



The relations between processing style, autistic-like traits, and emotion recognition in individuals with and without Autism Spectrum Disorder



Karen McKenzie^{a,*}, Aja Louise Murray^{b,1}, Andrew Wilkinson^a, George C. Murray^c, Dale Metcalfe^a, Michael O'Donnell^d, Kris McCarty^a

^a Northumbria University, Newcastle upon Tyne NE18ST, UK

^b Violence Research Centre, University of Cambridge, Cambridge, UK

^c NHS Lothian, Edinburgh EH91UW, UK

^d North Bristol NHS Trust, Bristol, UK

ARTICLE INFO

Article history:

Received 6 May 2017

Received in revised form 20 July 2017

Accepted 3 August 2017

Available online 12 August 2017

Keywords:

Autistic-like traits

Autism Spectrum Disorder

Processing bias

Emotion recognition

ABSTRACT

Having a more local processing style may contribute to the difficulties that some people with developmental disabilities, such as Autism Spectrum Disorder (ASD), experience with emotion recognition (ER). This study explored whether autistic-like traits (ALT), as measured by the Autism Spectrum Quotient (AQ), and a more local processing bias predicted performance on an ER task. The study was a cross-sectional study of individuals who self-reported diagnosis of ASD ($n = 40$) and typically developing (TD) participants ($n = 216$). Participants completed the AQ, an ER naming task using static coloured images of people, and two processing style tasks (a Navon type task and a false memory recall task using the Deese-Roediger-McDermott (DRM) paradigm). No significant relationships were found between processing style, ER, and ALT. Higher general ALT scores were significantly associated with poorer general ER. The implications of the results for interventions to improve ER in people with ASD are discussed.

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1. Introduction

Individuals with Autism Spectrum Disorder (ASD; see Table 1 for list of abbreviations) experience difficulties with socio-emotional relationships, of which the ability to correctly identify and interpret the emotions of others is an important part (Hext & Lunskey, 1997). Many people with ASD perform worse on emotion recognition (ER) tasks compared with their typically developing (TD) peers, although there is a lack of agreement about the exact nature and extent of these differences and some researchers have found no differences at all (for an overview, see Harms, Martin, & Wallace, 2010).

It has been proposed that the socio-emotional difficulties of people with ASD may result from deficits in cognitive (theory of mind) and affective empathy, combined with a preference for systematising and an associated preference for local or detail based information processing (Baron-Cohen, 2008). The reformulated Weak Central Coherence theory (Happé & Frith, 2006) and the Enhanced Perceptual Functioning model (EPF; Motttron, Dawson, Soulières, Hubert, & Burack, 2006),

while not explicitly attempting to explain ER difficulties, also propose that people with ASD have a more local processing style, but differ in their emphasis. The former suggests this local style results from a global processing deficit, while the latter posits an enhanced local processing ability.

There is some inconsistency in the results of research into the processing styles of people with ASD (see Behrmann, Thomas, & Humphreys, 2006; Simmons et al., 2009; Van der Hallen, Evers, Brewaeys, Van den Noortgate, & Wagemans, 2015). A recent meta-analysis suggests that, while there is limited evidence for individuals with ASD having a global processing deficit, global processing does take longer and seems to require more effort than for TD individuals. The authors suggest that this may indicate that people with ASD move from local to global processing, with details being processed first (Van der Hallen et al., 2015). This work indicates that it is likely to be misleading to consider processing style in terms of local versus global; it might be better considered in terms of an initial strategy which is utilised for a specific task or in a specific context (D'Souza, Booth, Connolly, Happé, & Karmiloff-Smith, 2016).

There is, however, some suggestion that information processing style may play a role in ER ability (e.g. Fallshore & Bartholow, 2003; Scotland, McKenzie, Cossar, Murray, & Michie, 2016) and that, to the extent that people with ASD perform poorly on ER tasks, they do so, at least partly, because of the initial adoption of a more local processing

* Corresponding author.

E-mail addresses: k.mckenzie@northumbria.ac.uk (K. McKenzie), am2367@cam.ac.uk (A.L. Murray).

¹ Joint first author.

Table 1
Abbreviations used in the article.

| Phrase | Abbreviation |
|---|--------------|
| Attention to detail | ATD |
| Autism Spectrum Disorder | ASD |
| Autism Spectrum Quotient | AQ |
| Autistic-like traits | ALT |
| Emotion recognition | ER |
| Enhanced Perceptual Functioning model | EPF |
| Deese-Roediger-McDermott | DRM |
| Root Mean Square Error of Approximation | RMSEA |
| Typically developing | TD |

style in situations where a more global approach would be more effective (Behrmann, Avidan, et al., 2006).

There has only been limited research which has directly tested this hypothesis. Gross (2005) explored the relationship between processing style and ER in children with ASD and other developmental disorders. He used a Navon type global/local identification task (Simmons et al., 2009) that asked the participant to choose which of three pictures most resembled a target image. The options were of a picture reflecting the general configuration of the target picture (global response), a picture reflecting the detail of the target picture (local response), and a picture that was unrelated to the target image. He found that children with ASD had fewer global responses and were less accurate when recognising both human and canine emotions. When considering all children, significant negative correlations were found between recognising human emotions and selecting local responses.

Scotland et al. (2016), using the same processing task as Gross (2005), found that, after controlling for group (adults with an intellectual disability or TD child controls), having a more local processing style was associated with poorer performance on an ER task for all participants.

As task type and difficulty appear to influence information processing style (e.g. D'Souza et al., 2016), it is advisable for researchers to consider more than one processing style task. The present study used the Deese-Roediger-McDermott (DRM) paradigm (Roediger & McDermott, 1995). This suggests that if gist/global processing dominates encoding of the stimulus, then these traces will be stronger at recall, resulting in higher recall of incorrect, but semantically related, answers. Conversely, if a more local processing style dominates, the fact that intrusions are semantically related should lead to less false recall. Previous evidence supports its validity and reliability and it has been used extensively and successfully in research measuring processing style in both TD individuals and people with ASD (see Miller, Odegard, & Allen, 2014).

A further question about the nature of the relationship between processing style and the ER of people with ASD arises from the continuum theory of ASD. This argues that autistic-like traits (ALTs) are characteristics that are distributed throughout the population to varying degrees, with individuals with a clinical diagnosis simply being those who have a more extreme presentation of the different characteristics (for an overview, see Murray, Booth, McKenzie, Kuenssberg, & O'Donnell, 2014). ALTs are measured by tools such as the Autism Spectrum Quotient (AQ; Baron-Cohen, Wheelwright, Skinner, Martin, & Clubley, 2001). This work raises the question of whether the relationship that is proposed to exist between a local processing style and ER in people with ASD, would also be found in individuals with subclinical levels of ALTs. That such a link might exist is suggested by the work of Vanmarcke and Wagemans (2016), which found that the responses of individuals with higher ALTs to a non-emotion based identification task were influenced by the nature of prime information (coarse [global], fine [local], or a hybrid of both) which preceded the task.

The current study aims to add to the limited extant literature on processing style and ER by examining the extent to which having a more local processing style (as indicated by a higher endorsement of local responses on the task developed by Gross, 2005 and lower false recall

scores on the DRM task) impacts on the relation between autistic traits – at the sub-clinical and clinical levels – and ER overall.

2. Method

For further details on the method, please see Supplementary materials.

2.1. Design

The study adopted a cross-sectional design, using both online and paper versions of a questionnaire, to assess the relationship between AQ score, DRM lure (false recall) score, and local score as predictors of ER score in TD individuals and individuals with ASD.

2.2. Participants

A total of 511 people participated, of whom 255 provided data on the ER task only. These were included in order to contribute to the ER measurement model and optimise the ER ability estimates. The remaining 256 participants also completed the AQ and at least one information processing task.

The ages of the 256 participants (male = 75, female = 117, bi-gender/transgender = 5, 59 chose not to respond) ranged from 16 to 73 ($m = 29.8$; $SD = 13.4$). Within this group, 40 people (male = 20, female = 18, bi-gender/transgender = 2) had a reported/self-reported diagnosis of ASD. Ages ranged from 16 to 62 years ($m = 29$; $SD = 10.5$). All 256 participants completed the global/local task and 154 also completed the DRM task, including 15 participants with ASD.

Individuals with and without a diagnosis of ASD were included in order to ensure an adequate range of variability in ALT. Participants were included if they were aged 18 or above (or aged 16–18 with parental consent) and were able to give informed consent. Individuals who had a condition other than ASD which was likely to impact on ER were excluded, e.g. an uncorrected visual impairment.

2.3. Materials

2.3.1. ER task

This was based on an assessment reported in McKenzie, Matheson, McKaskie, Hamilton, and Murray (2001) and subsequently used by Scotland et al. (2016). This involved presenting participants with examples of emotions depicted in photographs and asking them to identify the specific emotion. Nine different emotions – “happy”, “sad”, “worried”, “afraid”, “angry”, “surprised”, “disgusted”, “bored”, and “neutral” – were depicted. Participants were asked to note the name of the emotion depicted below each picture in response to the question “What is the person in this picture feeling?” The scores across the emotions were added to give a total ER score (possible range 0–18).

2.3.2. AQ (Baron-Cohen et al., 2001)

The AQ is a 50 item self-report questionnaire designed to measure ALTs. It is organised into 5 subscales – “Social Skills”, “Communication”, “Attention Switching”, “Attention to Detail” (ATD), and “Imagination” – and rated on a four-point Likert scale (scoring “definitely agree”, “slightly agree”, “slightly disagree”, and “definitely disagree”). As research suggests that, while the majority of items of the AQ form a coherent scale, the ATD items measure a relatively distinct construct (Murray, McKenzie, Kuenssberg, & Booth, 2015) which may be related to a preferred local processing style (Stevenson et al., 2016), the AQ was scored in two parts in the present study: “general autistic traits” excluding the ATD items, and ATD.

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