Quantifying the contribution of specific autistic traits to quality of life in autistic adults

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Abstract

Across research studies, autistic traits have consistently been found to predict the quality of life (QoL) of autistic adults. However, our understanding of their exact role remains limited, as autistic traits are typically examined as a unitary construct, with their multidimensional nature being largely overlooked. The present study examined the relative contribution of specific autistic trait domains – social anxiety, mentalising difficulties, and sensory reactivity – to QoL in autistic adults. Participants ($N = 300$) completed clinically relevant measures of their autistic traits (i.e., RAADS-14) and QoL (i.e., WHOQOL-BREF and ASQoL), and provided socio-demographic details. Results showed that the consistent presence of social anxiety and mentalising difficulties across development, but not sensory reactivity, significantly predicted poorer QoL, even after accounting for one another and potential confounders. Comparing their relative importance, social anxiety emerged as the most dominant predictor of QoL amongst all variables, followed by mentalising difficulties. These findings provide evidence for the divergent contributions of autistic trait domains to QoL, adding nuance to our understanding of factors relating to autistic adults' QoL. Overall, this study underscores the importance of considering individual differences in autistic trait profiles when designing individualised support programmes, such as prioritising attention to the presence of social anxiety and mentalising difficulties, to enhance the QoL of autistic adults.

Lay Abstract

Research consistently shows that autistic adults with more autistic traits generally experience poorer quality of life (QoL). However, our understanding of how they exactly link remains limited. This is because overall autistic trait scores are typically examined, even though autistic traits encompass different types of characteristics (e.g., social and non-social). Specifically, it is yet to be determined which particular autistic traits contribute most to QoL differences among autistic adults. To address this question, the present study examined the relative contributions of three specific domains of autistic traits – social anxiety, mentalising difficulties, and sensory reactivity – to QoL in 300 autistic adults, using self-report questionnaires. We found that the extent to which the three domains contributed to QoL differed. The consistent presence of social anxiety and mentalising difficulties across development, but not sensory reactivity, significantly predicted poorer QoL. Further to this, the presence of social anxiety, followed by mentalising difficulties, were the most important predictors of poorer QoL compared to all other variables, including being male, not being in a relationship, and having one or more co-occurring mental health conditions. These findings suggest that individual differences in specific autistic trait domains should be particularly attended to in the design of more tailored, personalised support programmes, given their important influence on one's satisfaction with life. Overall, this study demonstrates that it would be useful to maximise the clinical use of autistic trait measures, such as moving beyond the focus on overall scores, with an aim to effectively enhance the QoL of autistic adults.

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Introduction

Improving the quality of life (QoL) of autistic adults is critical and continues to be an important research priority for the autistic community (Benevides et al., 2020). In support of this, considerable research has been directed to identifying predictors of QoL among autistic people over the past decade. Notably, one such predictor is the extent of autistic traits exhibited by an individual. Across multiple studies, a greater presence of autistic traits has been consistently found as an independent, if not the strongest, predictor of QoL in autistic adults. This is true even when a range of other factors had been accounted for, such as sex/gender, household income, and the presence of co-occurring mental health conditions (Leung et al., 2023; Mason et al., 2018; Oredipe et al., 2023). However, the typical approach of such studies is to examine autistic traits as a unitary construct. Therefore, our understanding of how exactly autistic traits link to QoL remains limited given the multidimensionality of autistic traits, for example, social communication difficulties, restricted and fixated interests, and sensory processing challenges (American Psychiatric Association [APA], 2013).

To date, only a handful of studies have examined the associations between specific autistic trait domains and QoL in autistic people, which has been particularly limited for adults. In research with autistic children, several autistic trait components related to poorer social functioning (i.e., social cognition, communication, and motivation) and greater sensory processing differences have been shown to predict lower QoL, while social awareness and autistic preoccupations and mannerisms are not found to be related to QoL (de Vries & Geurts, 2015; Oakley et al., 2021). For autistic adults, lower quality and quantity of social interactions and more sensory processing differences have been found to predict reduced QoL (Charlton et al., 2022; Lin & Huang, 2019). However, the specific contribution of other autistic traits (e.g., those relating to social cognition) to QoL in autistic adults is yet to be examined. Moreover, due to a lack of research considering the different trait domains concurrently, their relative contributions to QoL remain uncertain. Overall, therefore, there is a need to directly evaluate which specific autistic traits are the most accountable for QoL in autistic adults.

To address this literature gap, the present study aimed to determine the relative contribution of specific autistic trait domains to QoL in autistic adults, utilising the Ritvo Autism and Asperger Diagnostic Scale (RAADS)-14 (Eriksson et al., 2013). The RAADS-14 is a brief screener specifically tailored to assess the presence and longevity of autistic traits across domains that align with those outlined in diagnostic manuals (APA, 2013; World Health Organization, 2019), thereby enhancing the clinical relevance of our study. Specifically, we examined the roles of mentalising difficulties, social anxiety, and sensory reactivity, as assessed by the measure, in predicting QoL among autistic adults, while accounting for one another and a range of potential confounding variables (e.g., sex, relationship status, household income, co-occurring mental health conditions). The inclusion of these additional variables was essential, given their previously reported associations with QoL (see Leung et al., 2023). Establishing the contribution of different autistic traits to reduced QoL is crucial, as it would inform the specific areas to be prioritised clinically, towards improving outcomes in autistic people with diverse symptom profiles (Lyall, 2023).

Methods

Participants, measures, and procedure

The present study utilised open-access data from Leung et al. (2023), which comprised responses from 300 autistic adults (171 female) in the United Kingdom, aged 18–68 ($M = 31.54$, $SD = 10.10$). Power analysis confirmed 95% power to detect 'small-to-medium' effects in our regression analysis with this sample size ($f^2 = 0.09$, $\alpha = 0.05$, two-tailed). All participants self-reported a clinical diagnosis of autism spectrum disorder from a professional. Ethical clearance was granted by the University of Bath Psychology Research Ethics Committee.

Self-reported autistic traits were measured using the Ritvo Autism and Asperger Diagnostic Scale (RAADS)-14 (Eriksson et al., 2013). A summed score was computed for each subscale, namely, mentalising difficulties (seven items), social anxiety (four items, one reverse-scored), and sensory reactivity (three items). Higher scores indicated a more consistent presence of autistic traits across development. For QoL, a composite index covering multiple aspects of life was used. This included five domains relating to physical health (seven items, two reverse-scored), psychological status (six items, one reverse-scored), social relationships (three items), and environmental contexts (eight items) measured with the Abbreviated World Health Organization Quality of Life questionnaire (WHOQOL-BREF; Harper et al., 1998), as well as experiences of challenging issues particularly salient for autistic

people (nine items, three reverse-scored) measured with the Autism-Specific Quality of Life measure (ASQoL; McConachie et al., 2018). The sum of participants' ratings for each of the five domains was first normalised separately;[1] the five normalised domain scores were then averaged to construct a composite score. A higher composite score indicated better QoL.

Measures were administered in a randomised order as part of a wider collection of self-report measures, followed by demographic questions about the age of receiving an autism diagnosis, current age, sex, ethnicity, relationship status, independent living status, employment status, household income, education level, as well as a question requiring participants to report any co-occurring mental health diagnoses they had received (e.g., ADHD, anxiety, and depression). For full details on all measures and questions, see Leung et al. (2023).

Analysis and results

Analyses were performed using R (R Core Team, 2022), with the data and accompanying code available as Supplemental Material.

Factor structure of the RAADS-14

Confirmatory factor analysis (CFA) using maximum likelihood estimation[2] showed that the three-factor solution of the RAADS-14 fitted the data adequately, with the model fit indices (comparative fit index (CFI) = 0.919, Tucker-Lewis index (TLI) = 0.900, root mean square error approximation (RMSEA) = 0.058 (90% CI [0.044, 0.071]), standardised root mean square residual (SRMR) = 0.051) meeting the recommended thresholds (i.e., ≥ 0.90, ≥ 0.90, < 0.06, and < 0.08, respectively). For factor loadings, see Supplemental Table S1.

Associations between autistic trait domains and QoL

Correlational analyses showed that all three autistic trait domains, namely social anxiety, mentalising difficulties, and sensory reactivity, were negatively correlated with QoL (Table 1). Notably, the three domains were significantly inter-correlated (all rs ≥ 0.35, ps < 0.001), with more autistic traits in one domain associated with more autistic traits in the other. For intercorrelations between the autistic trait domains and other variables, see Supplemental Table S3.

Because of the intercorrelations among autistic trait domains, multiple linear regression analysis was used to examine their unique associations with QoL. This analysis involved statistically adjusting for the effects of each trait domain on one another, as well as the effects of potential confounders including current age, age at diagnosis, sex, ethnicity, relationship status, independent living status, education level, employment status, adjusted household income,

and co-occurring mental health conditions. Results showed that, while the consistent presence of social anxiety and mentalising difficulties across development significantly predicted poorer QoL, sensory reactivity was not a significant predictor (Table 1).

To examine the importance of mentalising difficulties and social anxiety for QoL relative to other predictors, it is not sufficient to simply compare regression coefficients, as they only reflect a predictor's isolated effects without considering its combined effects with other predictors (Lebreton et al., 2004). To overcome this, dominance analysis was employed, which involved averaging each predictor's incremental R^2 contribution across all possible regression submodels involving that predictor. These averages were then used to generate a general dominance weight (GDW) for each predictor, indexing their relative importance in predicting QoL. The GDWs across predictors summed to the overall model R^2, enabling the ranking of each predictor's relative importance to QoL. Results showed that social anxiety was the most important predictor of QoL, dominating mentalising difficulties, with both domains dominating all other predictors (Table 1). Notably, sensory reactivity also dominated all other socio-demographic predictors.

Discussion

The present study found that the consistent presence of social anxiety and mentalising difficulties across development, but not sensory reactivity, were significant predictors of QoL, even after accounting for one another and potential confounders. Furthermore, social anxiety, followed by mentalising difficulties, were the most important predictors of QoL relative to sensory reactivity and all other relevant variables (such as sex and co-occurring mental health conditions). Overall, these findings add nuance to the existing literature that consistently reports the associations between a higher overall presence of autistic traits and poorer QoL.

Our findings suggest that the presence of social anxiety in autistic adults should be carefully attended to, considering its particularly important links to poorer QoL. A closer inspection of the measurement items suggests that experiences inducing social anxiety may stem from a lack of adequate social skills (e.g., "*How to make friends and socialize is a mystery to me.*"). However, whether this reflects one's perceived or actual social competence warrants further research to pinpoint the reason why social anxiety arises in real-world scenarios. Nonetheless, the continued development and implementation of social skills interventions, particularly those programmed for generalisation across contexts (e.g., Factor et al., 2022; see Gates et al., 2017 for discussion), may play a key role in enhancing autistic individuals' ability and/or confidence to engage in social activities, thereby improving their QoL (see Hotton & Coles, 2016).

The observation that the presence of mentalising difficulties significantly predicted lower QoL extended previous findings

Table 1. Links between autistic trait subdomains and overall QoL from correlations, multiple regression, and dominance analysis.

Predictors	r	p	β	p	GDW [95% CIs]	Rank
Social anxiety	−0.44	< 0.001	−0.28	< 0.001	0.096 [0.052, 0.154]	1
Mentalising difficulties	−0.42	< 0.001	−0.16	0.020	0.071 [0.037, 0.117]	2
Sensory reactivity	−0.32	< 0.001	−0.11	0.073	0.038 [0.015, 0.075]	3
Co-occurring mental health conditions	−0.23	< 0.001	−0.47	0.001	0.035 [0.008, 0.078]	4
Age at diagnosis	−0.21	< 0.001	−0.12	0.127	0.018 [0.005, 0.048]	5
Employment status	0.16	0.005	0.15	0.177	0.013 [0.002, 0.043]	6
Relationship status	0.12	0.039	0.23	0.036	0.012 [0.001, 0.039]	7
Ethnicity	−0.08	0.183	−0.32	0.074	0.010 [0.001, 0.034]	8
Sex	−0.02	0.780	−0.25	0.019	0.008 [0.002, 0.032]	9
Adjusted household income	0.14	0.017	0.05	0.354	0.008 [0.001, 0.036]	10
Education level	0.07	0.203	0.06	0.272	0.005 [0.001, 0.029]	11
Current age	−0.09	0.124	0.08	0.301	0.004 [0.002, 0.017]	12
Independent living status	0.03	0.588	−0.10	0.411	0.001 [0.001, 0.011]	13

Two participants reported not knowing when they received their diagnosis, the full sample in the multiple regression and dominance analyses therefore represents $N = 298$.

Pearson's (r) correlations measure the association between each variable and overall QoL.

Examination of variance inflation factor (VIF) values indicated that multicollinearity was not a concern (all ≤ 2.58), and the residuals were normally distributed (Shapiro-Wilk values $= 0.99$, $p = 0.098$) and showed homoscedasticity (Breusch-Pagan values $= 8.65$, $p = 0.799$). A Durbin-Watson value of 2.14 ($p = 0.234$) suggested that errors were independent, and no outliers were detected. Together, the data were suitable for multiple linear regression analysis. The regression analysis estimates the unique contribution (β) of each autistic trait to overall QoL while controlling for one another and other variables (model fit: $R^2 = 31.95\%$, $F(13, 284) = 10.26$, $p < 0.001$).

General dominance weights (GDW) and their corresponding confidence intervals (CI) and rankings reflect the relative importance of each variable to overall quality of life (QoL).

Significant associations are in bold.

in autistic children. This notion, now, opens up several new questions. Specifically, it is paramount to examine if the same associations can be replicated using objective measures, given the previously reported weak associations between self-report measures and behavioural assessments of social cognitive ability (Sunahara et al., 2022). In essence, interventions targeting improvement measured by cognitive tasks may not have the proposed impact on QoL. Additionally, expanding research to explore the links between different social-cognitive components (e.g., social attention and emotion recognition) and QoL would be fruitful for bridging cognitive findings with health research, while informing clinical practice on the constructs and measurements that should be focused on.

Sensory reactivity was not a significant independent predictor of QoL, contradicting previous research. Notably, the previous study found that sensation sensitivity, but not avoidance, was significantly associated with QoL (Lin & Huang,

2019). In our study, despite good model fit, the measurement items appear to encompass both sensitivity and avoidance components (e.g., "*When I feel overwhelmed by my senses, I have to isolate myself to shut them down*"), which may have contributed to the discrepant findings. However, this alone cannot explain why an association was observed in our zero-order correlations. It is possible that sensory reactivity may indirectly influence QoL through other variables, such as mentalising difficulties, given their intercorrelations. For instance, atypical sensory processing may influence the perception of social cues (e.g., Thye et al., 2018), thereby negatively impacting one's social functioning and QoL. Whilst this requires empirical clarification, the potential indirect role may further explain why sensory reactivity was not an independent, yet important, predictor of QoL.

Following this line of inquiry, it is noteworthy that while the present study demonstrates the differential contribution

of specific autistic trait domains to QoL, the intricate inter-relationships among these domains may not be as easily disentangled in nature, as evidenced by our zero-order correlations (see also Alvi et al., 2020). For instance, besides the previously discussed potential indirect contribution of sensory reactivity to QoL, the possible sequential pathway from mentalising difficulties to social anxiety (or vice versa; see Baez et al., 2023; Espelöer et al., 2021; Hezel & McNally, 2014) and its subsequent impact on QoL also warrant further investigation. Similarly, the extent to which mentalising difficulties and social anxiety influence secondary factors (e.g., social support; Charlton et al., 2022; Spain et al., 2020) and their resulting implications for QoL are yet to be thoroughly scrutinised. Future research could employ longitudinal designs to better elucidate the dynamic interplay between these domains and their collective influence on QoL. Effectively managing one domain may benefit the other, thereby resulting in a more comprehensive enhancement of QoL for autistic individuals.

Strengths and limitations

The use of the RAADS-14, with items aligned with diagnostic criteria for autism, adds clinical relevance to the findings. Specifically, this study highlights the potential of maximising the clinical utility of autistic trait measures by looking beyond overall scores, given the differential contribution of domains to QoL. Additionally, although the QoL composite measure encapsulated a range of dimensions, the recommended use of the WHOQOL Disabilities Module (Power & Green, 2010) alongside the ASQoL could not be fulfilled, as data were not available within the open-access dataset. Thus, the differential contributions of autistic trait domains to QoL in a broader sense (e.g., issues related to inclusion, discrimination, and autonomy) cannot be inferred until further investigation. More generally, the present retrospective assessment of QoL can be criticised for its lack of ecology. Future studies may employ more real-time experiential measurements of QoL, such as the ecological momentary assessment (EMA) approach, to enhance our understanding of the observed links at a more fine-grained level.

Conclusion

This study provides supporting evidence for the divergent contributions of autistic trait domains to autistic adults' QoL. Social anxiety, followed by mentalising difficulties, emerged as particularly important predictors, warranting prioritised attention when designing individualised support programmes to improve autistic people's QoL. Although sensory reactivity did not show a significant independent contribution to QoL, it also emerged as an important predictor, possibly due to its indirect influence on QoL through other variables. Further research is required to investigate this hypothesis. Overall, this study underscores

the importance of considering individual differences in autistic trait profiles during clinical assessment, while opening up avenues for future cognitive and health research to build upon the current findings, with an aim to enhance autistic people's QoL.

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Notes

1. The ASQoL total scores within Leung et al.'s (2023) dataset encompassed ratings of all nine items for replication purposes. In accordance with McConachie et al.'s (2018) recommendations, we recalculated the ASQoL total scores using eight items (excluding ratings for the global item on autistic identity), and hence the subsequent calculation of QoL composite scores.
2. As the RAADS-14 uses a 4-point Likert scale, we repeated the CFA model using the weighted least square mean and variance adjusted (WLSMV) estimation, specifically designed for ordinal data, which yielded the same conclusions (see Supplementary Table S2).

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