

RELATIONS BETWEEN AUTISTIC TRAITS, SOCIAL ANXIETY, AND  
ATTRIBUTION BIASES IN YOUNG ADULTS

by

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## DEDICATION

I would like to dedicate this thesis to my brother, Pete. The day that I was born, and the first time that you held me in your arms, my life changed forever. I looked into your eyes for the first time, and I have been seeing through them ever since.

I have always been told that having an autistic sibling has made me empathetic, patient, and unafraid to stand up for and advocate for others. I can still see myself in elementary school, a bundle of long, awkward limbs and fire, standing in between those that were “different” and those that were the “same”. Even before I knew what I was doing, I was fighting for inclusion, I was fighting for understanding. Although I am far less confrontational now, when I notice things, and I listen, and I speak, I am always speaking for you. Being your sister is a gift. It has sent me blazing down a path toward debunking the illusion of sameness and differentness. Humanity is what connects us, but our amazing and intricate brains that sit inside our silly human heads and the experiences that shape us make us wholly unique. If anything, what makes us so unique is what makes us the same.

When I was scouring the internet looking for articles for this very thesis, and didn't find much of anything, it wasn't discouraging; it was totally and utterly inspiring. I promise you that as I move forward with my education that I will always strive to challenge others' perspectives. I will take new approaches when researching autism. As unique as you, the entire autistic community, and humankind as a whole are, research within this field should be too. The word “different” is not a bad word. In my eyes, especially when viewing it through the lens of psychology, it just means that there is an opportunity to discover, learn, and understand.

When I looked into your eyes for the first time, I really saw you, and you really saw me. You have changed my world, and I hope that I can change the world for you, too.

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## **ABSTRACT**

Previous research has found that autistic children show increased hostile or negative attributions (e.g., assuming a classmate bumped into you on purpose) as compared to their neurotypical peers. Very little work, however, has examined relations between autistic traits and attribution styles in adults, leaving open questions about whether these relations change over development. This study examined whether autistic traits modulated attribution biases in a large sample (N=826) of young adults.

Participants completed a survey which included measures of autistic traits, social attribution biases (positive, negative, and neutral), social interaction anxiety, and social support. Despite previous findings, the current study found no relation between higher autistic traits and increased negative attributions, although social anxiety did predict increased rates of negative attributions. More research should be done in clinical samples and should examine attribution styles longitudinally, as there is potential for styles to change as an autistic individual ages and matures.

*Key words:* Autism, social attribution theory, social interaction anxiety, hostile attribution

## **Introduction**

Autism spectrum disorder (ASD) is defined by the National Institute of Mental Health (2022) as a “neurological and developmental disorder that affects how people interact with others, communicate, learn, and behave” (para. 1). As autism is a spectrum, there is wide variability in symptom presentation, including variability in speech and motor function, cognitive ability, and social functioning. Social functioning broadly refers to areas like empathy, thinking in terms of other people’s perspectives, communicating effectively in social situations, and social information processing. Although research on ASD has increased dramatically in the last twenty years, open questions remain about autistic adults, particularly in terms of social attributions, or positing reasons to explain people’s behavior.

Neurotypical and autistic people engage in social attributions, which refers to the fact that, “people interpret behavior in terms of its causes and that these interpretations play an important role in determining reactions to the behavior,” (Kelley & Michela, 1980, p458). For example, when someone bumps into you in the hallway, you can decide whether to attribute their action to inattention or hostility. As we experience different social situations, we are constantly assigning meaning to each interaction, which, in turn, impacts how we view, perceive, and respond to others (Kelly, Michela, 1980). The attributions that we make play a key role in our social lives. For example, in a study of neurotypical adults, if participants believed their behavior caused another’s positive emotions they would find the situation and relationship to have more rapport, whereas if they believed their behavior to be the cause of another’s negative emotions they would

find the situation to be more threatening and attempt to alter their behavior (Hillebrandt & Barclay, 2017).

There are several reasons to hypothesize that social attributions may be altered in autistic individuals. In particular, extensive research has shown links between ASD and atypical understanding of both social cues (e.g., Chan et. al, 2022; Jellema et. al, 2009) and others' intentions (Boria et. al, 2009; Phillips et. al, 1998). If an autistic individual is missing positive social cues or finds that social situations tend not to go well, their attribution styles could be impacted. Despite these important factors that could influence social attribution theory, attribution styles within autistic individuals remain under researched, particularly in adulthood.

The limited body of research on social attribution and ASD has been predominantly conducted in school-aged children. In 2006, Meyer and colleagues examined the link between autistic traits, social attribution processes, and comorbid symptoms like depression and anxiety in autistic children. Using vignettes in which they asked children to make attributions, they found that autistic children were more likely to have hostile attribution biases. A subsequent study by Embregts et al. (2009), also found that autistic children had more difficulty encoding social information and were more likely to make negative attributions. Since these two initial studies, other work has found roughly the same pattern of increased negative attributions. For example, Ziv and colleagues (2014) found that, in response to different scenarios that focused on ambiguous social interactions, autistic children were more likely to be avoidant or aggressive than neurotypical children. Similar studies have also found that autistic

children were more likely to misinterpret situations, encode social information improperly, and make hostile attributions (Russo et al., 2015).

One explanation for these findings is that autistic children may have issues processing these hypothetical vignettes. To address this possibility, Russo and colleagues (2018) conducted a study that changed the format of the vignettes into a computer game, in which children could customize their character, include their likes and dislikes, and choose friends similar to them in race and interests. Again, autistic children were more likely to be avoidant in their response styles and interpret the interaction as hostile. Thus, the work in children consistently indicates an increase in hostile or negative attributions.

Despite the consistent findings of increased negative social attributions in autistic children, there are still open questions. One limitation of previous research is that the focus was only on school-age autistic children, which limits our understanding of whether or not these trends continue into adulthood. A second limitation of previous research is that studies typically focused on negative vs neutral styles, as opposed to positive styles (i.e., interpreting an ambiguous action to come from an explicitly positive motivation). Positive styles are of particular interest in ASD because they may be a double-edged sword. For example, given some research on individuals with ASD being vulnerable to scams (Fisher et. al, 2013), excessive positive attributions may be a risk factor for real-world difficulties. On the other hand, positive biases may foster social success by promoting warmer social relationships. A third limitation is that most studies have compared clinical to non-clinical populations, rather than exploring the effect of autistic-like traits in the general population, which limits the applicability to the general population who may have subclinical traits. Exploring a larger sample in the general

population would also allow for greater exploration of the heterogeneity of ASD, as one possibility is that some individuals show a bias toward positive attributions and others toward negative attributions.

To close these gaps in the literature, within this study, we examined the link between autistic traits and positive, neutral, and negative attribution biases in a large sample (N=826) of Texas State undergraduates. Additionally, we aimed to examine what other factors may play a role in relations between autistic traits and attribution biases. In particular, we were interested in the potential role of social interaction anxiety, defined by the DSM-5 as a disorder marked by anxiety that is caused by social situations, including interactions, being observed, and performing (APA, 2013).

Our main hypothesis was that autistic traits would be related to attribution style. In particular, we hypothesized that individuals with higher autistic-like traits would be more likely to show a bimodal pattern of being either quite positive or quite hostile in their styles, corresponding to the heterogeneity of social life in ASD. In children, all the findings suggest that autistic traits are only predictive of increased negative attributions. If the relationship between autistic traits and social attributions is similar in adults, then it would suggest continuity across clinical and subclinical autistic traits and across the lifespan. In contrast, if the relationship between autistic traits and social information processing biases are different for autistic adults and autistic children, then more research would need to be done in order to examine what factors could potentially impact this change. Additionally, this work will specifically examine the potentially overlooked category of positive biases, which may be an important part of understanding the vast

individual differences in ASD, particularly in how individuals on the spectrum interpret social situations in a variety of complex and different ways.

Our secondary hypotheses related to social anxiety. We hypothesized that someone high in autistic traits and high in anxiety may show higher levels of negative attributions. Past studies have found links between social anxiety and hostile attribution biases (Bell-Dohan et. al, 1994; Fresco et. al, 2006), perhaps because more socially anxious individuals assume that interactions are going to go poorly. In contrast, someone with high levels of autistic traits but low levels of social anxiety might have more tendencies to make positive or neutral attributions.

## **Methods**

### **Participants**

All protocols were approved by the Texas State Institutional Review Board. A large sample (N=826) of Texas State University students were recruited to participate in this study. Students were recruited via SONA, an online scheduling system used to give participation credit to students who participate in university studies. After signing up via SONA, participants completed a survey that was made in Qualtrics, an online survey tool. To be eligible to complete the survey, all participants had to be aged 18-30 and fluent English speakers. Informed consent was acquired in the beginning of the survey, in which participants received all pertinent information before agreeing to participate in the study.

Since this study was conducted online, participants completed surveys remotely and at their own pace. However, in order to account for the lack of a researcher overseeing the completion of the survey, multiple attention checks were included in order to ensure that participants were reading questions and answering carefully. Those who

failed 2 or more attention checks were not included in data analysis. The final sample consisted of 697 participants.

Of this final sample, 70.9% were female, 23.5% were male, 2.2% were non-binary, and 3.4% did not report gender. Participants ranged from 18 to 24 years old, with an average age of 18.93 years. The sample was 43.7% Hispanic/Latino and 49.0% non-Hispanic/Latino (the remainder did not answer or did not wish to disclose). The sample was also majority White (63.1%), 10.3% Black/African-American, 5.9% multiracial, 2.9% Asian, 2.2% American Indian or Alaska Native, 0.4% Native Hawaiian or Pacific Islander, and the remaining did not answer or did not wish to disclose.

## **Procedures**

Participants completed the roughly 45 minute survey on Qualtrics on their own devices. The questionnaire contained a variety of measures, including measures outside the scope of the current research. Below, we review the measures included in this study.

### *Social Attribution Bias*

Ten novel social vignettes which depicted ambiguous social situations were administered to participants. A situation was introduced in which another party took an action, then the participants were asked to make an attribution for the other person's action. For example, the text of one vignette read: "You are eating lunch with your friends at a restaurant. You get up to use the restroom and they start looking at you and whispering about something. Why do you think they were whispering?" Participants were then supplied with 3 different options: negative (they were talking about how much they dislike you and they are glad you left the table), neutral (they were talking about their food and how they liked it), and positive (they were talking about how much they loved

your outfit and were planning to tell you when you got back to the table). Participants chose which option they found most likely and then also ranked the likelihood of each option on 1-5 scale (higher values indicated more likely). Thus, we had two dependent measures: the total number of negative, positive, and neutral attributions across the ten vignettes and the Likert scale value for each attribution type, averaged across all vignettes.

### *Autism Quotient*

To our knowledge, participants in this study did not have formal ASD diagnoses, however, the Autism Quotient (AQ; Baron-Cohen et al., 2001) was administered in order to measure autistic traits. The AQ is a self-administered test which can be taken by adults aged 16 and up in which higher scores (out of 50) indicate more autistic like traits. Some sample items include “I prefer to do things with others rather than on my own (reverse scored),” “I prefer to do things the same way over and over again.” Although the AQ is not used for clinical diagnosis, it can be used as a first pass screening tool, with various sources recommending cutoffs of 26 (Baron-Cohen et al., 2001; Lever & Geurts, 2016) and 32 (Broadbent et al., 2013; Heylens et al., 2018).

### *Social Interaction Anxiety*

The Social Interaction Anxiety Scale (SIAS) (developed by Mattick and Clarke) was used to determine participants’ levels of social anxiety. The SIAS is a 20 item test scored on a 4 point scale, with the highest total being 80. A score of 43 or more would indicate social anxiety, a score of 34 to 42 would indicate social phobia, and a score below 34 would indicate no presence of social anxiety traits. Some samples included: “I

get nervous if I have to speak with someone in authority (teacher, boss, etc.)” and “I find it easy to make friends my own age (reverse scored)”.

### *Social Support*

Although we did not have prior hypotheses about the effect of perceived social support on the relation between autistic traits, attribution biases, and social anxiety, we included social support as an exploratory measure. We used a shortened version of the Social Support questionnaire (Sarason et. al, 1983) Participants were expected to answer questions with the initials of individuals in their life that would fit that question. For example, if asked “Who can you be yourself around?”, the participant would put a series of initials to represent the people they could be themselves around. Participants were also asked about their satisfaction with their social support. Our main measure was averaged satisfaction across all 6 items.

## **Results**

### *Descriptive Statistics*

There was substantial variability on the measures of attribution bias. Out of 10 vignettes, participants’ number of positive attributions ranged from 0-8 ( $M = 3.48$ ,  $SD=1.70$ ), the number of neutral attributions ranged from 0-9 ( $M = 3.24$ ,  $SD=1.54$ ), and the number of negative attributions ranged from 0-9 ( $M = 3.19$ ,  $SD=1.54$ ). Likert scale measures showed similar variability. Average endorsement of positive explanations ranged from 2.2-5 ( $M=3.59$ ,  $SD=0.45$ ), for neutral, average endorsement ranged from 2-5 ( $M=3.23$ ,  $SD=0.43$ ), and for negative, the range was 1.9-5 ( $M = 3.46$ ,  $SD=0.35$ ).

Other questionnaires also displayed large individual differences. Scores on the Autism Quotient ranged from 4-39 ( $M=20.13$ ,  $SD=5.87$ ). Using two conventionally

accepted cut-offs for clinical concerns,  $n=117$  (16.79%) participants scored 26 or higher and  $n=31$  (4.45%) participants scored 32 or higher. On the SIAS, scores ranged from 0-80 with a mean of 36.20 ( $SD=16.66$ ). A large share of participants ( $n=242$ , 34.72%) scored at or above the most stringent cut-off for clinical concern (scoring 43 or higher) and an additional  $n=155$  (22.24%) scored at an intermediate level of concern (scoring between 34 and 42). In other words, less than half the sample (43.00%) scored below concern for social anxiety. As expected based on past literature, AQ scores and SIAS scores were strongly positively correlated ( $r(695)=.58$ ,  $p<.0001$ ).

Participant ratings of social support were quite high ( $M=5.4$  out of 6,  $SD=.84$ , range 1-6). Ratings were negatively correlated with both AQ scores ( $r=-.15$ ,  $p<.001$ ) and SIAS scores ( $r=-.13$ ,  $p<.001$ ), such that individuals who perceived more social support had lower autistic and social anxiety traits.

#### *Relations between Autistic Traits, Social Anxiety, and Attribution Biases*

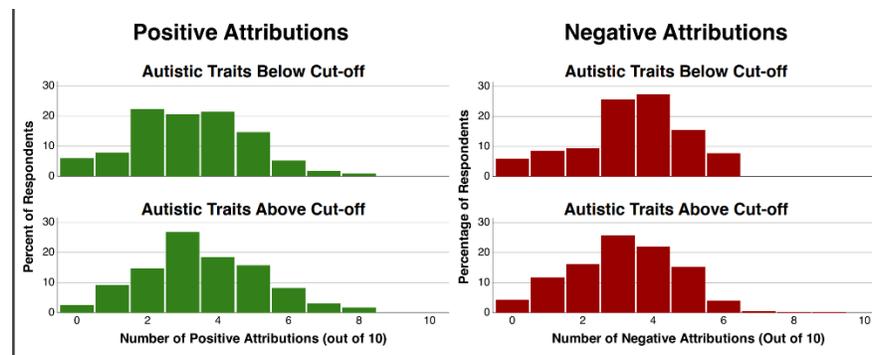
In a correlation analysis, higher levels of autistic traits (i.e., AQ scores) were related to lower numbers of positive attribution biases ( $r(695)=-.102$ ,  $p=.007$ ) and lower Likert-scale endorsement of positive explanations ( $r(695)=-.122$ ,  $p=.001$ ). There were no significant relations between autistic traits and neutral or negative biases. We conducted a follow-up analysis comparing those with AQ scores of greater than or equal to 26 to those with AQ scores of less than 26, since the number of individuals with scores about the more stringent 32 cutoff was so small. Broadly, these dichotomized results were similar to the correlational analyses. Those in the low AQ group made marginally more positive attributions ( $t(695)=1.88$ ,  $p=.06$ ) and had higher Likert scales for positive attributions ( $t(692)=2.14$ ,  $p=.03$ ). Interestingly, there was also marginally higher

endorsement of Likert-scale plausibility of negative attributions in the low AQ group ( $t(692)=1.81, p=.070$ ). Taken together, and contrary to past literature, these results do not suggest the presence of excessive hostile or negative attributions in individuals with higher AQ scores.

We then examined the  $n=117$  individuals with AQ scores above the cut-off of 26. We had hypothesized that there might be sub-samples of individuals prone to excessively positive or excessively negative attributions. However, the histograms comparing low AQ and high AQ individuals on these attribution types revealed roughly normal distributions in both cases, suggesting that there is not a larger tendency toward bimodal attribution styles in the ASD group (Figure 1).

Figure 1

*Distributions of Attribution Biases in Low AQ and High AQ Groups*



Finally, we conducted exploratory analyses examining how social anxiety and social support impacted attribution biases. Higher social anxiety predicted lower numbers of positive choices ( $r(695)= -.14, p<.001$ ) and higher numbers of negative choices ( $r(695)=.112, p=.003$ ). Higher levels of social support predicted slight increases in the

number of positive choices ( $r(685)=.088, p=.021$ ) and in the Likert scale values of both positive ( $r(685)=.134, p<.001$ ) and negative options ( $r(685)=.116, p=.002$ ).

#### *Influence of Social Anxiety on Relations between Autistic Traits and Attribution Biases*

As reviewed above, higher levels of social anxiety were related to both lower numbers of positive attributions and higher numbers of negative attributions. However, moderation analyses using the PROCESS macros in SPSS revealed no significant moderation effect with AQ scores. That is, the relation between AQ and attribution biases was not influenced by social anxiety for either total number of positive ( $F(1, 693)=2.32, p=.13$ ) or negative ( $F(1, 693)=1.57, p=.21$ ) attributions.

### **Discussion**

The current study examined the relation between autistic traits and attribution biases in a large sample of young adults. In contrast to past literature, we did not find a link between higher levels of autistic traits and a greater tendency toward negative or hostile attributions when explaining the reasons behind someone's actions. Instead, there was some suggestion of a reduced propensity toward positive biases. In follow-up analyses comparing high AQ individuals to low AQ individuals (based on recommended cutoffs from the literature), we found that both positive and negative biases were reduced in the high AQ group. These results have implications for studying autism and attribution bias into adulthood.

There are several potential explanations for why our findings are different from the findings of hostile biases in past studies of autistic children. One possibility is that we studied subclinical traits in a general college student population and the effects of autism on hostile attributions are only present in clinical cases. Increased levels of hostile

attributions may only be found at higher levels of symptomatology. Another potential explanation, which may unfold in parallel with links to symptomatology, is that having an explicit diagnosis may change an individual's social life either due to differential treatment by peers (Golu et. al, 2022) or an internalization of the diagnosis (e.g., that their diagnosis must mean they won't do well socially). The current study cannot disentangle these possibilities, but future work should compare biases among individuals diagnosed at different ages, as previous findings have shown that trajectories of internalizing and externalizing of symptoms can change from adolescence to adulthood (Woodman et. al, 2016).

Another reason our findings do not fit with past literature could be because we were examining adults. As we mature, we may gain more emotional regulation skills to become less reactionary and less prone to hostile biases. Previous work has suggested that some negative cognitive biases increase between 10 and 17 (Slavny et al., 2019), but since the current sample were young adults, they may have decreased again. Additionally, there may be an interaction between autism diagnosis and age on hostile attribution biases, such that autistic children show a protracted pattern of development in emotional regulation (Berkovits et. al, 2017). Potentially, young adulthood could involve decreases in overt bullying and aggression, at least as compared to the school age years (Pepler et al., 2008), which could help lessen hostile attribution biases and counteract childhood lessons about others' negative intentions.

To address the role of development, future work should examine attribution bias in autistic individuals longitudinally. There has been some limited work on changes in hostile attribution bias over the lifespan (Wang et al., 2019), but none of this work has

examined autism. One prediction is that autistic children show a sharper decline in their hostile attribution bias, which causes the differences present in childhood to disappear by young adulthood. Longitudinal work could also examine which factors lead to the emergence or decline of this bias.

There was some suggestion that when our sample was split into high AQ and non-high AQ (based on suggested cut-offs) that the high AQ group showed lower endorsement of both positive and negative attributions. This may indicate that higher AQ individuals are less likely to show detailed internal attributions of others' actions, as the majority of the positive and negative choices involve rich attributions of intention. Potentially there was also a hesitation to make a strong choice, especially about this kind of vague, hypothetical vignette task. That is, given the paucity of information in these brief vignettes, higher AQ individuals may have had a greater tendency to default to the neutral option. These possibilities should be investigated in more detail in future work, potentially using a free-response task that measures the detailed amount of mental state information that participants are given when describing another person's intentions or internal states (e.g., Pequet & Warnell, 2021).

Although we hypothesized that individuals with higher AQ scores would be more likely to show extreme attribution biases, we did not find support for bimodal subgroups. Again, this could be due to working with college students and not a clinical sample. Another possibility is that our vignettes were too decontextualized to capture real-world clusters of attribution styles. Measuring attribution styles in the real-world would involve higher stakes interactions with more emotional salience and real-time verbal and non-verbal social cues. Our untimed, written vignettes allowed participants unlimited

processing time, unlike in real situations. Past work suggests that autistic social differences are more pronounced in fast-paced real-world contexts (Klin et al., 2003; Senju et al., 2009) and we may have found larger effects if we did not use vignettes but instead created an interaction in the laboratory or surveyed individuals about their real experiences.

Our preliminary analyses of social anxiety indicated that higher social anxiety was related to lower positive and higher negative attributions, consistent with the past literature (e.g., Stopa et. al, 2000). We also found that higher levels of social support predicted a slight increase in positive choices. However, we did not find that the relation between autistic traits and attribution biases was moderated by social anxiety. That is, an individual's level of social anxiety did not influence links between AQ scores and propensity to endorse positive or negative explanations for others' behavior.

One key limitation of this study is that the vignettes were written by neurotypical researchers and did not specify the neurotype of the characters in the story. Autistic individuals may have unique social experiences or interpretations that they would give for the actions in the story, but were forced to choose between the three options given by researchers. An important future direction would be to create vignettes by and about autistic individuals and allow a free response section for generating attributions. It would also be interesting to see if labeling the characters in the story as explicitly autistic or non-autistic would change attributions by both neurotypical and autistic individuals (e.g., Morrison, 2022). Previous research has found that the motivation behind differences in individual's biases can be linked to cultural differences, wherein those within Eastern cultures are more likely to reference context whereas those within Western cultures are

more likely to reference one's personality or disposition (Choi et al, 1999). As the autistic community has rich and varied sets of social norms, social attribution theory should be viewed through the lens of an autistic culture.

Overall, the lack of hostile attribution biases in individuals with higher autistic traits is an important addition to the preexisting body of literature. In the future, more work should be done to examine attribution styles in autistic individuals from new perspectives and with new approaches. As autism is a spectrum, it is important to allow room for and highlight differences from one individual to another. Taking perspectives that challenge previous findings only increases the chances of diversifying literature that surrounds autism and is crucial for improving the field as a whole. Although in this case our hypotheses were not supported, our findings still have important implications for examining how social information processing skills can be impacted by autism and creates more opportunities of understanding differences in social functioning from person to person. Unique perspectives and results are only fitting for a community with such rich perspectives and experiences.

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