RESEARCH ARTICLE

Does camouflaging predict age at autism diagnosis? A comparison of autistic men and women

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Abstract

It is frequently reported that females are likely to receive an autism diagnosis at a later age than their male counterparts, despite similar levels of autistic traits. It has been suggested that this delay in diagnosis may in part reflect the propensity of females, more than males, to engage in camouflaging behaviors that reduce the appearance of autism-related traits. This article presents two studies which examined the relationship between gender/sex, camouflaging, and age at diagnosis in two samples of (cis-gender) autistic adults. Study 1 included data from three online samples including 242 autistic men and 570 autistic women aged 18–75 years. Study 2 included data from a longitudinal population-based sample including 24 autistic men and 35 autistic women aged 20–24 years. Camouflaging was measured with the self-report Camouflaging Autistic Traits Questionnaire (CAT-Q). Overall, the results showed that, on average, females were diagnosed later than males. There was a stronger relationship between camouflaging and age at autism diagnosis (AaD) for females, compared with males. Within sample one, there was a significant camouflaging-by-sex interaction; high-camouflaging females had a later AaD. The role of autistic traits and changes in attitudes towards female autism and camouflaging need further exploration. These findings highlight the need for greater clinician and key stakeholder awareness and understanding of camouflaging behavior, particularly for females, during the diagnostic process.

Lay Summary

Autistic females receive an autism diagnosis, on average, later than autistic males. This may be because autistic females use strategies to appear less autistic, which means they are less likely to be diagnosed. These strategies are known as "camouflaging." In this study, we looked at whether camouflaging is related to the age at which someone receives an autism diagnosis. We looked to see whether this relationship was different for autistic males and females in two samples of autistic adults. Overall, the females were diagnosed later than the males. The participants' self-reported camouflaging scores were related to age at diagnosis, and even more so for autistic females compared with males. Females who had high camouflaging scores were diagnosed later. This study highlights the need for a better understanding of camouflaging, especially during the diagnostic process.

KEYWORDS
age at diagnosis, camouflaging, diagnosis, female autism, sex differences

INTRODUCTION

Autism spectrum disorder, henceforth referred to as autism, is a heterogenous condition characterized by differences in social communication and interaction, restricted and repetitive behaviors, and sensory hyper-/hyposensitivities (American Psychological Association [APA], 2013). The prevalence of autism currently stands at ~1% of the population (Brugha et al., 2011; Zeidan et al., 2022) with the majority of individuals receiving a diagnosis during childhood (Mandell et al., 2005; van't Hof et al., 2021).

There is a male preponderance in terms of autism diagnoses, with the current male: female ratio estimated at 3:1 (Loomes et al., 2017). In addition to being diagnosed less frequently, females have reported more frequent delayed and/or misdiagnoses, compared with males (Begeer et al., 2013; Hiller et al., 2016; Shattuck et al., 2009). For instance, Siklos and Kerns (2007) found females wait longer for an autism diagnosis, despite the same number and duration of assessments. Previous studies have found that the average age at autism diagnosis (AaD) is significantly later for females, compared with males, despite similar ages of first concern/identification (McDonnell et al., 2021; Rutherford et al., 2016; Shattuck et al., 2009). It is imperative to explore explanations for possible gender/sex differences[1] in age at diagnosis, given evidence that delayed diagnosis can lead to poorer mental health (Jadav & Bal, 2022; Mandy et al., 2022). Furthermore, there is evidence of improved outcomes for those who receive an autism diagnosis at an earlier age, potentially due to timelier support (Koegel et al., 2014). It is important to note that biological sex and sociocultural gender are separate but interacting concepts (Lai et al., 2015). Throughout the remainder of this article, we predominantly refer to gender to reflect the sociocultural constructs potentially driving differences in camouflaging between women and men (Kreiser & White, 2014); male/men female/women are used interchangeably[1].

One possible explanation for this male preponderance in autism diagnosis is that some females adopt strategies to camouflage, mask, or compensate for their autistic behaviors, despite persistent underlying autistic characteristics (Hull, Lai, et al., 2020; Hull, Petrides, & Mandy, 2020). Camouflaging was first discussed in anecdotal evidence from autistic authors before the rise of empirical studies on this topic. Camouflaging spans a range of strategies that may be consciously or unconsciously adopted by an individual. For instance, a person may rehearse social prompts prior to a social event, or they may mimic the facial expression or body language of a socially successful peer. Ai et al. (2022) proposed that camouflaging shares a similar framework to impression management strategies adopted in the wider (nonautistic) population to facilitate successful social interaction. However, the neurocognitive underpinnings of autism, for example, differences in executive function and social cognition, likely make this a more effortful process for autistic individuals (Ai et al., 2022).

Camouflaging may contribute to delayed autism diagnosis, particularly for women and girls (Hull, Lai, et al., 2020; Hull, Petrides, & Mandy, 2020; Lockwood Estrin et al., 2021). Wing (1981) suggested autistic girls may be missed by clinicians due to a greater ability to mimic typical social communication, compared with autistic boys. More recent evidence suggests that autistic people of all genders may camouflage to some extent (Cook et al., 2021). However, a growing field of literature has demonstrated that autistic females may be more likely to adopt camouflaging strategies than autistic males (Cook et al., 2021; Hull, Lai, et al., 2020; Hull, Petrides, & Mandy, 2020). It has been suggested that camouflaging may delay identification and diagnosis of some autistic females, until they find themselves in a situation where social pressures outstrip capacity to cope with them, often in adolescence when peer relationships become more complex (Mandy et al., 2018; Hull, Lai, et al., 2020; Hull, Petrides, & Mandy, 2020; Pender et al., 2023). At this time, camouflaging coping strategies may no longer succeed, and autistic characteristics may become more apparent to an observer, resulting in diagnosis.

To date, the majority of evidence suggesting a relationship between camouflaging and the AaD has been qualitative. To the best of our knowledge, no study has empirically examined whether differences exist in the relationship between camouflaging and AaD for autistic men and women using quantitative data; the current study aims to address this gap in the literature. Two datasets from autistic adults were utilized to examine these questions. The first study dataset was from adult participants combined across three online studies. The second study dataset was from a sample consisting of young adults (20–24 years) obtained from a longitudinal, population-based twin study. Due to the methodological differences in these studies, the samples were analyzed separately. We predicted that in both samples:

1. Autistic women will be diagnosed later than autistic men;
2. Across all groups, higher camouflaging will be associated with later age of diagnosis, even when controlling for age, autistic traits, and IQ;
3. There will be a stronger positive association between age at diagnosis and camouflaging for women compared with men.

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[1]Gender/sex is used interchangeably to refer to the inter-related concepts of biological sex and sociocultural gender.

STUDY 1

Methods

Participants

Fully anonymized data were provided by the authors from the following datasets.

Sample 1
Participants were recruited from the Cambridge Autism Research Database and from social media, as described in Hull et al. (2019). Only cisgender autistic participants from the broader dataset were included in this sample, to allow for comparison across all samples (26 noncis-participants excluded). The Sample 1 sample comprised 100 men and 179 women, aged 18–75 years (mean = 42.64, SD = 13.55), all of whom self-reported a formal diagnosis of autism from a healthcare professional. The majority of participants (56%) were British. Further information on participants' native language and occupation is available in Hull et al. (2019); no other ethnicity or socioeconomic information was reported. This sample has been previously reported upon in Hull et al. (2019), Hull, Lai, et al. (2020), Hull, Petrides, and Mandy (2020), and Hull et al. (2021). Within the total sample, 1/279 (0.3%) had two missing items on the CAT-Q, 7/279 (2.5%) participants had missing items on the Broader Autism Phenotype Questionnaire (BAP-Q). Participants with missing data were omitted from the relevant analyses.

Sample 2
Participants were recruited via advertisements distributed to the Cambridge Autism Research Database and social media. Participants accessed the online survey by following a link in an advert asking for autistic adults to complete a survey about 'social behaviors, relationships, and wellbeing'. Only cisgender autistic participants with a formal diagnosis (self-reported by the participant) from the broader dataset were included in this sample, to allow for comparison across all samples (92 noncis-participants excluded). The sample is comprised of 85 autistic

cisgender men and 234 autistic cisgender women, aged 18–72 years (mean = 41.50, SD = 13.22). The majority of the sample (57%) was from the United Kingdom. Participants who indicated that they had an intellectual or learning disability were excluded from the sample. Within the total sample, 16/319 (5%) had missing items within the CAT-Q only. Participants with missing data were omitted from the relevant analyses.

Sample 3
Participants were recruited via the Autistica Discover Network and social media adverts. The large online cross-sectional online survey was advertised as being about neurodiversity, stress, and burnout, and recruited both autistic and nonautistic participants. Only cisgender participants with a formal autism diagnosis (self-reported by the participant) from the broader dataset were included in this sample, to allow for comparison across all samples (96 noncis-participants excluded). The sample comprised of 157 autistic women and 57 men aged 18–75 years (mean = 39.01, SD = 13.64). The majority of the sample (88%) was White. Within the total sample, 2/157 (1.3%) had one missing item on the CAT-Q. Participants with missing data were omitted from the relevant analyses.

Total sample
Combining the three survey datasets, the total online survey sample consisted of 242 autistic men and 570 autistic women (total $n = 812$) aged 18–75 years (mean age [SD] = 41.22 [13.50]). The average age at diagnosis for the online sample was 35.16 (14.81) years. See Table 1 for demographics split by gender.

Measures

Demographics

Participants were asked to indicate their sex (assigned at birth), gender, and AaD. See Supplementary Materials S1 for the wording of demographic questions.

TABLE 1 Descriptive statistics for key variables separated by study: Mean (SD) (range).

	Study 1			Study 2		
	Male	**Female**	*t*-Test	**Male**	**Female**	*t*-Test
N	242	570		24	35	
Age (years)	45.03 (14.64)	39.60 (12.66)	$t = 5.33$, ***p* < 0.001**	21.57 (0.90)	21.91 (1.05)	$t = 1.29$, $p = 0.202$
Age at Dx (years)	36.32 (17.16) (3–71 years)	34.67 (13.69) (3–74 years)	$t = 1.45$, $p = 0.188$	9.85 (5.47) (2–21 years)	13.06 (4.82) (3.5–24 years)	$t = 2.37$, ***p* = 0.021**
CAT-Q	111.19 (22.70)	125.60 (21.15)	$t = -8.58$, ***p* < 0.001**	98.39 (21.62)	107.28 (24.33)	$t = 1.45$, $p = 0.151$
Autistic traits[a]	−0.11 (1.15)	0.04 (0.93)	$t = -1.82$, ***p* = 0.070**	76.68 (24.36)	96.93 (23.92)	$t = 3.14$, ***p* = 0.003**
IQ	—	—	—	102.36 (14.02)	101.03 (13.69)	$t = -0.40$, $p = 0.689$

Note: Significant *p*-values are in bold.
Abbreviations: CAT-Q, Camouflaging Autistic Traits Questionnaire; Dx, diagnosis.
[a]Autistic traits were measured using different tools in each study, and therefore scores are not comparable across datasets: Study 1 value is a *z*-score, Study 2 value is the AQ10.

Camouflaging

The Camouflaging Autistic Traits Questionnaire (CAT-Q; Hull et al., 2019) is a 25-item self-report measure of camouflaging strategies. Participants are asked to indicate the extent to which a statement, such as "When I am interacting with someone, I deliberately copy their body language or facial expressions," applies to them on a seven-point Likert scale from 1 *strongly agree*, to 7, *strongly disagree*, for all items. A sum score of all 25 items was computed for this analysis. Higher scores indicate greater use of camouflaging strategies. The Cronbach alpha was 0.91, 0.81, and 0.91 for each sample, respectively.

Sample 2

The instructions on the CAT-Q were altered to ask participants to consider their social interactions within the last 4 weeks. This was because the study was longitudinal, and the original CAT-Q does not specify a time range.

Autistic traits

Sample 1

The BAP-Q (Hurley et al., 2007) is a 36-item self-report measure of autistic traits. Items include "I would rather talk to people to get information than to socialize" and are scored on a six-point Likert scale from "1—very rarely" to "6—very often." Higher scores indicate a greater number of autistic traits.

Samples 2 and 3

The Autism Quotient 10-item Scale (AQ-10; Allison et al., 2012) is a 10-item self-report measure of autistic traits Participants are asked to respond to items such as, "I find it difficult to work out people's intentions." Four response options are offered. On half the items slightly or strongly agree are coded 1 and slightly and strongly disagree are coded 0, whereas on the other half of items the reverse scoring applies. Scores on the AQ thus range from 0 to 10 with higher scores indicating the presence of more autistic characteristics, and a score of 6 or above indicating possible autism.

Procedure

Data were collected online between 2016 and 2017 via Qualtrics (Sample 1) and in 2020 via Opinio and Qualtrics (Samples 2 and 3, respectively).

Ethical approval was obtained for all datasets from the relevant university research ethics committee.

Data analysis

As the online surveys had similar methods and measures, these samples were combined. It is possible that there is overlap in the participants from each study. However, due to the anonymity of participants it was not possible to determine the extent of this overlap.

Participants who did not complete all items on a relevant measure were not included in analysis. Listwise deletions were used for each analysis to handle missing data.

In order to streamline the complex relationship between biological sex and gender identity, and due to the wide range of nonbinary and transgender identities reported by participants resulting in small subgroup sizes, only cisgender individuals were included in the subsequent analysis.

A standardized (z-score) score of autistic traits was calculated due to differences in the measures used across studies. This was deemed appropriate as previous evidence has demonstrated a significant positive correlation between the BAPQ (Hurley et al., 2007) and AQ-10 (Allison et al., 2012) measures used within these samples (Ingersoll et al., 2011). Assumptions were met for parametric tests (visual inspection of Q–Q plots).

For Hypothesis 1, an independent sample t-test was administered to test group differences on key variables.

For Hypotheses 2 and 3, initial correlation analyses were conducted including all key variables (age, AaD, camouflaging, autistic traits). For both hypotheses, the main association of interest was camouflaging and AaD. If other variables showed a significant ($p < 0.05$) association with AaD and/or camouflaging, they were included as controlled variables in subsequent analyses.

The sample was split by gender a correlation analysis assessing the relationship between AaD and camouflaging was conducted. Fisher's r to z calculations were computed online (https://www.psychometrica.de/correlation.html) to determine significant differences in the strength of relationship between camouflaging and AaD for males versus females (see Supplementary Materials S1).

Hierarchical regression analyses with three blocks were conducted. The first block included age and autistic traits. The second block included sex and CAT-Q total score. The third and final block included sex*CAT-Q interaction.

Results

> **Hypothesis 1.** Autistic females will be diagnosed later than autistic males.

An independent sample t-test revealed no significant difference between the AaD for males and females, $t(368.64) = 1.32$, $p = 0.188$, Cohen's $d = 0.11$, 95% CIs $[-0.81, 3.13]$.

> **Hypothesis 2 and 3.** Across all groups, higher camouflaging will be associated with later age of diagnosis, even when controlling for age, autistic traits, and IQ; There will be a stronger positive association between age at diagnosis

and camouflaging for females compared with males.

Pearson's correlation analyses were completed to determine associations between key variables, to justify inclusion within linear regression analyses for hypotheses testing. The sample was split by gender and correlation results can be found in Table 2. Further exploration of data using correlation analyses, including Fisher's r to z transformations, can be found in Supplementary Materials S1.

The final linear regression model including age, autistic traits, gender, CAT-Q score, and interaction of gender*CAT-Q to predict AaD was statistically significant, $R^2 = 0.77$, $F(5, 765) = 523.91$, $p < 0.001$, adjusted $R^2 = 0.78$. The addition of gender and CAT-Q score to the predication of AaD (Model 2) led to a statistically significant increase of R^2 from 0.763 to 0.773, $F(2, 766) = 17.77$, $p < 0.000$. The main effect of gender was significant ($B = 3.04$, $p < 0.001$, 95% Cis [1.88, 4.19]) indicating that being a woman was related to later age at diagnosis when controlling for age and autistic traits in this sample. The addition of gender*CAT-Q interaction to the prediction of AaD (Model 3) did not increase the total R^2 for Model 3, $F(1, 765) = 0.18$, $p = 0.673$. See Table 3 for full details of each regression model and the Supplementary Materials S1 for the (nonsignificant) interaction between key variables.

Post hoc sensitivity analysis.

Post hoc sensitivity analyses were conducted using G*Power version 3.1 (Faul et al., 2009) for each statistical test used above. The probability was entered as 0.05, the power was 0.95 and the sample size was entered.

When using an independent t-test with a sample of 242 men and 570 women, we can reasonably detect an effect size of 0.25, when using bivariate correlational analysis, we can reasonably detect an effect size of 0.11, and finally for multiple linear regression analysis, we can reasonably detect an effect size of 0.02.

STUDY 2

Participants

Participants included in this analysis are from the Social Relationships Study (SRStudy) sample, a substudy of the Twins Early Development Study (TEDS; Haworth et al., 2013). Details of the recruitment of the original SRStudy sample can be found elsewhere (Colvert et al., 2015). The SRStudy is a longitudinal population-based twin study, which includes participants from the wider TEDS sample who have a diagnosis of autism or have scored highly on autistic trait measures at various

TABLE 2 Correlations between key variables, split by gender.

	1	2	3	4
1. Age		0.84***	−0.12	0.21***
2. Age at autism diagnosis	0.90***		−0.08	0.28***
3. CAT-Q score	−0.11*	−0.05		
4. Standardized Autistic Trait Score	−0.03	−0.01	0.11*	

Note: ***$p < 0.001$, *$p < 0.05$. Scores for men are shown in the top diagonal, score for women are shown in the bottom diagonal.
Abbreviation: CAT-Q, Camouflaging Autistic Traits Questionnaire.

TABLE 3 Hierarchical multiple regression predicting age at autism diagnosis from age, autistic traits, gender, and CAT-Q total score within the Online Sample.

	Age at dx					
	Model 1		Model 2		Model 3	
IV	B	beta	B	beta	B	beta
Constant	−4.08***		−12.54***		−10.50*	
Age	0.95***	0.87	0.98***	0.89	0.98***	0.89
Autistic Traits	0.84***	0.06	0.66**	0.04	0.67**	0.05
Gender			3.04***	0.09	1.81	0.06
CAT-Q			0.02	0.03	0.00	0.00
Gender*CAT-Q					0.01	0.05
R^2	0.76		0.77		0.77	
F	1239.19***		655.55***		523.91***	
R^2 change	0.76		0.01		0.000	
F change	1239.19***		17.77***		0.18	

Note: $n = 771$ *$p < 0.05$, **$p < 0.01$, ***$p<0.001$.
Abbreviation: CAT-Q, Camouflaging Autistic Traits Questionnaire.

time-points, along with their co-twins. The sample included in the current paper derives from the third wave of the longitudinal study and includes 24 cisgender men and 35 cisgender women with a confirmed clinical autism diagnosis, born in England and Wales between 1994 and 1996. Autism diagnoses were confirmed via parent report, from longitudinal data and from scores on the Autism Diagnosis Observation Schedule (ADOS; Lord et al., 2012) conducted by the first or second author. Participants were aged 20–24 years (mean age = 21.92 SD = 0.96) at the time of data collection. See Table 1 for age split by gender.

Measures

Demographics

Participants were asked to indicate their sex (assigned at birth), gender and AaD. See Supplementary Materials S1 for the wording of demographic questions.

Camouflaging

The CAT-Q (Hull et al., 2019) is a 25-item self-report measure of camouflaging strategies. Participants are asked to indicate the extent to which a statement, such as "When I am interacting with someone, I deliberately copy their body language or facial expressions," applies to them on a seven-point Likert scale from 1 *strongly agree*, to 7, *strongly disagree*, for all items. A sum score of all 25 items was computed for this analysis. Higher scores indicate greater use of camouflaging strategies.

Autistic traits

The Social Responsiveness Scale (Second Edition) (SRS-2; Constantino & Gruber, 2012) is a 65-item questionnaire with both self-report and informant versions. Participants are asked to respond to items such as "I am usually aware of how others are feeling" on a four-point Likert scale from 1, *not true*, to 4, *almost always true*. Higher scores indicate more autistic traits. The self-report form was used in this study.

IQ

The Wechsler Abbreviated Scale of Intelligence (Second Edition) (WASI-2; Wechsler, 2011) was used to provide an estimate of IQ. For the purpose of this study, the two-subtest version was used. Participants completed the Matrix Reasoning subtest, which is a measure of perceptual intelligence, and the Vocabulary subtest, which is a measure of verbal intelligence. A full-scale IQ composite

score was computed from the results of these subtests. To allow comparison with the online sample who completed online surveys and therefore are assumed to have average or above average IQ, participants who scored >70 on this measure were included in subsequent analyses.

Procedure

Data were collected between 2017 and 2019 via both Qualtrics, an online survey platform, and in-home assessments. The measures described above were administered as part of a larger battery of measures.

Ethical approval was obtained from the relevant university research ethics committee.

Data analysis

The same data analysis plan was used as outlined in Study 1 above, with the addition of IQ in block 1 of the hierarchical regression.

Results

Hypothesis 1. Autistic females will be diagnosed later than autistic males.

An independent sample *t*-test revealed that females were diagnosed significantly later than males with mean difference of 3.21 years; $t(57) = 2.38$, $p = 0.021$, Cohen's $d = 0.62$, 95% CIs [0.51, 5.91].

Hypothesis 2 and 3. Across all groups, higher camouflaging will be associated with later age of diagnosis, even when controlling for age, autistic traits, and IQ; There will be a stronger positive association between age at diagnosis and camouflaging for females compared with males.

Pearson's correlation analyses were completed to determine associations between key variables, to justify inclusion within linear regression analyses for hypotheses testing. The sample was split by gender and correlation results can be found in Table 4. Further exploration of data using correlation analyses, including Fisher's *r* to *z* transformations, can be found in Supplementary Materials S1.

The final linear regression model including age, IQ, autistic traits, gender, CAT-Q score, and interaction of gender*CAT-Q to predict AaD was statistically significant, $R^2 = 0.36$, $F(6, 39) = 3.59$, $p = 0.006$, adjusted $R^2 = 0.26$. The addition of gender and CAT-Q score to the prediction of AaD (Model 2) led to an increase of R^2 from 0.259 to 0.262; however, this was not statistically

TABLE 4 Correlations between key variables, split by gender in the SRStudy sample.

	1	2	3	4	5
1. Age		0.11	0.05	−0.33	−0.38
2. Age at autism diagnosis	0.01		−0.26	0.37	−0.45
3. CAT-Q score	−0.22	0.37*		0.28	0.21
4. SRS score	−0.20	0.58**	0.42*		
5. FSIQ	−0.36	0.38*	0.24	0.04	

Note: Scores for men are shown in the top diagonal, score for women are shown in the bottom diagonal. **$p < 0.01$, *$p < 0.05$.
Abbreviations: CAT-Q, Camouflaging Autistic Traits Questionnaire; FSIQ, full scale IQ.

TABLE 5 Hierarchical multiple regression predicting age at autism diagnosis from age, IQ, autistic traits, gender and CAT-Q total score within the SRStudy sample.

	Age at Dx					
	Model 1		Model 2		Model 3	
IV	B	beta	B	beta	B	beta
Constant	−30.53		−32.37		−40.10*	
Age	1.39	0.71	1.44	0.74	1.55*	0.71
IQ	0.04	0.04	0.04	0.04	0.05	0.04
Autistic traits	0.10**	0.03	0.10**	0.03	0.09**	0.03
Gender			0.48	1.46	13.76*	5.74
CAT-Q			0.01	0.03	0.05	0.04
Gender*CAT-Q					−0.13*	0.06
R^2	0.26		0.26		0.36	
F	4.90**		2.84*		3.59**	
R^2 change	0.26		0.00		0.09	
F change	4.90**		0.07		5.69*	

Note: $n = 46$ *$p < 0.05$, **$p < 0.01$. Values rounded up to two decimal places.
Abbreviation: CAT-Q, Camouflaging Autistic Traits Questionnaire.

significant $F(2, 40) = 0.07$, $p = 0.937$. The addition of gender*CAT-Q interaction to the prediction of AaD (Model 3) led to a statistically significant increase in R^2 of 0.09 (total R^2 for Model 3 = 0.36), $F(1, 39) = 5.69$, $p = 0.022$. See Table 5 for full details of each regression model.

Linear regressions were conducted for each gender separately to determine the interaction between CAT-Q and AaD. For females, the model including Age, IQ, autistic traits and CAT-Q was statistically significant (F [4, 23] = 6.66, $p = 0.001$), however, CAT-Q was not a significant predictor ($B = 0.028$, $p = 0.362$). For males, the model including age, IQ, autistic traits and CAT-Q was not statistically significant (F[4, 13] = 2.46, $p = 0.098$, 95% CI [−0.034, 0.091]), and CAT-Q was not a significant predictor ($B = −0.021$, $p = 0.710$, 95% CI [−0.140, 0.098]). See Figure 1 for the gender*CAT-Q interaction.
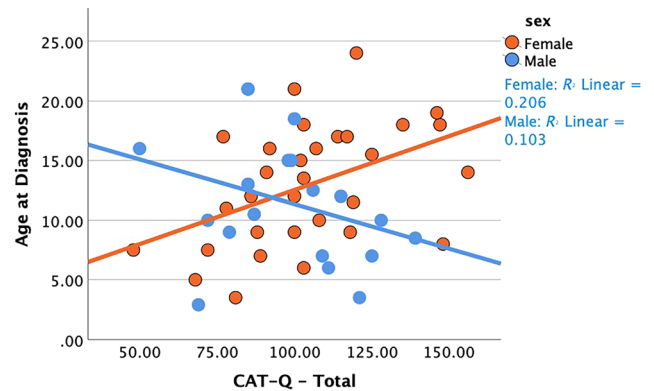
FIGURE 1 Gender*Camouflaging Autistic Traits Questionnaire (CAT-Q) interaction predicting age at autism diagnosis in the Study 2 sample.

Post hoc sensitivity analysis

Post hoc sensitivity analyses were conducted using G*Power version 3.1 (Faul et al., 2009) for each statistical test used above. The probability was entered as 0.05, the power was 0.95 and the sample size was entered.

When using an independent *t*-test with a sample of 24 men and 35 women, we can reasonably detect an effect size of 0.88, when using bivariate correlational analysis, we can reasonably detect an effect size of 0.40, and finally for multiple linear regression analysis, we can reasonably detect an effect size of 0.28.

GENERAL DISCUSSION

The studies included in this paper aimed to investigate gender differences in the relationship between age at diagnosis and camouflaging in two samples of autistic adults. In Study 1, the results of regression analysis revealed a main effect of gender; when controlling for age and autistic traits in the regression model, women were diagnosed later than men. The results from Study 2 revealed a significantly later age of autism diagnosis for autistic women, compared with men; however, this result did not remain significant when controlling for age and autistic traits in the regression model. Interestingly, the autistic women in the Study 2 sample had significantly higher levels of self-reported autistic traits and similar IQ compared with the men yet were diagnosed substantially later in life. This may reflect existing evidence that suggests autistic women need "additional" difficulties such as intellectual disability or more "complex" presentations of autism to gain an autism diagnosis compared with autistic men (Ratto et al., 2018); however, data regarding additional diagnoses were not available for the present analysis. These findings together support existing literature which has found that autistic women tend to be diagnosed later than men (Siklos & Kerns, 2007).

Neither camouflaging, nor an interaction between camouflaging and sex, predicted age at diagnosis in Study 1. A possible explanation is that both men and women in the online sample on average had an age at diagnosis in adulthood (average age = 35 years), and therefore there was less variation in the age at diagnosis. Both men and women in this sample demonstrate camouflaging to some extent, and the lack of sex differences may be related to other factors, such as improved attitudes and understanding of autism for women and girls in recent years. In contrast, a significant interaction between camouflaging and gender in the Study 2 data suggests that "high camouflaging" women were diagnosed significantly later than women who do not score highly on the CAT-Q, but this effect was not seen in the autistic men. However, follow-up analyses analyzing female and male data separately revealed that camouflaging did not significantly predict age at diagnosis when controlling for age, IQ and autistic traits. Despite the nonsignificance (possibly due to small sample size), it is of interest that the direction of the relationship between camouflaging and age at diagnosis was positive for females (increased camouflaging was related to later diagnosis) and negative for males (increased camouflaging related to earlier diagnosis). Further research with larger sample sizes is needed to explore this potential interaction further to allow concrete conclusions to be drawn. Overall, the findings emphasize the need for clinicians to be aware that autistic individuals, particularly autistic women, may be camouflaging their underlying difficulties during diagnostic assessment. It may also reflect the limitations of current diagnostic tools in identifying camouflaging behaviors. In line with this, and with an expanding knowledge about camouflaging, in the most recent addition of the Diagnostic and Statistical Manual (DSM-5; APA, 2013), clinicians are explicitly directed to consider camouflaging strategies during diagnostic processes.

It is important to note that the CAT-Q measures intention/attempts to camouflage, not how successful such attempts are. It is possible that there are gender differences, on average, in how "successful" camouflaging attempts are in practice. To our knowledge, there is limited research examining the "success" of camouflaging in men and women on the autism spectrum; however, studies adopting a "discrepancy" approach to measuring camouflaging (i.e., looking at the difference between self-reported and observer-reported autistic traits) suggest women camouflage to a greater extent (Lai et al., 2017). It must be noted the participants had already received a diagnosis when measures of camouflaging were collected for both studies. Therefore, the current self-report camouflaging scores may not reflect the extent to which camouflaging strategies were adopted earlier in life and prior to diagnosis. Extending this consideration, it would be interesting for future research to test the hypothesis that, subsequent to an autism diagnosis, autistic women continue to camouflage, while men reduce camouflaging efforts. This might reflect the notion that diagnosis gives men (but not women) "permission" not to hide their autistic traits—perhaps related to commonly-held male-related stereotypes of autism, or greater societal expectations for women to be sociable and expressive (Bargiela et al., 2016; Wood et al., 1997).

Although this study offers novel findings from two unique samples, it is important to keep in mind the limitations of this study. Each of our study's samples harness different strengths and weakness. The SRStudy sample was ascertained from a UK-wide longitudinal study, and therefore is arguably more representative than an online study where samples may be biased to those who are more cognitively able, and/or have a particular interest in the topic (Rødgaard et al., 2022). Despite this, the SRStudy sample was small, particularly for the autistic men group, which may limit the power to detect group differences and associations between variables. In contrast, the online sample was large; however, the representativeness of this group may be limited due to the recruitment process. Autistic individuals with access to and use of the internet, and who engage in autism-related research, may lead to biased samples predominantly comprised of autistic individuals diagnosed later in life (as seen in this sample; Rødgaard et al., 2022), predominantly female and from a moderate to high socioeconomic status (as often found in survey studies; Goyder et al., 2002; Singer et al., 2000). It should also be noted that participants in Study 1 provided self-reported diagnostic status that could not be confirmed from other sources. Although participants were also given the option to indicate "self" (i.e., not clinical) diagnosis for the majority of these surveys, there is the possibility that some diagnoses may not be accurate, thus potentially limiting the reliability of our findings. Additionally, the majority of the participants in these samples were British and White (although data on participant race were not available for all surveys), and therefore the findings may not generalize to non-White and/or non-British samples. Finally, samples were limited to those without additional learning or intellectual difficulties, therefore these findings may not be generalizable to the people across the full autism spectrum. Future studies should endeavor to replicate these findings in a large and more representative sample of autistic adults, including those who received a diagnosis in childhood.

The cross-sectional design of the study does not allow us to infer causality from the associations identified; longitudinal or intervention designs are needed. Only cisgender individuals were included in this study, and sex was viewed in a binary way. This is a limitation as there is emerging evidence that autistic people may have different conceptualization/perceptions of gender than nonautistic individuals and are more likely to be gender diverse or nonbinary (De Vries et al., 2010; DeWinter et al., 2017; Warrier et al., 2020). It is possible that a person who

identifies as a gender different to their sex assigned at birth may engage in more camouflaging strategies in response to stigma and noninclusive environments (Ai et al., 2022).Therefore, it is essential that future explores how camouflaging is associated with obtaining an autism diagnosis and subsequent support for people who do not identify as cisgender.

However, despite these limitations, this study is the first to our knowledge to quantitatively examine sex differences in the relationship between camouflaging and AaD. Our findings show that females in our samples were diagnosed later than males and give tentative evidence that later autism diagnosis is associated with greater camouflaging for females more than for males. Although caution should be taken when applying these findings, and the role of autistic traits needs to be considered, these results have several important clinical implications:

1. It is imperative that all professionals involved in referral and diagnostic pathways, including teachers and clinicians, are not only aware of, but also understand and can identify, camouflaging strategies in order to eliminate this barrier to early identification and diagnosis.
2. Key stakeholders should be particularly aware of camouflaging as a barrier to diagnosis for autistic girls.
3. Autism should not be ruled out solely on the basis of isolated social behaviors (NICE, 2017) or a seemingly neurotypical type behavioral presentation.
4. During a comprehensive autism assessment, clinicians should consider and assess for possible camouflaging. This will require additional assessment beyond current Gold Standard tools (e.g., ADOS-2, ADI-R) which do not consider camouflaging. For example, it may be helpful to assess behavioral presentation in extended, naturalistic, or complex social situations where social differences and difficulties may be more evident (Attwood, 2007; Cumin et al., 2022). It is also helpful to seek individual's subjective view on their possible engagement in camouflaging.

In conclusion, in this study, autistic females were diagnosed later than autistic males. Tentative findings suggest camouflaging is associated with later age of autism diagnosis for autistic females, but not males; however, it is essential to consider the role of confounding variables such as age and level of autistic traits. Due to potential negative consequences of camouflaging, the study findings highlight the importance of improving timely identification and diagnosis of all autistic individuals.

FUNDING INFORMATION

CONFLICT OF INTEREST STATEMENT
Laura Hull and William Mandy were part of the original research team that developed the CAT-Q. However, they receive no financial gains from this freely available resource. The remaining authors have no conflicts of interest to declare that are relevant to the content of this article.

DATA AVAILABILITY STATEMENT
The data that support the findings of this study are available from the corresponding author upon reasonable request.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.