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Understanding the relationship between social camouflaging in autism and safety behaviours in social anxiety in autistic and non-autistic adolescents

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Background: Social camouflaging (hereafter camouflaging) in autism includes factors such as masking and compensating for one's neurodevelopmental differences, and to assimilate or 'fit in' with non-autistic peers. Efforts to hide one's authentic self and autism traits (masking) resemble impression management (IM) in safety behaviours identified in Clark and Wells' (1995) cognitive model of social anxiety (SA). This study explores the relationship between camouflaging in autism and safety behaviours in SA among autistic and non-autistic adolescents. **Methods:** One hundred fifteen adolescents (14–19 years) with (n = 61; 36 female) and without (n = 54; 37 female) a clinical diagnosis of autism matched on age and SA symptom severity were recruited from clinics, schools and online. Adolescents completed online measures including autism traits, SA symptoms, camouflaging behaviours, SA-related safety behaviours and SA-related negative cognitions. Partial and bivariate Pearson's correlations and structural equation modelling were used to understand the relationship between camouflaging, safety behaviours, autism traits and SA in both groups. Exploratory factor analysis assessed item-level factor cross-loadings between camouflaging and safety behaviours. **Results:** Across both groups, masking and IM were significantly associated with SA symptom severity, not autism traits, via SA-related social cognitions. Exploratory factor analysis indicated construct overlap across masking, assimilation, IM and avoidance behaviours and identified factors analogous to self-focused attention, social avoidance and mental rehearsal identified in the Clark and Wells' (1995) model of SA. **Conclusions:** This is the first study using group-matched design to identify that masking (factor in social camouflaging) and IM both relate to SA in autistic and non-autistic adolescents. Assessment and formulation of construct overlap between masking and IM may inform psychoeducation and adaptation of SA treatment for autistic adolescents. **Keywords:** Autism spectrum disorder; social anxiety; social camouflaging; safety behaviours; cognitive behaviour therapy; adolescent.

Introduction

Autism spectrum disorder (hereafter autism) is a neurodevelopmental condition characterised by social communication difficulties, restricted and repetitive behaviour and sensory anomalies (American Psychiatric Association, 2013) that affects 1 in 54 children (Centers for Disease Control and Prevention, 2019). Between 29% and 57% of autistic children and adolescents have co-occurring Social Anxiety Disorder (SAD; Bellini, 2006; Hollocks et al., 2022; Kuusikko et al., 2008; Simonoff et al., 2008). Common aetiological factors underlying SAD (e.g. fear of negative evaluation by others (Lei & Russell, 2020), intolerance of uncertainty, alexithymia and interoceptive sensibility (Pickard, Hirsch, Simonoff, & Happé, 2020)) in both autistic and non-autistic adolescents suggest that it may be possible to extend cognitive therapy for SAD in non-autistic adolescents to autistic adolescents (Hollocks, Pickles, Howlin, & Simonoff, 2016; Pickard et al., 2020; Sukhodolsky, Bloch, Panza, & Reichow, 2013).

Developments in cognitive therapy for SAD in non-autistic adolescents have been guided by maintenance models of social anxiety (SA; Clark & Wells, 1995; Ingul, Aune, & Nordahl, 2014; Leigh & Clark, 2018, 2021; Rapee & Heimberg, 1997). In the Clark and Wells (1995) cognitive model of SAD, individuals who perceive social situations as threatening engage in safety behaviours (defined as 'advanced, elaborate, and creative strategies that aim to eliminate social-evaluative threat in these circumstances [social situations] without physically removing oneself' in Wong & Rapee, 2016, pp. 95) in order to prevent or mitigate the feared outcome. Safety behaviours can be categorised into avoidance (e.g. avoid eye contact) and impression management (IM; e.g. putting on an appearance of being more sociable; Evans, Chiu, Clark, Waite, & Leigh, 2021). Although both types can maintain SA over time, avoidance, but not IM, can have additional negative effect on social interaction (e.g. avoiding eye contact is perceived more negatively by social partners than rehearsing sentences in one's mind; Evans et al., 2021; Gray, Beierl, & Clark, 2019).

Using safety behaviours to 'hide' one's SA draws parallels to literature on social camouflaging (hereafter camouflaging) in autism (Hull et al., 2017; Hull, Petrides, et al., 2020), which include compensation strategies that address social and communication

difficulties associated with autism, masking strategies that allow one to present a non-autistic persona to non-autistic peers, and assimilation strategies used to fit in to potentially uncomfortable social situations (Hull et al., 2019). Masking is described as the use of simple or 'shallow' behavioural strategies to regulate autism-associated behaviours, compared to 'deep' compensation where social cognitive strategies are actively used to generate new social behaviours adapted to specific social contexts to help individuals fit in (Livingston, Colvert, et al., 2019; Livingston, Shah, et al., 2019). Recent studies have linked camouflaging to exhaustion, burnout and elevated psychopathology in autistic adults (Beck, Lundwall, Gabrielsen, Cox, & South, 2020; Cage & Troxell-Whitman, 2019; Hull et al., 2019, 2021; Lai et al., 2019), with one study suggesting that heightened camouflaging may be driven by high levels of SA rather than autism alone (Cage & Troxell-Whitman, 2019).

A shared motivation behind both camouflaging and IM safety behaviours is to live up to other people's expectation of the self and are driven by a fear of negative evaluation and/or a desire to be accepted by others (Gino, Sezer, & Huang, 2020). Among non-autistic adults, such behaviours result in presenting an inauthentic version of the self to cater to perceived external expectations, exacerbating anxiety and leading to cognitive exhaustion (Gino et al., 2020). The propensity for IM is even greater for individuals from minoritised groups such as autistic individuals who are more vulnerable to experiencing social stigma (Ai, Cunningham, & Lai, 2022; Goffman, 1959, 1968), and IM may mitigate discrimination by concealing stigma-associated identities (Ai et al., 2022; Goffman, 1959, 1968). Anecdotal reports from autistic adults suggest benefits from camouflaging (e.g. avoiding bullying and getting by in conventional work and education settings; Cage & Troxell-Whitman, 2019). One potential difference between camouflaging and IM safety behaviours may be that the former is used to disguise objective social communication differences in autism, whereas the latter are used to address the self-perceived social inadequacy in SA in the absence of objective social skill difficulties.

This study aimed to explore construct overlap between camouflaging in autism and safety behaviours in SA (particularly the IM factor due to potential construct overlap in measurement of self-presentation strategies in social situations), among autistic and non-autistic adolescents with similar levels of SA symptoms. Understanding the relationship between both sets of behaviours will inform assessment and formulation of how maintenance factors identified in cognitive models of SAD for non-autistic adolescents are shared by autistic adolescents, with clinical implications for adapting cognitive behavioural treatment of SAD for autistic adolescents.

Methods

Participants

This study included 115 adolescents (14–19 years old), recruited following attendance at Child and Adolescent Mental Health Services (CAMHS) in South London (Autism: 89%; Non-Autism: 98%), a university transition programme for autistic students (Autism: 3%) and online (Autism: 8%; Non-Autism: 2%). Autistic adolescents (n = 61) had a clinical diagnosis of autism (DSM-5 autism spectrum disorder) by a qualified professional gathered either from local CAMHS records or provided by parent/carer electronically. Non-autistic adolescents (n = 54) did not have a clinical diagnosis of autism as per clinical records, nor self and parent/carer disclosure. Exclusion criteria for both groups included diagnosis of intellectual disability, epilepsy, genetic or psychotic conditions, have current risk of harm to self or from others, current in-patient or non-fluent in written English. Assessment for exclusion criteria is based on parent report, clinical records and cross-checking with their local care co-ordinator.

Measures

A detailed summary of all demographic and outcome measures is provided in Appendix S1, Methods. Given that adolescents in the autism group (with or without formal diagnosis of SAD) may experience high levels of SA, we screened non-autistic adolescents in attempt to match levels of SA reported by adolescents in both groups. At the point of initial contact, non-autistic adolescents or their parent/carer were asked to complete the 3-item Mini-SPIN (Connor, Kobak, Churchill, Katzelnick, & Davidson, 2001) with those scoring 6 or higher invited to take part in the full questionnaire session. All participants first completed demographic questions including age, gender, identity, ethnicity and socioeconomic status, and completed the Receptive One-Word Picture Vocabulary Test (4th Edition, Martin & Brownell, 2010) to assess reading ability. Participants completed Autism Quotient-28 (AQ-28; Hoekstra et al., 2011; previously used with autistic children and adolescents in Dewinter, De Graaf, & Begeer, 2017; Martini, Merkelbach, & Begeer, 2023) to assess autism traits, and Social Phobia Inventory (SPIN; Johnson, Inderbitzen-Nolan, & Anderson, 2006) to asses SA symptom severity, both measures showed good internal consistency in this study (α = .78–.92). All participants completed the Camouflaging Autistic Traits Questionnaire (CAT-Q; Hull et al., 2019; previously used with autistic adolescents in Bernardin, Lewis, Bell, & Kanne, 2021; Jorgenson, Lewis, Rose, & Kanne, 2020) to measure social camouflaging constructs including masking, assimilation and compensation, Adolescent Social Behaviours Questionnaire (ASBQ; Leigh, Chiu, & Clark, 2021) to assess safety behaviours including avoidance and IM, and Adolescent Social Cognitions Questionnaire (ASCQ; Leigh & Clark, 2021) to assess SA-related cognitions. Participants completed Revised Children's Anxiety and Depression Scale – Depression and Generalised Anxiety subscale (RCADS-Dep, RCADS-GAD; Baron, Hurn, Adlington, Maguire, & Shapiro, 2021; previously used with autistic children and adolescents in Hallett et al., 2013) to measure symptoms of generalised anxiety and depression. All outcome measures showed good internal consistency in the current study (α = .80–.95).

Procedure

Adolescents who met study eligibility criteria used a link to access the full questionnaire session hosted on Qualtrics, where they first read through the study information sheet, provided written assent (aged 14–15 years, with parents providing written consent) or consent (aged 16–19 years) depending on their age, before completing demographic information and

questionnaires. Participants also completed a one-word reading task hosted on Gorilla to assess their reading ability. Adolescents who successfully completed the full session were reimbursed £5 in gift vouchers to compensate for their time.

Ethical considerations

All procedures comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975 (revised in 2008) and those involving participants were approved by the London Brent Research Ethics Committee (21/LO/0750), IRAS project number 300879.

Analyses

A detailed analyses plan is provided in Appendix S1. Descriptive statistics and exploratory factor analyses were performed using SPSS v28, confirmatory factor analyses and path analyses were performed using the *lavaan* package in R (Rosseel, 2012). All participants completed all questionnaires, with no missing data in the full complete dataset used for subsequent analyses. First, between-group differences across demographic factors and key outcome measures were explored using independent samples *t*-test and Chi-squared tests. Second, bivariate and partial Pearson's correlations (controlling for depression and generalised anxiety symptoms) were independently completed in both groups investigate the association between factors underlying camouflaging and safety behaviours, and SA-related cognitions. Third, a confirmatory factor analysis was conducted using Diagonally Weighted Least Square Means (DWLS) estimator to test for factor measurement invariance in CAT-Q and ASBQ in both groups, by comparing configural to strict invariance models using Chi-square likelihood ratio test. The rationale for testing factor measurement invariance for each questionnaire was to provide justification for combining both groups for subsequent path analyses. Adequate model fit was indicated by a Standardised Root Mean Square Residual (SRMR) value of less than 0.08, Root Mean Square Error of Approximation (RMSEA) value below 0.06, and Comparative Fit Index (CFI) value of 0.90 or greater (Hu & Bentler, 1999).

Fourth, we collapsed the two groups into a single sample given factor measurement invariance and used structural equation modelling (SEM) to assess: (a) independent associations between camouflaging, autistic traits and SA, and between safety behaviours, autistic traits and SA; (b) with group added as covariate; (c) with social cognitions associated with SA. Full information maximum likelihood was used to fit raw data to the model. We note that although an adequate model fit would usually be indicated by a Chi-square likelihood ratio test *p*-value ≥.05, CFI ≥0.90, and RMSEA ≤0.08 (Hu & Bentler, 1999), the combination of small sample size and reduced degrees of freedom will likely result in larger RMSEA that will falsely indicate a poor model fit (Kenny, Kaniskan, & McCoach, 2015). We report SRMR to provide standardised effect size of overall model fit alongside RMSEA, as SRMR is more appropriate for smaller samples (Maydeu-Olivares, Shi, & Rosseel, 2018; Rosseel, 2020). Finally, we completed a post hoc exploratory analysis to identify possible construct overlap at the item level across ASBQ and CAT-Q with oblique rotation (Oblimin). We used scree plot and parallel analysis to determine the number of factors to extract from the EFA, with only items that had a loading 0.4 or greater on a single factor retained in each factor (Stevens, 2012).

Results

All participant demographic information and outcome variables are shown in Tables 1 and 2. Groups were matched on age (t (113) = 1.07, p = .29), reading ability (% correct trials) (t (94) = −0.53, p = .60), gender identity (χ^2 (5, 115) = 6.80, p = .24), ethnicity (χ^2 (3, 115) = 4.14 p = .25), presence of mental health difficulties (χ^2 (3, 115) = 3.81, p = .28), parental education (χ^2 (2, 115) = 3.96,

Table 1 Participant demographic information

	Autism (n = 61) (Mean, SD)	Non-Autism (n = 54) (Mean, SD)
Age (years)	16.34 (1.69)	16.02 (1.56)
Reading task	**(n = 51)**	**(n = 45)**
% Correct	74.75	75.86
	(n, %)	**(n, %)**
Gender		
Male	17 (27.87)	11 (20.37)
Female	36 (59.02)	37 (68.52)
Gender variant/non-conforming	6 (9.84)	1 (1.85)
Other/Prefer not to say	2 (3.28)	3 (5.56)
Ethnicity		
White	50 (81.97)	37 (68.52)
Black	3 (4.92)	8 (14.81)
Asian	1 (1.64)	2 (3.70)
Mixed/Other	7 (11.48)	7 (12.96)
Education (school type)		
State school	35 (57.38)	48 (88.89)
Private school (bursary/scholarship)	8 (13.11)	1 (1.85)
Private school (full fees)	6 (9.84)	3 (5.56)
Home-schooled	8 (13.11)	1 (1.85)
Other/Prefer not to say	4 (6.56)	1 (1.85)
Eligible for free school meals	19 (31.15)	21 (38.89)
Parent education: ≥1 parent with university degree or higher	40 (65.57)	26 (48.15)
Parent employment: ≥ 1 parent in full-time employment	56 (91.80)	47 (87.04)
Co-occurring diagnosis		
Any (≥1) mental health condition(s)	49 (80.33)	38 (70.37)
Any (≥1) physical health condition(s) diagnosis	17 (27.87)	8 (14.81)
Any (>1) co-occurring (either mental or physical) condition(s)	54 (88.52)	39 (72.22)
Mental health condition		
ADHD	9 (14.75)	0 (0)
Generalised anxiety disorder	22 (36.07)	19 (35.19)
Social anxiety disorder	19 (31.15)	8 (14.81)
Obsessive compulsive disorder	21 (34.43)	15 (27.78)
Panic	1 (1.64)	1 (1.85)
Post-traumatic stress disorder	2 (3.28)	4 (7.41)
Depression	17 (27.87)	13 (24.07)
Eating disorder	6 (9.84)	3 (5.56)
Physical health condition		
Diabetes	1 (1.64)	0 (0)
Anaemia	1 (1.64)	0 (0)
Hypermobility	2 (3.28)	0 (0)
Chronic pain	2 (3.28)	2 (3.70)
Chronic fatigue syndrome	1 (1.64)	0 (0)
Asthma	2 (3.28)	1 (1.85)
Hypothyroidism	1 (1.64)	1 (1.85)

ADHD, attention deficit hyperactivity disorder.

Table 2 Participant characterisation using outcome measures

	Autism (n = 61)		Non-Autism (n = 54)		
	Mean, SD	Range	Mean, SD	Range	t Value (df = 113)
AQ28 total	77.93 (10.23)	51–100	70.74 (11.28)	39–98	3.58***
Social behaviours total	69.07 (10.39)	41–94	62.35 (10.85)	36–88	3.39***
Numbers patterns total	13.26 (3.57)	5–20	12.24 (4.09)	5–20	1.43
SPIN total	39.41 (14.40)	4–63	39.52 (14.12)	8–61	−0.041
CAT-Q total	115.02 (29.65)	48–169	114.31 (24.06)	48–159	0.138
Compensation	37.75 (14.23)	11–63	34.69 (12.75)	9–60	1.21
Masking	37.26 (10.82)	8–54	41.02 (7.41)	19–54	−2.13*
Assimilation	40 (9.04)	12–56	38.61 (8.56)	9–53	0.84
ASBQ total	41.41 (14.18)	6–75	42.98 (11.33)	11–63	−0.65
Avoidance	19.38 (7.34)	3–36	18.94 (6.84)	1–30	0.33
Impression management	14.3 (5.66)	3–24	15.33 (4.85)	5–23	−1.04
ASCQ total	94.54 (25.88)	30–129	92.74 (25.22)	29–125	.377
RCADS – Dep	18.54 (6.85)	4–30	17.17 (6.91)	1–30	1.07
RCADS – GAD	10.67 (4.38)	1–18	12.11 (3.23)	2–18	−1.79

AQ28, Autism Quotient 28; ASBQ, Adolescent Social Behaviour Questionnaire; ASCQ, Adolescent Social Cognition Questionnaire; CAT-Q, Camouflaging Autistic Traits Questionnaire; Dep, Depression; GAD, Generalised Anxiety Disorder; RCADS, Revised Children's Anxiety and Depression Scale; SPIN, Social Phobia Inventory.
*p < .05; ***p < .001.

p = .14) and employment status (χ^2 (2, 115) = 0.76, p = .68) and eligibility for free school meals (χ^2 (2, 115) = 1.66, p = .44). Autistic adolescents scored higher on autism traits (t(113) = 3.58, p < .001) and lower on masking behaviours (t(113) = −2.13, p = .03) compared to non-autistic adolescents. Both groups were matched on symptoms of SA (p = .97), Assimilation (p = .40) and Compensation (p = .23) behaviours, SA-related safety behaviours (p = .30 to .75) and cognitions (p = .71), and symptoms of depression (p = .29) and generalised anxiety (p = .08). Autistic adolescents were more likely to be home-schooled or privately educated compared to non-autistic adolescents (χ^2 (6, 115) = 18.57, p < .01). Given the small sample sizes of adolescents who attended private education (n = 18) and other forms of education including home-schooling (n = 14) compared to state school education (n = 83) across both autism and non-autism groups, we used non-parametric Kruskal-Wallis test to explore the impact of schooling type (state vs. private vs. other types of schooling) on key outcome variables (autism traits, social anxiety symptom severity, social camouflaging total score, safety behaviours total score and social cognitions total score) across both groups. Using Bonferroni correction to control for multiple comparisons (p < .01), we found that main outcome variables did not differ by school type across the two groups (H(2) = 0.48 to 8.33, p > .016), schooling type was therefore not controlled for in further analyses.

For comparison of camouflaging and SA scores in current sample with other community adolescent samples (Bernardin et al., 2021; Cooper, Russell, Lei, & Smith, 2022; Hull et al., 2019; Hull, Lai, et al., 2020; Jorgenson et al., 2020; Lei & Russell, 2020; Ranta et al., 2007; Wood et al., 2022), see Appendix S2 Results and Table S1a,b.

Bivariate and partial correlations between social camouflaging and safety behaviours

Results of all bivariate and partial correlations are shown in Table 3. Bivariate correlations showed that within the autism group, all factors within CAT-Q and ASBQ were significantly correlated within each measure and between the two measures, and all factors were correlated with ASCQ. Within the non-autism group, all factors between CAT-Q, ASBQ and ASCQ were significantly positively correlated with each other, except for Masking which only significantly correlated with IM (r = .63).

When controlling for symptom severity of low mood, partial correlations showed that IM was associated with Masking (r = .72 and .56, respectively) and Compensation (r = .61 and .56, respectively) in both groups, but with Assimilation only in the autism group (r = .52). Avoidance was associated with Assimilation (r = .49 and .55, respectively) in both groups, but only with Compensation in the non-autism group (r = .46). ASCQ was only associated with IM (r = .54 and .46) in both groups, with Compensation (r = .43) and Assimilation (r = .47) in autism group and Avoidance (r = .46) in the non-autism group.

When controlling for symptom severity in generalised anxiety, partial correlations showed that IM was associated with all camouflaging factors in both groups (r = .41 to .69). Avoidance was associated with Assimilation in both groups (r = .59 and .55, respectively), but with Compensation only in the non-autism group (r = .49). ASCQ was associated with Assimilation (r = .50 and .39, respectively) and IM (r = .39 and .51, respectively) in both groups, but with Compensation only in the non-autism group (r = .49).

Table 3 Bivariate and partial correlations between social camouflaging, safety behaviours and social cognitions in autism and non-autism groups

	Autism					Non-Autism				
	Mask	Assim	Av	IM	ASCQ	Mask	Assim	Av	IM	ASCQ
a. Bivariate correlations										
Compensation[a]	.76*	.56*	.49*	.71*	.59*	.64*	.56*	.53*	.63*	.49*
Masking[a]	–	.50*	.38*	.77*	.50*	–	.35	.21	.63*	.34
Assimilation[a]	–	–	.69*	.67*	.66*	–	–	.61*	.49*	.52*
Avoidance[b]	–	–	–	.61*	.63*	–	–	–	.40*	.56*
Impression M[b]	–	–	–	–	.69*	–	–	–	–	.61*
ASCQ	–	–	–	–	–	–	–	–	–	–
b. Partial correlations controlling for symptom severity of low mood										
Compensation[a]	.71*	.41*	.26	.61*	.43*	.58*	.49*	.46*	.56*	.35
Masking[a]	–	.37	.16	.72*	.35	–	.25	.09	.56*	.12
Assimilation[a]	–	–	.49*	.52*	.47*	–	–	.55*	.39	.38
Avoidance[b]	–	–	–	.38*	.35	–	–	–	.29	.46*
Impression M[b]	–	–	–	–	.54*	–	–	–	–	.46*
ASCQ	–	–	–	–	–	–	–	–	–	–
c. Partial correlations controlling for symptom severity of generalised anxiety										
Compensation[a]	.69*	.42*	.31	.58*	.36	.62*	.53*	.49*	.61*	.49*
Masking[a]	–	.35	.18	.69*	.23	–	.31*	.15	.61*	.29
Assimilation[a]	–	–	.59*	.53*	.50*	–	–	.55*	.41*	.39*
Avoidance[b]	–	–	–	.43*	.43*	–	–	–	.30*	.45*
Impression M[b]	–	–	–	–	.39*	–	–	–	–	.51*
ASCQ	–	–	–	–	–	–	–	–	–	–

Bonferroni corrections to control for multiple comparisons within each group: * $p < .003$.
[a]CAT-Q, Camouflaging of Autistic Traits Questionnaire.
[b]ASBQ, Adolescent Social Behaviour Questionnaire; ASCQ, Adolescent Social Cognitions Questionnaire; Assim, Assimilation; Av, Avoidance; IM, Impression Management; Mask, Masking.

Associations between autistic traits, social anxiety, social camouflaging and safety behaviours

Using confirmatory factor analyses, both CAT-Q (χ^2 diff (69, 115) = 78.16, $p = .21$) and ASBQ (χ^2 diff (59, 115) = 74.868, $p = .08$) indicated factor loading invariance across both groups when comparing the configural and strict invariance models (see Appendix S2). Subsequent analyses therefore collapsed data from both groups into one sample to treat both autism and SA symptom severity as traits lying on a continuum. We first regressed participants' autistic traits and SA symptom severity onto the three factors underlying camouflaging (Assimilation, Masking, Compensation) and the two factors underlying safety behaviours (Avoidance and IM). This analysis indicated inconsistent model fit (χ^2 (1) = 23.61, $p < .001$; CFI = 0.95, RMSEA = 0.443 (90% CI: 0.30, 0.606), SRMR = 0.138 (90% CI: 0.082, 0.194); Figure 1a) and indicated that a greater degree of Masking and IM were associated with greater SA symptoms only ($\beta = .277$, SE = 0.06, $p = .002$; $\beta = .447$, SE = 0.03, $p < .001$, respectively) and not autistic traits ($\beta = .044$, SE = 0.08, $p = .62$; $\beta = .125$, SE = 0.038, $p = .13$, respectively). In comparison, Assimilation, Compensation and Avoidance were significantly associated with greater autism traits ($\beta = .44$, SE = 0.05, $p < .001$; $\beta = .28$, SE = 0.09, $p < .001$; $\beta = .14$, SE = 0.04, $p = .041$, respectively) and SA ($\beta = .47$, SE = 0.04, $p < .001$; $\beta = .47$, SE = 0.07, $p < .001$; $\beta = .65$, SE = 0.03, $p < .001$, respectively).

Regressing group onto the dependent variables (Figure 1b), the overall model showed inconsistent model fit (χ^2 (3) = 39.19, $p < .001$; CFI = 0.92, RMSEA = 0.32 (90% CI: 0.238, 0.418), SRMR = 0.133 (90% CI: 0.082, 0.179)), and group had a significant effect on Masking ($\beta = .242$, SE = 1.64, $p = .005$), as non-autism group had higher levels of Masking than autism group. Patterns of associations between autism traits, SA, camouflaging, and safety behaviours remained the same as model shown in Figure 1a, with the only change being IM is significantly associated with autism traits ($\beta = .19$, SE = 0.04, $p = .021$).

Adding social cognitions to the overall model (Figure 1c), the model showed inadequate model fit (χ^2 (1) = 23.61, $p < .001$; CFI = 0.958, RMSEA = 0.443 (90% CI: 0.30, 0.606), SRMR = 0.134 (90% CI: 0.08, 0.188)) and greater SA-related social cognitions was only associated with SA symptom severity ($\beta = .67$, SE = 0.123, $p < .001$), and not autistic traits ($\beta = .03$, SE = 0.155, $p = .661$). SA-related social cognitions mediated the associations between SA symptoms and Masking ($\beta = .40$, SE = 0.04, $p = .001$) and IM ($\beta = .59$, SE = 0.02, $p < .001$). Patterns of associations between autism traits, SA, and Assimilation, Compensation and Avoidance remained the same as shown in Figure 1a.

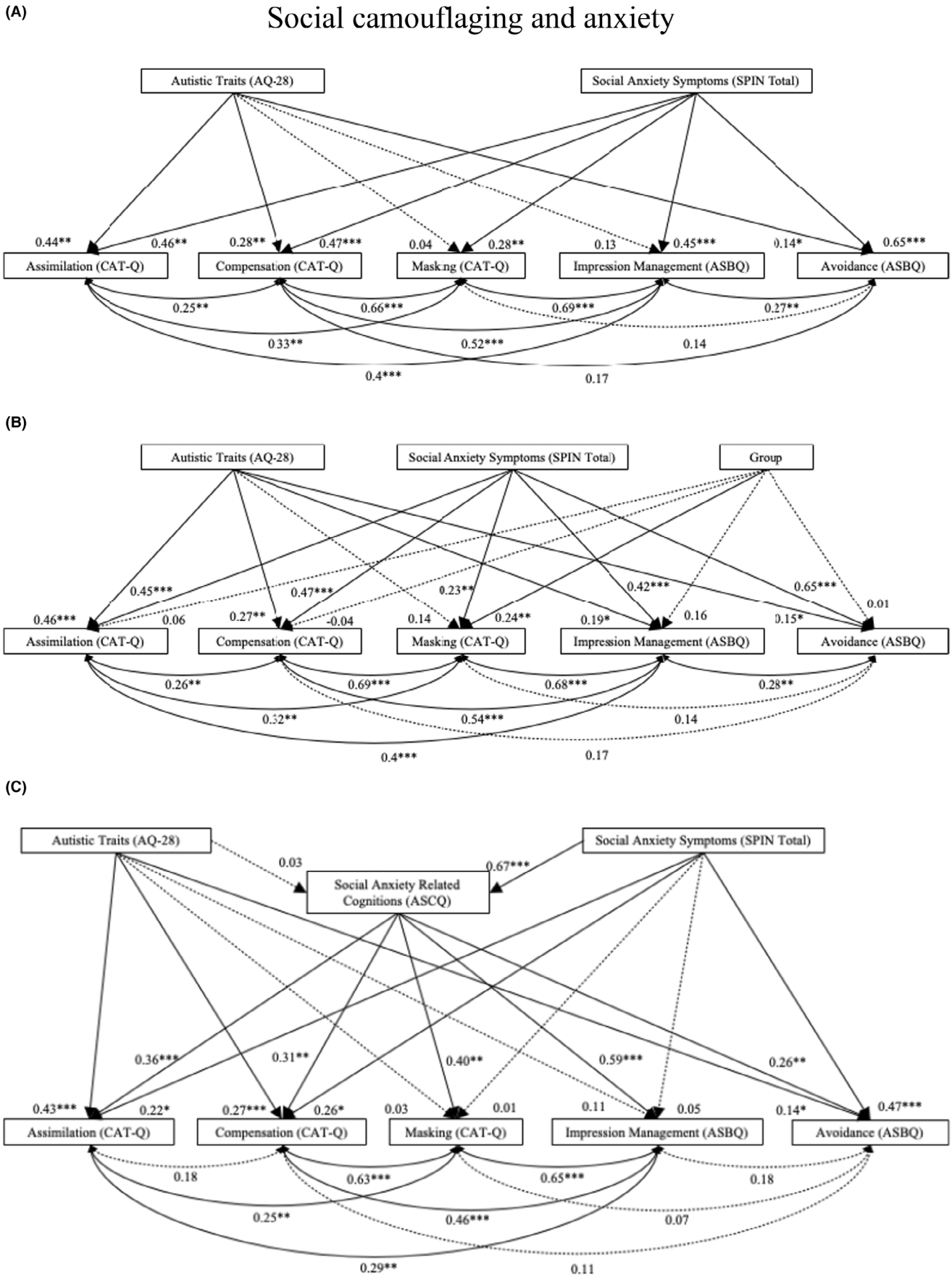

Figure 1 Structural equation models showing independent associations between (a) autistic traits, social anxiety symptoms and social camouflaging and safety behaviours; (b) when accounting for the effect of group on social camouflaging and safety behaviours; (c) when accounting for individual differences in social cognition associated with social anxiety. Standardised coefficients and covariances are shown. *$p < .05$, **$p < .01$, ***$p < .001$. AQ-28, Autism Quotient-28; ASBQ, Adolescent Social Behaviour Questionnaire; ASCQ, Adolescent Social Cognitions Questionnaire; CAT-Q, Camouflaging Autistic Traits Questionnaire.

Given constraints in model fit parameters using SEM, we completed a sensitivity analysis to examine associations between camouflaging, safety behaviours and autism traits and SA by conducting two sets of partial correlations (see Table 4). When controlling for SA symptom severity, partial correlations show that autism traits are significantly associated with Compensation ($r = .289$, $p = .002$) and Assimilation only ($r = .456$, $p < .001$) but not Masking ($p = .66$), IM ($p = .18$) or Avoidance ($p = .07$). When controlling for autism traits, partial correlations show that SA symptom severity is significantly associated with all factors underlying camouflaging and safety behaviours associated with SA ($r = .25$ to $.62$, $p < .01$). This suggests that both masking from camouflaging, IM and avoidance from safety behaviours are all only associated with symptom severity of SA, and not autism traits. Exploratory analyses to examine gender-based effects are reported in Appendix S2 and Table S2. Only the correlation between IM and SA showed statistically significant difference between the two gender groups. Those who self-identified as male showed greater use of safety behaviours in the context of SA symptom severity as opposed to autism traits when compared to those who self-identified as female.

Exploring construct overlap at individual item level between social camouflaging and safety behaviours

We explored construct overlap between items from the CAT-Q and ASBQ through exploratory factor analysis. Data were suitable for exploratory factor analysis as Kaiser-Meyer-Olkin measure of sampling adequacy (KMO = 0.834) and Bartlett's test of sphericity (χ^2 (1035) = 3408.12, $p < .001$) both met threshold. Parallel analysis and inspection of the scree plot both indicated that four factors would be suitable for extraction and interpretation. The four-factor solution explained 49.84% of the variance (Factor 1: 30.61%; Factor 2: 8.82%; Factor 3: 5.80%; Factor 4: 4.60%). The four factors showed various degrees of correlation between 0.073 to 0.395, suggesting that there is some overlap across the underlying constructs, though they were not identical to each other. Factor 1 reflects 'self-focused attention', Factor 2 reflects 'social avoidance', Factor 3 reflects 'assimilation' and Factor 4 reflects 'mental rehearsal' (See Table S3 for standardised factor loadings).

Discussion

This is the first study to investigate construct overlap between safety behaviours associated with SA and camouflaging associated with autism in adolescents. The strong positive association between masking and IM persisted over and above symptoms of low mood and GAD, and both factors were significantly associated with SA symptom severity in both groups. Exploratory analysis of gender-based effects showed that the association between safety behaviours and SA symptoms is greater in self-identified males than in self-identified females. With the caveat that sample sizes to explore potential sex-based differences based on self-identified gender in this study is much smaller compared with the overall sample, this is the first study to suggest that potential differences in safety behaviours observed between males and females may be associated with differences in co-occurring SA symptoms above and beyond that of autism traits.

Consistent with the Clark and Wells' (1995) SA model, the relationship between safety/masking behaviours and SA is via a path through SA-related cognitions. This suggests that the self-monitoring involved in masking may be analogous to increased self-focused attention that is core to processing of self as a social object in the cognitive model of SA. Although masking under camouflaging is conceptualised as 'behaviours used to hide autistic characteristics or present a non-autistic personality' (Hull et al., 2019), in the context of heightened SA during adolescence, the increase in self-focused attention may inadvertently reinforce anxious thoughts (such as related to fear of negative evaluation and believing that oneself will act outside of social norm), and safety behaviours (further IM and/or social avoidance) that maintain SA over time. Item-level breakdown of CAT-Q and ASBQ indicate some construct overlap across masking, assimilation, IM and avoidance, with items loading onto latent factors that resemble maintaining behavioural and cognitive factors identified in the Clark and Wells' (1995) model of SA, such as self-focused attention, social avoidance and mental rehearsal.

Given that most adolescents in both groups were actively engaged with mental health services and are group-matched on SA, individual differences in masking and IM may be involved in hiding self-perceived social differences beyond those associated with autism diagnosis or autistic traits alone. Previous cross-sectional studies measuring the

Table 4 Partial correlations between social camouflaging, safety behaviours, social anxiety and autism traits across combined autism and non-autism groups

	Compensation	Masking	Assimilation	Impression management	Avoidance
a. Controlling for social anxiety symptom severity measured by SPIN					
Autism traits	.29**	.04	.46***	.13	.17
Compensation[a]	–	.64***	.35***	.53***	.21*
Masking[a]	–	–	.31***	.69***	.15
Assimilation[a]	–	–	–	.41***	.42***
Impression Management[b]	–	–	–	–	.29**
Avoidance[b]	–	–	–	–	–
b. Controlling for autism traits measured by AQ-28					
Social anxiety	.45***	.25**	.48***	.42***	.62***
Compensation[a]	–	.68***	.41***	.61***	.40***
Masking[a]	–	–	.40***	.71***	.26**
Assimilation[a]	–	–	–	.52***	.57***
Impression Management[b]	–	–	–	–	.45***
Avoidance[b]	–	–	–	–	–

[a]CAT-Q, Camouflaging of Autistic Traits Questionnaire.
[b]ASBQ, Adolescent Social Behaviour Questionnaire; AQ-28, Autism Quotient-28; SPIN, Social Phobia Inventory.
***$p < .001$; **$p < .01$; *$p < .05$.

association between CAT-Q and mental health difficulties in adolescents and adults have suggested that greater camouflaging may be associated with burnout, exhaustion and poorer mental health outcomes (Beck et al., 2020; Bernardin et al., 2021; Hull et al., 2019, 2021; Hull, Lai, et al., 2020; Mandy, 2019), though direction of causation cannot be determined without longitudinal studies. The current finding that non-autism group scored higher on masking than autistic adolescents supports the notion that aspects of camouflaging such as masking and compensation may be conceptualised as coping strategies in social situations that are not unique to autism (Fombonne, 2020).

Given that IM has long been outlined as a key mechanism underlying self-presentation (Goffman, 1959), effective self-presentation relies on self-other monitoring to collate information from the external environment to enable one to assess the success of IM and adjust accordingly in the social situation (Ai et al., 2022). In the context of safety behaviours in SA (i.e. behaviours in response to anxiety in social situations and to reduce fear of negative evaluation from others), one key difference is that the focus of attention is largely internal, such that behaviours may be driven by one's own belief that they are coming across badly in social situations, rather than relying on external feedback from others to check the facts of how one is really presenting oneself in the eyes of others. IM in such contexts does serve the function of improving self-presentation as there is no negative effect on social interactions compared to avoidance-based safety behaviours, though the reliance and dependence on such strategies in social situations might maintain SA over time.

Given that masking and assimilation subscales of camouflaging show construct overlap with IM in safety behaviours, it may be that such behaviours are driven by internal focus of attention in social situations, in response to anxiety and to keep oneself safe from doing things that may increase negative evaluation from others. In contrast, the lack of association between compensation and IM may suggest that such behaviours are more related to external focus of attention and monitoring the behaviour of others (e.g. 'I deliberately copy their language or facial expressions', 'I have tried to improve my understanding of social skills by watching other people'). As Ai et al. (2022) discussed, the presence of the double empathy problem in cross-neurotype coupling along with reduced tolerance of uncertainty (Jenkinson, Milne, & Thompson, 2020) in social situations might make IM a far more cognitively effortful process for autistic individuals to engage in and may require greater monitoring of others through external focus of attention. The external focus of attention to monitor the environment and others may reflect IM in the general population beyond that of safety behaviours in the context of SA.

This is one of the first studies to provide some psychometric validation for the use of CAT-Q in autistic and non-autistic adolescents, the degree of discrepancy in camouflaging scale scores between the two groups is considerably smaller than previous studies in adults (Hull et al., 2019; Hull, Lai, et al., 2020). Given that adolescence is a developmental period marked by heightened awareness of peer acceptance/rejection and identity development (Blakemore & Robbins, 2012; Leigh & Clark, 2018), behaviours related to self-presentation in social contexts (both encapsulating camouflaging and IM) may be particularly important to adolescents to ensure they fit in with their peers, irrespective of autism diagnosis.

Previous research suggested that adolescents in secondary education are particularly prone to experiencing elevated distress from academic and social pressures and from hiding their emotional difficulties from others so to not come across as different (Flett, Hewitt, Nepon, & Zaki-Azat, 2018). The hiding of one's psychological distress during adolescence has long been associated with increased risk of 'flying under the radar' and not receiving adequate and timely support, which overtime can further negatively impact their self-esteem and ability to cope with external stressors (Elliott, 1982). This study presents preliminary evidence to support the notion that masking one's true self may not be uniquely associated with autism-specific differences during adolescence, but may reflect an exaggeration of the more commonly observed developmental phenomenon of choosing to present one's false self to gain social acceptance and validation from others during this turbulent time of change (Harter, Marold, Whitesell, & Cobbs, 1996).

Strengths, limitations and future directions

A major strength of this paper is in using a well-matched and largely clinical sample of autistic and non-autistic adolescents, with comparable levels of SA symptom severity. However, this study has several limitations to consider when interpreting findings. First, the sample is of modest size and largely recruited from clinics, with many having co-occurring mental and physical health conditions. Given potential diagnostic overshadowing, it is possible that some adolescents in the non-autism group may meet autism diagnostic criteria if assessed clinically by professionals. However, a novelty in this study's design is to match both groups on SA symptom severity. Standardised assessment measures for SA (SPIN) and autism traits (AQ-28) may show construct overlap when there is high degree of SA present, and adolescents may conflate some of the behaviours reported across both questionnaires, resulting in higher scores on both measures using self-reports (White, Bray, & Ollendick, 2012). For example, behaviours underlying IM (e.g. 'Try to stay in control of your behaviour' – ASBQ) and masking (e.g. 'I monitor my body language or facial expressions so that I appear interested by the person I am interacting with' – CAT-Q) may look very similar due to increasing self-monitoring and internal focus of attention, and adolescents may not be able to differentially relate such behaviours to either SA or autism traits when using self-report measures. Future studies may ask clinicians to consider using observer ratings and clinician ratings to triangulate anxiety and autism trait reports across individuals and contexts, to try and disentangle potential symptom overlap between autism traits/camouflaging and SA/safety behaviours and reduce possible diagnostic overshadowing.

When exploring the associations between camouflaging and IM, we treated both autism traits and SA symptom severity as lying on a continuum across the whole sample rather than by diagnostic group. By having a comparison group that showed similar profile of complexity in clinical presentation that was matched by SA symptom severity, we are more interested in the impact of differences in autism traits between the groups that may have an impact on social camouflaging differences when controlling for SA symptom severity. Therefore, the generalisability of the patterns of results may not be limited by autism diagnosis per se, but rather extend to adolescents with higher levels of autism and SA traits. Future studies may benefit from having a control sample of adolescents with low levels of SA without autism following formal assessment to further compare similarities and differences in camouflaging and safety behaviours. Using a larger and more diverse sample of adolescents across all three groups will allow future studies to examine possible interaction effects with social identity characteristics such as race, sex assigned at birth and gender identity and explore whether camouflaging and IM may be related to other sociodemographic characteristics beyond autism and SA symptomatology. Future studies might wish to take a developmental perspective by comparing CAT-Q scores across younger children, adolescents and adults, to further explore changes in camouflaging over time.

This study did not have information on age of autism diagnosis for the autism group, and recent studies suggested that prolonged autism diagnostic process for many autistic females might increase their self-awareness of autism traits and the need to camouflage (Begeer et al., 2013; Milner, Colvert, Mandy, & Happé, 2022). Like previous literature in camouflaging, this study is cross-sectional in nature, and future studies that adopt a longitudinal design may consider the impact that age at autism diagnosis may have on children's development over the course of adolescence. Longitudinal studies can offer further insight into the direction of causality between camouflaging, safety behaviours and SA among autistic and non-autistic youths, while accounting for potential interaction between age at diagnosis and sex-based differences in autism presentation across the development.

This study was limited to measuring camouflaging using self-report measures. Future studies can also include behaviour-cognition discrepancy approach by identifying mismatch between observable social behaviours and underlying social cognitions (Milner et al., 2022) to evaluate effectiveness of adolescents' safety and camouflaging behaviours in social situations and explore whether there may be between-group differences in observer ratings on how each group performs when accounting for SA and autistic traits. Finally, this study did not randomise the order of administration of

questionnaires across participants. Although CAT-Q questions used an ascending scale, and ASBQ used both ascending and descending scales, to reduce potential left-side selection bias or primacy effect as part of response-order effects when completing written questionnaires (Chyung, Kennedy, & Campbell, 2018), future studies can randomise the order of questionnaires to further control for response-order effects.

Clinical implications

This study raises the possibility that 'masking' as a construct defined in camouflaging may be a perpetuating factor in maintaining SA among adolescents with and without autism diagnosis. From SA literature in neurotypical adolescents, although IM maintains SA over time, it is not associated with additional negative effects on social interaction when compared to avoidance behaviours (Evans et al., 2021; Gray et al., 2019). However, as literature suggests that increased camouflaging is associated with poorer mental health in autistic adolescents and adults (Bernardin et al., 2021; Hull et al., 2021), clinicians can carefully assess and formulate with the adolescent the short and long-term pros and cons of camouflaging versus social avoidance in relation to SA and autism traits, so to avoid any potential increases in increasing negative effects on social interactions were adolescents to reduce camouflaging and/or IM.

Given that cognitive therapy for SA assumes that individuals do not have underlying social skill differences when asked to drop safety behaviours, autistic individuals asked to drop SA-related safety behaviours may still use camouflaging to hide their social skill difficulties. Given that socially anxious individuals who tend to use more IM than avoidance as part of their safety behaviours may be less vulnerable to experiencing peer victimisation and better friendship quality than those who engage in avoidance (Evans et al., 2021; Plasencia, Alden, & Taylor, 2011), it is important to consider how to help autistic individuals understand how the potential short-term benefits associated with masking may be outweighed by potential maintenance of SA in the long-term.

Promoting self-knowledge and reflection of the intersection between one's autism and mental health difficulties can raise adolescents' conscious awareness of what their 'mask' looks like when compared to core parts of self-identity in order to make informed decisions about whether or not to 'unmask' (Pearson & Rose, 2021). By adopting a strength-based approach to build a more positive autism identity (Cooper et al., 2022; Cooper, Smith, & Russell, 2017), clinicians can support autistic adolescents to develop more self-compassion towards their differences in both individual and group based interventions where social acceptance of neurodiversity can be modelled (Bernardin et al., 2021; Chapman, Rose, Hull, & Mandy, 2022).

Finally, given that camouflaging and IM may both be responses to manage and reduce experiences of stigma for those with elevated autism traits and social communication differences (Perry, Mandy, Hull, & Cage, 2022), professionals have a responsibility to actively promote acceptance and inclusivity of autistic adolescents by non-autistic peers and reduce autism-associated stigma and help to reduce environmentally induced demands for adolescents to socially camouflaging or manage their impressions in social situations.

Supporting information

Additional supporting information may be found online in the Supporting Information section at the end of the article:

Appendix S1. Methods.

Appendix S2. Results.

Table S1. Comparison of scores from current study to previous studies in autistic and non-autistic samples.

Table S2. Partial correlations between social camouflaging, safety behaviours, social anxiety and autism traits across self-identified males and females in both autism and non-autism groups.

Table S3. Exploratory Factor Analysis combining items from CAT-Q (Assimilation, Masking, Compensation) and items from ASBQ (Avoidance, Impression Management).

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Key points

- Social camouflaging and safety behaviours in social anxiety (SA) are both associated with hiding one's authentic self in social situations to reduce potential negative evaluation from others.
- This study found that masking and impression management behaviours are significantly associated with SA, not autism traits, in autistic and non-autistic adolescents with elevated SA symptoms.
- Clinicians working with autistic adolescents with SA need to carefully assess and formulate potential construct overlap between camouflaging and safety behaviours, and to strike a balance between autism psychoeducation and supporting the adolescent to drop safety behaviours in cognitive therapy for SA during treatment planning.

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