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Running Head: Positive Functioning in Children with and without ASD

Manuscript Title: Happiness, Self-Esteem, and Prosociality in Children with and without Autism Spectrum Disorder: Evidence from a UK-Based Population Cohort Study

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Conflict of Interest:

On behalf of both authors, the corresponding author states that there is no conflict of interest.

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Happiness, Self-Esteem, and Prosociality in Children with and without Autism Spectrum Disorder: Evidence from a UK Population Cohort Study

Abstract

Background: High levels of happiness, self-esteem, and prosociality during childhood are all associated with a number of positive social and emotional outcomes. Little is known about whether these constructs co-occur and how the levels of co-occurrence are different in children with/without Autism Spectrum Disorder (ASD). Methods: Data was obtained from 13,285 11-year olds (408 with ASD and 12,877 without) who took part in the Millennium Cohort Study. Findings: Latent class analysis revealed five distinct classes: optimum (61%), moderate to high positive functioning (23%), low to moderate positive functioning (6%), low happiness (3%), and very low prosociality (7%). Only 32% of children with ASD were characterised in the very low prosociality class, which was associated with adverse behavioural and emotional psychopathologies.
Autism Spectrum Disorder (ASD) is characterized by social and communication difficulties, problems understanding nonverbal cues, being highly dependent on routines, and highly sensitive to changes (American Psychiatric Association, 2013). In the UK, by middle childhood the prevalence of ASD has been estimated at ~1% (Baird et al., 2006) but it may be as high as 3.5% (Dillenburger, Jordan, McKerr, & Keenan, 2015). ASD is associated with a number of co-morbidities, which include emotional difficulties (Matson & Nebel-Schwalm, 2007), social anxiety (van Steensel, Bogels, & Perrin, 2011), and behavioural difficulties and disorders (Green, McGinnity, Meltzer, Ford, & Goodman, 2005; Matson & Nebel-Schwalm, 2007). The condition comes with a substantial cost, such as special education needs services and loss of productivity in parental workplaces (Buescher, Cidav, Knapp, & Mandell, 2014). Much of the past research has focussed on the deficits associated with ASD. Studies that focus on the positive functioning and areas of strength in children with ASD are scarce.

Self-Esteem

Self-esteem refers to a person’s confidence in their own worth or abilities. Young children have very high self-esteem and this may be because they do not yet possess the ability to engage in the process of self-evaluation, which protects them from thinking negatively about themselves (Harter, 2012). Self-esteem is at its relative peak in preadolescence after which it begins a downward trend (Robins, Trzesniewski, Tracy, Gosling, & Potter, 2002). Processes associated with identity formation and physical changes to the body are thought to be related to this drop in self-esteem during adolescence (Ricciardelli & Yager, 2016).

Evidence suggests that self-esteem may also have a detrimental effect on other areas of psychopathological development. Children with low self-esteem have more conduct problems (Ha, Petersen, & Sharp, 2008) and higher levels depression and anxiety (Moksnes & Espnes,
These effects of low childhood self-esteem have long lasting effects. Children with low self-esteem have worse mental health, worse physical health, more criminal convictions, and poorer economic prospects in adulthood compared to their peers with high self-esteem (Trzesniewski et al., 2006). Risk factors for low self-esteem have also been identified. Females and those from lower socioeconomic backgrounds generally have lower self-esteem compared to males and those from higher socioeconomic background (Dukes & Martinez, 1994; McClure, Tanski, Kingsbury, Gerrard, & Sargent, 2010). However, such single variable based approaches assume homogeneity within populations and may lead to labelling of whole groups of people, which can be stigmatising.

Previous research suggests that adolescents with ASD have lower self-esteem compared to their typically developing peers (Williamson, Craig, & Slinger, 2008). This may be because from very early in childhood, typically developing children are able to demonstrate their ability to understand other peoples’ perspectives (Howlin, Baron-Cohen, & Hadwin, 1999). However, children with ASD have difficulties with perspective taking (Baron-Cohen, Leslie, & Frith, 1985).

**Happiness**

For this purposes of this study, happiness and wellbeing will be used interchangeably, whilst it is acknowledged that there is some disagreement on the definitions of these constructs (Raibley, 2012). Being happy in childhood is important because children who are happy go on to be happier adults (Freeman, Templer, & Hill, 1999) and have better academic outcomes (Quinn & Duckworth, 2007). Being happy is associated with better relationships and interactions with the people around us, which can be an area of impairment in children with ASD.
Children who are happy, have better relationships and feel more connected with parents and peers (Dunn & Bennett, 2007; Guhn, Schonert-Reichl, Gadermann, Hymel, & Hertzman, 2013; Holder & Coleman, 2009). Simply being with friends is associated with higher levels of happiness than being alone (Csikszentmihalyi & Hunter, 2003). In general, children who are highly social are happier (Holder & Klassen, 2010). Physical activity is also associated with happiness in children (Holder, Coleman, & Sehn, 2009; Sacker & Cable, 2006) and this may be due to the social interactions that occur during exercise (Fredricks & Eccles, 2006; Holder & Coleman, 2009). Moreover, children who spend more time with their parents, perceive that they are able to get emotional support easily from their parents, live with both parents, have more educated parents are happier, have higher family income (Burton & Phipps, 2008; Gudmundsdottir et al., 2016).

**Prosociality**

Prosocial behaviours are voluntary actions with the intention of benefiting someone else (Eisenberg & Fabes, 1998). They appear very early on in infancy (Liszkowski, Carpenter, & Tomasello, 2008; Warneken & Tomasello, 2007). Some research studies suggest that there is stability in prosociality during middle childhood (Cote, Tremblay, Nagin, Zoccolillo, & Vitaro, 2002; Flynn, Ehrenreich, Beron, & Underwood, 2014) but others finding modest declines (Kokko, Tremblay, Lacourse, Nagin, & Vitaro, 2006). Children who are prosocial are more popular amongst their peers (Asher & Coie, 1990; Zimmer-Gembeck, Geiger, & Crick, 2005), have better quality friendship (Markiewcz, Doyle, & Brendgen, 2001), and are less likely to manifest antisocial and delinquent behaviours (Carlo et al., 2014; Pursell, Laursen, Rubin, Booth-LaForce, & Rose-Krasnor, 2008). Taking part in prosocial peer relationships appears to provide support for children who have negative experiences (such as victimisation), facilitating
coping and psychosocial resilience (Griese & Buhs, 2014; Martin & Huebner, 2007). Being male (Hay & Pawlby, 2003) and from a low socioeconomic background (Guinote, Cotzia, Sandhu, & Siwa, 2015; Piff, Kraus, Cote, Cheng, & Keltner, 2010) are risk factors for prosociality. Children with ASD also score lower on measures of prosociality (Lin, Tsai, Rangel, & Adolphs, 2012). Again, many of the correlates of prosociality are in the domain of relationships with others, which is an area of weakness for children with ASD (American Psychiatric Association, 2013).

In the present study, the co-occurrence of happiness, self-esteem, and prosociality at age 11 years was examined in children with and without ASD. Many of the factors associated with happiness, self-esteem, and prosociality are linked to social relationships and functioning, an area of weakness for children with ASD (American Psychiatric Association, 2013). There is also evidence for an association between self-esteem with prosociality (Zuffiano et al., 2014) and self-esteem with happiness (Baumeister, Campbell, Krueger, & Vohs, 2003). It may be that all three areas of functioning share a common aetiology. Identifying sub-groups of children who share common patterns across all three constructs will allow a comparison of associations between children with ASD who have optimum positive functioning compared to those with sub-optimum positive functioning. This study aimed to address three main research questions:

1) What are the different patterns of co-occurrence of happiness, self-esteem, and prosociality in a population sample of children?

2) How do patterns of co-occurrence differ in children with ASD compared to the general population?

3) What factors are associated with positive functioning in children with ASD?

Method
**Study Sample**

The Millennium Cohort Study (MCS) is a multi-disciplinary study, which follows the lives of approximately 19,000 children born in the UK between the years 2000-2001. Data was accessed via the UK Data Archive ([http://www.data-archive.ac.uk/](http://www.data-archive.ac.uk/)). The MCS sample population was randomly selected from UK electoral wards, with the application of disproportionate stratification in order to provide an adequate representation of all four areas of the UK (England, Scotland, Wales, Northern Ireland), including deprived areas and areas where there is a high concentration of ethnic minority families. Drawn from the entire live birth cohort of the UK between the years 2000-2001, the first data sweep was carried out when the children were just 9 months old. At the time of this present study, five data sweeps were available for analysis; children sampled at age 9months (N = 18522), 3 years (N = 15590), 5 years (N = 15246), 7 years (N = 13857), and 11 years (N = 13287). MCS participants at each data sweep were surveyed on an extensive range of information, including areas covering parenting, cognitive development, education, and socioeconomic status. Full details of the MCS, including methodological information, is reported elsewhere (Hansen et al., 2012). Data used in this paper were collected from cohort members (the children) and the main respondent, who was usually the parent.

This cross-sectional analysis focused on data from the age 11 years sweep of the MCS. In a number of cases more than one child per household was surveyed. Only the primary cohort member was included in the work presented here. The total sample size used for this study was 13,285 (6,710 males and 6,575 females). The total sample was split into two groups, children with Autism Spectrum Disorders (ASD) and the remaining sample, which will be referred to as the Children without Autism Spectrum Disorder (ASD).
Children with Autism Spectrum Disorders (ASD). The sample of children with ASD was determined using the process previously described by (Dillenburger et al., 2015). At parental interviews carried out at ages 5, 7, and 11 the main respondents were asked “Has a doctor or health professional ever told you that (child) had Autism, Asperger’s syndrome or autistic spectrum disorder?” Respondents who answered affirmatively to the question at least one of the three time points were included in the sample of children with ASD. At age 11, this yielded a sample size of 408. The mean age for the sample of children with ASD was 10.67 years (SD =0.49 years), of which 79% were male.

Children from without Autism Spectrum Disorder (ASD). The remainder of the total sample is termed children without ASD. The sample size of children without ASD was 12,877, of which 50% were male. The mean age was 10.68 years (SD = 0.48 years). There were no significant (p<0.05) differences in gender (p=0.41), socioeconomic status (p=0.93), and ethnicity (p=0.75) at age 9 months between participants who took part at 11 years and those who did not.

Measures of Happiness, Self-Esteem, and Prosociality

Happiness. Self-report was used to measure happiness. Participants were asked 6 questions and asked to respond on a 7-point scale (1= completely happy to 7=not at all happy). These were recoded so that scale ranged from 0 to 6 and reverse scored for ease of understanding. The questions were “How do you feel about your school work?”, “How do you feel about the way you look?”, “How do you feel about your family?”, “How do you feel about your friends?”, “How do you feel about the school that you go to?”, and “How do you feel about your life as a whole?” The responses summed to create a happiness score (range 0-42). A higher sum score indicated higher levels of happiness. This scale has been used previously
literature (Chan & Koo, 2011). The internal reliability was high for the happiness scale (Cronbach’s alpha for children with ASD = 0.79 and children without ASD = 0.83).

**Self-esteem.** Participants were asked to complete a shortened version of the Rosenberg Self-Esteem scale. They were asked to respond on a 4-point scale (0=strongly disagree to 3=strongly agree). The statements were “On the whole, I am satisfied with myself”, “I feel that I have a number of good qualities”, “I am able to do most things as well as most other people do”, “I am a person of value”, and “I feel good about myself”. The responses were summed to form a self-esteem score (range 0-15). Higher scores indicated higher levels of self-esteem. Scores of 7 or under were taken as low self-esteem. The internal reliability was high for the self-esteem scale (Cronbach’s alpha for children with ASD = 0.73 and children without ASD = 0.74).

**Prosociality.** The prosocial subscale of the parent-report Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997) was used to measure prosociality. Main respondents were asked to respond to 5 statements about the child on a scale ranging from 0 to 2 (0 = Not true, 1 = Somewhat true, and 2 = Certainly true). The statements were “Considerate of other people’s feelings”, “Shares readily with other children”, “Helpful if someone is hurt, upset or feeling ill”, “Kind to younger children”, and “Often volunteers to help others”. Sum scores for the subscale range from 0 to 10. The clinical cut-off for low prosociality is a sum score of 4 or less. A score of 5 is considered borderline. A score of 6 or above is considered normal. The internal reliability was high for the self-esteem scale (Cronbach’s alpha for children with ASD = 0.79 and children without ASD = 0.64).

**Additional Measures**

**Socioeconomic Status (SES).** A measure of household income was used to determine SES. Using the UK Government’s poverty ‘threshold’ of 60% of median household income
(Department for Work & Pensions, 2014), with low SES applying to those who fall below this threshold.

**Communication problems.** Children were considered to have a communication problem if the main respondent answered yes to any of the following; a stammer or a stutter, another problem with talking, a problem understanding other people.

**Emotional Difficulties.** The Parent-report SDQ was used to measure emotional symptoms. Main respondents were asked to respond to 5 statements about the child on a scale ranging from 0 to 2 (0 = Not true, 1 = Somewhat true, and 2 = Certainly true). The statements were “gets a lot of headaches, stomach aches or sickness”, “worries a lot”, often unhappy, downhearted or tearful”, “nervous in new situations”, and “many fears, easily scared”. Sum scores for the subscale range from 0 to 10. A score of 3 or lower is considered normal, 4 is borderline, and 5 or above is considered abnormal. For this study, a score of 4 or above was termed clinical impairment. The internal reliability was high for the emotional difficulties sub-scale (Cronbach’s alpha for children with ASD = 0.77 and children without ASD = 0.69).

**Peer problems.** The parent-report SDQ was used to measure peer problems. Main respondents were asked to respond to 5 statements about the child on a scale ranging from 0 to 2 (0 = Not true, 1 = Somewhat true, and 2 = Certainly true). The statements were “usually on his/her own”, “one good friend or more”, “other people their age generally like him/her”, “other children or young people pick on him/her”, “gets on better with adults than people his/her age”. Sum scores for the subscale range from 0 to 10. A score of 2 or lower is considered normal, 3 is borderline, and 4 or above is considered abnormal. For this study, a score of 3 or above was termed clinical impairment. The internal reliability was high for the peer problems sub-scale (Cronbach’s alpha for children with ASD = 0.75 and children without ASD = 0.60).
**Conduct problems.** The parent-report SDQ was used to measure conduct problems. Main respondents were asked to respond to 5 statements about the child on a scale ranging from 0 to 2 (0 = *Not true*, 1 = *Somewhat true*, and 2 = *Certainly true*). The statements were “gets very angry and often loses temper”, “usually does as he/she is told”, “fights a lot”, “often accused of lying or cheating”, and “takes things that are not theirs”. Sum scores for the subscale range from 0 to 10. A score of 2 or lower is considered normal, 3 is borderline, and 4 or above is considered abnormal. For this study, a score of 3 or above was termed clinical impairment. The internal reliability was acceptable for the conduct problems sub-scale (Cronbach’s alpha for children with ASD = 0.69 and children without ASD = 0.61).

**Hyperactivity.** The parent-report SDQ was used to measure hyperactivity. Main respondents were asked to respond to 5 statements about the child on a scale ranging from 0 to 2 (0 = *Not true*, 1 = *Somewhat true*, and 2 = *Certainly true*). The statements were “restless, cannot stay still for long”, “constantly fidgeting or squirming”, easily distracted”, “thinks before doing things”, and “finishes work he/she is doing”. Sum scores for the subscale range from 0 to 10. A score of 5 or lower is considered normal, 6 is borderline, and 7 or above is considered abnormal. For this study, a score of 6 or above was termed clinical impairment. The internal reliability was high for the hyperactivity sub-scale (Cronbach’s alpha for children with ASD = 0.80 and children without ASD = 0.79).

**Secondary Data Analysis Procedure**

Access to the MCS data was obtained via the UK Data Archive, with data collectors and copyright holders bearing no responsibility for the interpretation of analysis included in this present study.

**Statistical Analyses**
Statistical analyses were conducted using Mplus version 7.3 (Muthen & Muthen, 2012) and IBM SPSS 23 (IBM Corp, 2015). All values are reported to 2 decimal places, except percentages, which are reported as whole numbers, and significance values, which are reported to up to 3 decimal places. Weighted means are reported throughout the paper unless otherwise specified. Independent samples t-tests was carried out to determine if there were any significant differences between children with and without ASD for levels of happiness, self-esteem, and prosociality.

Latent Class Analysis (LCA) was run to determine if there were meaningful groups of children sharing similar patterns of positive functioning. The total scores from the three scales (happiness, self-esteem, & prosociality) were standardised before running the LCA. The fit of five models was assessed (two-class to six-class). The most parsimonious model was assessed with the Akaike Information Criterion (AIC: Akaike, 1987), the Bayesian Information Criterion (BIC: Schwarz, 1978), and the sample size-adjusted Bayesian Information Criterion (ssaBIC: Sclove, 1987). Better fitting models are indicated by lower values. Entropy measures were also used to assess how accurately the children were classified into the chosen model, with higher values (range 0-1) indicating better classification (Celeux & Soromenho, 1996). Finally the Lo-Mendell-Rubin adjusted likelihood test (LRT: Lo, Mendell, & Rubin, 2001) identified the best model, with non-significance indicating the previous model as the most appropriate fit for the data. Seventy-five children (60% male) had missing information data for all three well-being scales, and were not included in analysis. The final total included and weighted for analysis was 13,210.

After the most parsimonious model was chosen, multivariate multinomial regression models were run to examine predictors of class membership in the total sample. Gender, ASD
status, and SES were entered as predictor variables and class membership was the outcome variable. The optimum class was used as the baseline class. To investigate membership of the optimum class in the sample of children with ASD, five univariate multinomial logistic regression models were run. The outcomes was always class and the predictors were one of the following: subscales of the SDQ: emotional, peer, conduct, or hyperactivity, peer victimisation, or communication difficulties.

Results

Happiness, Self-Esteem, and Prosociality

Children from the general population were happier (p<.001), had higher self-esteem (p<.001), and were more prosocial (p<.001) compared to children with ASD. Means, standard deviations, and test statistics are shown in Table 1.

[Insert Table 1 here]

Latent Classes

The fit indices for the LCA are shown in Table 2 and happiness, self-esteem, and prosociality scores by class are shown in Table 3. The most parsimonious model was the 5-class solution, which is shown in Figure 1. The “very low prosociality class” (7%) is characterised by children who are happy and have high self-esteem but they are not prosocial. This class has the lowest levels of prosociality across all classes with the participants in the class on the borderline of clinical impairment. The “low happiness class” (3%), the smallest class, includes those children who have moderate self-esteem and are prosocial but they are the least happy. Children in the “low to moderate positive functioning class” (6%) are not happy and have the lowest self-esteem but they are prosocial. The “moderate to high positive functioning class” (23%) is characterised by children who are happy, have moderate self-esteem, and are very prosocial.
The majority of children were classified into the “optimum class” (61%). Children in optimum class are very happy, have high self-esteem, and are very prosocial.

[Insert Table 2 here]

[Insert Table 3 here]

[Insert Figure 1 here]

**Class Membership by Gender, ASD and SES**

As shown in Table 4, the rates of class membership varied according to gender and ASD status. For children without ASD, the majority were in the optimum class (62%), whilst the least were in the low happiness class (3%). The children with ASD exhibited a different pattern of functioning. The highest proportion was in the very low prosociality class (32%) but there approximately an equal number (31%) in the optimum class. As with the children without ASD, the lowest proportion of children with ASD was also in the low happiness class (3%).

[Insert Table 4 here]

As shown in Table 5, after controlling for ASD and socioeconomic status, males were nearly twice as likely to be in the low prosociality class compared to females. Moreover, after controlling for gender and socioeconomic status, children with ASD were more than twice as likely to belong to the low prosociality class and more likely to be in the low to moderate positive functioning class, when compared to children without ASD. After controlling for gender and ASD status, children in the low prosociality were more likely to be of low socioeconomic status and less likely to be in the moderate to high positive functioning class compared to children of high socioeconomic status.

[Insert Table 5 here]

**Class Membership in Children with ASD**
As shown in Table 6, children with ASD in the very low prosociality class were around three to five times more likely to have clinical impairment in emotional difficulties, peer problems, conduct problems, and hyperactivity compared to those children with ASD in the optimum class. They were also around three times more likely to have communication problems compared to the optimum class. Moreover, children with ASD in the low to moderate functioning class were three to five times more likely to have peer problems, conduct problems, and hyperactivity at the level of clinical impairment compared to those children with ASD in the optimum class.

[Insert Table 6 here]

Discussion

This is the first study to investigate the co-occurrence happiness, self-esteem, and prosociality in a population based sample of children with and without ASD. The research questions were (1) what are the different patterns of co-occurrence of happiness, self-esteem, and prosociality in a population sample of children, (2) how do patterns of co-occurrence differ in children with ASD compared to the general population, and (3) what factors are associated with positive functioning in children with ASD? Previous research suggests that self-esteem is associated with prosociality (Zuffiano et al., 2014) and happiness (Baumeister et al., 2003). This was generally borne out and, mostly, children exhibited similar levels of functioning across the three areas. By generating latent classes, however, the analysis revealed that not all children have a similar pattern of association.

*Patterns and predictors of class membership*

Five distinct latent classes were found and are reported in this study. Overall, the findings are encouraging. Most children (optimum and moderate to positive functioning classes)
have a good level of positive functioning across the three areas: happiness, self-esteem, and prosociality. A small minority of children were in the low to moderate positive functioning class, which followed a similar pattern of co-occurrence to the moderate to high positive functioning class, albeit at a lower level. Children in the low to moderate positive functioning class were less likely to be male and more likely to have a diagnosis of ASD compared to children from the optimum class. For 90% of children, happiness, self-esteem, and prosociality co-occur and are strongly associated.

The two classes that deviated from the general pattern of co-occurrence were the low happiness class and the very low prosociality class. Together they made up 10% of the total sample. Children in the low happiness class have comparable levels of self-esteem and prosociality to the moderate to high positive functioning class but happiness levels are very low. The make up of this class did not differ to the optimum class in terms of gender, ASD status, and socioeconomic status.

Children in the very low prosociality class have otherwise normal positive functioning (happiness & self-esteem) but have impairment of a clinical level for prosociality. Children in this class were nearly twice as likely to be male, more than twice as likely to have a diagnosis of ASD, and more likely to be from a low socioeconomic background. This pattern of class membership is consistent with previous research, which suggests that prosociality is lower in males (Hay & Pawlby, 2003) and children with ASD (Lin et al., 2012). The findings are not consistent with previous work on socioeconomic status. Children (Guinote et al., 2015) and adults (Piff et al., 2010) from low socioeconomic backgrounds tend to be more prosocial compared to children from high socioeconomic backgrounds. We found that when controlling for ASD status and gender, children from a low socioeconomic background were more likely to
be in the very low prosociality class. Such differences may have arisen due to the multivariable approach that we have employed that also controls for potential confounders.

Class Membership and ASD Status

The distribution between classes was different for children with and without ASD. Encouragingly, nearly half of children with ASD were in the optimum or moderate to high positive functioning class. That is, they were happy, had good levels self-esteem, and were prosocial. These findings suggest that adverse outcomes in relation positive functioning are not inevitable in children with ASD. Future research studies should adopt multivariable approaches to studying positive functioning to allow for individual differences within groups to become apparent.

Low Self-Esteem in Children with ASD

Children with ASD were more likely than those without ASD to be in the low to moderate positive functioning class, which is characterised by lower levels of happiness and self-esteem. This is line with previous research, which found that children with ASD have lower levels of self-esteem than those without (Williamson et al., 2008). It should, however, be noted that only 16% of children with ASD were in the low to moderate positive functioning class. Although this is higher than the 6% of children without ASD, it evidences that the majority of children with ASD have comparable levels of self-esteem to children without ASD.

Although, very low levels of happiness alone are not associated with impairment in other areas of functioning, having low levels of happiness with lower self-esteem (low to moderate positive functioning class) is associated with a clinical level of impairment in peer, hyperactivity, and conduct problems in children with ASD. This is in line with previous research in children
without Autism, in which low self-esteem is associated with conduct and peer problems (Ha et al., 2008; O'Moore & Kirkham, 2001; Patchin & Hinduja, 2010).

**Very Low Prosociality in Children with ASD**

It is accepted that there is considerable behavioural heterogeneity in children with ASD but typically, research employs a single variable approach to studying prosociality, which can be simplistic and stigmatising. We found that less than one third of children with ASD were identified as having low levels of prosociality. The remaining two thirds of children were in classes with prosociality comparable to the general population. These findings suggest that taking into account happiness and self-esteem, most children with ASD don’t have impairment in prosociality. Further research is needed to specifically investigate prosociality in children with ASD using a multivariable approach.

Membership of the very low prosociality class for children with ASD was associated with clinical impairment in emotional difficulties, peer, hyperactivity, and conduct problems. It may be that being prosocial promotes resilience and protective against behavioural and emotional difficulties in children with ASD. These findings suggest that targeting interventions to improve prosociality may have a beneficial effect on co-morbid emotional and behavioural problems in children with ASD. Longitudinal studies are needed to provide evidence for the long-term benefits of prosociality on emotional and behavioural difficulties in children with ASD.

**Conclusions**

Our findings demonstrate that, for the majority of children in our sample, happiness, self-esteem, and prosociality co-occur. Furthermore, although, as a group, children with ASD have lower levels of happiness, self-esteem, and prosociality, our multivariable latent class approach suggests that nearly half of children with ASD are happy, have good levels self-esteem, and are
prosocial. For children with ASD, having very low levels of prosociality is associated with adverse psychopathological comorbidities.
Compliance with Ethical Standards

Ethical Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The University of London research governance ensured covering of ethical requirements.

Informed Consent

Informed consent was obtained from all individual participants included in the study.
References


externalizing problems. *Journal of Research in Personality, 42*(2), 472-481. doi:10.1016/j.jrp.2007.06.003


Table 1. Group differences in happiness, self-esteem, and prosociality

<table>
<thead>
<tr>
<th>Scale</th>
<th>Children without ASD</th>
<th>Children with ASD</th>
<th>t</th>
<th>df</th>
<th>Mean Difference [95%CI]</th>
<th>Cohen’s d</th>
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</thead>
<tbody>
<tr>
<td>Happiness</td>
<td>0-42</td>
<td>35.74 (6.36)</td>
<td>33.01 (7.14)</td>
<td>7.04***</td>
<td>2.73 [1.97, 3.48]</td>
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<tr>
<td>Self-esteem</td>
<td>0-15</td>
<td>11.98 (2.15)</td>
<td>11.26 (2.56)</td>
<td>4.99***</td>
<td>0.71 [0.43, 0.99]</td>
<td>0.26</td>
</tr>
<tr>
<td>Prosociality</td>
<td>0-10</td>
<td>8.86 (1.47)</td>
<td>6.92 (2.45)</td>
<td>15.59***</td>
<td>1.94 [1.70, 2.19]</td>
<td>0.62</td>
</tr>
</tbody>
</table>

Table 2. Latent Class Analysis Fit Statistics (2 class to 6 class solutions)

<table>
<thead>
<tr>
<th>Classes</th>
<th>Log-Likelihood</th>
<th>AIC</th>
<th>BIC</th>
<th>Sample Size Adjusted BIC</th>
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<th>LRT (p)</th>
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<td>93578.80</td>
<td>93508.89</td>
<td>.80</td>
<td>1132.25</td>
</tr>
<tr>
<td>6</td>
<td>-46199.17</td>
<td>92450.33</td>
<td>92645.04</td>
<td>92562.41</td>
<td>.81</td>
<td>946.78</td>
</tr>
</tbody>
</table>
Table 3. Happiness, Self-Esteem, and Prosociality Scores by Class

<table>
<thead>
<tr>
<th></th>
<th>Very Low Prosociality Class (N=969)</th>
<th>Low Happiness Class (N=421)</th>
<th>Low to Moderate Positive Functioning Class (N=776)</th>
<th>Moderate to High Positive Functioning Class (N=3000)</th>
<th>Optimum Class (N=8044)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Happiness (0-42)</td>
<td>36.49</td>
<td>12.43</td>
<td>24.65</td>
<td>32.54</td>
<td>39.10</td>
</tr>
<tr>
<td>Self-esteem (0-15)</td>
<td>12.01</td>
<td>10.99</td>
<td>8.87</td>
<td>10.45</td>
<td>12.87</td>
</tr>
<tr>
<td>Prosociality (0-10)</td>
<td>5.15</td>
<td>8.53</td>
<td>8.00</td>
<td>9.06</td>
<td>9.23</td>
</tr>
</tbody>
</table>

Values are mean (standard deviation)
Table 4. Class Membership Frequencies ($n = 13\,210$)

<table>
<thead>
<tr>
<th>Class Membership</th>
<th>Very Low Prosociality Class</th>
<th>Low Happiness Class</th>
<th>Low to Moderate Positive Functioning Class</th>
<th>Moderate to High Positive Functioning Class</th>
<th>Optimum Class</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Sample</td>
<td>969 (7%)</td>
<td>421 (3%)</td>
<td>776 (6%)</td>
<td>3000 (23%)</td>
<td>8044 (61%)</td>
<td>13210 (100%)</td>
</tr>
<tr>
<td>Males</td>
<td>650 (10%)</td>
<td>231 (4%)</td>
<td>390 (6%)</td>
<td>1480 (22%)</td>
<td>3914 (59%)</td>
<td>6665 (100%)</td>
</tr>
<tr>
<td>Females</td>
<td>319 (5%)</td>
<td>190 (3%)</td>
<td>386 (6%)</td>
<td>1520 (23%)</td>
<td>4130 (63%)</td>
<td>6545 (100%)</td>
</tr>
<tr>
<td>Children without ASD</td>
<td>840 (7%)</td>
<td>408 (3%)</td>
<td>711 (6%)</td>
<td>2932 (23%)</td>
<td>7918 (62%)</td>
<td>12809 (100%)</td>
</tr>
<tr>
<td>Males</td>
<td>541 (9%)</td>
<td>219 (3%)</td>
<td>342 (5%)</td>
<td>1426 (23%)</td>
<td>3820 (60%)</td>
<td>6348 (100%)</td>
</tr>
<tr>
<td>Females</td>
<td>299 (5%)</td>
<td>189 (3%)</td>
<td>369 (6%)</td>
<td>1506 (23%)</td>
<td>4098 (63%)</td>
<td>6461 (100%)</td>
</tr>
<tr>
<td>Children with ASD</td>
<td>129 (32%)</td>
<td>13 (3%)</td>
<td>65 (16%)</td>
<td>68 (17%)</td>
<td>126 (31%)</td>
<td>401 (100%)</td>
</tr>
<tr>
<td>Males</td>
<td>109 (34%)</td>
<td>12 (4%)</td>
<td>48 (15%)</td>
<td>54 (17%)</td>
<td>94 (30%)</td>
<td>317 (100%)</td>
</tr>
<tr>
<td>Females</td>
<td>20 (24%)</td>
<td>1 (1%)</td>
<td>17 (20%)</td>
<td>14 (17%)</td>
<td>32 (38%)</td>
<td>84 (100%)</td>
</tr>
</tbody>
</table>

Values represent $n$ (%). % are rounded to the nearest whole number. $^1$Missing data for 75 participants (68 general population and 7 children with ASD) were not included in LCA, therefore $n = 13\,210$. 
Table 5. Covariates predicting latent class membership (multinomial, full sample)

<table>
<thead>
<tr>
<th>Gender</th>
<th>Very Low Prosociality Class</th>
<th>Low Happiness Class</th>
<th>Low to Moderate Positive Functioning Class</th>
<th>Moderate to High Positive Functioning Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>1.84*** (1.51-2.23)</td>
<td>0.99 (0.78-1.27)</td>
<td>0.76** (0.62-0.94)</td>
<td>0.97 (0.87-1.08)</td>
</tr>
<tr>
<td>Female</td>
<td>b</td>
<td>b</td>
<td>b</td>
<td>b</td>
</tr>
<tr>
<td>ASD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children with ASD</td>
<td>2.25*** (1.49-3.40)</td>
<td>1.54 (0.55-4.32)</td>
<td>1.69* (1.10-2.59)</td>
<td>0.95 (0.63-1.43)</td>
</tr>
<tr>
<td>Children without ASD</td>
<td>b</td>
<td>b</td>
<td>b</td>
<td>b</td>
</tr>
<tr>
<td>Socioeconomic Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Socioeconomic Status</td>
<td>1.35** (1.08-1.68)</td>
<td>1.00 (0.70-1.44)</td>
<td>1.14 (0.89-1.46)</td>
<td>0.86* (0.74-1.00)</td>
</tr>
<tr>
<td>High Socioeconomic Status</td>
<td>b</td>
<td>b</td>
<td>b</td>
<td>b</td>
</tr>
</tbody>
</table>

Each class is compared to the baseline (Optimum Class, N = 8044) with ‘b’ as comparison within variables. Values represent Odds Ratios (95% Confidence Intervals). *p<0.05, **p<0.01, ***p<0.001.
Table 6. Covariates predicting membership of class (univariate, children with ASD only)

<table>
<thead>
<tr>
<th></th>
<th>Very Low Prosociality Class</th>
<th>Low Happiness Class</th>
<th>Low to Moderate Positive Functioning Class</th>
<th>Moderate to High Positive Functioning Class</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Emotional Difficulties</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical Impairment</td>
<td>3.28*** (1.72-6.24)</td>
<td>0.74 (0.13-4.09)</td>
<td>1.93 (0.95-3.93)</td>
<td>1.90 (0.91-3.97)</td>
</tr>
<tr>
<td>Normal</td>
<td>b</td>
<td>b</td>
<td>b</td>
<td>b</td>
</tr>
<tr>
<td><strong>Peer Problems</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical Impairment</td>
<td>5.00*** (2.38-10.50)</td>
<td>4.10 (0.75-22.30)</td>
<td>5.29*** (2.29-12.24)</td>
<td>1.41 (0.66-3.00)</td>
</tr>
<tr>
<td>Normal</td>
<td>b</td>
<td>b</td>
<td>b</td>
<td>b</td>
</tr>
<tr>
<td><strong>Conduct Problems</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical Impairment</td>
<td>4.15*** (2.17-7.92)</td>
<td>3.74 (0.76-18.32)</td>
<td>3.30** (1.62-6.72)</td>
<td>0.57 (0.26-1.25)</td>
</tr>
<tr>
<td>Normal</td>
<td>b</td>
<td>b</td>
<td>b</td>
<td>b</td>
</tr>
<tr>
<td><strong>Hyperactivity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical Impairment</td>
<td>2.78** (1.41-5.46)</td>
<td>13.06* (1.40-122.17)</td>
<td>3.68** (1.71-7.91)</td>
<td>1.09 (0.53-2.23)</td>
</tr>
<tr>
<td>Normal</td>
<td>b</td>
<td>b</td>
<td>b</td>
<td>b</td>
</tr>
<tr>
<td><strong>Communication Problems</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>3.05** (1.61-5.78)</td>
<td>0.72 (0.13-3.90)</td>
<td>1.74 (0.85-3.57)</td>
<td>2.10 (0.99-4.45)</td>
</tr>
<tr>
<td>Absent</td>
<td>b</td>
<td>b</td>
<td>b</td>
<td>b</td>
</tr>
</tbody>
</table>

Each class is compared to the baseline (Optimum Class, N = 126) with ‘b’ as comparison within variables. Values represent Odds Ratios (95% Confidence Intervals). *p<0.05, **p<0.01, ***p<0.001. †This comparison should be interpreted with caution as there are only 13 children with ASD in the low happiness class.
Figure 1. Happiness, Self-Esteem, and Prosociality by Class Membership