Discrimination thresholds for recognition of facial expressions of varying intensities in people with autism

Yongning SONG1
Yuji Hakoda2

1: School of Psychology and Cognitive Science, East China Normal University, China.
2: Faculty of Human Development and Education, Kyoto Women's University, Japan

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Autism Spectrum Disorders (ASD) are characterized by early onset qualitative impairments in reciprocal social development. However, whether individuals with ASD exhibit impaired recognition of facial expressions corresponding to basic emotions is debatable. Studies reporting an absence of deficits may have used stimuli that were too simple, for instance, 100% expressions (with associated ceiling effects). In the current study, we chose to use a precise task to explore basic emotion recognition in people with ASD. Specifically, we employed graph synthesis technology to generate a symmetrical continuum of graphs (morphs) representing gradual transitions between arousal levels (i.e., from a neutral face to a fully expressive face), for six basic emotions. We used psychophysical measures to systematically evaluate different discrimination thresholds for recognition of six basic emotions in individuals with ASD and typically developing peers.

Method

Fourteen individuals with HFA/AS (Mean = 11.49, S.D. = 2.21 years) were included in the final HFA/AS-group. The control group included seventeen community-living control children (Mean = 11.52, S.D. = 1.58 years). We used original facial photographs generated during the construction and evaluation of the ATR facial expression database (DB99, Kyoto, Japan). We chose seven different facial expressions (i.e., neutral, happiness, sadness, surprise, anger, disgust, fear). We morphed the average neutral face with each of the six full expressive faces. This enabled us to generate a symmetrical continuum of 9 images (morphs) for each expression, which represented graduated transitions from one neutral face to one fully expressive face in 10% steps (i.e., 10% to 90%).

We performed a two-way ANOVA for thresholds. The results revealed that the main effect of group type had significance ($F(1,29) = 19.73, p < 0.001$). Additionally, the main effect of emotion had significance ($F(5, 145) = 24.71, p < 0.001$). Finally, the interaction between group type and emotion type was also significant ($F(5, 145) = 2.27, p < 0.05$).

Further analysis of the simple main effects of group type on the various emotions revealed significant simple main effects for anger, disgust, and fear ($F(1, 5) = 3.52, p < 0.05; F(1, 5) = 17.10, p < 0.001; F(1, 5) = 10.34, p < 0.01$), but not happiness, sadness, or surprise ($F(1, 5) = 2.01, p = 0.16; F(1, 5) = 0.35, p = 0.56; F(1, 5) = 0.56, p < 0.20$).

We used morphing sequences of facial expressions to examine diminished sensitivity for recognition of basic emotional facial expressions in individuals with ASD. We found that individuals with ASD had higher thresholds than typically developing individuals for the discrimination of facial expressions, and members of this population also exhibited selective impairment in emotion recognition for anger, disgust, and fear. These results suggest that individuals with ASD might use a compensatory mechanism in which they depend more heavily on explicit high intensity emotional information to decode facial expressions and thus, they do not have a general impairment, but a selective impairment in basic emotion recognition.