Developmental Cognitive Neuroscience 8 (2014) 121–130

Contents lists available at ScienceDirect

Developmental Cognitive Neuroscience

journal homepage: http://www.elsevier.com/locate/dcn

Equivalent neural responses in children and adolescents with and without autism during judgments of affect

Brent C. Vander Wyk[a,*], Ferdinand Hoffman[b], Kevin A. Pelphrey[a]

[a] Yale University, 230 South Frontage Road, New Haven, CT 06520, USA
[b] Max Planck Institute for Human Cognitive and Brain Sciences, P.O. Box 500355, 04303 Leipzig, Germany

ARTICLE INFO

Article history:
Received 1 April 2013
Received in revised form 17 July 2013
Accepted 12 August 2013

Keywords:
Emotion
Autism
fMRI
Self-referential processing
Connectivity

ABSTRACT

Previous research has noted disrupted patterns of neural activation during emotion, processing in individuals with autism spectrum disorders (ASD). However, prior research relied on, designs that may place greater cognitive load on individuals with ASD. In order to address this issue, we adapted the fMRI task of Ochsner et al. (2004a) for children by, presenting fewer stimuli, with fewer valence levels, and longer stimuli duration. A localizer sample of, typically developing children ($n = 26$) was used to construct regions of interest involved in emotional, processing. Activations in these regions during self- and other-referential emotion processing was, compared in age, IQ, gender matched groups ($n = 17$ ASD, $n = 16$ TD). Matched samples replicate, condition contrasts of the localizer, but no group differences were found in behavior measures or, neural activation. An exploratory functional connectivity analysis in a subset of the matched groups, also did not detect striking differences between the groups. These findings suggest that disruptions in activation in emotion processing neural networks in ASD is partially a function of task related cognitive load.

© 2013 The Authors. Published by Elsevier Ltd. Open access under CC BY-NC-ND license.

1. Introduction

Autism spectrum disorders (ASD) are a set of pervasive neurodevelopmental disorders characterized by a triad of impairments that include a delay or the absence of communicative skills, restricted interests and stereotyped, repetitive behaviors, and finally, impairment in social interactions. Social impairments manifest across a variety of domains in behavior and brain function. Individuals with ASD exhibit disrupted processing of faces (Behrmann et al., 2006; Chawarska and Shic, 2009; Klin et al., 2002; Webb et al., 2010), actions and biological motion (Blake et al., 2003; Cook et al., 2009; Kaiser et al., 2010; Klin et al., 2009), and emotions (Greimel et al., 2010; Nuske et al., 2013; Sigman et al., 1997). High priority has been given to identifying the neural bases of these deficits, evidenced by the increasing amount of research dedicated to them. A specific focus, of particular relevance to the current study, has been research into the way in which typically developing individuals (TD) and individuals with an ASD represent and process emotion about themselves and others.

Although there is a general consensus that individuals with an ASD tend to have impairments in processing emotion, the pattern of results is complex (for reviews see Harms et al., 2010; Weigelt et al., 2012). So while both parents rate their children with ASD and the individuals with an ASD tend to rate themselves as having more difficulty in recognizing their own emotions and exhibiting emotional awareness (Hill et al., 2004; Hobson et al., 2006), individuals can reliably exhibit and identify emotions when tested (Hobson et al., 2006). Complexity of emotion seems to be an important dimension, since they perform better on simpler emotions such as happiness and

* Corresponding author. Tel.: +1 203 737 3631.
E-mail address: brent.vanderwyk@yale.edu (B.C. Vander Wyk).

1878-9293 © 2013 The Authors. Published by Elsevier Ltd. Open access under CC BY-NC-ND license.
http://dx.doi.org/10.1016/j.dcn.2013.08.001

fear, while struggling with more complex emotions such as shame (Heerey et al., 2003). The concepts of empathy and emotion processing are intimately linked, especially in the literature discussing ASD. Individuals with autism have generally failed cognitive empathy tasks, which possibly involve the mentalization system or higher order inferential processes (Baron-Cohen and Wheelwright, 2004; Rogers et al., 2006). But it should be noted that many of the empathy self-report measures focus on cognitive components of empathy. Thus when measures of affective empathy are used individuals with autism do not appear to be as impaired (Dziobek et al., 2008).

In an important paper, Ochsner et al. (2004a) utilized fMRI to identify both distinct and overlapping regions for processing the self-referential and other-referential affect, relative to a non-emotional control task in typically developing adults. They presented affective pictures, which included positive, negative, and neutral images, drawn from the International Affective Picture Set (IAPS; Lang et al., 2008). Participants were asked to judge the affect in the picture, again positive, negative or neutral, either with respect to their own affect in response to the picture or with respect to the person in the picture. Regions common to self and other representation included the medial prefrontal cortex (mPFC), the inferior and middle frontal gyrus (IFG and MFG), and the superior temporal gyrus and sulcus (STG and STS). Several regions were activated more strongly during self-referential processing, including more specialized regions of the mPFC, the MFG, and the middle temporal gyrus, while regions in the IFG and posterior midline structures exhibited greater activation to other-referential processing. In general, this set of finding has held up in subsequent studies (Legrand and Ruby, 2009; Northoff et al., 2006; Uddin et al., 2007).

The experimental design described in Ochsner's study has since been used in several neuroimaging studies of individuals with ASD. For example, using a novel faces set, fMRI studies of self- and other-referential processing were run in adults (Schulte-Rüther et al., 2011) and adolescents (Greimel et al., 2010). Adults were reported as having aberrant patterns of activation (sometimes ASD > TD, sometimes TD > ASD) during self- and other-referential affective processing in some of the key regions described above, including mPFC and IFG. Adolescents were reported as having lower activation in IFG relative to controls during self-referential processing. Another study of adults with ASD using a very similar paradigm as that in the Ochsner study also reported a pattern of deviant activations in these key structures in ASD relative to TD controls (Silani et al., 2008). These findings, especially when added to a literature of disrupted cognitive self-referential processing (Lombardo et al., 2010; Pfeifer et al., 2013), paint a picture of a highly disrupted representation of self-knowledge and awareness.

However, it is interesting to note that in addition to using a similar method of emotional judgments, the timing of the follow-up ASD studies was also very similar to the original Ochsner study. That study was designed for, and carried out in, TD adults. Stimuli were presented for 2s followed by a rating scale for 1.5 s. The stimuli and affective judgments utilized 3 levels of emotional valence. The Greimel and Schulte-Rüther studies presented stimuli for 2.5 s, with an average ISI of 0.7 s. The Silani study presented stimuli for 2 s followed by a 4 s response window. All three studies had three levels of stimuli and judgment valence. Given that concurrent affective and cognitive processing affect one another (Blair et al., 2007; Pessoa et al., 2005) the question can be asked, without invalidating the previous results, what effect might the cognitive load of the tasks have had on this kind of emotional processing in ASD relative to TD individuals?

In face processing literature differences between ASD and TD groups are less evident in tasks with lower difficulty or cognitive load. For example, individuals with ASD tend to do worse on face recognition tasks using mismatched labels (Grossman et al., 2000) or when faces are presented very rapidly (Clark et al., 2008). However, individuals with ASD not as evidently impaired especially if the emotions expressed are basic (Baron-Cohen et al., 1997) or presentation is slower (Michelle and Rutherford, 2008). Task demands can also change the likelihood of finding differences in brain activation. For example, expression matching tasks are likely to drive differences in activation within face-processing regions between ASD and TD participants, while face labeling tasks are not (Piggot et al., 2004; Wang et al., 2004).

In order to address the issue of cognitive load, we adapted the task of Ochsner et al. (2004a) for children. Participants viewed age-appropriate emotionally salient pictures and were asked to evaluate how they felt about each picture (Self condition), how the people in the pictures felt (other condition), or where the picture was taken (control condition). Stimuli were presented for a total of 5.5 s and were present while children made ratings. The valence dimensions in the pictures and the requested responses were limited to only positive and negative (neutral was eliminated). The primary planned contrast was between emotion judgment conditions and the non-emotion judgment condition (self and other > location) with the hypothesis that with the lower processing demands, the differences between the groups would be attenuated or eliminated. A secondary comparison of interest is the contrast between self-referential processing and other-referential processing (self > other).

2. Materials and methods

2.1. Participants

Two samples of typically developing children, a localizer sample and a matched control sample and a sample of children with an ASD participated in the study. Individuals were excluded from participation in the current study if parents reported that the child had experienced neurological problems or abnormalities (unrelated to autism). In addition, if the child ever experienced seizures, epilepsy, hearing or vision loss, motor impairment, or severe allergies, then he or she was excluded from participation. Typically developing children were prescreened and excluded from participation if they had a first degree relative with an ASD, or if parent responses on the Adolescent and Child Symptom Inventories (Gadow and Sprafkin,

Download English Version:

https://daneshyari.com/en/article/4316657

Download Persian Version:

https://daneshyari.com/article/4316657

Daneshyari.com