Abstract

People's moral values and social emotions play an important role in everyday interactions. We investigated moral values and social emotions in people with autism spectrum disorders (ASD). Adults with ASD (*N* = 18) and neurotypical adults (*N* = 44) rated their endorsement of "group-binding" (versus individual-based) moral values (e.g., ingroup loyalty) and responded to a series of vignettes designed to elicit social comparison emotions: envy and schadenfreude. ASD participants reported reduced endorsement of binding moral values and reduced levels of social comparison emotions. We also found a positive correlation between endorsement of binding values and social comparison emotions. These findings reveal important associations among social cognition, moral values, and social emotions.

Keywords: autism spectrum disorder, envy, schadenfreude, moral values

Moral Values and Social Emotions in People with Autism

People's social cognitive abilities shape their thoughts and feelings toward others across group boundaries. People with autism spectrum disorders (ASD) often experience difficulties with social cognitive abilities such as social communication (APA, 2000), theory of mind (ToM; Richardson et al., 2020; Baron-Cohen, 2000), empathy (Mazza et al., 2014), and coordinating joint attention (Redcay et al., 2013). Limitations in social cognitive abilities can make it harder for autistic people[1] to engage in reciprocal social interaction (APA, 2000), recognize and process social emotions (Willians & Happe, 2010b), and understand their own and others' intentions (Williams & Happe, 2010a). These limitations may also influence related social cognitive processes, such as social comparison and endorsement of group-binding moral values ("binding values"). Little work has investigated moral values in autistic people and, while some work has examined their limited recognition of social comparison emotions such as *envy*, burdensome pain about being inferior (Lange et al., 2018), and *schadenfreude*, pleasure at other's misfortunes (Shamay-Tsoory, 2008), less work has examined their reported experience of social comparison emotions. The current study aimed to build on this work by investigating how autistic people might be less likely to endorse binding values and report experiencing reduced levels of social comparison emotions.

Autism and Morality

Moral cognition hinges on social cognitive skills, such as reasoning about mental states (Ames & Fiske, 2013; Cushman, 2008; Malle, 1999). Inferences about people's intentions and emotions strongly influence blame and punishment (Young & Tsoi, 2013)

[1] A recent survey of 654 English-speaking autistic adults found that a majority (79.5 percent) prefer the term "autistic person" (Keating et al., 2022), so we use that term when discussing autism in this paper.

and moral praise (Yudkin et al., 2018), sometimes even more so than the outcome of the action itself (Young et al., 2010). Moral cognition is also shaped by information about social relationships. For example, perceptions of social obligations influence evaluations of helping behavior in children (Marshall et al., 2020) and adults (McManus et al., 2020; 2021). Additionally, perceptions of group norms like care, hierarchy, and reciprocity vary across different types of relationships (Earp et al., 2021). These findings are complemented by research on the "social brain," revealing that regions of the brain responsible for social processes such as ToM are robustly engaged for processing moral stimuli (for a review, see Greene & Young, 2020; Young & Dungan, 2012). Accordingly, prior work shows that autistic people are less sensitive to intent when evaluating the moral permissibility of actions, compared to neurotypical people (Moran et al., 2011). Instead, autistic people rely more on information about the consequences of actions when assigning blame and punishment (Dempsey et al., 2020a).

Autism and Binding Moral Values

Moral Foundations Theory (Graham et al., 2018) proposes a distinction between moral values that emphasize the needs and goals of the group, *binding* foundations, and those that emphasize the needs of individuals, *individualizing* foundations. The former include loyalty, authority, and purity, while the latter include care and fairness. Only a few studies have directly examined the moral values of autistic people using the MFT framework. Dempsey and colleagues (2022) found similar endorsements across moral foundations for autistic children compared to neurotypical children. However, in qualitative interviews, Dempsey and colleagues (2020b) found that autistic people were less likely to bring up binding (versus individualizing) values when discussing moral

transgressions. The current study provides an initial quantitative examination of differences in the prioritization of individualizing versus binding values in autistic people and neurotypical controls.

Autism and Social Comparison

Social comparison allows for evaluating one's status relative to group members and learning about group norms (Festinger, 1954; Križan & Gibbons, 2014). Many types of social comparison emotions have been identified, including inspiration, sympathy, empathy, envy, and schadenfreude (Smith, 2000). Prior work on social comparison in autistic people is limited. Work on overactive ToM in social anxiety disorder suggests underactive ToM in autism may lead to reduced social comparison (Hezel & McNally, 2014). Indeed, Dvash and colleagues (2014) found that, compared to neurotypical people, autistic people were less sensitive to social comparison (e.g., how much money other people had) in a monetary game. Autistic people also display difficulty recognizing social comparison emotions (Shamay-Tsoory, 2008). Few studies directly measure the reported experience of social comparison emotions in autistic people. One study on autistic children showed that their expression of social comparison, coded in physical and verbal expressions of jealousy, was similar to that of controls, but that they have a less coherent understanding and limited ability to explain their jealousy (Bauminger, 2004). The current study directly measured two self-reported social comparison emotions in autistic people: envy and schadenfreude. Prior work suggests that schadenfreude is more closely associated with aggressive forms of envy (malicious envy) than benign envy (Lange et al., 2018) and may rely on judgements about

deservingness (Brambilla & Riva, 2017), requiring ToM (Santamaría-Garcia et al., 2017).

Current Study

Moral values and social comparison emotions play a key role in social group functioning. Binding values can bolster social ties and cooperation within existing groups: ingroup loyalty promotes helping and trusting of ingroup members, respect for authority encourages compliance to leaders' instruction and group norms, and purity and sanctity facilitate the preservation and protection of group boundaries though the moralization of social norms about food, sex, and the body more generally (Carnes & Lickel, 2018; Graham et al., 2009; Haidt & Joseph, 2004). Similarly, social comparison emotions are key to the operation of group hierarchies; expressing empathy toward those at the top and schadenfreude toward those at the bottom creates and maintains hierarchies, whereas the opposite weakens them (Hudson & Uenal, 2022; Hudson et al., 2019). They can also motivate status-seeking through the embodiment of group ideals and reinforcing what those ideals are by providing information about high-status social referents.

While binding values and social comparison emotions may have some positive effects on groups, they can also have a deep negative impact. Endorsement of binding values can motivate derogation of those who may threaten the security and certainty of the group, leading to prejudice toward outgroup members (Hadarics & Kende, 2018) and victim-blaming (Niemi & Young, 2016). Similarly, social comparison emotions such as envy and schadenfreude can motivate the subversion of others' successes (van de Ven et al., 2009) and collective violence (Cikara, 2015), and can be harmfully directed

toward outgroup members (Hudson & Uenal, 2022) and stereotyped groups (van Dijk et al., 2015).

Sensitivity to group boundaries, consideration of group membership, and attention to groups are all likely to influence how people compare themselves to others and their assignment of value to group cohesion. These outcomes may manifest differently in those with social cognitive difficulties, including people with ASD. The current study aimed to investigate the links among ASD, moral values and social comparison emotions.

Method

Sample

Between spring 2013 and summer 2014 we recruited 44 neurotypical adults (NTs; 24 male, M_{age} = 24.98, SD_{age} = 5.53) and 18 autistic adults (ASDs; 16 male, M_{age} = 31.61, SD_{age} = 8.05) from the Greater Boston Area for unrelated neuroimaging studies. The NT and ASD groups did not differ in IQ (NT: M = 112.39, SD = 15.55; ASD: M = 116.56, SD = 15.62; $t(45) < 1.0$, $p > .35$) or political orientation (NT: M = 3.1, SD = 1.20; ASD: M = 3.00, SD = 1.28; $t(55) = -.29$, $p = .77$).

All participants were prescreened using the Autism Quotient (Baron-Cohen et al., 2001) for a possible ASD. Data are missing for two ASD participants. NTs scored lower (M = 16.36, SD = 6.24) than ASDs (M = 32.31, SD = 7.59; $t(58) = 8.26$, $p < .001$, d = 2.30). ASD participants underwent both the Autism Diagnostic Observation Schedule (ADOS; Lord et al., 2000) and impression by a trained clinician based on the diagnostic criteria of the DSM-IV (American Psychiatric Association, 2000). All ASD participants received a diagnosis of Asperger’s syndrome.

Procedure

Participants were asked to read a scenario and imagine themselves as the subject of the scenario (Appendix I). The vignette described their goals and hobbies and struggles to pursue them. Next, participants read two vignettes adapted from Takahashi et al. (2009). Participants read about two hypothetical people: a gender-matched target person (Sam/Samantha) meant to elicit social comparisons and an opposite-gender control person (Don/Donna) meant to serve as a baseline.

The target was similar to the subject in terms of goals and interests, but much more successful. The baseline was described as different from the subject in terms of goals and interests, but similar in terms of success.

After reading these descriptions, participants responded to 14 questions: seven measuring envy and seven measuring schadenfreude (6-point scales from *no envy/pleasure* to *extreme envy/pleasure*). For each question, ratings for the control were subtracted from ratings for the target to get a measure of social comparison emotions for the question.

Next, participants completed the Moral Foundations Questionnaire[2] (MFQ30; Graham et al., 2011), rating each of 30 considerations on their relevance to deciding whether something is right or wrong (6-point scale from *Not at all relevant* to *Extremely relevant*). The survey ended with a short demographics questionnaire[3]. Political orientation was measured as the average of two items: “Please indicate your political

[2] In the current study, binding foundations had a cronbach’s alpha of $\alpha = 0.89$ and individualizing foundations had a cronbach’s alpha of $\alpha = 0.67$.

[3] In addition to the social comparison emotion and moral foundations measures, we also collected data from an implicit association task (IAT) but due to coding errors, this data was unusable.

orientation on [social issues/economic issues]" (7-point scales from *Very Liberal* to *Very Conservative*).

Results

We conducted a series of linear mixed effects models (LMEs) to examine the main effect of group (ASD versus NT) on each outcome measure. We report *t* values and corresponding *p* values obtained using Satterthwaite's method provided by the lmer package in R (Kuznetsova et al., 2017). Effect sizes are calculated as the estimate for the fixed effect divided by the square root of the sum of variances of random effects (Westfall et al., 2014). LMEs included participant and item as random intercepts.

Moral Values

To test whether endorsement of moral values differed across groups, we fitted the following model: Endorsement = 3.08 + 0.43*Group + 1.73*Value - 0.55*GroupXValue. We observed an effect of group[4], $t(69.99) = 2.20$, $p = .031$, d = 0.28, such that ASDs reported less endorsement of moral values than NTs, and an effect of value type, $t(39.77) = 7.36$, $p < .001$, d = 1.14, such that participants reported more endorsement of individualizing than binding values. These effects were qualified by a group × value interaction, $t(1767.03) = -4.096$, $p < .001$, d = -0.36. NTs endorsed binding values more than ASDs.

Following up on this interaction, we ran separate tests for the effect of group on binding and individualizing values. ASDs were not significantly different from NTs in

[4] We also fitted a model controlling for gender, age, and political orientation, which has been shown to influence endorsement of binding values (Graham et al., 2009): Endorsement = 1.58 + 0.56*Group + 1.73*Value + 0.03*Age + 0.05*Gender + 0.15*PoliticalOrientation - 0.53*GroupXValue. This interaction appears to be robust, $t(1622.03) = -3.90$, $p < .001$, d = -0.35. We found very small main effects of age, $t(52.09) = 2.32$, $p = .024$, d = 0.02, and political orientation, $t(52.01) = 2.152$, $p = .036$, d = 0.10. We found no significant main effect of gender, $t(52.00) = 0.27$, $p = .783$, d = 0.04.

their endorsement of individualizing values, $t(60.12) = -0.71$, $p = .482$, d = -0.08; however, ASDs reported less endorsement of binding values than NTs, $t(60.00) = 1.70$, $p = .095$, d = 0.26.

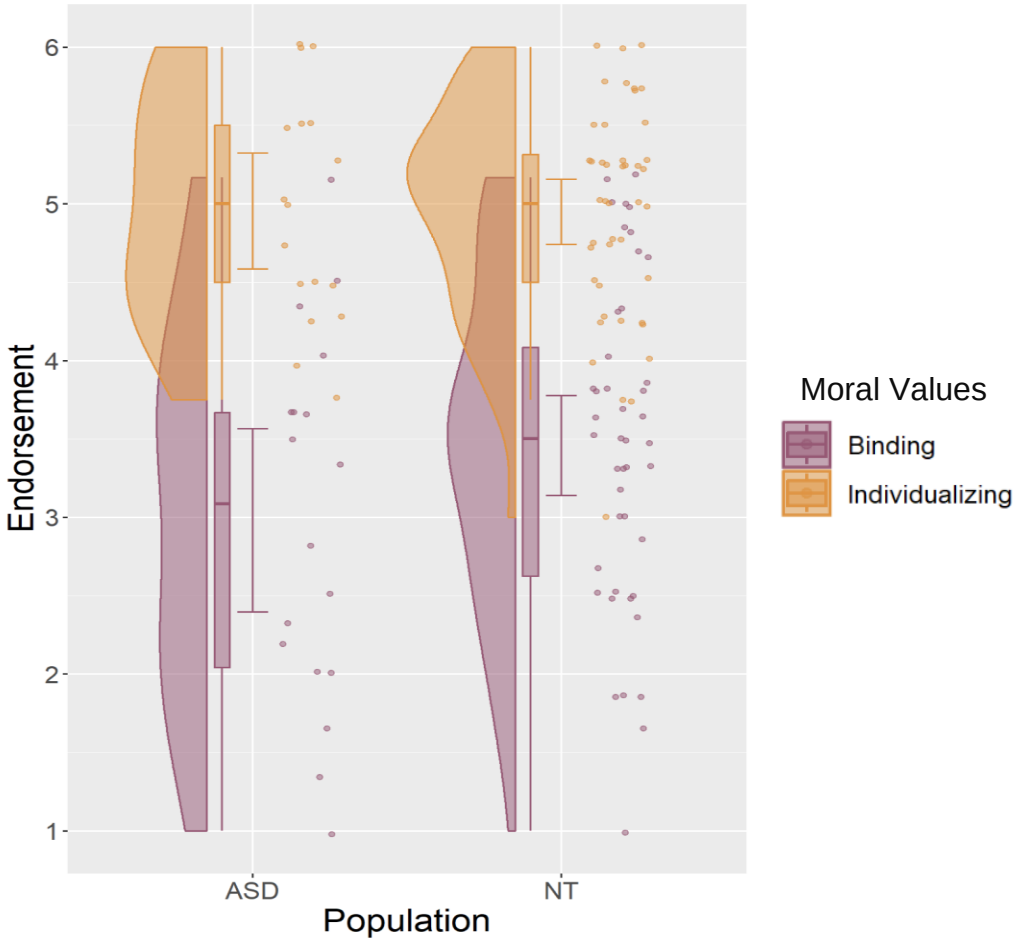
Table 1

Pairwise Correlations

Variable	*Individualizing*	*Envy*	*Schadenfreude*
Binding	0.35**	0.27*	0.25
Individualizing	-	0.16	0.26*
Envy	-	-	0.56**

**$p < 0.001$, **$p < 0.01$, *$p < 0.05$

Fig. 1 Distribution of mean endorsement of binding and individualizing values per group



Note: Individualizing and binding values were weakly correlated (r = 0.35).

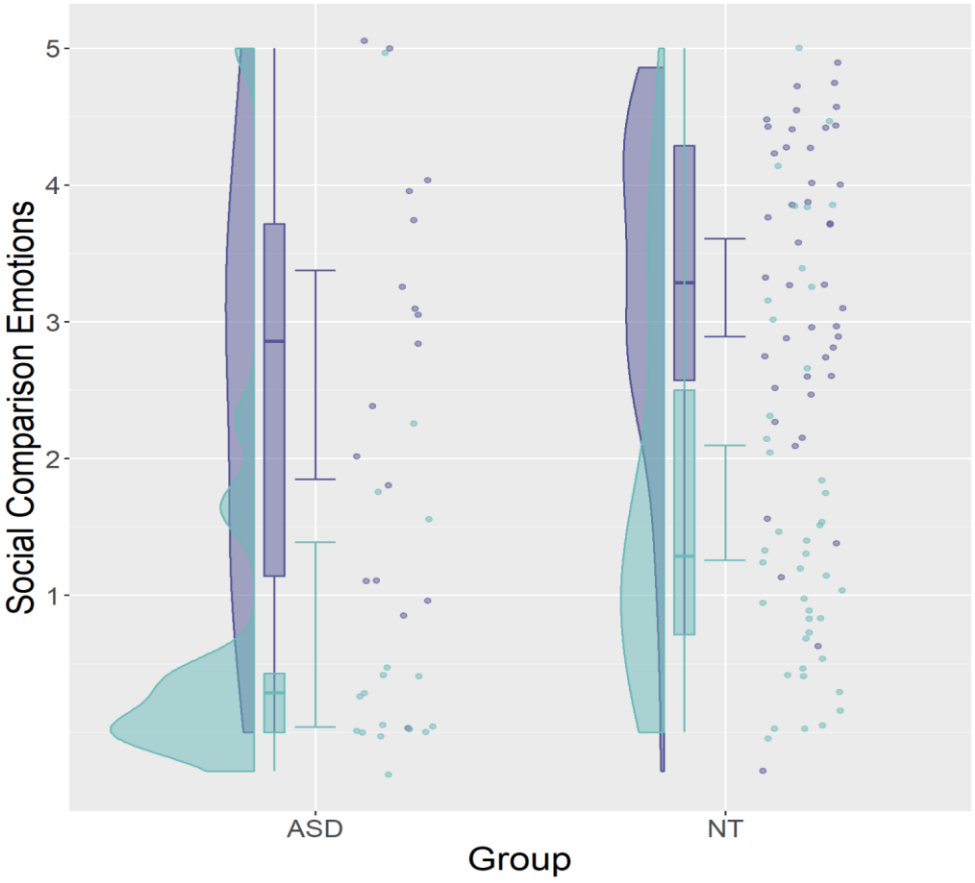
Social Comparison

Here, we use the term social comparison emotions (SCEs) to refer to participants' self-reported envy and schadenfreude. To test whether SCEs differed across groups, we fitted the following model: SCE = 2.62 + 0.63*Group - 1.95*Emotion + 0.34*GroupXEmotion. We observed a marginal effect of group[5], t(69.19) = 1.90, p =

[5] When emotion type is not included in the model, we observe a main effect of group, t(60.05) = 2.49, p = .015, d = 0.43. We also fitted a model controlling for age, gender, and political orientation: SCE = 2.68 + 0.87*Group - 0.02*Age - 0.25*Gender - 0.17*PoliticalOrientation. We found a main effect of group, t(52.01) = 2.31, p = .025, d = 0.47. We did not find a main effect of age, t(52.21) = -0.60, p = .564, d = -0.01, gender, t(52.00) = -0.69, p = .492, d = -0.13, or political orientation, t(52.02) = -1.29, p = .201, d = 0.09.

.062, d = 0.39, such that ASDs reported less SCEs than NTs, and an effect of emotion type, $t(24.38) = -8.64$, $p < 0.001$, d = -1.20, such that participants felt more envy than schadenfreude. There was a marginal group × emotion interaction, $t(789.01) = 1.95$, $p = .052$, d = 0.21. The difference between ASDs and NTs was larger for schadenfreude than envy. Following up on this interaction, we ran separate tests for the effect of group on envy and schadenfreude. ASDs reported less schadenfreude than NTs, $t(60.02) = 2.56$, $p = .013$, d = 0.59, and marginally less envy, $t(60.08) = 1.770$, $p = .082$, d = 0.38.

Fig. 2 Distribution of mean responses on the social comparison emotions activity (target – baseline) per group



Note: As found in prior research, schadenfreude and envy were moderately correlated (*r* = 0.56) (Lange et al., 2018).

Moral Values and Social Comparison Emotions

Endorsement of binding moral values was correlated with both envy (*r* = 0.27, *p* = .036) and schadenfreude (*r* = 0.25, *p* = .053). Endorsement of individualizing moral values was correlated with schadenfreude (*r* = 0.26, *p* = .042) but not significantly correlated with envy (*r* = 0.16, *p* = .219).

Discussion

In the present work, we investigated the links among ASD, moral values and social comparison emotions. We found that autistic people 1) were less likely to endorse binding moral values and 2) reported reduced social comparison emotions.

First, autistic people were less likely to endorse binding values, even after controlling for age, gender, and political orientation. This finding adds quantitative evidence to previous qualitative work demonstrating weaker emphasis on binding versus individualizing foundations in autistic people (Dempsey et al., 2020b). We suggest two possible explanations for future work to explore. Autistic people may devalue binding values because they are less attuned to group information. Autistic people demonstrate difficulty with social categorization (Skorich et al., 2016) and display less stereotypical attitudes (Kirchner et al., 2012), suggesting reduced sensitivity to group membership. Alternatively, autistic people may devalue binding foundations due to ambiguity aversion (Fujino et al., 2017). While violations of individualizing values often involve clear perpetrators and victims (Schein & Gray, 2018), violations of binding values can be arbitrary and context-specific (Gray et al., 2022), lacking clear victims or clear harm, and our reactions to them can be more difficult to explain (Haidt et al., 2000).

Second, autistic people reported reduced envy and schadenfreude, even after controlling for age and gender. This finding extends prior work suggesting that autistic people may be less sensitive to social comparison information (Dvash et al., 2014).

Other work has explored the dual nature of binding values, which can both *bind and build* but also *blind and divide* (Haidt, 2012). Binding values motivate some prosocial behaviors, consistent with loyalty to group members, respect for group

leaders, and adherence to group standards for purity. Binding values also have a “dark” side, motivating antisocial attitudes and actions, in line with outgroup prejudice (Monroe & Plant, 2019) and social dominance orientation (Niemi & Young, 2013). Similarly, social comparison can be useful for maintaining group cohesion by motivating upward movement in the group but can also be harmful by motivating subversion of others’ success (Lange & Crusius, 2015) and preferences for inequality (Sheskin et al., 2014). Certain conditions, such as ASD, might buffer against moral values and social emotions that have been linked to intergroup conflict. Autistic people are not immune to these effects; they still display implicit social biases (Birmingham et al., 2015); however, our work suggests they may be less susceptible.

Our work revealed associations not just between autism and moral values and autism and social emotions, but also between moral values and social emotions. Endorsement of binding values was positively correlated with both envy and schadenfreude, while endorsement of individualizing values was positively correlated only with schadenfreude. These initial results suggest a robust link between binding foundations and both social comparison emotions tested. Given the associations between these constructs and autism, the relationship between them likely hinges on facets of social cognition in ways that should be tested in future work.

The current study is limited in its reliance on the self-report of only two social comparison emotions. Future work should examine a wider range of social comparison emotions among autistic people. Such work may focus on positive emotions such as inspiration, which can be measured as self-improvement motivation (Diel & Hofmann, 2019). Additionally, as the current study is cross-sectional, future work is needed to

clarify the directional nature of the relationship between moral values and social comparison.

Taken together, these findings build upon an existing literature on the social cognitive characteristics of autism spectrum disorders, suggesting that these characteristics may have a strong influence on two social psychological processes: decreased social comparison emotions and underemphasis of binding moral values.

References

American Psychiatric Association. (2000). Diagnostic and statistical manual of mental disorders (4th ed., text rev.). Washington, DC: Author.

Ames, D. L., & Fiske, S. T. (2013). Intentional Harms Are Worse, Even When They're Not. *Psychological Science*, *24*(9), 1755–1762. https://doi.org/10.1177/0956797613480507

Baron-Cohen, S., Wheelwright, S., Skinner, R., Martin, J., & Clubley, E. (2001). The autism spectrum quotient (AQ): Evidence from asperger syndrome/high-functioning autism, males and females, scientists and mathematicians. *Journal of autism and developmental disorders*, *31*(1), 5-17.

Baron-Cohen, S. (2000). Theory of mind and autism: A review. In *International Review of Research in Mental Retardation* (Vol. 23, pp. 169–184). Elsevier. https://doi.org/10.1016/S0074-7750(00)80010-5

Bauminger, N. (2004). The expression and understanding of jealousy in children with autism. *Development and Psychopathology*, *16*(01). https://doi.org/10.1017/S0954579404044451

Birmingham, E., Stanley, D., Nair, R., & Adolphs, R. (2015). Implicit Social Biases in People With Autism. *Psychological Science*, *26*(11), 1693–1705. https://doi.org/10.1177/0956797615595607

Brambilla, M., & Riva, P. (2017). Predicting pleasure at others' misfortune: Morality trumps sociability and competence in driving deservingness and schadenfreude. *Motivation and Emotion*, *41*, 243-253.

Carnes, N. C., & Lickel, B. (2018). Moral binding: How emotions, convictions, and identity fusion shape progroup behavior. *Self and Identity*, *17*(5), 549–573. https://doi.org/10.1080/15298868.2018.1451362

Cikara, M. (2015). Intergroup Schadenfreude: Motivating participation in collective violence. *Current Opinion in Behavioral Sciences*, *3*, 12–17. https://doi.org/10.1016/j.cobeha.2014.12.007

Cushman, F. (2008). Crime and punishment: Distinguishing the roles of causal and intentional analyses in moral judgment. *Cognition*, *108*(2), 353–380. https://doi.org/10.1016/j.cognition.2008.03.006

Dempsey, E. E., Moore, C., Johnson, S. A., Stewart, S. H., & Smith, I. M. (2022). Moral Foundations Theory Among Autistic and Neurotypical Children. *Frontiers in Psychology*, *12*, 782610. https://doi.org/10.3389/fpsyg.2021.782610

Dempsey, E. E., Moore, C., Johnson, S. A., Stewart, S. H., & Smith, I. M. (2020a). Morality in autism spectrum disorder: A systematic review. *Development and Psychopathology*, *32*(3), 1069–1085. https://doi.org/10.1017/S0954579419001160

Dempsey, E. E., Moore, C., Richard, A. E., & Smith, I. M. (2020b). Moral foundations theory in autism spectrum disorder: A qualitative investigation. *Autism*, *24*(8), 2202–2212. https://doi.org/10.1177/1362361320939331

Dvash, J., Ben-Zèev, A., Noga, A., & Shamay-Tsoory, S. (2014). The road not taken: Social vs. private comparisons in Asperger′s syndrome and high functioning autism. *Psychiatry Research*, 216(3), 385–390. https://doi.org/10.1016/j.psychres.2014.01.036

Earp, B. D., McLoughlin, K. L., Monrad, J. T., Clark, M. S., & Crockett, M. J. (2021). How social relationships shape moral wrongness judgments. *Nature Communications*, *12*(1), 5776. https://doi.org/10.1038/s41467-021-26067-4

Festinger, L. (1954). A theory of social comparison processes. *Human relations*, *7*(2), 117-140.

Fujino, J., Tei, S., Hashimoto, Ri. et al. Attitudes toward risk and ambiguity in patients with autism spectrum disorder. *Molecular Autism*, 8, 45 (2017). https://doi.org/10.1186/s13229-017-0162-8

Graham, J., Haidt, J., Motyl, M., Meindl, P., Iskiwitch, C., & Mooijman, M. (2018). Moral foundations theory. *Atlas of moral psychology*, *211*.

Graham, J., Nosek, B. A., Haidt, J., Iyer, R., Spassena, K., & Ditto, P. H. (2011). *Moral Foundations Questionnaire* [Data set]. American Psychological Association. https://doi.org/10.1037/t05651-000

Graham, J., Haidt, J., & Nosek, B. A. (2009). Liberals and conservatives rely on different sets of moral foundations. *Journal of personality and social psychology*, *96*(5), 1029.

Gray, K., DiMaggio, N., Schein, C., & Kachanoff, F. (2022). The problem of purity in moral psychology. *Personality and Social Psychology Review*, 10888683221124741.

Greene, J. D., & Young, L. (2020). The Cognitive Neuroscience of Moral Judgment and Decision-Making. *The Cognitive Neurosciences, Volume 6* (Ed. M.S. Gazzaniga). MIT Press.

Hadarics, M., & Kende, A. (2018). The Dimensions of Generalized Prejudice within the Dual-Process Model: The Mediating Role of Moral Foundations. *Current Psychology*, *37*(4), 731–739. https://doi.org/10.1007/s12144-016-9544-x

Haidt, J. (2012). *The righteous mind: Why good people are divided by politics and religion*. Vintage.

Haidt, J., & Joseph, C. (2004). Intuitive ethics: How innately prepared intuitions generate culturally variable virtues. *Daedalus*, *133*(4), 55–66. https://doi.org/10.1162/0011526042365555

Haidt, J., Bjorklund, F., & Murphy, S. (2000). Moral dumbfounding: When intuition finds no reason. *Unpublished manuscript, University of Virginia*, 191-221.

Hezel, D. M., & McNally, R. J. (2014). Theory of Mind Impairments in Social Anxiety Disorder. *Behavior Therapy*, *45*(4), 530–540. https://doi.org/10.1016/j.beth.2014.02.010

Hudson, S. T. J., & Uenal, F. (2022). *Connecting personality and ideology as antecedents of group-based empathy and schadenfreude* [Preprint]. PsyArXiv. https://doi.org/10.31234/osf.io/t2wnp

Hudson, S. K. T. J., Cikara, M., & Sidanius, J. (2019). Preference for hierarchy is associated with reduced empathy and increased counter-empathy towards others, especially out-group targets. *Journal of Experimental Social Psychology*, *85*, 103871.

Keating, C. T., Hickman, L., Leung, J., Monk, R., Montgomery, A., Heath, H., & Sowden, S. (2022). Autism-related language preferences of English -speaking individuals

across the globe: A mixed methods investigation. *Autism Research*, aur.2864. https://doi.org/10.1002/aur.2864

Kirchner, J. C., Schmitz, F., & Dziobek, I. (2012). Brief Report: Stereotypes in Autism Revisited. *Journal of Autism and Developmental Disorders*, *42*(10), 2246–2251. https://doi.org/10.1007/s10803-012-1460-9

Križan, Z., & Gibbons, F. X. (Eds.). (2014). *Communal functions of social comparison*. Cambridge University Press.

Kuznetsova, A., Brockhoff, P. B., & Christensen, R. H. B. (2017). **lmerTest** Package: Tests in Linear Mixed Effects Models. *Journal of Statistical Software*, *82*(13). https://doi.org/10.18637/jss.v082.i13

Lange, J., Weidman, A. C., & Crusius, J. (2018). The painful duality of envy: Evidence for an integrative theory and a meta-analysis on the relation of envy and schadenfreude. *Journal of Personality and Social Psychology*, *114*(4), 572–598. https://doi.org/10.1037/pspi0000118

Lange, J., & Crusius, J. (2015). Dispositional Envy Revisited: Unraveling the Motivational Dynamics of Benign and Malicious Envy. *Personality and Social Psychology Bulletin*, *41*(2), 284–294. https://doi.org/10.1177/0146167214564959

Lord, C., Risi, S., Lambrecht, L., Cook, E. H., Leventhal, B. L., DiLavore, P. C., ... & Rutter, M. (2000). The Autism Diagnostic Observation Schedule—Generic: A standard measure of social and communication deficits associated with the spectrum of autism. *Journal of autism and developmental disorders*, *30*(3), 205-223.

Malle, B. F. (1999). How people explain behavior: A new theoretical framework. *Personality and social psychology review*, *3*(1), 23-48.

Marshall, J., Wynn, K., & Bloom, P. (2020). Do Children and Adults Take Social Relationship Into Account When Evaluating People's Actions? *Child Development*, *91*(5). https://doi.org/10.1111/cdev.13390

Mazza, M., Pino, M. C., Mariano, M., Tempesta, D., Ferrara, M., De Berardis, D., Masedu, F., & Valenti, M. (2014). Affective and cognitive empathy in adolescents with autism spectrum disorder. *Frontiers in Human Neuroscience*, *8*. https://doi.org/10.3389/fnhum.2014.00791

McManus, R. M., Mason, J. E., & Young, L. (2021). Re-examining the role of family relationships in structuring perceived helping obligations, and their impact on moral evaluation. *Journal of Experimental Social Psychology*, *96*, 104182. https://doi.org/10.1016/j.jesp.2021.104182

McManus, R. M., Kleiman-Weiner, M., & Young, L. (2020). What We Owe to Family: The Impact of Special Obligations on Moral Judgment. *Psychological Science*, *31*(3), 227–242. https://doi.org/10.1177/0956797619900321

Monroe, A. E., & Plant, E. A. (2019). The dark side of morality: Prioritizing sanctity over care motivates denial of mind and prejudice toward sexual outgroups. *Journal of Experimental Psychology: General*, *148*(2), 342–360. https://doi.org/10.1037/xge0000537

Moran, J. M., Young, L. L., Saxe, R., Lee, S. M., O'Young, D., Mavros, P. L., & Gabrieli, J. D. (2011). Impaired theory of mind for moral judgment in high-functioning autism.

Proceedings of the National Academy of Sciences, *108*(7), 2688–2692. https://doi.org/10.1073/pnas.1011734108

Niemi, L., & Young, L. (2016). When and Why We See Victims as Responsible: The Impact of Ideology on Attitudes Toward Victims. *Personality and Social Psychology Bulletin*, *42*(9), 1227–1242. https://doi.org/10.1177/0146167216653933

Niemi, L., & Young, L. (2013). Caring across Boundaries versus Keeping Boundaries Intact: Links between Moral Values and Interpersonal Orientations. *PLoS ONE*, *8*(12), e81605. https://doi.org/10.1371/journal.pone.0081605

Redcay, E., Dodell-Feder, D., Mavros, P. L., Kleiner, M., Pearrow, M. J., Triantafyllou, C., Gabrieli, J. D., & Saxe, R. (2013). Atypical brain activation patterns during a face-to-face joint attention game in adults with autism spectrum disorder: Neural Correlates of Joint Attention in ASD. *Human Brain Mapping*, *34*(10), 2511–2523. https://doi.org/10.1002/hbm.22086

Richardson, H., Gweon, H., Dodell-Feder, D., Malloy, C., Pelton, H., Keil, B., Kanwisher, N., & Saxe, R. (2020). Response patterns in the developing social brain are organized by social and emotion features and disrupted in children diagnosed with autism spectrum disorder. *Cortex*, *125*, 12–29. https://doi.org/10.1016/j.cortex.2019.11.021

Santamaría-García, H., Baez, S., Reyes, P., Santamaría-García, J. A., Santacruz-Escudero, J. M., Matallana, D., ... & Ibáñez, A. (2017). A lesion model of envy and Schadenfreude: legal, deservingness and moral dimensions as revealed by neurodegeneration. *Brain*, *140*(12), 3357-3377.

Shamay-Tsoory, S. G. (2008). Recognition of 'Fortune of Others' Emotions in Asperger Syndrome and High Functioning Autism. *Journal of Autism and Developmental Disorders*, *38*(8), 1451–1461. https://doi.org/10.1007/s10803-007-0515-9

Schein, C., & Gray, K. (2018). The theory of dyadic morality: Reinventing moral judgment by redefining harm. *Personality and Social Psychology Review*, *22*(1), 32-70.

Sheskin, M., Bloom, P., & Wynn, K. (2014). Anti-equality: Social comparison in young children. *Cognition*, *130*(2), 152–156. https://doi.org/10.1016/j.cognition.2013.10.008

Skorich, D. P., May, A. R., Talipski, L. A., Hall, M. H., Dolstra, A. J., Gash, T. B., & Gunningham, B. H. (2016). Is Social Categorization the Missing Link Between Weak Central Coherence and Mental State Inference Abilities in Autism? Preliminary Evidence from a General Population Sample. *Journal of Autism and Developmental Disorders*, *46*(3), 862–881. https://doi.org/10.1007/s10803-015-2623-2

Smith, R. H. (2000). Assimilative and contrastive emotional reactions to upward and downward social comparisons. *Handbook of social comparison: Theory and research*, 173-200.

Takahashi, H., Kato, M., Matsuura, M., Mobbs, D., Suhara, T., & Okubo, Y. (2009). When Your Gain Is My Pain and Your Pain Is My Gain: Neural Correlates of Envy and Schadenfreude. *Science*, *323*(5916), 937–939. https://doi.org/10.1126/science.1165604

van Dijk, W. W., Ouwerkerk, J. W., Smith, R. H., & Cikara, M. (2015). The role of self-evaluation and envy in schadenfreude. *European Review of Social Psychology*, *26*(1), 247–282. https://doi.org/10.1080/10463283.2015.1111600

van de Ven, N., Zeelenberg, M., & Pieters, R. (2009). Leveling up and down: The experiences of benign and malicious envy. *Emotion*, *9*(3), 419–429. https://doi.org/10.1037/a0015669

Westfall, J., Kenny, D. A., & Judd, C. M. (2014). Statistical power and optimal design in experiments in which samples of participants respond to samples of stimuli. *Journal of Experimental Psychology: General*, *143*(5), 2020–2045. https://doi.org/10.1037/xge0000014

Williams, D., & Happé, F. (2010a). Representing intentions in self and other: Studies of autism and typical development. *Developmental Science*, *13*(2), 307–319. https://doi.org/10.1111/j.1467-7687.2009.00885.x

Williams, D., & Happé, F. (2010b). Recognising 'social' and 'non-social' emotions in self and others: A study of autism. *Autism*, *14*(4), 285–304. https://doi.org/10.1177/1362361309344849

Young, L., & Dungan, J. (2012). Where in the brain is morality? Everywhere and maybe nowhere. *Social Neuroscience*, *7*(1), 1–10. https://doi.org/10.1080/17470919.2011.569146

Young, L., Nichols, S., & Saxe, R. (2010). Investigating the neural and cognitive basis of moral luck: It's not what you do but what you know. *Review of philosophy and psychology*, *1*, 333-349.

Young, L., & Tsoi, L. (2013). When Mental States Matter, When They Don't, and What That Means for Morality: When Mental States Matter for Morality. *Social and Personality Psychology Compass*, *7*(8), 585–604. https://doi.org/10.1111/spc3.12044

Yudkin, D. A., Prosser, A. M. B., & Crockett, M. J. (2019). Actions speak louder than outcomes in judgments of prosocial behavior. *Emotion*, *19*(7), 1138–1147. https://doi.org/10.1037/emo0000514

Appendix I

Envy and Schadenfreude Stimuli

Please read the following scenarios about three classmates. Imagine that you are the person in the first scenario as you read it. The next two scenarios are about classmates of yours, named Sam/Samantha and Don/Donna.

You, in school:

You are an undergraduate student in the last year of a science program. You would like to get a good job at a multinational IT company after graduation. Getting a job at the enterprise is highly competitive. You finished your graduation examinations, but your final grades were mediocre. The company will evaluate you in terms of academic achievements and sport activities, but they put a premium on the impression of the job interview. You belong to the baseball club, but you are a benchwarmer. You visited the company for a job interview, but you were so nervous that you failed to reply appropriately to the interviewers. You live in a dormitory. You prefer a metropolitan lifestyle. Your hobbies are traveling, driving, and collection of watches. You do not have a steady girlfriend.

You, one year after graduation:

You fail to get a job at the company and eventually find yourself working at a small-scale retail merchant near your hometown. You are busy and have little time off, and your salary is not good. You live in a tiny apartment alone. You do not have a steady girlfriend and there are few opportunities to meet girls. You managed to buy a small

second-hand car, but you do not have enough money and time to enjoy your hobbies. Recently, you attended an alumni reunion of the university. Person A and Person B were also there. You listened to their recent life and news.

PRETEND THAT THIS IS YOU AS YOU READ ABOUT SAM AND DONNA AND ANSWER THE RELATED QUESTIONS!

Please read the following short profiles of 2 other people in your class and answer the questions below.

Sam, in school:

He and you attended the same high school. He also lived in the dormitory and was a science major. He wanted to get a job at the same company as you. His grades from his final examinations were outstanding. He belonged to the baseball club and was an ace pitcher. He was successful in presenting his selling points at the job interview. He and you are very similar in terms of preferences regarding lifestyle and hobbies. He is very popular among female students.

Sam, one year later:

He works at a multinational IT company. His salary is high enough to enjoy life in metropolitan area. He lives in a luxurious condominium downtown and owns a high-class European car. His hobby is collecting watches. He often spends his long

weekends on overseas travel. He has many opportunities to meet girls after work. He had dinner at a fancy French restaurant last night.

Donna, in school:

She took literature courses and her graduation exam grades were mediocre. She belonged to the volleyball club where she was a benchwarmer. She wanted to get a job at a local bank. She failed to do well at the job interview. She prefers the countryside and a simple lifestyle. She is not popular among male students.

Donna, one year later:

She works at a small enterprise. Her salary is low. She lives in an old apartment in the suburbs and owns a small secondhand car. Her hobby is collecting music CDs. She often spends her weekends going for walks in the park. She has few opportunities to meet boys after work. She ate instant food at home for her dinner last night.

Supplementary

Matched Subset

As a test of robustness, we created a matched sample of ASD and NT participants to replicate effects the main effects of interest. We selected 16 NT participants for a one-to-one matching with the 16 ASD participants (two of the original 18 were excluded due to missing Autism Quotient scores). The matched group did not have significantly different mean gender, age, political orientation, or IQ scores (*p-values* > 0.20) and was different on Autism Quotient score (NT: *M* = 16.75, *SD* = 8.38; ASD: *M* = 32.08, *SD* = 7.69; *p* < 0.001). We replicated the main effect of group on social comparison emotions, *t*(34.02) = 2.18, *p* = .036, d = 0.49. Additionally, we replicated the interaction effect between group and foundation on endorsement of moral values, *t*(1013.00) = -4.48, *p* < .001, d = -0.45.

Moral Values & Social comparison emotions

The results of the three regressions run on moral values and social comparison emotions are displayed below.

Predicting social comparison emotions by moral value endorsement

```
Call:
lm(formula = avgSocCom ~ bindMean + indMean, data = raw.data)

Residuals:
     Min       1Q   Median       3Q      Max
-2.19375 -0.72831 -0.02688  0.69935  2.00032

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)   0.0606     1.0953   0.055   0.9561
bindMean      0.2584     0.1442   1.792   0.0785 .
indMean       0.2673     0.2336   1.144   0.2572
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 1.152 on 57 degrees of freedom
  (2 observations deleted due to missingness)
Multiple R-squared:  0.1073,    Adjusted R-squared:  0.07596
F-statistic: 3.425 on 2 and 57 DF,  p-value: 0.03939
```

ASD, MORAL VALUES AND SOCIAL COMPARISON

Controlling for the effect of group

```
Call:
lm(formula = avgSocCom ~ bindMean + indMean + Pop, data = raw.data)

Residuals:
    Min      1Q  Median      3Q     Max
-2.1841 -0.7461 -0.1157  0.8224  2.5969

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)   0.3060     1.0680   0.287   0.7755
bindMean      0.1894     0.1434   1.320   0.1921
indMean       0.3043     0.2271   1.340   0.1857
Pop          -0.7073     0.3283  -2.155   0.0355 *
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 1.117 on 56 degrees of freedom
  (2 observations deleted due to missingness)
Multiple R-squared:  0.1756,    Adjusted R-squared:  0.1315
F-statistic: 3.977 on 3 and 56 DF,  p-value: 0.01222
```

Moderation of values-emotions link by group

```
Call:
lm(formula = avgSocCom ~ Pop * bindMean + Pop * indMean, data = raw.data)

Residuals:
    Min      1Q  Median      3Q     Max
-2.1833 -0.7532 -0.1028  0.8753  2.6264

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept)    0.4643     1.2883   0.360    0.720
Pop           -1.2433     2.3613  -0.527    0.601
bindMean       0.2272     0.1803   1.260    0.213
indMean        0.2461     0.2792   0.882    0.382
Pop:bindMean  -0.1057     0.3070  -0.344    0.732
Pop:indMean    0.1747     0.4987   0.350    0.727

Residual standard error: 1.135 on 54 degrees of freedom
  (2 observations deleted due to missingness)
Multiple R-squared:  0.1784,    Adjusted R-squared:  0.1023
F-statistic: 2.345 on 5 and 54 DF,  p-value: 0.05345
```