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Short Communication

# A preliminary investigation into the relationship between empathy, autistic like traits and emotion recognition☆

Rachel Martin*, Karen McKenzie, Dale Metcalfe, Thomas Pollet, Kris McCarty

*Psychology Department, Northumbria University, Newcastle upon Tyne, UK*

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ABSTRACT

*Objectives:* To determine the effects of autistic-like traits (ALT), empathy and situational cues on emotion recognition ability.
*Methods:* Eighty-six participants (64 male, 22 female) completed measures of empathy, ALT and emotion recognition (with and without situational cues) online. Results were analysed using a multilevel logistic model.
*Results:* The presence of situational cues and ALT were significantly related to emotion recognition.
*Conclusions:* High levels of ALTs and a lack of situational cues resulted in poorer emotion recognition. Future research should seek to control possible confounds, including processing style. Potential implications of the current study are discussed.

## 1. Introduction

Typically developing (TD) individuals can recognise emotions early in life, with infants as young as four months able to discriminate between facial expressions of emotion (Walker-Andrews, 1998). People with Autism Spectrum Disorder (ASD) appear to have greater difficulty with emotion recognition (ER), meta-analytic work comparing the ER ability of individuals with and without ASD finds the former performed worse (Uljarevic & Hamilton, 2013).

There are a number of influences on ER. Situational cues relevant to the emotion being portrayed can improve ER accuracy in TD participants and people with an intellectual disability (Matheson & Jahoda, 2005; McKenzie, Matheson, McKaskie, Hamilton, & Murray, 2001; Scotland, McKenzie, Cossar, Murray, & Michie, 2016). These cues can override facial expressions and change a person's judgement of emotion in some circumstances (Aviezer et al., 2008). While research with people with ASD is limited, it suggests they utilise situational cues less when matching emotions to their correct context (e.g., Wright et al., 2008). The type of stimuli can also affect ER in people with ASD, with research suggesting facial stimuli are processed differently, depending on whether they are static or dynamic (Speer, Cook, McMahon, et al., 2007). Individuals with ASD also appear to attend differently to facial stimuli, when the eyes are visible, compared to TD individuals (e.g., Jones, Carr, & Klin, 2008) and have comparable ER from facial emotion stimuli when the eyes are occluded (Grossman & Tager-Flusberg, 2008). This suggests that differences may relate to eye avoidance rather than ER difficulties. Empathy has also been implicated in ER, with Sucksmith, Allison, Baron-Cohen, Chakrabarti, and Hoekstra (2013) suggesting that it mediates the process between viewing an emotive stimulus and successful ER. People with ASD have difficulties empathising, as reflected in the extreme male brain theory of ASD (Baron-Cohen, Wheelwright, Skinner, Martin, & Clubley, 2001).

Research in this area is, therefore, important to help inform both the theoretical explanations about, and refine interventions for, ER difficulties in people with ASD. For example, those delivering holistic school approaches to improve the socio-emotional skills of children and young people may need to adapt such approaches to account for the ways in which children with developmental disabilities process emotion stimuli and use context (see Murray et al., 2018). Such research is also likely to be relevant to people with high autistic like traits (ALT).

The continuum theory of ASD proposes that individuals in the general population vary in the extent to which they have autistic like traits (ALT) and that those with a diagnosis of ASD have higher/more extreme levels of the relevant traits (see Murray, Booth, McKenzie, Kuenssberg, & O'Donnell, 2014). Recent research has found that individuals with higher levels of autistic like traits (ALT) showed

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* Corresponding author at: Northumbria University, Faculty of Health and Life Sciences, Department of Psychology, City Campus, Northumberland Building, Northumberland Road, Newcastle upon Tyne, NE1 8ST, UK.

*E-mail address:* rachel4.martin@northumbria.ac.uk (R. Martin).

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significantly poorer ER (e.g., McKenzie et al., 2018). It is, therefore, possible to extrapolate findings from a sub-clinical sample to those with a formal diagnosis of ASD, while avoiding some of the methodological constraints associated with using a clinical sample (Lord et al., 2005; Murray et al., 2014).

Building on the above research, the current study will address the extent to which empathy, ALT and situational cues predict ER accuracy in a sub-clinical sample. To reduce confounding and maximize the sensitivity of testing the expected associations, facial features were absent and dynamic stimuli were used.

## 2. Method

### 2.1. Ethical approval

Ethical approval was obtained from the authors' University.

### 2.2. Participants

Participants were recruited using opportunity sampling via social media, the authors' university, and psychology research hosting sites. In total, 86 individuals participated (male = 64), with a mean age of 26.06 years (SD = 11.4 years).

### 2.3. Materials

#### 2.3.1. Emotion recognition

An online task was developed by Metcalfe et al. (submitted) comprising short video clips depicting a male avatar displaying eight emotions (angry, bored, disgusted, afraid, happy, sad, surprised and worried). The ER measure was piloted with two groups: adults (N = 22, male = 10, M age = 32.41, SD = 12.05) and children (N = 27, male = 26, M age = 10.96, SD = 3.01). This pilot found the pattern of identification of emotions was broadly similar to that found in other studies using static emotion stimuli with context (McKenzie et al., 2018), with the exception of disgust and boredom. The latter emotions had considerably lower accuracy levels, perhaps reflecting the increased challenge of processing more complex emotions when they are presented dynamically.

Each emotion was displayed with and without situational cues. Stimuli were devoid of facial expressions, background information or sound. Emotions were conveyed through gestures, movement and, in the 'situational cues' condition, additional relevant situational information, such as a stylised vending machine, insect, phone or door (see Figs. 1 and 2).

Participants were asked to report the emotion depicted. Responses were coded according to a scoring matrix, with a score of 1 for each correct response (range 0–8 for each condition, total range 0–16), with higher scores indicating better ER.

#### 2.3.2. Autistic like traits (ALT)

These were measured by the Autism-Spectrum Quotient (AQ: Baron-Cohen et al., 2001). This comprises 50 statements, (e.g., I prefer to do things with others rather than on my own) scored on a 4-point scale from 'definitely agree' to 'definitely disagree' (range 0–50), with higher scores representing higher levels of ALT. The AQ has been found to have good psychometric properties and to assess a range of ALT with good measurement precision (see Murray, Booth, McKenzie, & Kuenssberg, 2015). The Cronbach's alpha in the current study was 0.80.

#### 2.3.3. Empathy

This was measured by the Questionnaire of Cognitive and Affective Empathy (QCAE: Reniers, Corcoran, Drake, Shryane, & Völlm, 2011). This has 31 items (e.g., I find it easy to put myself in somebody else's shoes) scored on a 4-point scale (strong agreement to strong disagreement) and provides cognitive and affective empathy subscales and an overall empathy score, with higher scores representing higher levels of empathy. The measure is used internationally and has been found to have good psychometric properties when used in a range of settings and with different populations (see Queirós et al., 2018 for an overview). The Cronbach's alpha in the current study was 0.92.

### 2.4. Procedure

Potential participants were provided with information about the study and a link to access it online, where more detailed information was provided. Once consent was given, brief demographic information was requested and the three tasks were completed before participants accessed debrief information. The online platform was configured to only allow a participant to complete the survey once.

### 2.5. Analysis strategy

A multilevel logistic model was conducted to predict ER, with relevant variables being entered incrementally and only those that improved model fit being retained. Explanatory variables were, total AQ score ($z$-scored) and situational cue presence (Cue) and gender. The analyses were run in R 3.5.1 with the lme4 package (Bates, Maechler,


**Fig. 1.** Example stills from 'anger' without cues video clip. For video see https://youtu.be/6ZbulYHQiAc.

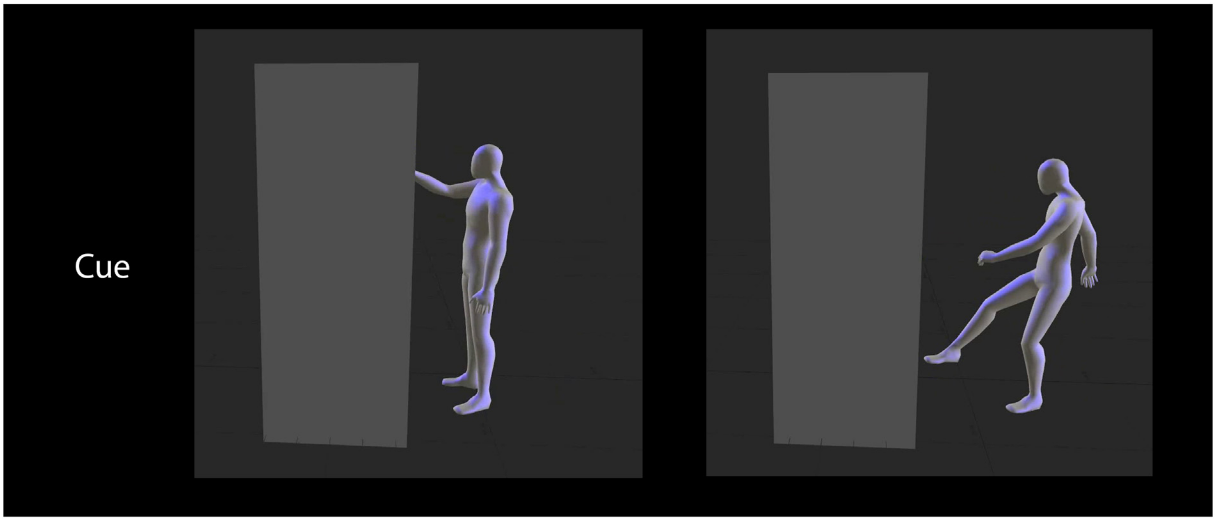


**Fig. 2.** Example stills from ‘anger with cues video clip. For video see: https://youtu.be/r4Vr1VZtoBI.

Bolker, & Walker, 2014; R Development core team, 2012; script see: https://osf.io/jh3ks/).

## 3. Results

Table 1 illustrates the mean scores and standard deviations for the background and explanatory variables and correctly identified trials, and the correlations between these variables at participant level. Correlations highlighted a high degree of overlap between the AQ and QCAE. AQ was deemed to be the better predictor based on model fit statistics, as such, AQ score was retained for the analysis and QCAE was not. QCAE did not improve model fit over the null model and was not a significant predictor ($B = 0.085 \pm 0.055$, $Z = 1.551$, $p = .121$) (see ESM for analyses).

### *3.1. Modelling outcome*

Change in model fit was judged according to change in fit criteria (AIC/BIC). Compared to the null model, the inclusion of AQ improved model fit in AIC and the addition of Cue, further improved fit. The inclusion of gender and the inclusion of an interaction between AQ and Cue did not improve model fit. The best fitting model in terms AIC and BIC is with AQ and Cue as predictor. It should be noted that while this model represented a good improvement over the null model with AIC, it did not improve the model much in BIC, which is more conservative (Table 2 for model summaries).

Table 3 shows the odds ratios for selected models. For model 3, a shift of one standard deviation in AQ score decreases the odds of correctly identifying an emotion by a factor of 1.12 (1/0.891). The presence of a Cue improves the odds of correctly identifying an emotion by a factor of 1.197. Fig. 3 summarizes the key findings: Higher AQ score and absence of situational cues are associated with lower ER ability.

**Table 1**
Means, standard deviations (SD), and correlations with 95% confidence intervals (noted in square brackets).

| Variable | Mean | SD | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|
| 1. Age | 26.21 | 11.52 | | | | |
| 2. Gender | 1.25 | 0.43 | 0.13 [−0.09, 0.33] | | | |
| 3. AQ | 18.59 | 7.06 | 0.13 [−0.08, 0.34] | 0.16 [−0.05, 0.36] | | |
| 4. QCAE | 94.58 | 12.55 | −0.03 [−0.25, 0.18] | −0.25* [−0.44, −0.04] | −0.41** [−0.57, −0.22] | |
| 5. Correct | 0.59 | 0.12 | 0.02 [−0.20, 0.23] | −0.05 [−0.26, 0.17] | −0.23* [−0.43, −0.02] | 0.17 [−0.04, 0.37] |

* $p < 0.05$.
** $p < 0.01$.

**Table 2**
Model summaries of multilevel models.

| | Correct | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Autism Quotient (AQ) score | | −0.115* | −0.116* | −0.115* | −0.011 |
| Cue | | | 0.180** | 0.180** | 0.181** |
| Gender | | | | −0.013 | |
| AQ * Cue | | | | | −0.053 |
| Constant | 0.354*** | 0.355*** | −0.003 | 0.013 | −0.004 |
| N | 1360 | 1360 | 1360 | 1360 | 1360 |
| Log Likelihood | −921.748 | −919.573 | −914.267 | −914.262 | −913.805 |
| AIC | 1847.495 | 1845.146 | 1836.535 | 1838.525 | 1837.610 |
| BIC | 1857.926 | 1860.792 | 1857.396 | 1864.601 | 1863.686 |

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

**Table 3**
Odds ratios for selected models corresponding to Table 2.

| | Correct | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Autism Quotient (AQ) score | | 0.892* | 0.891* | 0.892* | 0.989 |
| Cue | | | 1.197** | 1.197** | 1.199** |
| Gender | | | | 0.987*** | |
| AQ * Cue | | | | | 0.948 |
| N | 1360 | 1360 | 1360 | 1360 | 1360 |
| Log likelihood | −921.748 | −919.573 | −914.267 | −914.262 | −913.805 |
| AIC | 1847.495 | 1845.146 | 1836.535 | 1838.525 | 1837.610 |
| BIC | 1857.926 | 1860.792 | 1857.396 | 1864.601 | 1863.686 |

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

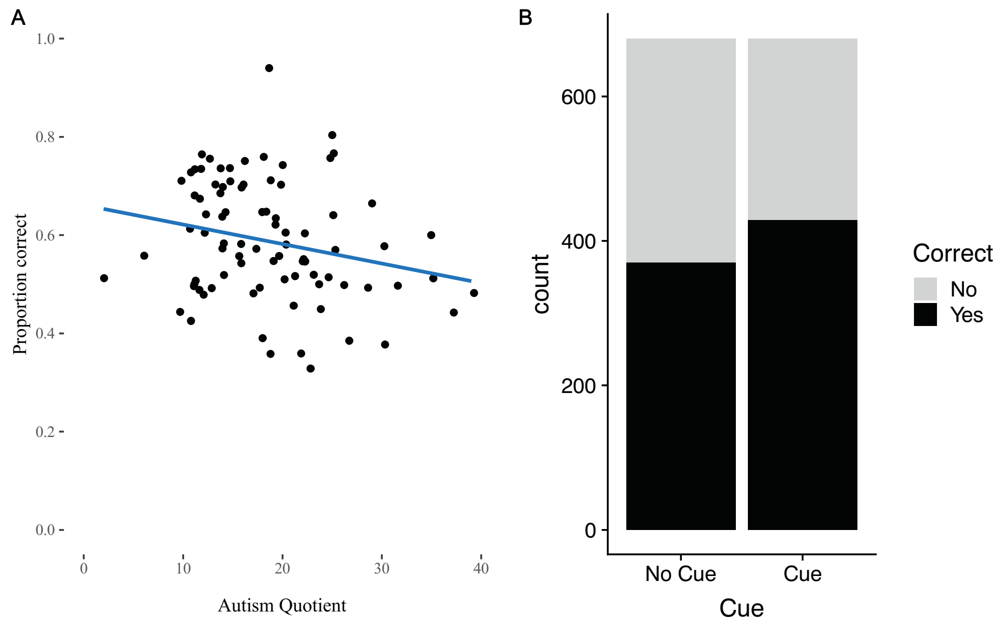


**Fig. 3.** Panel A shows the relationship between AQ score and proportion of emotion correctly identified (with regression line and 95% CI). Panel B shows proportion of emotions correctly identified at trial level in cue and no cue condition.

## 4. Discussion

Results suggest that a higher score on ALT and an absence of situational cues lead to poorer ER ability. An interaction between the two variables did not improve model fit, nor did the inclusion of gender within the model. AQ score and QCAE score were highly correlated, with only the former improving model fit and being included in the final analysis. Additional multilevel analyses presented in ESM show no significant associations between QCAE and ER.

The effect of ALT on ER is consistent with its clinical extension, with previous work finding those with ASD have poorer ER than their TD counterparts (e.g., McKenzie et al., 2018; Uljarevic & Hamilton, 2013). We extend this work, which has largely used static emotion stimuli, by using more ecologically valid dynamic emotion stimuli, including body posture and gesture.

The study also contributes to the small body of evidence showing that situational cues improve ER (Matheson & Jahoda, 2005; McKenzie et al., 2001; Scotland et al., 2016). While we found no significant interaction between AQ score and situational cues in relation to ER, the results suggest that including situational information in interventions designed to improve ER may be helpful, particularly as many people with ASD have difficulty identifying emotion from facial expression alone (Grossman & Tager-Flusberg, 2008; Jones et al., 2008) and may use situational cues less than their TD peers (Wright et al., 2008).

The current study had some limitations. There is research indicating that processing style can influence the ER of TD individuals, adults with an intellectual disability (Scotland et al., 2016) and children with ASD (Gross, 2005), with an association existing between a more holistic processing style and more accurate ER. The present study did not control for processing style. While recent research found no significant relationship between ER and processing style in individuals with and without ASD (McKenzie et al., 2018), it may be worth including in future studies of ER. We were unable to determine if the sample characteristics of the participants recruited via different means differed. This raises the possibility of bias in our sample. Related to this, while the AQ is able to measure a good range of ALT, it is less precise at measuring very high or very low ALT, which may have influenced our results (Murray et al., 2015). Further research using dynamic stimuli is needed with individuals with a diagnosis of ASD to help determine if our results hold for people with very high levels of ALT, which in turn could help refine interventions aimed at improving ER for this group of people. Similarly, there is a need to further explore the role of dynamic situational cues in the ER of those with the full range of ALT.

### 4.1. Conclusions

Overall, the study indicated that higher ALT and the absence of situational cues were significantly related to emotion recognition. Future work should assess the extent to which such findings hold true within a clinical sample using dynamic ER stimuli while giving consideration to the limitations identified in the present study.

Supplementary data to this article can be found online at https://doi.org/10.1016/j.paid.2018.07.039.

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