Links between traits associated with the broad autism phenotype and empathy and young adults' ability to decode speaker intentionality

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A B S T R A C T

Background: Expressions of social, but not non-social, traits associated with the broad autism phenotype (BAP) have been linked with social difficulties in parents of children with a formal diagnosis of autism spectrum disorder (ASD). How subclinical expression of BAP traits are related to social communication abilities in individuals in the general population is less well understood.
Method: We explored relationships between social and non-social BAP traits and the ability to use multimodal, nonverbal cues to infer a speaker's intended meaning in a general sample of university students ($N = 70$). Data on the empathic abilities of, and the emotion regulation strategies used by, participants were also collected.
Results: After controlling for verbal IQ, accuracy in labeling speakers' intentions was positively associated with the non-social BAP trait of rigidity (an effect that past research suggests may be mediated by superior face processing ability), and with one's drive to empathize with the thoughts and feelings of a fictional character. We suggest that being both imaginative *and* motivated to engage with others may have been key to participants' success on the task. We also observed that the participants who found sarcasm, jocularity, and white lies particularly rude were those who tended to engage in more emotional suppression – a self-regulatory strategy that negatively biases the processing and expression of affect.
Conclusions: Together, these results expand our understanding of personality factors that influence social communication skills, and may inform future research into the role that particular symptom clusters play in the expression of ASD.

1. Introduction

Individuals with autism spectrum disorder (ASD) often experience significant difficulty with social interactions (American Psychiatric Association, 2013). Some researchers attribute these problems to deficits in theory of mind reasoning and cognitive empathy (i.e., to difficulties in understanding others' points of view and their mental and emotional states) that are presumed to arise, in part, from problems decoding subtle nonverbal cues (e.g., Baron-Cohen, Leslie, & Frith, 1985; Brewer, Young, & Barnett, 2017; Murray et al., 2017; Smith, Montagne, Perrett, Gill, & Gallagher, 2010; Yang & Baillargeon, 2013). Atypical social drive, which might limit or alter how one *attends* to such cues, could also be a contributing factor (see Chevallier, Kohls, Troiani, Brodkin, & Schultz,

2012, for a review). However, in addition to these receptive/cognitive difficulties, individuals with ASD often find it difficult to express and regulate their own emotions (Bachevalier & Loveland, 2006), leading them to act in ways that are difficult to interpret or that seem unsuitable for the situation (Sigman, Karsari, Kwon, & Yirmiya, 1992; Travis & Sigman, 1998). In a recent study, Sasson et al. (2017) presented compelling evidence that atypicalities in the way those with ASD present themselves are likely to create a negative first impression in neurotypical peers that could limit or impede future social interactions (see also Hubbard, Faso, Assman, & Sasson, 2017).

ASD is diagnosed on the basis of impaired social communication and interaction, and the presence of restricted and repetitive behaviours and interests (American Psychiatric Association, 2013). However, while these symptoms co-occur in ASD, both behavioural and genetic studies support the idea that they are distinct and arise through different mechanisms (Brunsdon & Happé, 2014; Happé, Ronald, & Plomin, 2006; Happé & Ronald, 2008; Ronald, Larsson, & Anckarsater, 2011; Williams & Bowler, 2014). Happé and Ronald (2008) argue on these grounds that behavioural research should assess the influence of individual traits. One way to accomplish this is to examine the relationship between traits associated with the Broader Autism Phenotype (BAP) and behaviour.[1] This behavioural phenotype is characterized by subclinical expression of aloofness, pragmatic language difficulties, and/or behavioural rigidity.

The BAP was originally identified based on rigorous clinical assessment of first degree relatives of individuals with ASD (Bolton et al., 1994; Piven et al., 1994, ; Piven, Palmer, Jacobi, Childress, & Arndt, 1997 ; Piven, Palmer, Landa et al., 1997). However, it is now acknowledged that BAP traits are continuously distributed in the general population (Hurley, Parlier, & Piven, 2007; Sasson, Lam et al., 2013; Wainer, Ingersoll, & Hopwood, 2011). In parents of those with ASD, and in individuals in general samples, BAP traits can be expressed in single or multiple domains (Happé et al., 2006; Losh et al., 2009; Piven, Palmer, Landa et al., 1997; Sasson, Nowlin, & Pinkham, 2013), and this allows researchers to assess the influence of individual traits on things such as social functioning. A clear advantage of studying BAP traits in general samples is that it allows one to take advantage of a greater range in the expression of particular traits across individuals. While studies utilizing the BAP model cannot substitute for basic research involving clinical samples with ASD, they do provide complementary data that may inform future work.

In an effort to expand our understanding of ASD, a number of researchers have examined links between BAP traits and social functioning. Individuals who score high on measures of the BAP can display social difficulties similar to (albeit generally less severe than) those with a formal diagnosis of ASD (Ingersoll, 2010; Losh et al., 2009; Lamport & Turner, 2014; Piven, Palmer, Landa et al., 1997; Sasson, Nowlin et al., 2013; Sucksmith, Roth, & Hoekstra, 2011; Wainer et al., 2011, 2013). They are also at heightened risk for loneliness, social withdrawal, social anxiety and hostility, relationship distress, and reduced life satisfaction (Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001; Faso, Corretti, Ackerman, & Sasson, 2016; Jobe & White, 2007; Lamport & Turner, 2014; Pugliese, Fritz, & White, 2015; Wainer, Block, Donnellan, & Ingersoll, 2013). Their difficulties in these areas have been linked to problems with emotion regulation (e.g., Pugliese et al., 2015); reduced empathy (Jamil, Gragg, & DePape, 2017; Lamport & Turner, 2014) and responsiveness (Pollmann, Finkenauer, & Begeer, 2010); and to reduced or atypical processing of nonverbal cues (e.g., Ingersoll, 2010; Kadak, Demirel, Yavuz, & Demir, 2014; Sasson, Nowlin et al., 2013). Importantly, in first-degree relatives of children with ASD, it is the social BAP traits, rather than rigidity, that appear to underlie difficulties in the social domain (Adolphs, Spezio, Parlier, & Piven, 2008; Losh & Piven, 2007; Losh et al., 2009; Yucel et al., 2015).

When tested with static stimuli, first-degree relatives scoring high on social BAP traits focus more on the mouth and less on the eyes; benefit less from face cues when evaluating complex emotional scenes; find faces displaying positively-valenced expressions less trustworthy; and have difficulty inferring mental states based on information from the eye region, as well as identifying *subtle* expressions of fear (Adolphs et al., 2008; Losh & Piven, 2007; Losh et al., 2009). They also show atypical activation in face processing areas during tasks involving face memory and expression matching (Yucel et al., 2015). Interestingly, Losh et al. found that individuals exhibiting strong social BAP traits did not have difficulty identifying basic emotions conveyed in dynamic, whole-body, point-light displays, although their ratings of the trustworthiness of the figures depicted were somewhat atypical. Together, these findings suggest that relationships between social BAP traits and social perceptual/cognitive functions may vary depending on task demands and stimulus properties.

Researchers studying links between BAP traits and social functioning have advocated grouping aloofness and pragmatic language difficulties together into a social domain, and expanding the rigidity factor to include a range of non-social characteristics, such as heightened attention to detail. This clustering makes sense both on statistical grounds and from a clinical perspective. In samples recruited from the general population, researchers have identified two subclasses of individuals: one showing strong signs of rigidity/attention-to-detail but relatively good social skills, and another with social difficulties but relatively weak orientation to detail (Davis et al., 2017; Palmer, Paton, Enticott, & Hohwy, 2015; Sasson, Nowlin et al., 2013). Interestingly, Davis et al. (2017) found that those exhibiting non-social BAP traits had relatively *good* facial recognition skills (an effect that was mediated by an increased tendency to fixate on the eye region), whereas Sasson, Nowlin et al., 2013 found that those exhibiting social BAP traits performed worse on several social cognitive tests, including those assessing face and emotion recognition, and theory of mind reasoning, using static stimuli. These data highlight the importance of considering clusters of traits in studies of social perception and cognition.

2. The current study

In the present study, we explored relationships between social and non-social BAP traits (measured through self-report) and the

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[1] This is just one of several advantages of the BAP model (for additional discussion, see Landry & Chouinard, 2016; Yucel et al., 2015).