 2017; Hochard et al., 2020; Pelton & Cassidy, 2017; Richards et al., 2019), we also examined whether autistic traits

would significantly predict thoughts of self-harm when considering depression and wellbeing.

We utilized data from two longitudinal samples comprising autistic adolescents and adults. Extending Teismann, Forkmann, et al. (2018), we hypothesized that psychological wellbeing as measured by the Warwick-Edinburgh Mental Wellbeing Scale would buffer the association between depression and thoughts of self-harm. Second, to examine possible relationship between autistic traits and thoughts of self-harm, we hypothesized that autistic traits would be positively associated with depression and thoughts of self-harm, negatively associated with wellbeing, and would independently predict thoughts of self-harm when controlling for wellbeing and depression.

Methods

Participants

The initial sample at baseline (T1) included 528 autistic people (56.3% women, 38.1% men, 5.7% non-binary) aged 15–80 years ($M = 36.97$, $SD = 14.01$), drawn from one of two longitudinal studies conducted in Australia: the Longitudinal Study of Australian School Leavers with Autism, (SASLA, 15–25 years, $n = 112$) (Richdale et al., 2022) and the Australian Longitudinal Study of Autism in Adulthood (ALSAA, 25+ years, $n = 416$) (Arnold et al., 2019). Two-year follow-up (T2) data were available for 209 participants (48.3% women, 47.4% men, 4.3% non-binary; $n = 83$ [SASLA] and $n = 126$ [ALSAA]) aged 15–80 years ($M = 34.20$, $SD = 15.38$) who formed the sample for the present analyses.

Bootstrapped (5000 samples) (Efron & Tibshirani, 1993; Tabachnick & Fidell, 2007) t-tests or Chi-square analyses revealed no significant differences between included and excluded participants on the primary study variables; however, included participants were significantly older (Cohen's $d = .341$) and returned marginally but significantly lower daily living skills ($d = .357$) compared to excluded participants. Additionally, while most males at

baseline were retained at follow-up, there was a greater portion of females and individuals with a gender identity reported as "other" who did not provide follow-up data. This resulted in a significant gender difference between included and excluded participants (refer to Supplementary Table S1 for analyses comparing included and excluded participants). At T1, 45% (n = 94) of participants reported they were currently studying and 43.1% reported having some form of employment (n = 90). Participants lived with parent(s) (40.2%, n = 84), a partner (26.3%, n = 55), alone (17.2%, n = 36), or with others (10%; n = 21), with a small portion (6.2%, n = 13) reporting other living conditions or were missing data. Most participants were born in Australia (78.9%, n = 165) and primarily spoke English in the home (96.7%, n = 202).

Procedure

Ethics approval was received from relevant university ethics committees and informed consent was obtained from the participants; where participants were aged under 18 years their guardians also provided consent. Potential participants were contacted nationally (through flyers, online sites, autism organizations, education institutions, participant databases, and clinical services) (Arnold et al., 2019; Richdale et al., 2022). Following consent, participants received a link to the survey which was hosted on Qualtrics (2017); a hard copy survey was available on application. Data were collected between 2015–2021 via self-report questionnaires (parent report for SASLA daily living skills only), with T2 data collected approximately 2-years after T1.

Community Consultation

Prior to commencement of the SASLA study, community consultation was undertaken to determine research priority areas through an adult forum with members of the autism community and a national collaboration of an advisory network, researchers, and clinical health providers, including autistic individuals, parents, and peak organizations.

Mental health and wellbeing were identified as critical areas of interest, and scales used to measure these constructs were included in the final survey. Local autism associations, individual parents, and young adults on the autism spectrum and a research advisory network were consulted to develop the online surveys to ensure they were relevant, valid, and accessible. Additionally, our program of research examining suicidality in autism included an autistic advisory group who were consulted and advised on the design of the present study.

Measures

Daily Living Skills

Waisman Activities of Daily Living (W-ADL) (Maenner et al., 2013) is a 17- item scale designed to assess daily living skills in individuals with developmental disability, including autism, and is strongly associated with intelligence quotient (IQ) score (Maenner et al., 2013). Items are rated from 0–2 (range 0–34), with higher scores indicating greater independence. The W-ADL was completed by parent- (SASLA) or self-report (ALSAA). In the present study, McDonald's omega (ω) = 0.866 (T1).

Autistic Traits

AQ-Short (Hoekstra et al., 2011) is a 28-item, self-report measure designed to assess autistic traits in individuals with an average or above IQ score (Baron-Cohen et al., 2001). Respondents answer statements on a 4-point Likert-type scale (range = 28–112), with higher scores indicating increased autism traits. In the present study, a total score was generated if no more than 10% of items were missing (Baron-Cohen et al., 2001). In the present study, ω = 0.862–0.875 (T1, T2).

Psychological Wellbeing

Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS) (Tennant et al., 2007) is a 14-item scale designed to assess wellbeing including affect (e.g., optimism, cheerfulness), satisfaction with interpersonal relationships, and functioning (e.g., energy, competence,

autonomy). Items load on a single factor (Tennant et al., 2007). Although no validation studies have been performed with autistic populations, WEMWBS full (Hedley et al., 2019; Hull et al., 2019) and short (Maitland et al., 2021) versions have previously been used with autistic samples, returning good reliability (e.g., Cronbach's α = 0.85–0.92). The scale is completed using a 5-point Likert scale; item scores are summed to derive a total score (range = 14–70), with higher scores indicating higher levels of wellbeing. In the present study, ω = 0.923–0.933 (T1, T2).

Depression

For the SASLA sample, depressive symptoms were assessed with the Hospital Anxiety and Depression Scale depression subscale (HADS-D) (Zigmond & Snaith, 1983). HADS-D consists of 7-items assessing depressive symptoms on a 4-point Likert scale (range = 0–28); it does not include any items concerning suicidality. For the ALSAA sample HADS-D was not administered, therefore depressive symptoms were assessed with the first eight items of the Patient Health Questionnaire (henceforth, PHQ-8) (Kroenke et al., 2009). Our decision to use HADS-D depression data for SASLA participants (constituting 39.7% of the total sample) instead of PHQ-8 was aimed at reducing as much as possible the reliance on a single scale to assess both depression and thoughts of self-harm—notably, due to HADS-D not being administered to the ALSAA sample, this was not possible across the entire sample. We felt the advantages of using a separate measure for approximately 40% of the sample outweighed any possible advantages of using a single measure for depression. For analyses, depression Z-scores were therefore calculated for each sample and combined into a single depression score (we also provide supplementary analyses where we statistically controlled for group by including it as a covariate and utilizing PHQ-8 scores for the SASLA sample). On the PHQ-8 respondents rated 8-items regarding depressive symptoms on a 4-point Likert scale (range = 0–24) in the past two weeks. On both instruments, higher scores indicate

greater depressive symptoms. Both scales have been utilized and validated with autistic samples (Arnold et al., 2020; Moseley et al., 2022; Uljarević et al., 2017). In the present study, ω = 0.708–0.823 (HADS-D) and 0.889–0.901 (PHQ-8; T1, T2).

Thoughts of Self-harm

Thoughts of self-harm were assessed with item-9 ("Thoughts that you would be better off dead, or of hurting yourself"; range 0–3) of the PHQ-9 (Kroenke & Spitzer, 2002; Kroenke et al., 2001). This item has been found to provide an independent predictor of subsequent suicide attempt in clinical samples when controlling for PHQ-8 scores, hazard ratio = 1.91 (95% CI: 1.79, 2.04) and suicide death, hazard ratio = 1.92 [1.53, 2.41] (Simon et al., 2013). This approach (i.e., PHQ-8 as a depression measure and item 9 as an independent measure of thoughts of self-harm or suicide) has also been reported in research with autistic samples (Hedley, Uljarević, Foley, et al., 2018; Hedley, Uljarević, Wilmot et al., 2018; Radoeva et al., 2022) thereby providing additional support for the application of this approach in the present study. Higher PHQ item 9 scores indicate increased thoughts of self-harm.

Data Cleaning and Analysis

Analyses were conducted in SPSS version 27 (IBMCorp., 2020). Across the sample (n = 209), missing data for T1 variables were: W-ADL = 22.5%, AQ-Short = 1.4–2.9%, WEMWBS = 1.9–2.4%, HADS-D (SASLA) = 16.9–18.1%, PHQ-9 = 3.3–4.3%. Little's MCAR test was not significant for the analysis including W-ADL, AQ-Short, WEMWBS, PHQ-9 (item-9), $\chi 2(646)$ = 706.330, p = .05, and HADS-D (SASLA), $\chi 2(12)$ = 8.106, p = .777, but was for the PHQ-9, $\chi 2(36)$ = 62.600, p = .004. Normality of the variables was assessed by visually inspecting P–P plots and histograms. Several variables violated the assumptions of normality, thus bootstrapping analysis with 5000 re-samples was applied

(Efron & Tibshirani, 1993; Tabachnick & Fidell, 2007). Statistical significance was determined by 95% bias-corrected and accelerated confidence intervals (BCa 95% CI).

Given that overall data were not missing at random, cases with item-level missing data were excluded from descriptive and correlational analyses. Mean score replacement was applied to predictor variables for all regression analyses. All metric predictors were z-standardized for analyses. We first used correlations to explore associations between possible covariates (i.e., age, gender, daily living skills) and study variables. We examined changes in variables over time using bootstrapped t-tests for dependent samples with Cohen's d for effect size. We then ran a linear multiple regression analysis to examine predictors (T1) of self-harm (T2). Baseline (T1) self-harm was included in the model.

Results

Descriptive Statistics

Means and standard deviation and bootstrapped paired t-test comparisons for study variables are provided in Table 1. No significant differences were identified between T1 and T2 for any of the study variables. At T1, 35.82% ($n = 72$; data were missing for $n = 8$ participants) participants reported thoughts of self-harm (i.e., PHQ-9 item-9 score > 0) over the last 2-weeks, and this was similar at T2, with 35.41% ($n = 74$) of participants reporting thoughts of self-harm.

[Insert Table 1 about here]

Correlations

Bootstrapped correlation coefficients (upper panel) and confidence intervals (lower panel) between age, gender, and study variables are provided in Table 2. Age was significantly and positively correlated with daily living skills and autistic traits, with effect sizes in the small to large range ($r = 0.268$ to 0.517). Binary gender was significantly correlated with autistic traits (T2), although the association was small ($r_{pb} = 0.220$). Age,

gender, and daily living skills were not significantly associated with any of the other study variables, including thoughts of self-harm. Wellbeing was significantly negatively associated with autistic traits with medium effect size ($r = –0.350$ to $–0.404$) and depression, with large effect sizes ($r = –0.480$ to $–0.759$). Self-harm (T1, T2) was significantly positively associated with autistic traits and depression ($r = 0.242$ to 0.659), and significantly negatively associated with wellbeing ($r = –0.287$ to $–0.609$).

[Insert Table 2 about here]

Linear Multiple Regression Model

Results of the linear multiple regression model predicting thoughts of self-harm are provided in Table 3. Because preliminary screening analyses showed age, gender and daily living skills were not related to self-harm (T1 or T2), these were not proceeded further with. Variables (T1) entered into the model were self-harm, autistic traits, psychological wellbeing, depression, and the two-way-interaction between depression and psychological wellbeing, the dependent variable was self-harm at T2. Contribution of variables to the model were examined using standardized beta coefficients (β) and semi-partial correlations (sr). Standardized beta coefficients (β) and semi-partial correlations (sr) were calculated without bootstrapping. For consistency, non-bootstrapped p-values are provided in text and bootstrapped p-values are reported in the tables. We also ran models where we a) statistically controlled for potential group differences by including group as a covariate (Supplementary Table S2) and b) examined a model where we replaced HADS-D depression scores for the SASLA sample thereby improving data harmonization (Supplementary Table S3). Overall, these models were similar to the original model with no significant differences between models in terms of identified predictors.

[Enter Table 3 about here]

The full model accounted for 40.0% of the variance in T2 thoughts of self-harm, $F(5, 200) = 26.040$, $p < .001$. Significant predictors of thoughts of self-harm at follow-up (T2) included baseline self-harm (T1), autistic traits (T1), and depression (T1). The b-weights revealed that for each unit increase in baseline thoughts of self-harm (T1), self-harm at follow-up (T2) increased by 0.504 units, for each unit increase in autistic traits, thoughts of self-harm (T2) increased by 0.156 units, and for each unit increase in depression, self-harm (T2) increased by 0.258 units. However, neither wellbeing nor the Depression × Wellbeing interaction significantly predicted T2 thoughts of self-harm; for each unit increase in wellbeing, self-harm (T2) increased by 0.091 units. Overall, baseline self-harm (T1) made the largest significant contribution to self-harm at follow-up (T2) ($\beta = 0.517$, $sr = 0.498$, $p <.001$), followed by depression ($\beta = 0.254$, $sr = 0.239$, $p =.001$) and autistic traits ($\beta = 0.162$, $sr = 0.191$, $p =.007$). Wellbeing ($\beta = 0.091$, $sr = 0.089$, $p =.195$) and the interaction ($\beta = 0.115$, $sr = 0.135$, $p =.067$) made small and statistically non-significant contributions to the model. Given the two-way-interaction of wellbeing and depression did not significantly predict thoughts of self-harm, there was no evidence that psychological wellbeing moderates the effect of depression on thoughts of self-harm.

Discussion

In this study, we evaluated the hypothesis that psychological wellbeing acts as a buffer between depression and thoughts of self-harm. We also examined whether autistic traits would be associated with depression and self-harm. Our data were drawn from a longitudinal sample of autistic adolescents and adults. We analyzed baseline (T1) data as well as follow-up (T2) data which was collected two years following T1 data collection. Consistent with our hypothesis predicting relationships between wellbeing, depression, and self-harm, we found that wellbeing was negatively associated with both depression and self-harm. However, when controlling for the effects of depression on self-harm, the association

between wellbeing and self-harm was no longer statistically significant. Thus, our primary hypothesis that psychological wellbeing would moderate the relationship between depression and thoughts of self-harm was not supported. Our regression model identified autistic traits and depression scores as the only statistically significant predictors of thoughts of self-harm scores two years later, controlling for baseline thoughts of self-harm.

Autistic traits were significantly negatively correlated with wellbeing, and positively associated with depression and thoughts of self-harm. Moreover, when entered in the regression analysis, autistic traits emerged as a significant predictor of thoughts of self-harm. This finding contrasts with research in other autistic samples where autistic traits have not been found to reliably predict thoughts of self-harm or suicidality (Cassidy, Bradley, Shaw, et al., 2018; Hedley, Uljarević, Foley, et al., 2018; Hedley et al., 2017; Hedley, Uljarević, Wilmot, et al., 2018). In Cassidy, Bradley, Shaw et al.'s (2018) study, suicide risk was assessed with the Suicide Behaviors Questionnaire-Revised (SBQ-R) (Osman et al., 2001), a 4-item self-report questionnaire that assesses suicidal thoughts and behavior in the past 12 months. Thus, suicidality differed from the construct of self-harm assessed with the PHQ-9 in our study, which might explain differences in findings. However, this does not entirely explain our findings as, consistent with our approach, Hedley and colleagues (Hedley, Uljarević, Foley, et al., 2018; Hedley et al., 2017; Hedley, Uljarević, Wilmot, et al., 2018) utilized the PHQ-9 to provide an indicator of self-harm/suicidality.

It is interesting to note that research in non-autistic samples has found significant relationships between autistic traits and self-harm or suicidality (Cassidy, Bradley, Shaw, et al., 2018; Cassidy et al., 2020; Hedley et al., 2021; Hochard et al., 2020; Richards et al., 2019). Different findings between autistic and non-autistic samples may reflect characterization of the underlying construct of autistic traits in clinical (i.e., enriched) and general population samples—although autistic traits are thought to reflect a dimensional

structure normally distributed within the general population, the distribution of autistic traits

in clinically enriched samples indicates a dual distribution model suggesting underlying

categorical differences with respect to the extent to which autistic traits are present in autistic

and non-autistic populations (Abu-Akel et al., 2019). Second, the 50-item AQ may function

differently for autistic and non-autistic groups, although the AQ-28 addresses some of these

limitations through removal of poorly performing items (Agelink van Rentergem et al.,

2019). Differences in measures across studies may also affect relationships with autistic

traits. For example, Hochard et al. (2020) used the four-item Depression Severity Index-

Suicide Subscale (DSI-SS) in their study, whereas we used a single item on thoughts of self-

harm. The lack of association between autistic traits and depressive symptoms that has been

reported in some studies (e.g., Cai et al., 2023), or that the connection between autism and

depression may occur through a third factor such as mastery (van Heijst et al., 2020), may

also impact any relationship between autistic traits and thoughts of self-harm. Further

research into potential relationships between autistic traits and mental health and wellbeing,

particularly self-harm and suicidality, is required. Indeed, if there is a relationship between

autistic traits and self-harm or suicidality within the autistic population, better understanding

of the mechanisms underlying these relationships may be important for the development of

effective suicide intervention and prevention strategies.

Our results are inconsistent with findings from non-autistic samples which offer

support for the role of wellbeing as a buffer between depression and suicidality (i.e.,

Siegmann et al., 2018; Teismann, Brailovskaia, et al., 2018; Teismann, Forkmann, et al.,

2018). In our sample of autistic adolescents and adults, one possibility is that wellbeing may

not be salient to psychological functioning in the same way as in a non-autistic population.

Other factors, such as social support, more reliably offset the impact of depression on self-

harm in autistic people. In autistic samples, satisfaction with social support has been found

to mediate the relationship between the number of supports the individual had access to and both depression and loneliness (Hedley, Uljarević, Foley, et al., 2018). Social support in the form of perceived availability of tangible supports was found to be indirectly associated with self-harm (PHQ-9 item 9) through depression, suggesting it may act as a protective factor for thoughts of self-harm (Hedley et al., 2017). In non-autistic samples, depression mediated the relationship between social support and suicidal ideation, supporting the hypothesis that better social support may be particularly salient to depressed individuals who are susceptible to thoughts of self-harm and suicidality (Kim et al., 2021).

It is important to acknowledge methodological differences between the present study and previous research. While we assessed wellbeing with the WEMWBS (Tennant et al., 2007), other studies have utilized different measures, for example, the Positive Mental Health Scale (Lukat et al., 2016) used by Teismann and colleagues (Teismann, Brailovskaia, et al., 2018; Teismann, Forkmann, et al., 2018). The two scales differ such that the WEMWBS assesses participants' current experience of psychological wellbeing (e.g., "I've been feeling loved") whereas the PMH-scale is more attitudinal (e.g., "I feel that I am actually well equipped to deal with life and its difficulties"). It may be that attitudes to psychological wellbeing are more enduring and impactful on self-harm, than positive feelings. This possibility warrants further exploration.

We did not identify any change in mental health and wellbeing scores over the two-year period when data were collected, suggesting stability in these factors over time; this stability in mental health over extended periods of time is consistent with previous studies in different autistic samples (Hedley et al., 2019). Similarly, in other studies using different subsets of the SASLA data set used here, there was also no change in depression or mental wellbeing (Muniandy et al., 2023; Richdale, Chetcuti, et al., 2023), quality of life (Lawson et al., 2020), or fatigue (Richdale, Chetcuti, et al., 2023) over a 2-year period. Additionally,

mental wellbeing was associated with improved quality of life cross-sectionally and at 2-year follow-up in autistic adults, but like the current study, T1 quality of life was the only significant predictor of quality of life 2-years later (Lawson et al., 2020). These findings suggest that, at least for the autistic adolescents and adults in these data sets, mental health, wellbeing, and related variables do not change over time and that environmental impacts such as lack of supports or access to treatment may be responsible.

Without focused intervention to address poor mental health and wellbeing outcomes, things are unlikely to improve for autistic adults. Indeed, the study by Hedley et al. (2019) demonstrated that even transitioning to well-paid employment failed to significantly budge health and wellbeing scores in autistic adults. The absence of psychological wellbeing as a moderator on the relationship between depression and thoughts of self-harm might have been affected by this lack of variability in scores over time. Most likely, the strong relationship between depression and thoughts of self-harm may simply override other, smaller effects. As noted by others (Culpin et al., 2018), shifting depression is likely critical to positively impacting the high rate of self-harm and suicidality within the autistic population.

There are other variables associated with depression that may, directly or indirectly through depression, influence self-harm and suicidality in autistic adults. In other samples, disengagement coping style (Muniandy et al., 2023), social wellbeing (Richdale, Chetcuti, et al., 2023), insomnia (Richdale, Chetcuti, et al., 2023; Richdale, Lawson, et al., 2023) and specific traits commonly co-occurring with autism including sensory sensitivities, autonomic arousal, and intolerance of uncertainty (Richdale, Lawson, et al., 2023) influenced depressive symptoms. Indeed, the relationship between insomnia and suicidality in autism remains unexplored, but in non-autistic samples it is an independent predictor of suicidality (Hochard et al., 2020; Lin et al., 2018). Autistic adults report high rates of insomnia and sleep difficulties (Morgan et al., 2020), suggesting that sleep is another fruitful area for further

exploration. Overall, this supports the complexity of factors that may lead to thoughts of self-harm and suicidal behavior in autistic individuals.

Strengths and Limitations

Our study was strengthened by using longitudinal data collected over two years. This goes some way toward addressing limitations associated with the high prevalence of cross-sectional studies within autism and suicide literature. Our sample also represented a relatively large and diverse in age group of autistic people. However, sample size was nonetheless smaller compared to similar studies in the general population, which may have affected our power to detect significant effects. Furthermore, there was a significant drop-out rate (39.58%) between baseline and 2-year follow-up, although our analysis revealed no significant differences between the two time-points for scores on the primary study variables. We were also limited by the availability of only a single self-report item to assess thoughts of self-harm. The use of a single item limits our ability to assess internal consistency and may lead to more error than scales based on multiple correlated items. For the ALSAA sample, the item was drawn from the same measure as depression scores (i.e., PHQ-9).

Future Directions

Despite the utility of PHQ-9 as a predictor of suicidality (Kim, Lee, & Lee, 2021) and previous use of item 9 for this purpose in research involving autistic and non-autistic samples (Hedley, Uljarević, Foley et al., 2018; Hedley, Uljarević, Wilmot et al., 2018; Radoeva et al., 2022; Simon et al., 2013), thereby supporting its use in the present study, future studies would benefit from more extensive assessment of suicidality, independent of depression measures, and ideally including assessment of previous suicide attempts. Future research should also consider a broader range of risk and protective factors that might underlie the high rate of self-harm and suicidality within the autistic population. In doing so, it will be important to consider factors that are both evident in non-autistic groups (e.g., mental health

challenges, social support) as well as those that might be more salient within autistic samples (e.g., camouflaging, unmet support needs) (Cassidy et al., 2018; Cassidy et al., 2020). We hope that our findings reported here can guide future research into positive mental health factors that might be protective against the high rate of self-harm and suicidality in autism.

Conclusion

In this study we did not find support for the hypothesis that psychological wellbeing buffered the relationship between depression and thoughts of self-harm in autistic adolescents and adults. However, our correlational data demonstrated significant associations between wellbeing and both depression and thoughts of self-harm indicating that further research into the potential role of psychological wellbeing in offsetting negative psychopathology may be justified. Our identification of baseline autistic traits as a potential predictor of thoughts of self-harm at 2-year follow-up within autistic samples is novel and requires further investigation to identify underlying mechanisms and may be useful in informing intervention and prevention strategies. This should include a non-autistic group where model invariance can be examined across groups. Stability of health and wellbeing trajectories suggests interventions may need to target autistic people at a young age (e.g., in childhood) (Culpin et al., 2018), before these trajectories become ingrained and increasingly difficult to shift.

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Table 1

Descriptive (M, SD, Range)and T1–T2 Bootstrapped Comparisons[1]

	T1				T2				Bootstrapped comparisons (T1–T2)			
	n	*M*	*SD*	Range	*n*	*M*	*SD*	Range	*t*(df)	*p*-value	BCa 95% CI	*d* [95% CI]
Daily Living	162	30.14	4.84	15–34	–	–	–	–	–	–	–	–
Autistic Traits	209	84.04	12.00	49–111	207	83.59	12.50	54–112	0.683(206)	0.502	–0.667, 1.397	0.047 [–0.089, 0.183]
Wellbeing	204	40.55	10.02	14–65	206	41.42	9.91	14–64	–1.42(200)	0.160	–2.105, 0.371	0.100 [–0.239, 0.038]
HADS-D[a]	67	5.84	3.33	0–16	83	5.29	4.01	0–14	1.248(66)	0.219	–0.309, 1.239	0.152 [–0.89, 0.393]
PHQ-8[b]	121	9.64	6.35	0–24	123	9.14	6.64	0–24	1.616(117)	0.110	–0.118, 1.664	0.149 [–0.033, 0.330]
Thoughts of Self-harm	201	0.56	0.876	0–3	209	0.54	0.866	0–3	0.625(200)	0.531	–0.065, 0.129	0.044 [–0.094, 0.182]

Note. [1]Five thousand bootstrap samples; 95% BCa confidence intervals that do not cross zero are bolded. HADS-D: Hospital Anxiety and Depression Scale (S1 BLINDED);

PHQ-8 Patient Health Questionnaire, 8 item (S2 BLINDED); Thoughts of Self-harm: PHQ item 9.

Table 2

Pearson's Bootstrapped Correlations[1] (Upper Panel) and BCa 95% CI (Lower Panel)

Variables	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. Age	–	0.009	0.517***	0.268***	0.333***	–0.117	–0.027	–0.048	–0.047	0.026	–.018
2. Gender (Binary)[2]	–.178, .150	–	0.132	0.139	0.220*	–0.043	–0.016	0.020	0.044	0.049	0.105
3. Daily Living	**.413, .606**	–.036, .277	–	0.074	0.146	0.044	0.123	–0.043	–0.155	0.005	–0.107
4. Autistic Traits (T1)	**.109, .419**	–.021, .305	–.112, .249	–	0.786***	–0.355***	–0.350***	0.214**	0.291***	0.242**	0.251**
5. Autistic Traits (T2)	**.183, .483**	**.057, .380**	–.037, .321	**.703, .855**	–	–0.395***	–0.404***	0.246**	0.366***	0.247**	0.253**
6. Wellbeing (T1)	–.272, .038	–.202, .116	–.126, .216	**–.489, –.209**	**–.513, –.259**	–	0.562***	–0.617***	–0.483***	–0.507***	–0.287***
7. Wellbeing (T2)	–.187, .130	–.172, .145	–.026, .276	**–.490, –.197**	**–.535, –.258**	**.420, .685**	–	–0.480***	–0.759***	–0.371***	–0.609***
8. Depression (T1)[3]	–.206, .115	–.150, .194	–.210, .116	**.067, .362**	**.097, .385**	**–.705, –.515**	**–.602, –.342**	–	0.624***	0.518***	0.422***
9. Depression (T2)[3]	–.201, .111	–.127, .212	–.323, .009	**.135, .440**	**.217, .501**	**–.590, –.361**	**–.825, –.673**	**.505, .726**	–	0.429***	0.659***
10. Self-harm (T1)	–.123, .176	–.117, .204	–.125, .128	**.072, .404**	**.097, .386**	**–.627, –.364**	**–.512, –.217**	**.392, .630**	**.264, .572**	–	0.590***
11. Self-harm (T2)	–.153, .132	–.059, .264	–.281, .063	**.070, .415**	**.053, .422**	**–.424, –.136**	**–.712, –.481**	**.276, .559**	**.561, .739**	**.430, .730**	–

Note. [1]Five thousand bootstrap samples; 95% BCa confidence intervals that do not cross zero are bolded. Point-biserial correlations (r_{pb}) were applied where analyses include continuous and dichotomous variables. [2]Bootstrapped point-biserial correlation, exclude non-binary gender ($n = 9$). [3]Depression scores are derived from Hospital Anxiety and Depression Scale (HADS-D; S1 BLINDED) and Patient Health Questionnaire (PHQ-8; S2 BLINDED).

*p <.05

**p < .01

***p <.001

Table 3

	b	*SEB*	*β*	*p*-value[b]	BCa 95% CI[c]
Constant	−0.023	0.054	–	.672	[−.126,.084]
Thoughts of Self-harm (T1)	0.504	0.063	0.517	**<.001**	**[.362,.661]**
Autistic Traits[a]	0.156	0.058	0.162	**.007**	**[.045,.264]**
Wellbeing[a]	0.091	0.073	0.093	.195	[−.044,.228]
Depression[a]	0.258	0.075	0.254	**<.001**	**[.108,.416]**
Depression × Wellbeing[a]	0.116	0.061	0.115	.067	[−.008,.236]
Model	$R^2 = 0.400$, $F(5, 200) = 26.040$, $p < .001$				

Bootstrapped Hierarchical Linear Regression Models with T1 Variables Predicting Thoughts of Self-harm at T2

Note. [a]*z*-score used in analysis. [b]5000 samples bootstrapped *p*-value. [c]BCa 95% confidence intervals that do not cross zero are bolded.

Supplementary Table S1

Mean (SD), and 5000 Sample Bootstrapped Comparisons for Included (n = 209) and Excluded (n = 319) Participants on Study Variables (T1)

Variable	Included			Excluded			Comparison Statistics [BCa 95% CI][1]
	n	*M (%)*	*SD*	*n*	*M (%)*	*SD*	
Gender							
Male	99	(47.4)	–	102	(32)	–	
Female	101	(48.3)	–	196	(61.4)	–	$\chi^2(2) = 12.874$, $p = .002$, Cramer's $V = .156$ [.066, .258]
Non-binary	9	(4.3)	–	21	(6.6)	–	
Age	209	34.13	15.381	318	38.84	12.714	$t(525) = 3.828$, $p < .001$, [2.21, 7.39], $d = .341$ [.165, .516]
W-ADL	162	30.14	4.840	256	31.63	3.728	$t(416) = 3.556$, $p = .001$, [.636, 2.33], $d = .357$ [.159, .555]
AQ-Short	206	83.89	12.927	299	85.48	12.848	$t(503) = 1.729$, $p = .085$, [–.296, 3.88], $d = .156$ [–.021, .333]
WEMWBS	204	40.55	10.017	276	40.75	10.172	$t(478) = .210$, $p = .840$, [–1.633, 1.982], $d = .019$ [–.162, .200]
HADS-D (S1 BLINDED)	67	5.84	3.333	15	5.53	3.563	$t(80) = -.314$, $p = .754$, [–2.303, 1.587], $d = -.090$ [–.649, .471]
PHQ-8 (S2 BLINDED)	121	9.64	6.353	239	10.55	6.324	$t(358) = 1.290$, $p = .198$, [–.505, 2.256], $d = .144$ [–.075, .363]
PHQ-8 (S1/S2 BLINDED)	197	9.04	6.252	263	10.26	6.339	$t(458) = 2.058$, $p = .038$, [.057, 2.380], $d = .194$ [.009, .379]
Thoughts of Self-harm	201	.56	.876	268	0.64	0.956	$t(467) = .939$, $p = .348$ [-.090, .251], $d = .088$ [–.095, .271]

Note. [1]Bonferroni adjusted *p*-value for 8 tests = .00625. W-ADL: Waisman Activities of Daily Living (Maenner et al., 2013); AQ-Short: Autism Quotient, Short (Hoekstra et al., 2011); WEMWBS: Warwick-Edinburgh Mental Wellbeing Scale (Tennant et al., 2007); HADS-D: Hospital Anxiety and Depression Scale (BLINDED; Zigmond & Snaith, 1983); PHQ-8: Patient Health Questionnaire, 8 item (Kroenke et al., 2009); Thoughts of Self-harm: PHQ, item 9 (Kroenke & Spitzer, 2002; Kroenke et al., 2001).

Supplementary Table S2

Bootstrapped Hierarchical Linear Regression Models with T1 Variables and Group (S1 BLINDED, S2 BLINDED) Predicting Thoughts of Self-harm at T2

Note. [a]z-score used in analysis. [b]5000 samples bootstrapped p-value. [c]BCa 95% confidence intervals that do not cross zero are bolded.

	b	*SEB*	*β*	*p*-value[b]	BCa 95% CI[c]
Constant	–0.176	0.169	–	.391	[–.492,.167]
Group	0.095	0.102	0.048	**.439**	[–.105,.285]
Thoughts of Self-harm (T1)	0.500	0.075	0.513	**<.001**	**[.360,.655]**
Autistic Traits[a]	0.138	0.055	0.143	**.027**	**[.038,.243]**
Wellbeing[a]	0.096	0.071	0.097	.195	[–.042,.232]
Depression[a]	0.265	0.079	0.262	**<.001**	**[.113,.424]**
Depression × Wellbeing[a]	0.114	0.063	0.113	.064	[–.010,.236]
Model	$R^2 = 0.402$, $F(6, 200) = 21.756$, $p < .001$				

Supplementary Table S3

Bootstrapped Linear Regression Model with T1 Variables Predicting Thoughts of Self-harm (T2) utilizing PHQ8 (T1) Depression (S1 BLINDED, S2 BLINDED Samples)

Note. [a]*z*-score used in analysis. [b]5000 samples bootstrapped *p*-value. [c]BCa 95% confidence intervals that do not cross zero are bolded.

	b	*SEB*	*β*	*p*-value[b]	BCa 95% CI[c]
Constant	0.006	0.063	–	.928	[–.122,.144]
Thoughts of Self-harm (T1)	0.467	0.067	0.487	**<.001**	**[.306,.642]**
Autistic Traits[a]	0.112	0.059	0.118	.051	**[.002,.225]**
Wellbeing[a]	0.065	0.075	0.068	.370	[–.078,.217]
Depression[a]	0.197	0.080	0.207	**.016**	**[.037,.363]**
Depression × Wellbeing[a]	0.063	0.049	0.079	.204	[–.039,.164]
Model	$R^2 = 0.362$, $F(5, 196) = 21.661$, $p < .001$				