

Associations between social camouflaging and internalizing symptoms in autistic and non-autistic adolescents

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Abstract

Autistic individuals experience higher rates of psychiatric comorbidities than their peers. Camouflaging, the process through which individuals hide autistic traits, can be detrimental to mental health. This may be particularly true for autistic females, although research on sex differences in the relationship between camouflaging and mental health has focused on adults. The purpose of this study was to extend previous research on camouflaging and mental health through examining age, sex, autism diagnosis, and camouflaging as predictors of depression, anxiety, and stress levels in autistic and non-autistic adolescents. One hundred forty adolescents ages 13–18 years (62 non-autistic, 58 female) completed an online survey including measures of camouflaging, autistic traits, and internalizing symptoms. Hierarchical linear regression was used to examine age, sex, diagnosis, and camouflaging as predictors of internalizing symptoms. Findings suggest that level of camouflaging is an important predictor of depression, anxiety, and stress in autistic and non-autistic adolescents and that camouflaging may be particularly distressing for females, regardless of diagnosis. These findings inform our understanding of camouflaging and its consequences and point to future directions for support for autistic and non-autistic adolescents. Clinicians may consider interventions targeting social skills, self-acceptance, and self-esteem to reduce possible negative effects of camouflaging.

Lay abstract

Autistic individuals have more mental health difficulties than non-autistic individuals. It is important to understand why this might be. Research has shown that camouflaging, or strategies used to hide autistic traits, might contribute to mental health difficulties in autistic adults. We examined whether this was also the case for autistic adolescents. This study included 140 adolescents ages 13–18 years (62 non-autistic, 58 female). All participants answered questions about camouflaging, autistic traits, and mental health difficulties. We found that autistic and non-autistic adolescents who reported higher levels of camouflaging also reported higher levels of depression, anxiety, and stress. We also found that camouflaging might be particularly stressful for females. These findings improve our understanding of camouflaging during adolescence and point to potential ways to support autistic adolescents, such as help with social skills, self-acceptance, and self-esteem. The findings also support the importance of increasing autism acceptance in the general population.

Keywords

adolescents, anxiety, autism spectrum disorders, camouflaging, depression

Introduction

Psychiatric comorbidities are common among autistic individuals and have many negative consequences, such as decreases in daily functioning levels (Mattila et al., 2010). Anxiety may lead to increase in social withdrawal among autistic individuals, and comorbid depression is associated with increased suicidality (Cassidy et al., 2014). Autistic individuals have higher rates of suicidal ideation and attempts compared to the general population (Cassidy et al., 2014). It is important to understand the mechanisms

behind the increased risk for psychiatric comorbidities in autistic individuals, and one potential explanatory factor is the use of strategies to hide autistic traits. The use of these strategies is known as camouflaging, and it has been shown

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to be associated with poorer mental health in adults (Hull et al., 2019). However, there is a need to understand the role camouflaging may play in adolescence.

Internalizing symptoms and disorders in autistic and non-autistic adolescents

Many studies find that autistic adolescents report higher levels of internalizing symptoms (e.g. anxiety, depression, and stress) and higher prevalence of internalizing disorders (e.g. generalized anxiety disorder and major depressive disorder) than their non-autistic peers. For example, studies have found that autistic adolescents report higher levels of anxiety and depression than non-autistic adolescents (Keith et al., 2019; Mertens et al., 2017; Rynkiewicz & Łucka, 2015; van Steensel et al., 2011). Anxiety disorders are reportedly the most common comorbid conditions in autistic youth, with a meta-analysis reporting the average prevalence rate to be around 40% across studies (van Steensel et al., 2011). This meta-analysis included children up to age 18 years and found that studies with older youth reported higher prevalence of anxiety than studies with younger participants. Thus, it is reasonable to estimate that the prevalence in autistic adolescents is higher than 40%. In comparison, around 32% of non-autistic adolescents meet criteria for an anxiety disorder (Merikangas et al., 2010). Similarly, parents of 20.2% of a sample of 1272 autistic adolescents reported that their child had been diagnosed with depression (Greenlee et al., 2016). This is nearly double the prevalence rate reported for non-autistic adolescents by a nationally representative survey of over 10,000 adolescents (11.0% lifetime prevalence; Avenevoli et al., 2015).

While non-autistic adolescent females report higher levels of anxiety and mood disorders than non-autistic males, there have been conflicting findings regarding sex differences in psychiatric comorbidities among autistic adolescents (Merikangas et al., 2010). Some studies including autistic adolescents report the same trends by sex while others report no significant differences or even reversed trends (Margari et al., 2019; Mattila et al., 2010; Oswald et al., 2016; Rynkiewicz & Łucka, 2015). These largely mixed findings regarding sex differences in psychiatric comorbidities in autism may be due to differences in sample size, sex distributions, and measures used across studies.

An important, but underutilized, methodological component for research comparing psychiatric comorbidities in autistic and non-autistic youth is to include autistic and non-autistic adolescents in the same study samples in order to compare across both sex and diagnosis while reducing variability due to samples and procedures. This can improve understanding of the similarities and differences for these populations. Studies including both autistic and non-autistic adolescents have found that adolescent autistic females may report higher levels of anxiety and depression than non-autistic females, while the same pattern is not found

for males (Oswald et al., 2016; Pisula et al., 2016). Another study including both autistic and non-autistic adolescents ages 8–18 years found that autistic females were at heightened risk for internalizing symptoms compared to autistic males and non-autistic females (Solomon et al., 2012). The number of studies examining psychiatric comorbidities in autistic adolescents that include both autistic and non-autistic participants is quite limited in number, despite the clear need for and implications of such research.

Relation of camouflaging to mental health and well-being

An important aspect of understanding mental health in autistic individuals is understanding what factors may contribute to poorer mental health and well-being. One topic in this area that has received considerable interest recently is the construct of camouflaging. This is the process through which autistic individuals mask, hide, or compensate for their autistic traits (Hull et al., 2019). Camouflaging is similar to the well-developed construct of self-monitoring, or sensitivity to the expressive behaviors of others and the ability to modify self-presentation across settings (Lennox & Wolfe, 1984). Both camouflaging and self-monitoring reflect behavior change with the goal of managing the impression made on others, and the similarities between the two constructs have been noted by researchers (Hull et al., 2019; Lai et al., 2019). However, one way in which camouflaging is differentiated from self-monitoring is by its specific focus on strategies used to compensate for social difficulties related to autistic traits, which exist at varying levels across non-autistic and autistic individuals (Constantino & Todd, 2003). Findings show that autistic adults tend to report higher levels of camouflaging than non-autistic adults (Hull et al., 2019; Hull, Lai, et al., 2020; Robinson et al., 2020). Some studies suggest that autistic females may engage in higher levels of camouflaging than autistic males (e.g. Hull, Lai, et al., 2020). However, findings in this area are mixed and others have reported no sex differences (e.g. Cage & Troxell-Whitman, 2019).

Although research on camouflaging has focused mainly on measuring levels in adults, the construct seems particularly relevant to adolescents due to the similarities between camouflaging and self-monitoring and what is known about related developmental processes during this time. Studies in non-autistic populations show that self-monitoring behaviors and concern for formation of and acceptance into peer groups develop across the lifespan, beginning as early as 6 years of age (e.g. Banerjee, 2002; Bennett & Yeeles, 1990a, 1990b; Parker & Gottman, 1989; Watling & Banerjee, 2007). Self-monitoring is a component of the typical developmental process of identity formation, and it tends to increase throughout adolescence in response to the desire to form peer relationships in increasingly complex social landscapes (Erikson,

1980; Kumru & Thompson, 2003; Pledger, 1992; Selman, 1980). The similarities between camouflaging and self-monitoring suggest that adolescence may also be a time when individuals engage in high levels of camouflaging behaviors.

An earlier study using this study's sample suggested that both autistic and non-autistic adolescents camouflage, and that while non-autistic participants significantly increased their use of camouflaging throughout adolescence, autistic participants did not (Jorgenson et al., 2020). The finding in non-autistic participants is consistent with the literature indicating that the use of behaviors to modify self-presentation increases throughout adolescence in non-autistic individuals (Pledger, 1992). However, both the younger and older autistic participants in this sample reported camouflaging levels similar to the older non-autistic participants, suggesting that autistic adolescents may begin camouflaging at high levels earlier than their non-autistic peers. Another study in youth ages 7–14 years also found that both autistic and non-autistic participants camouflaged autistic traits (Wood-Downie et al., 2020). However, these studies are, to our knowledge, the only examination of camouflaging in non-autistic adolescents to date, and many questions about camouflaging in autistic and non-autistic adolescents remain.

Individuals report that camouflaging can be beneficial. Researchers suggest that camouflaging improves the ability of autistic individuals to fit in with others (Cage & Troxell-Whitman, 2019). Clinicians have noted that some autistic individuals appear to use cognitive skills in order to respond appropriately in social situations (Attwood, 2007). Autistic adults also report that camouflaging has helped them improve their connections with others, gain employment, and get along with others at work. They also report that camouflaging their autism so others are not aware of their diagnosis makes it more likely that they will be accepted by peers (Hull et al., 2017). In this study of autistic adults, males were more likely to report positive consequences of camouflaging than females. The authors posited that this may be due to the use of different camouflaging techniques which could lead to different consequences or to camouflaging being a more satisfying process for males, although they did not elaborate on these points (Hull et al., 2017). The benefits of camouflaging have not been studied for non-autistic individuals. However, research has shown that self-monitoring is positively associated with well-being and negatively associated with loneliness in non-autistic individuals (Clinton & Anderson, 1999; Selvidge et al., 2008).

Despite its potential benefits, camouflaging has also been associated with maladjustment in both autistic and non-autistic adults. This is opposite of the association between self-monitoring and well-being and highlights the second important difference between the two constructs. Camouflaging has been related to higher rates of

depression, anxiety, and reduced feelings of acceptance in autistic adults, particularly for autistic women (Bargiela et al., 2016; Cage et al., 2018; Hull et al., 2017; Lai et al., 2017). While there is a lack of qualitative research on camouflaging in autistic men, autistic women describe feeling drained after camouflaging due to the amount of effort involved in monitoring social situations and quickly deciding how to respond in a way that will be deemed socially appropriate (Baldwin & Costley, 2016; Hull et al., 2017). In non-autistic adults, higher levels of camouflaging are associated with higher levels of psychological distress and lifetime suicidality (Beck et al., 2020; Cassidy et al., 2019). The association between camouflaging and suicidality in autistic individuals reported by Cassidy et al. (2019) was mediated by thwarted belongingness. Although the nature of the relationship between camouflaging and poorer mental health is unclear, potentially reflecting unidirectional or bidirectional causality, or merely correlational as a byproduct of other variables, the clear association between camouflaging and internalizing symptoms warrants further study. To our knowledge, no studies have yet been published examining the potential relationship between camouflaging and internalizing symptomatology in autistic and non-autistic adolescents.

Current study

This study examines the role of sex, diagnosis, and camouflaging in relationship to symptoms of depression, anxiety, and stress in autistic and non-autistic adolescents. Specifically, we aimed to determine whether levels of camouflaging would significantly predict levels of internalizing symptoms above and beyond sex and diagnosis. This research may improve our understanding of the consequences of camouflaging for autistic and non-autistic adolescents and aid in identifying areas for improved support to decrease mental health difficulties and increase well-being.

Methods

Participants

One hundred forty adolescents ages 13–18 years participated in this study. A power analysis conducted using G*Power (Faul et al., 2007) indicated that this sample size was sufficient to detect main effects and interactions with a medium effect size ($f^2=0.15$; Cohen, 1988), an alpha of 0.05, and a power of 0.80 (minimum needed $n=103$). Participants included 78 autistic adolescents (23 females and 55 males) and 62 non-autistic adolescents (35 females and 27 males). Mean age was similar across groups (autistic sample mean (M)=15.03 and standard deviation (SD)=1.68; non-autistic sample M=15.31 and SD=1.65).

Autistic participants were eligible for the study if they were diagnosed with autism, between the ages of 13 and 18 years, and did not have a diagnosis of intellectual disability. They were recruited through the database of a specialty clinic for autism and through the Simons Foundation Powering Autism Research for Knowledge (SPARK) database (SPARK Consortium, 2018). Non-autistic participants, eligible if they were between the ages of 13 and 18 years and did not have a diagnosis of autism or an individualized education program (IEP; based on self- or parent-report), were recruited through advertisements in a local university email announcement (sent to all university faculty, staff, and students) and social media. Confirming that the non-autistic participants did not have an IEP provided evidence that their cognitive ability was sufficient to respond to the survey questions independently.

Measures

All participants completed the Subthreshold Autism Traits Questionnaire (SATQ; Kanne et al., 2012), the Camouflaging Autistic Traits Questionnaire (CAT-Q; Hull et al., 2019), and the short-form Depression Anxiety Stress Scales (DASS-21; Lovibond & Lovibond, 1995) and provided basic demographic information (age and sex).

The SATQ is a measure used to assess autistic traits that has been shown to be highly correlated with other self-report measures of autistic traits and to have good internal consistency ($\alpha=0.73\text{--}0.91$) and reliability (0.79) in autistic and non-autistic individuals ages 16 years and older (Kanne et al., 2012; Nishiyama et al., 2014). It includes 24 items and 5 subscales (social interaction and enjoyment, expressive language, reading facial expressions, oddness, and rigidity). Participants rated each item on a 4-point Likert-type scale from “false, not true at all” to “very true,” with higher scores reflecting higher levels of autistic traits. Example items include “I sometimes take things too literally, such as missing the point of a joke or having trouble understanding sarcasm” and “I enjoy social situations where I can meet new people and chat (i.e. parties, dances, sports, games).” Internal consistency of the SATQ in this sample was excellent ($\alpha=0.91$).

The CAT-Q contains 25 items related to camouflaging behaviors. Participants rated each item on a 7-point Likert-type scale from “strongly agree” to “strongly disagree.” Higher scores on the CAT-Q reflect higher levels of camouflaging behaviors. Example CAT-Q items include “I have tried to improve my understanding of social skills by watching other people” (compensation), “I always think about the impression I make on other people” (masking), and “In social situations, I feel like I am ‘performing’ rather than being myself” (assimilation).

The CAT-Q has demonstrated excellent internal consistency ($\alpha=0.94$) and acceptable reliability (0.77) in previous research (Hull et al., 2019). It has also shown to be

positively correlated with autistic traits in both autistic and non-autistic individuals (Hull et al., 2019). The CAT-Q has not yet been validated in individuals ages 13–15 years. However, analyses of internal consistency of the CAT-Q in this study across 13 to 15-year-old participants and 16 to 18-year-old participants suggested acceptable levels across groups (13–15 years, $\alpha=0.857$; 16–18 years, $\alpha=0.864$). In the current sample, overall internal consistency of the CAT-Q was also good ($\alpha=0.86$).

The DASS-21 is a shortened version of the Depression Anxiety Stress Scales, a 42-item measure used to assess internalizing symptomology (Lovibond & Lovibond, 1995). The DASS-21 has 21 items and 3 subscales (depression, anxiety, and stress). The DASS-21 total score is a valid measure of general psychological distress (Henry & Crawford, 2005). Participants rate each item on a 4-point Likert-type scale from “did not apply to me at all” to “applied to me very much or most of the time” based on the past week. Higher scores represent higher symptom levels. The DASS-21 has been shown to be appropriate for use with adolescents, including adolescents on the autism spectrum (Griffiths et al., 2017; Mellor et al., 2015). It has demonstrated excellent internal consistency in autistic adolescents ($\alpha=0.94$; Rhind et al., 2014). Internal consistency of the DASS-21 in this sample was excellent ($\alpha=0.91$).

Procedure

All study procedures were approved by the university Institutional Review Board (IRB), and consent/assent was obtained for all participants. Autistic community members were not involved in the development, design, or interpretation of results. For participants ages 13–17 years, caregivers were emailed a link to survey information and consent forms. Caregivers could then provide consent for their child to participate before providing the link to their children. Survey information was also presented to the adolescents prior to obtaining their assent to participate. Participants who were 18 years old reviewed information and consent forms themselves. Completion of the surveys took approximately 10–20 min and participants could exit and return to the survey to complete it within 1 week of starting.

Analysis

All analyses were performed in R (R Core Team, 2020). Figures were created using the ggplot2 package in R (Wickham, 2016). Hierarchical regression analyses were used to examine the relationship between DASS-21 internalizing symptoms and age, diagnosis, sex, and CAT-Q total scores. A separate set of analyses was conducted for each subscale of the DASS-21 (depression, anxiety, and stress). Continuous predictors were mean centered in order

Table 1. Mean values and standard deviations.

| | Autistic sample | | | Non-autistic sample | | |
|---------------------|-----------------|----------------|---------------|---------------------|----------------|---------------|
| | All | Female | Male | All | Female | Male |
| <i>N</i> | 78 | 23 | 55 | 62 | 35 | 27 |
| SATQ total (SD) | 38.74 (11.17) | 39.52 (10.48) | 38.41 (11.53) | 20.98 (8.54) | 19.54 (7.75) | 22.85 (9.29) |
| Social interaction | 13.26 (5.39) | 13.64 (5.10) | 13.10 (5.55) | 7.02 (4.03) | 6.20 (3.38) | 8.12 (4.61) |
| Expressive language | 3.94 (1.90) | 3.90 (2.09) | 3.96 (1.83) | 2.42 (1.52) | 2.26 (1.48) | 2.63 (1.57) |
| Facial expressions | 5.47 (2.40) | 5.21 (2.43) | 5.58 (2.40) | 2.50 (2.03) | 2.23 (1.78) | 2.86 (2.30) |
| Oddness | 6.95 (3.44) | 7.04 (3.78) | 6.91 (3.32) | 3.66 (2.72) | 3.73 (2.99) | 3.56 (2.39) |
| Rigidity | 9.30 (2.83) | 9.30 (2.93) | 9.30 (2.81) | 5.42 (2.69) | 5.23 (2.98) | 5.67 (2.29) |
| CAT-Q total (SD) | 99.46 (21.27) | 106.13 (22.37) | 96.67 (20.35) | 98.39 (21.36) | 101.25 (21.32) | 94.67 (21.25) |
| DASS-21 total (SD) | 35.43 (19.62) | 34.87 (21.81) | 35.69 (18.78) | 25.55 (19.18) | 30.17 (20.33) | 19.56 (16.01) |
| Depression | 9.57 (8.52) | 8.96 (9.34) | 9.84 (6.95) | 7.00 (6.86) | 7.94 (6.95) | 5.78 (6.66) |
| Anxiety | 10.19 (8.15) | 10.61 (8.69) | 10.00 (7.58) | 7.84 (6.99) | 9.26 (7.58) | 6.00 (5.77) |
| Stress | 16.41 (8.83) | 15.30 (9.30) | 16.90 (8.71) | 10.45 (7.95) | 12.51 (8.71) | 7.78 (5.98) |

SD: standard deviation; SATQ: Subthreshold Autism Traits Questionnaire; CAT-Q: Camouflaging Autistic Traits Questionnaire; DASS-21: short-form Depression Anxiety Stress Scales.

to increase interpretability of intercepts and interactions (Judd et al., 2017). Age was entered into the first block of each analysis as a control variable. Diagnosis and sex were added to the model in the second block as initial variables of interest based on findings in the literature regarding differences in internalizing symptoms by sex and diagnosis. CAT-Q total scores were added to the model in the third block to examine whether camouflaging levels explained variance in internalizing symptoms above and beyond other variables of interest. Finally, two-way interactions between all variables of interest (diagnosis, sex, and CAT-Q scores) were added to the models in block 4 and the three-way interaction of these variables was added in a fifth block if a significant two-way interaction was found. Follow-up analyses of simple slopes and comparisons of mean values were conducted when significant interactions were identified. The data met all assumptions of linear regression.

Results

Table 1 presents mean values and SDs for all study variables. CAT-Q scores for autistic participants ($M=99.46$) are similar to those reported by Hull, Petrides, and Mandy (2020; $M=105.03$) in an autistic adolescent sample. SATQ scores for both autistic participants ($M=38.7$) and non-autistic participants ($M=21.0$) were similar to those reported by Kanne et al. (2012; autistic $M=40.8$ and non-autistic $M=22.7$) in the original development of the measure. SATQ scores and CAT-Q scores were significantly correlated for non-autistic individuals, $r(60)=0.40$, $p=0.001$, but not for autistic individuals $r(75)=-0.01$, $p=0.95$. Hierarchical regression analysis was used to examine predictors of DASS-21 subscale scores (depression, anxiety, and stress). A summary of the results of these

analyses is provided in Table 2, and figures for the best fitting model for each subscale score are shown in Figure 1.

Depression and anxiety scores were best predicted by Model 3, which included age, diagnosis, sex, and CAT-Q total scores as predictors. For both depression and anxiety, CAT-Q was the only significant predictor, with higher levels of camouflaging predicting higher symptoms of depression and anxiety. Model 4, examining two-way interactions, was not significantly better than Model 3, and none of the two-way interactions were significant.

Stress scores were best predicted by Model 4, which included age, diagnosis, sex, CAT-Q total scores, and all two-way interactions between diagnosis, sex, and CAT-Q total scores as predictors. In this model, diagnosis and sex were both significant predictors of stress, although their interpretation is qualified by the significant two-way interactions of sex \times diagnosis and sex \times CAT-Q. Follow-up analyses were conducted to probe the two significant two-way interactions. Regarding the significant interaction between sex and diagnosis, there was no significant difference on stress scores ($t(56)=-1.162$, $p=0.25$, $d=0.29$, BCa 95% confidence interval (CI) $[-7.599, 2.019]$) between autistic females ($N=23$, $M=15.30$, $SD=9.93$) and non-autistic females ($N=35$, $M=12.51$, $SD=8.71$). However, there was a significant difference in stress scores ($t(76)=-4.883$, $p<0.01$, $d=1.22$, BCa 95% CI $[-12.846, -5.402]$) between autistic males ($N=51$, $M=16.90$, $SD=8.67$) and non-autistic males ($N=27$, $M=7.78$, $SD=5.98$), with autistic males reporting higher levels of stress. Regarding the significant interaction between camouflaging and sex, camouflaging was not a significant predictor of DASS-21 stress scores for males ($b=0.02$, $t(79)=0.40$, $p=0.69$, BCa 95% CI $[-0.07, 0.10]$), while it was a significant predictor of stress scores for females ($b=0.23$, $t(55)=4.60$, $p<0.01$, BCa 95% CI $[0.13, 0.33]$).

Table 2. Results of hierarchical regression analyses predicting DASS-21 scores.

| Model (M) ^a | Adjusted R ² | Significant predictors | F | B [95% CI] | t |
|--|-------------------------|------------------------|---------|------------------------|-------|
| DASS-21 depression | | | | | |
| M1: age | 0 | – | 0.06 | – | – |
| M2: sex, diagnosis | 0.01 | – | 1.3 | – | – |
| M3: CAT-Q | 0.1 | CAT-Q | 4.50** | 0.12** [0.05, 0.28] | 3.7 |
| M4: two-way interactions ^b | 0.1 | Dx | 3.23** | 3.70* [0.15, 7.25] | 2.06 |
| DASS-21 anxiety | | | | | |
| M1: age | 0 | – | 0.81 | – | – |
| M2: sex, diagnosis | 0.02 | Dx | 1.92 | 2.87* [0.18, 5.56] | 2.11 |
| M3: CAT-Q | 0.21 | CAT-Q | 9.92*** | 0.16*** [0.11, 0.22] | 5.7 |
| M4: two-way interactions ^b | 0.21 | Dx | 6.06*** | 3.83* [0.57, 7.09] | 2.33 |
| | | CAT-Q | | 0.12* [0.01, 0.22] | 2.26 |
| DASS-21 stress | | | | | |
| M1: age | 0 | – | 0.8 | – | – |
| M2: sex, diagnosis | 0.11 | Dx | 6.36** | 6.40*** [3.42, 9.36] | 4.25 |
| M3: CAT-Q | 0.17 | Dx | 7.58*** | 6.02*** [3.13, 8.91] | 4.13 |
| | | CAT-Q | | 0.11** [0.03, 0.17] | 3.15 |
| M4: two-way interactions ^b | 0.24 | Dx | 7.00*** | 9.12*** [5.41, 12.82] | 4.87 |
| | | Sex | | 4.12* [0.08, 8.16] | 2.02 |
| | | Sex × Dx | | –7.46* [–13.13, –1.80] | –2.61 |
| | | Sex × CAT-Q | | 0.21** [1.80, 0.34] | 3.15 |
| M5: three-way interaction ^c | 0.23 | Dx | 6.09*** | 9.18*** [5.44, 12.93] | 4.85 |
| | | Sex | | 4.14* [0.08, 8.20] | 2.02 |
| | | Sex × Dx | | –7.42* [–13.12, –1.73] | –2.58 |
| | | Sex × CAT-Q | | 0.23** [0.04, 0.42] | 2.39 |

Dx: diagnosis; CAT-Q: Camouflaging Autistic Traits Questionnaire; DASS-21: short-form Depression Anxiety Stress Scales.

^aEach model included all predictors from the prior step and added the new predictor(s) listed.

^bTwo-way interactions included sex × diagnosis, sex × CAT-Q, and diagnosis × CAT-Q.

^cThree-way interaction was sex × diagnosis × CAT-Q.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Discussion

To our knowledge, this is the first study to explore the potential relationship between camouflaging, sex, autism diagnosis and symptoms, and internalizing symptoms in autistic and non-autistic adolescents. Consistent with previous findings in adults, camouflaging was significantly associated with higher levels of anxiety and depression in both autistic and non-autistic individuals (Cage et al., 2018; Hull, Lai, et al., 2020; Lai et al., 2017). There was also a significant association between camouflaging and stress, although this differed based on sex, with camouflaging acting as a significant predictor of stress scores for females but not for males. Finally, there was a significant interaction between sex and diagnosis in predicting stress scores, with autistic males reporting higher levels of stress than non-autistic males, but no similar pattern for females. These findings have important clinical implications and implications for future research in the areas of characterization and treatment of anxiety, depression, and stress in both non-autistic and autistic adolescents.

When considering the DASS-21 depression and anxiety scores, camouflaging levels were stronger predictors than

sex or diagnosis. Although a few studies examining the relationship between camouflaging and internalizing symptoms have included both non-autistic and autistic participants, this is consistent with the findings of Hull and colleagues (2019), who found that camouflaging was positively correlated with anxiety and depression in autistic adults and positively correlated with social anxiety in non-autistic adults. These authors also found that camouflaging was negatively correlated with well-being for both autistic and non-autistic adults. The findings of this study suggest that camouflaging may be associated with anxiety and depression levels during adolescence regardless of diagnosis.

While in line with previous camouflaging research showing the negative association between camouflaging and mental health and well-being, this finding is in contrast to findings of a positive association between self-monitoring and well-being. This may point to a critical difference between the two constructs. In a study of non-autistic adults, feelings of authenticity mediated the relationship between self-monitoring and well-being (Pillow et al., 2017). In addition, the authors found that the “public performance” dimension of the self-monitoring measure used interacted with authenticity in predicting well-being. Specifically,

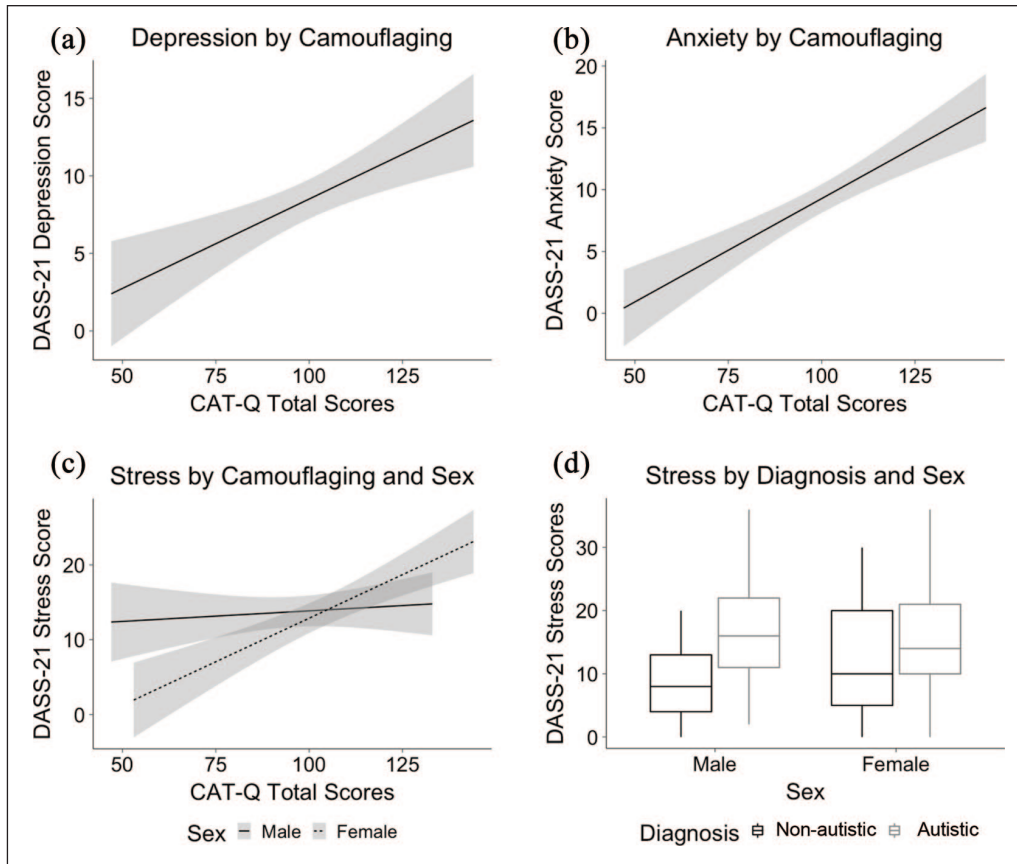


Figure 1. Figures of best models for DASS-21 depression, anxiety, and stress scores: (a) depression model 3, (b) anxiety model 3, and (c and d) stress model 4. Error bands depict 95% confidence intervals.

CAT-Q: Camouflaging Autistic Traits Questionnaire; DASS-21: short-form Depression Anxiety Stress Scales.

public performance, a dimension of self-monitoring, was positively associated with well-being when authenticity was high, but not when authenticity was low. As camouflaging is conceptualized as the use of strategies to hide or mask autistic traits, it may be the case that doing so leads to lower feelings of authenticity as individuals are working to mask part of themselves from others. This is also in line with the finding in this study that levels of autistic traits were significantly correlated with camouflaging levels in the non-autistic participants. Given all of this, authenticity is a potential third variable that may help further explain the association between camouflaging and well-being.

It is important to emphasize that there is not currently research that can clarify the direction of causality between poorer mental health and camouflaging. It is possible that camouflaging leads to poorer mental health, but it is also possible that individuals experiencing poorer mental health may be more likely to camouflage. For example, individuals experiencing anxiety may be likely to more closely and consistently monitor their behavior around others. It is also possible that the relationship is bidirectional and that camouflaging and poor mental health impact each other. To build on the previous example, individuals experiencing

anxiety may be more likely to closely monitor their behavior around others, and the experience of doing so may be distressing and contributes to increasing in internalizing symptoms. Finally, it is possible that another important variable is influencing both camouflaging levels and internalizing symptoms. As another example, it is possible that individuals who feel they do not fit in with others are more likely to camouflage more and to report higher levels of internalizing symptoms.

For the DASS-21 subscale of stress, differences emerged based on sex and diagnosis. A significant interaction between camouflaging and stress showed that camouflaging levels had more of an impact for females than for males, with females demonstrating both lower levels of stress than males with lower levels of camouflaging and higher levels of stress than males with higher levels of camouflaging. In other words, the same pattern of association between camouflaging and mental health was found for females across all three subscales, while this was only found in the depression and anxiety subscales for males.

One possible explanation for this difference by sex is that camouflaging may be more stressful for adolescent females than for adolescent males. Adolescence is a time when

social relationships become more important and complex, and this may be particularly true for females. A large review of sex differences in peer relationships supports the notion that adolescent girls must navigate different social dynamics and meet different social expectations than their male peers (Rose & Rudolph, 2006). Some of the main findings of this review were that girls engage in more social conversation and self-disclosure, are more sensitive to the status of their relationships with peers, are exposed to more stressors in their friendships and with their peers, and are more likely to spend time thinking about relationship stress. The authors also note that many of these differences increase throughout adolescence. This increased complexity for females could lead to social challenges that differ for males and females, and the camouflaging behaviors used to address these difficulties could in turn be experienced as more stressful for females due to the increased importance placed on them. In contrast, camouflaging could impact mental health without being associated with the same day-to-day stress for males as it is for females.

Another possible explanation for the differences based on sex in DASS-21 stress scores is related to variation in camouflaging behaviors across settings. A previous study in autistic adults found that patterns of camouflaging use across settings impacted the relationship between camouflaging and DASS-21 stress scores (Cage & Troxell-Whitman, 2019). These authors assessed whether participants reported high levels of camouflaging across all settings (formal vs informal), low levels of camouflaging across settings, or a tendency to camouflage more in one type of setting than in the other. They found that participants who reported high levels of camouflaging across all settings reported the highest levels of stress. This study found that camouflaging level was a significant predictor of DASS-21 stress scores for females, but not for males. It is possible that males and females were engaging in different patterns of camouflaging across settings. For example, females may have been camouflaging at high levels across most or all settings while males were more likely to vary how much they camouflaged in different settings. It may be the case that the increased complexity in female adolescent relationships necessitates more camouflaging in informal settings with friends for females than for males, while both males and females camouflage in formal settings. Setting data were not collected in this study, so this hypothesis could not be addressed empirically, and thus warrants further study.

In this study, there was also a significant sex by diagnosis interaction on the DASS-21 stress subscale, with autistic males reporting significantly higher levels of stress than non-autistic males, but no significant difference between autistic and non-autistic females. This lack of difference between autistic and non-autistic females may be explained by the more complex social relationships of adolescent females previously discussed. A significant difference may

appear for males due to increased stress for autistic males regarding the formation and maintenance of relationships compared to their peers. Although autistic adolescents report similar levels of desire for friendships and fitting in as their peers, they experience higher levels of loneliness (Locke et al., 2010; Vine Foggo & Webster, 2017). This discrepancy may account for the increased distress for autistic males compared to non-autistic males in this study, whereas social relationships may be experienced as similarly stressful for autistic and non-autistic females.

Limitations

Although the findings of this study have important implications, a few limitations are important to note. We did not collect in-depth demographic information, such as race/ethnicity and socioeconomic status, which may have improved the predictive power of the models and helped to control for potential confounding variables. We did not collect data regarding intelligence quotient (IQ); however, IQ was not found to predict camouflaging levels in a recent study with a similar sample (Hull, Petrides, & Mandy, 2020). A larger sample size, particularly for autistic females, would also improve the power of analyses comparing males and females. The findings of this study may not generalize across the autism spectrum, as the sample did not include individuals with intellectual disability. The cross-sectional design of this study did not allow us to assess causal relationships, and as discussed earlier, the lack of setting information related to camouflaging did not allow us to assess its potential impact on the outcome variables. Finally, this study utilized only self-report measures of adjustment. The use of multi-informant reports (e.g. parent, clinician, and teacher) may have provided a more complete picture of the adolescents' adjustment.

Clinical implications

The findings of this study have important clinical implications. As camouflaging was an important predictor of depression and anxiety, camouflaging levels could be an important consideration during assessment and possible treatment planning when clinicians are working with autistic or non-autistic adolescents presenting with depression and/or anxiety. Due to the lack of knowledge around the nature of the relationship between camouflaging and internalizing symptoms, assessment and treatment planning should focus on understanding how camouflaging functions for the individual and identifying other potential treatment targets (e.g. feeling a lack of connections with others).

It is also important for clinicians to consider how similar treatment targets for autistic and non-autistic adolescents may require different processes. For example, some level of camouflaging might be more important for autistic individuals in order to "fit in" socially. Direct teaching and

support in social skills may benefit autistic adolescents. It has been suggested that there could be a distinct difference between skills learned through social skills training and camouflaging (Green et al., 2019). Specifically, camouflaging may be driven by anxious thoughts and rules developed by the individual as opposed to skills learned through social skills training, which may be more naturalistic and less effortful. Given that the mechanisms involved in the relationship between camouflaging and mental health difficulties have not yet been well-defined, it is unclear whether social skills training would be beneficial. Clinicians should exercise caution in implementing social skills interventions to ensure that they are not inadvertently reinforcing feelings of alienation or inauthenticity.

However, working with individuals to help them feel more comfortable during social interactions is only one potential component of treatment for adolescents presenting with anxiety and/or depression and high levels of camouflaging. In addition, these youth may benefit from receiving treatment focused on increasing self-acceptance and self-esteem. The use of camouflaging behaviors should be explored on an individual basis in order to determine the unique benefits and negative consequences that result from those behaviors. This would allow clinicians to target only the aspects of camouflaging that are harmful for the individual. In addition, intervention is needed outside of that implemented directly with the individuals experiencing mental health difficulties. The relationship between camouflaging and poorer mental health outcomes supports the call for attention in the area of increasing autism acceptance in the general population. Work to increase autism acceptance could allow for autistic individuals to act in ways that are truer to themselves while still forming connections with others, which may reduce levels of stress during social interactions and improve mental health and well-being.

Implications for future research

This study identifies critical avenues for future research. Replication of this study in a larger sample would increase the generalizability of the findings and allow for psychometric testing of the CAT-Q in younger participants. Longitudinal studies will also be important for increasing understanding of the relationship between camouflaging and mental health throughout adolescence. Importantly, longitudinal studies could also shed light on whether there is a causal relationship between the two, and if so, in which direction.

Future studies should also include additional variables. First, extensive demographic information was not collected in this study due to concerns with participant fatigue, but this will be an important contribution of future research in order to help ensure appropriate representation of minority groups in the sample. It would also be helpful to collect data on whether and when participants have previously

received formal social skills training in order to examine whether this may impact the relationship between camouflaging behaviors and mental health difficulties. Another possibility would be to examine relationships between camouflaging and mental health/well-being outcomes before and after participation in a social skills training program. It is imperative to better understand the relationship between camouflaging, social skills interventions, and mental health difficulties in order to ensure that interventions are beneficial for autistic individuals. Authenticity, as mentioned earlier, could be another variable considered as a potential mediator or moderator in future work. Finally, research should consider collecting data regarding patterns of camouflaging across contexts to assess whether this impacts the association between camouflaging and mental health difficulties.

A final important direction for future research will be to continue to clarify the construct of camouflaging. Direct comparison of camouflaging and self-monitoring will help elucidate similarities and differences between the two. This research should also focus on the relationships between camouflaging and self-monitoring with external correlates, such as mental health and well-being. A critical component of such research will be the inclusion of both autistic and non-autistic participants in the same studies in order to allow for the comparison of the patterns between camouflaging, self-monitoring, and external correlates across groups.

Conclusion

Findings suggest that camouflaging is associated with poorer mental health in adolescence, regardless of autism diagnosis or sex. They also highlight potential differences in levels of stress related to camouflaging. Adolescent females, but not males, reported the same relationship between camouflaging and stress as between camouflaging and depression and anxiety. These findings contribute to a developmentally informed understanding of camouflaging and have important implications regarding assessment and treatment of autistic and non-autistic adolescents presenting with depression, anxiety, or elevated levels of general psychological distress. Assessment should consider camouflaging behaviors. If the individual reports high levels of camouflaging, a potential treatment focus could be determining which aspects of camouflaging are beneficial and which aspects may be harmful and working to address the harmful aspects. Social skills training may also reduce the effort needed to camouflage for autistic adolescents, which could alleviate the negative effects of camouflaging on mental health and well-being. Both autistic and non-autistic adolescents presenting with these difficulties and reporting high levels of camouflaging should also receive treatment focused on bolstering self-acceptance and self-esteem. Finally, interventions targeting increased autism acceptance in the general population may decrease the need for individuals to camouflage.

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