The Compilation and Validation of a Collection of Emotional Expression Images Communicated by Synthetic and Human Faces

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ABSTRACT

The BARTA (Bolton Affect Recognition Tri-Stimulus Approach) is a unique database comprising over 400 colour images of the universally recognised basic emotional expressions and is the first compilation to include three different classes of validated face stimuli: emoticon, computer-generated cartoon and photographs of human faces. The validated tri-stimulus collection (all images received ≥70% inter-rater (child and adult) consensus) has been developed to promote pioneering research into the differential effects of synthetic emotion representation on atypical emotion perception, processing and recognition in autism spectrum disorders (ASD) and, given the recent evidence for an ASD synthetic-face processing advantage (Rosset et al., 2008), provides a means of investigating the benefits associated with the recruitment of synthetic face images in ASD emotion recognition training contexts.

Keywords: Autism Spectrum Disorders (ASD), Bolton Affect Recognition Tri-Stimulus Approach (BARTA), Emotional Expressions, Synthetic Emotion, Validated Face Stimuli

Deficits in the recognition and understanding of both simple (Bormann-Kischkel, Vilsmeier & Baude, 1995; Deruelle et al., 2004) and complex (Adolphs, Sears & Piven, 2001; Golan, Baron-Cohen & Golan, 2008) emotions from facial expressions have been argued to contribute significantly to the severe social impairments experienced by children with autism spectrum disorders (ASD) (Golan and Baron-Cohen, 2006). The profound consequences of these socio-emotional impairments have led researchers to invest significant time gaining a greater understanding of this impairment in order to address the deficit. As such, there are currently thousands of photographs depicting human facial expression of emotion available via the

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numerous collections compiled for emotion recognition (ER) research, assessment and training reasons, e.g., Pictures of Facial Affect (Ekman, 1976). However, to date, there are no validated collections of facial emotional expression in synthetic characters such as emoticons, avatars and cartoon characters. This is quite perplexing given the recent, clinically relevant findings regarding emotion processing in children with ASD, which could be suggestive of a possible synthetic face advantage (van der Geest et al., 2002; Grelotti et al., 2005; Rosset et al., 2008). Furthermore, since children with ASD have been found to spend long periods of time looking at cartoons (Miyahara et al., 2007), this type of visual input may be particularly appealing to children with ASD, and, if this is the case, could have implications for the autistic child’s intrinsic motivation to attend to and appraise such faces. An appreciation of the differential effects synthetic and human faces may have on face processing could help guide the development of new ER training strategies. The work reported here was prompted by the authors’ reflections on whether the impaired capacity of some children with ASD to recognise, identify and understand emotions from human faces (MacDonald et al., 1989; Baron-Cohen, Wheelwright & Joliffe, 1997; Celani, Battacchi & Arcidiacono, 1999; Gross, 2004) is carried over to cartoon faces also, and whether researchers and clinicians could capitalise on the possible noted ASD preference for cartoons to improve ER interventions.

This paper does not provide answers to these clinically relevant research questions, however, what it does do is provide the necessary resources (The BARTA database) to facilitate and promote studies which can extend current, limited knowledge in the field. The purpose of this paper therefore, is to introduce the BARTA database and report on a study conducted to investigate the reliability and validity of the collection. The study also makes use of the validation consensus data in an attempt to tentatively investigate whether face type (synthetic and human) influences emotion category agreement levels and crucially, whether this influence is the same for adult and child decoders. A review of current developments in respect of the possible remedial effects of synthetic faces on atypical perceptual, attentional, cognitive and neural processes in ASD is also included to provide a context and rationale for potential applications of the collection and future research avenues.

**ASD AND THE ‘SYNTHETIC FACE ADVANTAGE’**

The case for including a fully validated set of emotionally expressive cartoon characters in ER research batteries and ER interventions for ASD is strong if we consider the remedial effect that cartoon characters have been noted to have on a number of atypical face processing behaviours characteristic of autism.

Early support for the notion of a cartoon preference in autism comes from a neuroimaging case study that compared the neural activity of a young autistic boy during the viewing of human and synthetic faces. Although there was, as is to be expected in ASD (Hubl et al., 2003; Piggot et al., 2004), no activation of the fusiform face area (an area implicated in face processing) when the boy processed human faces, this atypicality was eliminated when the boy processed cartoon faces (Grelotti et al., 2005). These findings are important as they provide evidence that typical neural functioning seen in response to viewing faces can occur in autism, provided the correct conditions are in place. However, the extent to which results suggesting that cartoon faces elicit typical neural functioning in ASD can be generalised is limited and the exact nature of the correct conditions remains elusive, given that the study used a single case study and the cartoon characters used were familiar to the participant.

In 2006, Lahaie et al. demonstrated that people with ASD generally adopt a ‘local’ or piecemeal approach when processing human faces, in contrast to the configural processing and recognition strategies typically employed by non-autistic individuals. In neurotypical individuals, human faces are perceived as special...
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