Non-clinical autistic traits, perceived social support and perceived stress: A preliminary study in the general population

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Previous research suggests individuals with autism spectrum disorder (ASD) report higher levels of perceived stress compared to individuals without a diagnosis of ASD. However, there is little research on the relationship between autistic traits and perceived stress, particularly within the general population/non-clinical samples. Research also suggests perceived social support may act as a buffer against perceived stress. However, the relationship between non-clinical/subthreshold autistic traits, perceived social support, and perceived stress has never been investigated. The current study aimed to assess if sub-threshold autistic traits and perceived social support predict perceived stress in the general population additionally if social support is potentially protective against perceived stress in a model alongside non-clinical autistic traits. A total of 322 participants from 32 different countries completed an online survey of three questionnaires: Perceived Stress Scale; Broad Autism Phenotype Questionnaire; and the Multidimensional Scale of Perceived Social Support. Data were analysed using multiple regression. Results indicated non-clinical autistic traits did predict perceived stress in the general population. However, not all traits acted as predictors, with only rigidity and pragmatic language difficulties predicting perceived stress. Additionally, alongside non-clinical autistic traits, only perceived social support from family negatively predicted perceived stress, indicating this may be the most important source of perceived social support alongside increasing non-clinical autistic traits to protect against perceived stress.

Keywords: autism; autistic traits; social support; stress

Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterised by deficits in social communication and interaction (e.g., difficulties in social relationships, sharing thoughts and feelings with others, use of language, and understanding emotion) and restricted/repetitive interests (e.g., ridged routines, affinity with having things the same, and focusing on special areas of interest such as trains; American Psychiatric Association, 2013). ASD has an estimated median global prevalence of 0.62% (Elsabbagh et al., 2012).

Research demonstrates a strong evidence base for the role of genetics in ASD's aetiology, with metanalyses finding extremely high concordance rates between monozygotic twins (Tick et al., 2016). This genetic influence has also been demonstrated by studies finding siblings and parents of autistic probands exhibit traits of autism, however, often falling below the clinical threshold for ASD diagnosis (e.g., Bailey et al., 1998; Constantino et al., 2006; Piven et al., 1997; for a review see Rubenstein & Chawla, 2018). Subthreshold traits have also been observed in the general population (Constantino & Todd, 2005; Ruzich et al., 2015). Researchers suggest this is evidence of a broader autism phenotype (BAP; Bailey et al., 1998; Ingersoll & Wainer, 2014; Sucksmith et al., 2011) and that autistic traits exist on a continuum within the population ranging in severity (Constantino & Todd, 2003; Robinson, Koenen, et al., 2011; Robinson, Munir, et al., 2011; Sasson et al., 2012).

Subthreshold autistic traits (referred to as non-clinical autistic traits throughout this paper) are associated with a range of psychosocial outcomes, including obsessive-compulsive disorder (Liew et al., 2015), anxiety and depression (Pilao et al., 2016; Rosbrook & Whittingham, 2010), and mental well-being (Stimpson et al., 2021). However, the literature provides little information on the impact of non-clinical autistic traits on perceived stress (Pisula et al., 2015). Perceived stress is an individual's perception or appraisal of the amount of stress they have in their life and how well they can cope with such stress (Cohen et al., 1983; Phillips, 2013). Higher levels have been associated with multiple negative physical and mental health outcomes, including increased risk of; smoking (Gallo et al., 2014; Ng & Jeffery, 2003; Stubbs et al., 2017), fat intake (Jair Vidal et al., 2018), Body Mass Index (BMI), waist circumference and visceral obesity (Tenk et al., 2018), coronary heart disease (Cohen et al., 2007; Katsarou et al., 2013), upper respiratory tract infections (Marsland et al., 2007), decreased levels of happiness (Denovan & Macaskill, 2017; Schiffrin & Nelson, 2010) and depression and suicidal behaviour (Hirsch et al., 2019; see also Bergdahl & Bergdahl, 2002; Cohen et al., 2007). Hence the study of perceived stress and its potential causes is important.

Research comparing clinical ASD samples to neurotypical controls finds individuals with ASD have higher levels of perceived stress (Bishop-Fitzpatrick et al., 2015, 2017; Hirvikoski & Blomqvist, 2015; McGillivray & Evert, 2018), suggesting a link between autism and increased perceived stress. However, there is little research on the relationship between autistic traits and perceived stress, particularly within the general population/non-clinical samples. To the author's knowledge, only one Swedish study has investigated this relationship (Hirvikoski & Blomqvist, 2015). The researchers found autistic traits positively correlated with perceived stress in individuals diagnosed with ASD and those without a diagnosis in the general population. However, the study's small (entirely Swedish) sample of 53 individuals, 25 of whom had been diagnosed with ASD, makes it hard to generalise such findings, particularly to a non-clinical population.

Additionally, researchers investigating autistic traits have suggested that autistic traits, whether in clinical or non-clinical populations, should be studied individually rather than using global scores as this potentially results in researchers 'missing important information ' (Happé & Ronald, 2008, p. 299; see also Happé et al., 2006). A recent study by Stimpson et al. (2021) investigating the relationship between non-clinical autistic traits and mental well-being supports this argument, finding that when measuring non-clinical autistic traits individually, only aloofness predicted mental well-being. Had only global scores been used, such intriguing results may not have been discovered (Stimpson et al., 2021). The existing literature looking at perceived stress and autistic traits (Hirvikoski & Blomqvist, 2015), in addition to its small sample (including clinically diagnosed individuals) and cultural confounds, used global scores of autistic traits, meaning potentially important information was missed in understanding the relationship between different traits and perceived stress.

Cohen and Wills's (1985) early work on perceived stress and health proposed a stress-buffering hypothesis, which posited that social support might help prevent perceived stress, assisting in the psychological reappraisal of the circumstances or event one may perceive stressful. This hypothesis has a growing body of psychological and neurobiological evidence to support it (Ditzen & Heinrichs, 2014; Hostinar & Gunnar, 2015; Raffaelli et al., 2013; Steptoe, 2000). There is potential for social support to act as a buffer against perceived stress alongside non-clinical autistic traits. Though not looking directly at autistic traits and perceived stress, studies find social support to be protective against negative psychosocial outcomes in clinical ASD samples and studies looking at non-clinical autistic traits within the general population. For example, Hedley et al. (2018) found social support to be protective against depression and suicide in a clinical ASD sample. Leader et al. (2021) found that social support predicted higher quality of life in a clinical ASD sample.

Similarly, Stimpson et al. (2021), in their research on non-clinical autistic traits and mental well-being in the general population, found social support to play a protective role against poorer mental well-being. Social support has been protective against other psychosocial outcomes in clinical ASD and non-clinical samples; there could be a potential protective relationship between social support and perceived stress when investigated in a model with non-clinical autistic traits. However, these variables have never been studied together. Thus, further research is needed.

Social support is a multifaceted construct that researchers have divided into two main categories, perceived and received support (e.g., Ditzen & Heinrichs, 2014; Goodwin & Hernandez Plaza, 2000; Helgeson, 1993; Norris & Kaniasty, 1996; Zimet et al., 1988). Perceived support is defined as a 'qualitative measure' (Zimet et al., 1988, p. 32) of social support (an assessment of the extent to which someone believes people will help them or how adequate the support provided is). Received support, on the other hand, can be defined as a 'quantitative measure ' (Zimet et al., 1988, p. 32) of social support (the number of people you can rely on in a difficult situation). Multiple studies demonstrate that measures of perceived support are superior to measures of received support in predicting psychological outcomes (Zimet et al., 1988; see also Hefner & Eisenberg, 2009; McDowell & Serovich, 2007; Prati & Pietrantoni, 2010; Szkody & McKinney, 2019). Hence to assess social support alongside non-clinical autistic traits in relation to perceived stress, it would seem most appropriate to measure perceived social support. Similar to Happé and Ronald's (2008) work on different autistic traits, it has been proposed that studies measuring just one source of social support may 'lose important information ' (Zimet et al., 1988, p. 38), on how different sources of support (e.g., support from friends or family) interact with the assessed outcome. Thus, to sufficiently investigate the relationship between non-clinical autistic traits, perceived social support, and perceived stress, different sources of support should be measured.

Across the literature, gender differences vary. Zhang et al. (2018) and Colarossi (2001) suggest no gender differences between males and females upon how much perceived support they received. Neff and Karney (2005) did suggest gender differences within a marital situation; however, this was not in terms of perceived support but in how support changed to a partner's responsiveness. Stronge et al. (2019) demonstrated that a partner (or significant other) could influence how social support was perceived. Perceived social support mediated the effects of having a partner and higher well-being, more strongly in men, suggesting that gender could influence perceived social support. It would be interesting to investigate this further to see if these gender differences were present in the current sample.

Current study

As there is no literature looking at non-clinical autistic traits and perceived social support as predictors of perceived stress in the general population, the current study aims to investigate whether non-clinical autistic traits and perceived social support predict perceived stress in the general population. Additionally, this study aims to see if perceived social support in a model with non-clinical autistic traits could be protective against perceived stress.

It was therefore hypothesised that:

> H_1: All non-clinical autistic traits (aloofness, pragmatic language, and rigidity) will positively predict perceived stress.
>
> H_2: All sources of perceived social support (friends, family, and significant other) will negatively predict perceived stress.

Due to the lack of literature investigating this topic area, the hypotheses did not specify which traits or sources of social support will predict perceived stress. However, based on Cohen and Wills's (1985) stress-buffering hypothesis (proposing perceived social support will buffer against stress/perceived stress), it was hypothesised that all sources of perceived social support would negatively predict perceived stress.

METHODS

Participants

Participants were recruited from the general public using opportunity sampling through an online study advertisement available from December 2020–February 2021. A total of 325 participants completed the online survey. The study's inclusion criteria were adults over 18 years without a previous autism diagnosis. This was included in the study advertisement and the participant information sheet. Participants who did not meet the inclusion criteria were advised not to participate. Before data analysis, three participants were removed from the data set, one for not meeting the minimum age criteria, the other two for missing multiple response items,

meaning the scoring of questionnaires was impossible. A final sample of 322 participants was used for the analysis. Using the participant to variable ratio outlined by Tabachnick and Fidell (2013), $N \geq 50 + 8M$ (with M being the number of predictors), the current sample considerably exceeded the minimum number of participants required (98 = 50 + 8*6) for six predictor variables to achieve adequate power to run a regression analysis.

The sample consisted of 218 females (*M* = 30.20, *SD* = 12.140, Range = 51.00); 84 males (*M* = 28.61, *SD* = 12.099, Range = 62.00); 14 non-binary participants (*M* = 28.38, *SD* = 3.001, Range = 62); 1 questioning participant (*M* = 24); 1 agender participant (*M* = 21); and 4 participants who did not wish to comment on their gender (*M* = 24.20, *SD* = 7.340, Range = 11.00). The overall sample's age ranged from 18–80 years old (*M* = 29.29, *SD* = 11.871). Most participants (70.8%) were from the UK, *n* = 117 and the US, *n* = 111. However, responses came from all over the world, including Canada, *n* = 19 (5.9%); Australia, *n* =13 (4.0%); Germany, *n* = 13 (4.0%); New Zealand, *n* = 5 (1.6%); Brazil, *n* = 4 (1.2%); Sweden, *n* = 4 (1.2%); the Netherlands, *n* = 4 (1.2%); and a host of other countries, *n* = 29 (9.0%). A full list is provided in Appendix 1. Three participants did not provide a country of questionnaire completion.

Materials

Broad Autism Phenotype Questionnaire (BAPQ; Hurley et al., 2007). The BAPQ is designed to measure autistic traits within the Broader Autism phenotype, and in the current study it was used to measure non-clinical autistic traits. The 36-item measure uses a 6-point Likert scale ranging from 1= 'vary rarely ' to 6 = 'very often'. The questionnaire produces an overall score of an individual's non-clinical autistic traits, as well as three subscales of the traits; aloofness (questions 1, 5, 9, 12, 16, 18, 23, 25, 27, 28, 31, 36) defined as a 'lack of interest in or enjoyment of social interaction' (Hurley et al., 2007, p. 1681), pragmatic language (questions 2, 4, 7, 10, 11, 14, 17, 20, 21, 29, 32, 34) defined as difficulties in social communication, and finally, rigidity (questions 3, 6, 8, 13, 15, 19, 22, 24, 26, 30, 33, 35) defined as 'little interest in change or difficulty adjusting to change' (2007, p. 1681). Scores are calculated after 15 of the items (1, 3, 7, 9, 12, 15, 16, 19, 21, 23, 25, 28, 30, 34, 36) have been correctly reversed scored. Subscale scores are calculated by averaging the 12 items for that subscale. A total score is calculated by averaging all 36 items. Scores for both subscales and the overall measure should range from 1-6. Higher scores indicate an individual has higher levels of non-clinical autistic traits and is likely to be part of the Broader Autism Phenotype, thus nearer the clinical ASD threshold. During development, the measure demonstrated good internal consistency with high Cronbach alphas for its subscales (.94 for the aloof subscale, .85 for the pragmatic Language subscale and .91 for the rigid subscale) and the overall measure α = .95 (Hurley et al., 2007). Additionally, the BAPQ has been found a more effective measure of autistic traits within the general population than other similar measures such as Baron-Cohen and colleagues Autism Quotient (Baron-Cohen et al., 2001), with the BAPQ showing higher internal consistency and greater validity in its factor structure (Ingersoll et al., 2011). In this study, good internal consistency was demonstrated for all BAPQ′ s subscales; aloof α = .92, pragmatic Language α = .83 and rigidity α = .90 and the overall measure α =.93.

Perceived Stress Scale (PSS; Cohen et al., 1983). The PSS was used to measure individual's levels of perceived stress. The 14-item scale asks participants to rate the frequency of several thoughts and feelings within the last month using a five-point Likert scale ranging from 0 = 'never ' to 4 = 'very often'. Scores are calculated after reversing the seven positive items (4, 5, 6, 7, 9, 10, 13) on the scale. A total score is achieved by summing up the 14 scale items. Scores can range from 0 to 56. Higher scores indicate higher levels of perceived stress. During validation, the measure demonstrated reasonable internal consistency α = .84 - .86 (Cohen et al., 1983). Furthermore, adequate internal consistency has been demonstrated across multiple international studies α = > .7 (Lee, 2012). In this study, the PSS also demonstrated good internal consistency α = .89.

Multi-Dimensional Scale of Perceived Social Support (MSPSS; Zimet et al., 1988). The MSPSS measures perceived social support from three different sources and was used to measure perceived social support in this study. The 12-item measure uses a seven-point Likert scale ranging from 1= 'very strongly disagree' to 7 = 'very strongly agree '. The measure has three sub-scales, each a different source of social support: the significant other subscale (items 1, 2, 5, & 10), family subscale (items 3, 4, 8, & 11), and friend's subscale (items 6, 7, 9, & 12). The measure produces a score for each subscale using the sum of the four questions for that subscale, divided by 4 to produce a mean score. The MPSS also produces an overall score of perceived social support calculated using the sum of the 12 items divided by 12. Higher scores indicate greater levels of perceived social support for the subscales and the overall measure. In previous literature (Zimet et al., 1988), the MSPSS demonstrated good internal consistency for its subscales (significant other α = .91, family α = .87 and friends α = .85) and for the whole scale α = .88. In the current study the MSPSS demonstrated excellent internal

consistency for the entire scale α = .92 and its subscales (significant other subscale α= .95, family subscale α = .97 and friend′s subscale α = .93).

Procedure

The current study was advertised on Facebook and online forums, including Redditt, The Student Room, and the BPS Student Forum. Participants were asked to fill out an online three questionnaire survey. The survey was designed using the online survey management software Qualtrics and took around 15-20 minutes to complete. Questionnaires were presented in the same order as in the materials section detailed above. Demographic questions were asked at the beginning of the study, the four questions asked for participants' age (in years), gender, and the country of questionnaire completion. This study was granted full ethical approval from Loughborough University's Human Participants Sub-Committee (study reference 2020-2276-2365) and aligned with British Psychological Society Ethics Guidelines (2018). Therefore, before starting the questionnaire, participants were presented with information on the background and purpose of the study.

Participants were also required to provide informed consent before progressing on to questionnaire completion. After questionnaire completion, participants were presented with a debriefing page reiterating the study's purpose and support resources should they have been affected by any material covered. Support resources were also provided to participants at the beginning of the study.

Data analysis

Data were analysed using the statistical analysis software IBM Statistical Package for the Social Sciences (SPSS, Version 27). Initial correlations were conducted using Two Tail Pearson's correlations. As collected data were continuous Likert scale data, the main analysis was run using a single multiple linear regression employing the enter method. A significance value of 0.05 was adopted for all analyses.

RESULTS

Gender difference analysis

Seven independent samples *t*-tests were conducted to look at the effect of gender (being male or female) upon all of the variables studied. There were no gender differences present with the BAPQ subscales, MSPSS Friends Subscale, or the Perceived Stress Scale (all $p > .05$).

However, gender differences were found in the MSPSS Significant Other Subscale, $t(300)–4.552$, $p < .001$. Females had a higher significant other social support score ($M = 5.63$, $SD = 1.54$) than males ($M = 4.63$, $SD = 2.08$). Gender differences were also found in the MSPSS Family Subscale, $t(300)–2.949$, $p = .003$. Females had a higher family support score ($M = 4.96$, $SD = 1.53$) than males ($M = 4.38$, $SD = 1.57$). See Table 1 for the descriptive statistics.

Table 1
Descriptive Statistics: Mean (and Standard Deviation) of Perceived Stress Scores, All Subscales of the Multi-Dimensional Scale of Perceived Social Support Scale, and all Three Non-Clinical Autistic Traits

	Male	Female
Perceived Stress Scale	28.00 (11.72)	28.81 (8.51)
MSPSS Significant Other Subscale	4.63 (2.07)	5.63 (1.54)
MSPSS Family Subscale	4.38 (1.57)	4.96 (1.53)
MSPSS Friends Subscale	4.85 (1.58)	5.04 (1.47)
BAPQ Aloof Subscale	3.51 (1.06)	3.41 (0.96)
BAPQ Pragmatic Language Subscale	3.14 (0.82)	3.14 (0.76)
BAPQ Rigid Subscale	3.27 (0.83)	3.39 (0.91)

Note: MSPSS: Multidimensional Scale of Perceived Social Support; BAPQ: Broad Autism Phenotype Questionnaire

Assumptions

All Tolerance values were above .50, and all VIF values were lower than 10, suggesting no violations of multicollinearity assumptions. The Durbin-Watson test produced a value of 2.013 within the suggested range of 1–3 (Field, 2018), indicating there was no autocorrelation in the data; thus, the assumption of independent

errors was not violated. All Cooks Distance values were smaller than 1, suggesting no individual cases were inordinately influencing the model. No issues were found with normality, heteroscedasticity, or linearity in the data, with an adequate distribution of residuals in the scatter plot and residuals falling closely to the line of the P-P plot. As all assumptions had been met a regression analysis was carried out.

Descriptive statistics

Descriptive statistics for all predictors and outcome variables are displayed in Table 2.

Table 2
Descriptive Statistics: Mean (and Standard Deviation) of Perceived Stress Scores, All Subscales of the Multi-Dimensional Scale of Perceived Social Support Scale, and all Three Non-Clinical Autistic Traits

	M	*SD*
Perceived Stress Scale	28.73	9.47
MSPSS Significant Other Subscale	5.36	1.75
MSPSS Family Subscale	4.78	1.57
MSPSS Friends Subscale	4.99	1.50
BAPQ Aloof Subscale	3.46	1.00
BAPQ Pragmatic Language Subscale	3.09	0.78
BAPQ Rigid Subscale	3.37	0.90

Note: MSPSS: Multidimensional Scale of Perceived Social Support; BAPQ: Broad Autism Phenotype Questionnaire

Correlations

Two-tailed Pearson's correlations (Table 2) revealed all predictor variables were significantly correlated with the outcome variable perceived stress ($p < .001$). All non-clinical autistic traits were significantly positively correlated with perceived stress (aloof $r = .335$, $p < .001$, pragmatic language $r = .461$, $p < .001$ and rigidity $r = .369$, $p < .001$). Pragmatic language showed the strongest correlation of the three traits demonstrating a moderate correlation ($r = .461$). All sources of social support were significantly negatively correlated with perceived stress (MSPSS Significant other subscale $r = -.178$, $p = .001$, MSPSS Family subscale $r = -.335$, $p < .001$ and MSPSS Friends subscale $r = -.236$, $p < .001$). The correlations between predictor variables were weak to moderate (the strongest correlation observed was between the non-clinical autistic traits aloofness and pragmatic language, $r = .579$, $p < .001$), further demonstrating the independence of the predictors and that no violation of multicollinearity assumptions had occurred. The significant correlations between the predictor variables and the outcome variable further highlighted a regression analysis would be the appropriate next step in analysing the data. It should be noted that all non-clinical autistic traits and all sources of perceived social support were significantly negatively correlated.

Table 3
Correlation Matrix of All Predictor Variables: Non-Clinical Autistic Traits, Sources of Perceived Social Support, and the Outcome Variable of Perceived Stress

		1	2	3	4	5	6	7
1.	PSS	–						
2.	MSPSS Significant Other	–.178**	–					
3.	MSPSS Family	–.335***	.423***	–				
4.	MSPSS Friends	–.236***	.498***	.459***	–			
5.	BAPQ Aloof	.335***	–.213***	–.396***	–.461***	–		
6.	BAPQ Pragmatic Language	.461***	–.172**	–.365***	–.306***	.579***	–	
7.	BAPQ Rigid	.369***	–.142*	–.244***	–.309***	.561***	.513***	–

Note: PSS: Perceived Stress Scale; MSPSS: Multidimensional Scale of Perceived Social Support; BAPQ: Broad Autism Phenotype Questionnaire
*$p < .05$; **$p < .01$; ***$p < .001$

Regression analysis

A multiple regression was carried out to assess if non-clinical autistic traits and social support predict perceived stress in the general population. See Table 4 for the full list of regression statistics. The overall regression model containing the three non-clinical autistic traits (aloofness, pragmatic language, and rigidity) and three sources of perceived social support (family, friends, and significant other) was a significant predictor of perceived stress, $F(6,315) = 18.99$, $p < .001$. The model explained 25.2% of the variance in perceived stress scores (adjusted $R^2 = .252$). In the model, only two non-clinical autistic traits positively predicted perceived stress, pragmatic language ($\beta = .317$, $p < .001$) and rigidity ($\beta = .170$ $p = .006$). Indicating that as pragmatic language and rigidity increased, perceived stress scores also increased. Of the social support variables in the model, only perceived social support from family was a significant negative predictor of perceived stress ($\beta = -.171$, $p = .004$), indicating that increasing perceived social support from family sources predicted lower perceived stress scores.

Table 4
Regression Table of the Relationship Between the Predictors Non-Clinical Autistic Traits, Perceived Social Support, and the Outcome Variable Perceived Stress

	B	β	*t*	*p*
Constant	17.295		4.604	<.001
MSPSS Significant Other	–.158	–.029	–.508	.612
MPSPSS Family	–1.033	–.171	–2.912	.004
MSPSS Friends	–.015	–.002	–.038	.970
BAPQ Aloof	–.182	–.019	–.282	.788
BAPQ Pragmatic Language	3.844	.317	5.054	<.001
BAPQ Rigid	1.784	.170	2.794	.006

Note: MSPSS: Multidimensional Scale of Perceived Social Support; BAPQ: Broad Autism Phenotype Questionnaire

DISCUSSION

Overview of aims and results

The current study aimed to assess whether non-clinical autistic traits and perceived social support predict perceived stress in the general population and if perceived social support in a model with non-clinical autistic traits could potentially be protective against perceived stress. To reach these aims, two hypotheses were derived. H_1: All non-clinical autistic traits (aloofness, pragmatic language, and rigidity) will positively predict perceived stress. H_2: All sources of perceived social support (friends, family, and significant other) will negatively predict perceived stress. Due to the lack of literature directly investigating this topic area, the hypotheses did not specify which traits or sources of social support would significantly predict perceived stress. However, based on Cohen & Wills's (1985) stress-buffering hypothesis that perceived social support would buffer against perceived stress, it was hypothesised that all forms of perceived social support would negatively predict perceived stress.

The first hypothesis that all three non-clinical autistic traits (aloofness, pragmatic language, and rigidity) will positively predict perceived stress was not supported. The current study found that only two of the three non-clinical autistic traits (pragmatic language and rigidity) predicted perceived stress. This would indicate that in the general population, higher levels of the non-clinical autistic traits, pragmatic language (difficulties in social communication), and rigidity (difficulty adjusting to change) were associated with higher levels of perceived stress, while aloofness (a disinterest in socialising) was not. This partially supports the findings of Hirvikoski and Blomqvist (2015), who observed that increasing global autistic traits in a small mixed sample of individuals (ASD and neurotypical participants) were associated with increased levels of perceived stress. However, the current study through measurement of individual traits rather than global scores produced the novel finding that not all non-clinical autistic traits predict perceived stress within the general population.

The findings that rigidity and pragmatic language difficulties were predictors of perceived stress were not unsurprising. For instance, Wainer et al. (2011) examined the structure of the broad autism phenotype and found higher rigidity to be associated with higher distress and anxiety. Furthermore, Morrison et al. (2018) found that individuals with high non-clinical autistic traits had similarly restricted (rigid) interests to individuals with ASD, and when unable to continue their interests, experienced heightened "resistance and distress" (Morrison et al., 2018, p. 31). It seems the inability to adjust to change/rigidity and its association with distress and anxiety is associated with perceived stress, as demonstrated by the current study. Additionally, studies

though not looking at autistic traits, have found difficulties in social communication ability, similar to pragmatic language difficulties, are associated with increased perceived stress (Segrin, 2019), while increased social communication ability, with lower levels of perceived stress (Segrin et al., 2007).

The finding that aloofness was not a significant predictor of perceived stress was unexpected. Especially as Stimpson et al. (2021) recently found aloofness to negatively predict mental well-being (a measure of positive mental health). However, Stice and Lavner (2019), when investigating non-clinical autistic traits and internalising symptoms (anxiety and depression), found only rigidity and pragmatic language difficulties were direct predictors, while aloofness was only an indirect predictor when mediated by social connectedness and loneliness. Therefore, it is possible that, like Stice and Lavner's (2019) findings with internalising symptoms, other mediating variables may be needed to unpick any possible relationships between aloofness and perceived stress, especially as initial correlations revealed a significant positive correlation between aloofness and perceived stress.

The second hypothesis that all sources of perceived social support (friends, family, and significant other) will negatively predict perceived stress was also not supported. In the current sample, only perceived social support from family was a significant negative predictor of perceived stress, indicating that in a model alongside the three non-clinical autistic traits, only perceived social support from family members was associated with less perceived stress. On the flip side, this finding suggests lower perceived social support from family members alongside increasing non-clinical autistic traits is associated with higher perceived stress. Together, this indicates a potential protective role of perceived social support from family members alongside increasing non-clinical autistic traits against perceived stress, thus possibly acting as a buffer in line with Cohen and Wills (1985) stress-buffering hypothesis, while support from friends and significant others is possibly not as important in protecting against perceived stress. In clinical ASD samples, some studies show perceived support from family to be the most beneficial for other psychological outcomes such as quality of life (Leader et al., 2021), so there is potential this may be the same for perceived stress alongside non-clinical autistic traits in the general population. However, the current study was conducted during the height of the COVID-19 pandemic so this finding may be a result of specific temporal influences. Other studies investigating perceived stress and sources of perceived social support during this time found in regression models only perceived support from family members acted as a significant negative predictor of perceived stress (Özer et al., 2021). Additionally, for adults, during this period, support from family has been reported as the most important for general mental health (Li et al., 2021), indicating the results in this study regarding perceived social support may be better explained within the context of the pandemic.

Another important finding regarding perceived social support and non-clinical autistic traits was that initial correlations revealed all non-clinical autistic traits were negatively correlated with all sources of perceived social support (see Table 2). This would indicate increasing non-clinical autistic traits may be associated with lower levels of perceived social support. Previous literature found associations between increased autism symptom severity in ASD populations and lower levels of perceived social support (Alvarez-Fernandez et al., 2017). The current study suggests these findings may continue into non-clinical populations. Furthermore, increasing autistic traits in the general population have been associated with decreased social network size (Lei et al., 2019) and decreased social connectedness (Stice & Lavner, 2019), suggesting that the current findings align with existing literature. Future researchers may wish to assess perceived social support as a mediating variable between non-clinical autistic traits and perceived stress.

One other finding that merits comment is that like Stimpson et al. (2021), this study demonstrated (through only moderate correlations between aloofness, rigidity and pragmatic language), support for the proposal that autistic traits may exist as fractionable/independent entities as suggested by Happé et al. (2006) and Happé and Ronald (2008), and rather than viewing these traits as unidimensional constructs, traits should be measured individually.

Gender differences were presented in the current investigation but only in terms of how males and females view the social support from their significant other and family. Females indicated that they had more support than males from both family and their significant other. In general, females undertake more caregiving roles (Shumaker & Hill., 1991), therefore this can mean that females see where and how they have the support in comparison to males who may not have as many caring responsibilities. Results can also be considered in terms of the type of supported offered by family and the significant other. Matud et al. (2003) provided gender differences in terms of the type of support needed. Males often need more practical support (which can be given from anyone) whereas females need more emotional support provided from the key individuals in their lives such as family or partners. While gender differences were presented, these must be taken with caution as there was a large difference in the sample size (84 males vs 218 females). Current results are similar to the previous research in suggesting such differences (e.g., Neff & Karney, 2005, and Stronge et al., 2019), however

the previous literature did investigate social support from family, friends and a significant other in relation to other concepts such as well-being. This is one thing that the current investigation did not investigate or control for.

Limitations

The current findings should be viewed considering several limitations. Firstly, the cross-sectional correlational design means causality cannot be inferred. Additionally, the study used a questionnaire design, employing self-report measures. This type of design can be subject to social desirability bias (van de Mortel, 2008), however, the survey was anonymised, and the questionnaires employed reverse scoring, recommended procedural techniques to reduce response bias (Nederhof, 1985; Podsakoff et al., 2003; Ray, 1983). In addition, the current sample was predominantly female. Gender differences have been demonstrated in the reporting of non-clinical autistic traits, with males reporting higher levels of traits than females (Hurley et al., 2007; Ruzich et al., 2015). Moreover, males report higher levels of aloofness (Klusek et al., 2014). A greater gender balance in the current sample may have presented different results regarding aloofness as a predictor of perceived stress.

Additionally, having diagnosed Attention Deficit Hyperactivity Disorder (ADHD) was not used as an exclusion criterion in this study. Correlations have been found between autistic traits and ADHD symptoms (Panagiotidi et al., 2017; Riglin et al., 2021); therefore, potential overlap could have influenced participants' responses to questionnaire items. However, ADHD traits also occur in non-clinical samples (Panagiotidi et al., 2017); therefore, unless actively screened case by case, this is a difficult confound to control for. Personality variables were also not controlled for, and studies demonstrate correlations between autistic traits and personality variables such as neuroticism (Stimpson et al., 2021). Attempts to control for these variables may give greater clarity to the explained variance in future research.

Arguably the greatest limitation of the current study is the possibility of significant temporal confounds arising from collecting data on psychosocial outcomes during a global pandemic. In addition to the aforementioned effects on sources of perceived social support, research suggests the impact of national lockdowns and the global pandemic has decreased mental well-being and increased levels of anxiety and perceived stress (Limcaoco et al., 2020; Savage et al., 2020). This may have tainted the results through participants recorded levels of perceived stress being influenced by the pandemic. Therefore, current results should be viewed through the lens of the pandemic and future studies should try and replicate these findings outside such adverse circumstances.

The current study also does not consider factors such as mental health issues and the influence of subsequent medication to treat such issues. Research has suggested that anxiety and depression can influence how people perceive the amount of social support they are receiving and can also be impacted by any medication taken to alleviate the symptoms of mental health conditions (Beehr & McGrath, 1992; Relojo-Howell & Stoyanova, 2019; Sinokki et al., 2009; Zhou et al., 2013). The current study did not control for any effects of mental health conditions or any effects of medication, therefore a consideration of this would be needed in future.

Despite these limitations, the current study had many strengths. For example, this was the first study to investigate the role of sub-threshold autistic traits and perceived social support on perceived stress in the general population. The study used reliable and previously validated measures, which demonstrated good to excellent reliability in the current study. Furthermore, using an online platform to collect data may have reduced social desirability as previously discussed and allowed the survey to reach participants from 32 different countries (see Appendix 1), suggesting specific cultural confounds may not limit this study. However, the study was only available to English speaking participants, future research should assess if the current study's findings are replicable in non-English speaking populations.

Future research and applications

Future research should also attempt to assess different variables that may mediate the relationship between non-clinical autistic traits and perceived stress in the general population and unpick the different associations found within the current study, possibly allowing for explanation of mechanism (Ogwuche et al., 2020). For example, personality has been shown to be linked with non-clinical autistic traits and social support in terms of how it is perceived and given (Stimpson et al., 2021).

As the current investigation did not control for any form of mental health condition, future research could investigate this in more detail. Individuals who have anxiety or depression (Zhou et al., 2013) may have

different perceptions of social support than clinically healthy individuals. This is very similar in consideration of mediation. In future, researchers could add medication and/or mental health conditions as part of exclusion criteria or they could compare individuals with and without such conditions to look at any influence of anxiety and depression.

Additionally, future studies may wish to control for potential confounds such as personality traits, to gain greater insights into the relationships between non-clinical autistic traits, perceived social support, and perceived stress. Research has suggested a strong link between lower levels of neuroticism and higher levels of agreeableness and conscientiousness (Barańczuk, 2019), therefore this would be of interest to investigate in future.

In summary, the current study suggests within the general population, non-clinical autistic traits do predict perceived stress. However, not all non-clinical autistic traits show an association, with only rigidity and pragmatic language difficulties acting as significant positive predictors. In addition, alongside increased rigidity and pragmatic language difficulties, only perceived social support from family members was a significant negative predictor of perceived stress, thus the only source of perceived social support that was potentially a buffer against perceived stress alongside non-clinical autistic traits. Additionally, higher non-clinical autistic traits were negatively associated with lower perceived social support. These findings should allow future researchers to use mediation analysis to further unpick relationships between subthreshold autistic traits, perceived social support, and perceived stress and assesses if the current results can be upheld outside the Covid-19 pandemic.

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APPENDIX

Table A
Country of Questionnaire Completion

	n	%
Brazil	4	1.2
Bulgaria	1	0.3
Canada	19	5.19
Chile	1	0.3
Czechia	2	0.6
Denmark	3	0.9
Finland	1	0.3
France	3	0.9
Germany	13	4.0
Hungary	1	0.3
India	1	0.3
Ireland	1	0.3
Italy	1	0.3
Lithuania	1	0.3
n/a	3	0.9
Netherlands	4	1.2
New Zealand	5	1.6
Norway	2	0.6
Poland	1	0.3
Romania	1	0.3
Serbia	1	0.3
Slovakia	1	0.3
South Africa	1	0.3
Spain	1	0.3
Sweden	4	1.2
Ukraine	1	0.3
United Arab Emirates	1	0.3
United Kingdom	117	36.3
United States	111	34.5