Face Processing Ability and Communication Skills in Students with Autism

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Introduction

- Autism is a developmental disability characterized by deficits in social interaction, communication, and restricted and repetitive behaviors and interests. The triad of impairments in autism is quite different from impairments that are more regularly encountered in the classroom (e.g., learning disability), and research on education in autism must take this qualitative difference into account.
- In the classroom setting, it is often assumed that basic communication between the teacher and student is intact. For students with autism, this may not be a correct assumption. Students with autism may not process facial information as well as other students, and this impairment may have a direct link to communication and learning in the classroom.
- Face processing is the ability to extract pertinent information from the face, such as age, gender, identity, and emotional expression. Multiple research studies have shown that individuals with autism have a deficit in face processing (e.g., Celani, Battacchi, and Arcidiacono, 1999).
- Face processing impairment has been shown to adversely affect many domains, including social interaction (Stormark and Braarud, 2004), language (Brooks and Meltzoff, 2005), and early word learning (Hollich, Newman, and Jusczyk, 2005). Working with an economically disadvantaged sample in the classroom, Izard et al. (2001) found that face processing ability at age 5 significantly predicted social skills, behavior problems, and academic competence at age 9.
- The current study will focus on communication in autism, as basic communication ability is a prerequisite for success in the classroom. In particular, this study will examine the relation between face processing ability and communication skills.

Specific Aims

- To examine group differences in face processing ability for students with and without autism.
- To examine how individual differences in face processing ability relate to individual differences in communication skills for students with autism.

Methods

Participants

- 13 students with an Autism Spectrum Disorder (ASD) diagnosis; 21 students without an ASD diagnosis
- There were no significant between-group differences on gender, age, WISC Verbal IQ, or WISC Perceptual IQ.

	Students with ASDs	*Students without ASDs*
Percentage of Males	84.6%	61.9%
Mean Age in Months	146	166
Mean WISC Verbal IQ	102	107
Mean WISC Perceptual IQ	106	101

Measures and Procedures

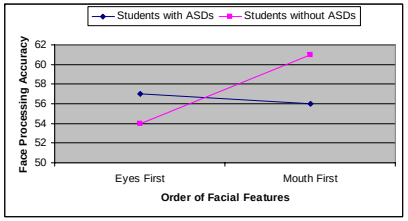
- Students were evaluated on one measure of face processing and four measures of communication.
- Face Processing Measure
  - Students were presented with 56 pictures of faces. Each face was divided into 14 sections such that one section of the face contained the eyes region, one section of the face contained the mouth region, etc.
  - When a picture was presented, a new section of the face was revealed each second, and students were asked to guess the emotion of the face as quickly and accurately as possible. Students were given a list of 7 possible emotions to choose from: angry, fear, happy, sad, surprised, neutral, and disgust.
  - Half of the pictures of faces were presented in an upright orientation, and half of the pictures of faces were presented in an inverted orientation. For half of the pictures, the eyes section of the face was revealed at the 4th second and the mouth section of the face was revealed at the 11th second. For the other half of the pictures, the order of presentation for eyes and mouth was reversed.
  - The following are examples of the face stimuli that were used:

- Communication Measures
  - *The Autism Diagnostic Observation Schedule (ADOS): Communication Scale* – An observational measure of autistic symptomology within the domain of communication.
  - *The Social Communication Questionnaire (SCQ): Communication Scale* – A parent-report measure of autistic symptomology within the domain of communication.
  - *The Social Responsiveness Scale (SRS): Communication Scale* – A parent-report measure of autistic symptomology within the domain of communication.
  - *The Children's Communication Checklist (CCC): General Communication Composite Scale* – A parent-report measure of general communication skills.

Results

Group Differences: Repeated-Measures ANOVA

- A repeated-measures ANOVA was conducted on accuracy scores.
- A main effect of orientation of face was found, such that students were more accurate on upright faces than inverted faces, F (1, 32) = 76.817, $p < 0.001$.
- An interaction between group and order of facial features was found, such that order of facial features did not affect accuracy performance for students with ASDs and students without ASDs performed more accurately in the 'mouth first' condition than in the 'eyes first' condition, F (1, 32) = 6.327, $p = 0.017$.



Consistency of Accuracy Scores Within Groups

- For each group, the correlations between the two upright accuracy scores and the two inverted accuracy scores were examined.
- For students with ASDs, the correlations were not significant at the 0.05 level (1-tailed), indicating little consistency across conditions. For students without ASDs, the correlations were significant at the 0.05 level (1-tailed), indicating greater consistency across conditions.

	Upright Faces	*Inverted Faces*
Students with ASDs	$r = 0.174$, $p = 0.285$	$r = 0.356$, $p = 0.116$
Students without ASDs	$r = 0.689$, $p < 0.001$	$r = 0.405$, $p = 0.034$

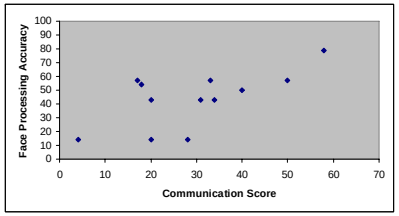
Age Effects on Accuracy Scores Within Groups

- For each group, the correlations between accuracy scores and age were examined.
- For students with ASDs, none of the correlations were significant at the 0.05 level (1-tailed). For students without ASDs, all of the correlations were significant at the 0.05 level (1-tailed). More accurate scores were correlated with greater age.

	Upright, Eyes First	*Upright, Mouth First*	*Inverted, Eyes First*	*Inverted, Mouth First*
Students with ASDs	$r = 0.324$, $p = 0.140$	$r = 0.047$, $p = 0.439$	$r = 0.061$, $p = 0.422$	$r = 0.219$, $p = 0.236$
Students without ASDs	$r = 0.585$, $p = 0.003$	$r = 0.474$, $p = 0.015$	$r = 0.411$, $p = 0.032$	$r = 0.520$, $p = 0.008$

Individual Differences: Face Processing & Communication

- For students with ASDs, accuracy scores were correlated with communication scores. One student was identified as an outlier and removed from these analyses.
- The correlation for the inverted faces, mouth first accuracy score and the CCC score was significant at the 0.05 level (1-tailed), indicating a relation between more accurate face processing and better communication, $r = 0.649$, $p = 0.011$.



Discussion

- For students without ASDs, order of facial features influences face processing performance. These students may have a flexible face processing strategy that can be tailored to meet the demands of a specific context (ex. only mouth visible). For students with ASDs, order of facial features does not influence face processing performance. These students may have a more generic face processing strategy that is less easily tailored to a specific context.
- For students without ASDs, face processing ability seems to remain fairly consistent across contexts. A student who can process faces well in one context seems to be able to process faces well in other contexts. For students with ASDs, face processing seems to be inconsistent across contexts. A student who can process faces well in one context may not be able to process faces well in other contexts.
  - Previous research has shown that individuals with autism have difficulty with generalization (Plaisted, 2001), so it is not surprising that students with autism may have difficulty generalizing face processing ability across contexts.
  - Students with ASDs may have to relearn face processing strategies with each new teacher. This may delay their ability to communicate and learn in new classroom settings.
- Students without ASDs become better at face processing as they grow older and gain more experience with faces. The face processing skills of students with ASDs do not seem to improve with age and experience. These groups may have two separate and distinct approaches to learning how to process faces.
  - As students without ASDs grow older, face processing and communication may become automatic, allowing these students to focus their attention on the educational demands of the classroom. As students with ASDs grow older, face processing and communication may not become automatic. These students may have to divide their attention between the social demands of the classroom and the educational demands of the classroom.
  - Students with and without ASDs may have separate and distinct approaches to learning in general. It is crucial to better understand how the learning process for students with ASDs works, and how this process differs from that of students without ASDs.
- Poor face processing ability correlates with poor communication ability. When students with ASDs look to a teacher's face for guidance, they may not be able to extract and interpret pertinent nonverbal communication cues. In the classroom, students with ASDs may miss important learning opportunities because of poor teacher-student communication.
  - The finding that mouth processing is correlated with communication ability in autism is consistent with prior research showing that fixation on the mouth region is associated with better social functioning in autism (Klin, Jones, Schultz, Volkmar, and Cohen, 2002).

Limitations and Future Directions

- The sample size in the current study was limited. Data is still in the process of being collected, and a larger sample size will shed more light on these preliminary results.
- Communication measures were completed by the parents. In the future, it would be helpful to have additional communication measures completed by the teacher.

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