Research in Autism Spectrum Disorders 4 (2010) 755–762

Contents lists available at ScienceDirect

Research in Autism Spectrum Disorders

Journal homepage: http://ees.elsevier.com/RASD/default.asp

# Facial emotion processing and social adaptation in adults with and without autism spectrum disorder

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ARTICLE INFO

*Article history:*
Received 8 January 2010
Accepted 22 January 2010

*Keywords:*
Autism spectrum disorders
Pervasive developmental disabilities
Intellectual disabilities
Facial processing
Facial emotion recognition
Adaptive behavior
Communication
Socialization

ABSTRACT

Individuals with autism spectrum disorder (ASD) and individuals with intellectual disabilities without ASD have limited facial emotion recognition abilities, which may adversely impact social adjustment and other adaptive behavior. This study was designed to examine this relationship in adults with and without ASD. Two groups of adults with intellectual disability, one with a comorbid ASD ($n = 19$) and one without ASD ($n = 28$) completed two facial emotion tasks and two facial non-emotion tasks, each with two experimental paradigms (labeling and matching-to-sample). Social adaptation was measured with the Socialization, Living Skills, and Communication domains of the Vineland Adaptive Behavior Scales, interview edition (VABS; Sparrow, Balla, & Cicchetti, 1983). An ANCOVA with a repeated measures factor for the two tasks with IQ as the covariate found that ASD group scored significantly lower on both emotion and non-emotion facial processing tasks. Hierarchical multiple regression analyses showed that the association between facial emotion processing accuracy and the level of social adaptation was statistically significance for the ASD group only, and that only facial emotion processing accuracy was associated with social adaptation. Limitations of the study are discussed, explanations for the differential findings for the ASD and non-ASD groups are proposed, and implications for intervention are addressed.



## 1. Introduction

Discerning the facial emotional expressions of others is a biologically anchored human skill that plays a pivotal role in early socio-emotional adjustment and other adaptive behaviors (Denham, Bassett, & Wyatt, 2007). The implications of deficits in facial emotion processing are often inferred through their association with a range of severe psychiatric and developmental disorders. In adults it has been noted in schizophrenia (Feinberg, Rifkin, Schaffer, & Walker, 1986; Heimberg, Gur, Erwin, Shtasel, & Gur, 1992), major depression (Gilboa-Schechtman, Ben-Artzi, Jeczemien, Marom, & Hermesh, 2004; Gur et al., 1992), social phobias (Gilboa-Schechtman, Foa, & Amir, 1999), alexithymia (Lane, Sechrest, Reidel, Weldon, et al., 1996; McDonald & Prkachin, 1990), psychosomatic disorders (Gerhards, 1998), autism (Clark, Winkielman, & McIntosh, 2008), Huntington's disease (Sprengelmeyer et al., 1997), and senile dementia (Brosgole, Kurucz, PlaHovinsak, Sprotte, & Haveliwala, 1983). In children and adolescents, emotion recognition deficits have also been reported in variety of clinical conditions, such as emotional disturbances (Walker, 1981; Zabel, 1979), attention-deficit hyperactivity disorder (Buitelaar, Van der Wees, Swabb-Barneveld, & Van der Gaag, 1999), learning disabilities (Holder &

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doi:10.1016/j.rasd.2010.01.016

Kirkpatrick, 1991), and bi-polar disorder (Brotman et al., 2008). Given that impaired social behavior is a constituting characteristic of autism spectrum disorders (ASD) such as autism and Asperger's syndrome, it is not surprising that they also have difficulties in visual facial recognition (Celani, Battacchi, & Arcidiacono, 2005; Hobson, Ouston, & Lee, 1989; Teunisse & de Gelder, 2001). Intellectual disabilities without comorbid ASD are also associated with facial emotion recognition weaknesses. This has been demonstrated in individuals without known etiology for their intellectual disabilities (Adams & Markham, 1991; Hetzroni & Oren, 2002; Kasari, Freeman, & Hughes, 2001; Mauer & Newbrough, 1987; McAlpine, Kendall, & Singh, 1991; Owen, Browning, & Jones, 2001; Rojahn, Rabold, & Schneider, 1995) and for those with genetic symptoms such as Down syndrome (e.g., Kasari et al., 2001; Wishart, Cebula, Willis, & Pitcairn, 2007), Williams syndrome (e.g., Gagliardi et al., 2003; Karmiloff-Smith et al., 2004), and Fragile X syndrome (e.g., Mazzocco, Pennington, & Hagerman, 1994; Wishart et al., 2007).

Although the assumption that emotion recognition is a component skill that is crucial for socio-emotional adaptation, little empirical evidence has been garnered so far to substantiate that in adults with intellectual disabilities. Therefore, this study was designed to investigate the relationship between emotion recognition and social adaptation in adults with intellectual disabilities with and without comorbid ASD. The two main questions raised in this study were (1) does ASD comorbidity impact the accuracy in visual facial processing in adults with intellectual disabilities, and (2) is there an association between facial processing accuracy and social adaptation in adults with intellectual disabilities with and without ASD? If an association between facial processing accuracy and social adaptation were to be found, is this association (a) specific to facial *affect* processing, and (b) is it a function of ASD comorbidity?

## 2. Methods

### 2.1. Participants

Participants were recruited from 2-day programs for adults with special needs in Madrid, Spain. Sixty-one adults with intellectual disabilities were identified as participants; 30 had a clinical diagnosis of autism spectrum disorder (ASD), 31 did not. Nineteen (11 males and 8 females) in the ASD group, and 28 in the no-ASD group (17 males and 11 females) had complete IQ and adaptive behavior assessments on file. In the ASD group, two had mild, four moderate, 1 severe, and six profound intellectual disabilities; in the non-ASD group one had mild, 1 moderate, 2 severe, and 10 profound intellectual disabilities. These levels of intellectual disability were derived from IQ scores.

Participants in the ASD group had clinical diagnoses of autism, Asperger's syndrome or autistic spectrum disorder according to DSM-IV (APA, 1994) criteria. Diagnoses were made by a psychiatrist or clinical psychologist, who had several years of experience in the diagnosis of autistic spectrum disorders using the. The diagnosticians were blind to the hypotheses being tested in this study. Intellectual functioning was assessed by administering the Leiter International Performance Scale (Leiter, 1979), adaptive behavior was determined with the Vineland Adaptive Behavior Scales: Interview edition (VABS; Sparrow, Balla, & Cicchetti, 1983), and each participant was assessed with the Childhood Autism Rating Scale (Schopler, Reichler, & Renner, 1988). All assessments had been conducted within the last 2 years before the study. Exclusion criteria for ASD and control subjects were cerebral palsy, congenital anomaly of the central nervous system, psychiatric illness, genetic syndrome, focal epilepsy, tuberous sclerosis, and neurofibromatosis.

### 2.2. Procedure

The research protocol was approved by the ethics committees of the two service programs. Candidates who met criteria were nominated by the clinical staff and then asked to participate. Informed consent, socio-demographic information and clinical characteristics were obtained from parents and teachers.

### 2.3. Materials

#### 2.3.1. Facial Discrimination Battery (FDB)

Facial processing was assessed with two emotion tasks and two non-emotion tasks of the FDB (Rojahn, Esbensen, & Hoch, 2006). Items were created with the Microsoft Power Point program and presented on a computer monitor. The test was paced by the participant's response speed. The tester scored the participant's responses as correct or incorrect and then converted the result into a percent correct scores. Percent correct scores were computed for each subtest.

*Emotion Labeling*. This task consisted of 36 items or trials depicting 12 happy, 12 sad, and 12 neutral facial expressions featuring 18 male and 18 female actors. Each trial presented one face at a time (6.0″ × 7.0″; 15.3 cm × 17.8 cm). Participants were asked to tell the experimenter whether a given face looked happy, sad, or not happy and not sad. The experimenter began the test after a few practice items to determine if the participant was able to follow the instructions.

*Emotion Matching*. This task consisted of 20 items, each showing a 1.5″ × 2.5″ (3.9 cm × 6.4 cm) sample face located at the center top of the monitor and five choices of equal size arranged in a row below. The experimenter pointed at the sample picture and asked, "Look at this person. How does this person feel? Now look at the five pictures below and point to the picture of the person down here that feels the same as the person up here." After a few practice items the experimenter began the test. The first 10 items involved within-gender matching the second 10 items across-gender matching.