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Assessing preference for and reinforcing efficacy of components of social interaction in individuals with autism spectrum disorder

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ABSTRACT

We evaluated the degree to which social interactions are reinforcing for two individuals with autism spectrum disorder by comparing individual components (i.e., edible, vocal, and physical interaction) alone and in combination. First, we conducted preference assessments to determine preference hierarchies within three stimulus classes: edible, vocal, and physical interaction. Second, we evaluated preference for individual stimuli across these classes. Third, we examined the relative reinforcing efficacy of highly preferred stimuli assessed individually. Fourth, with individuals for whom physical and vocal stimuli served as reinforcers, we evaluated if adding the other component, physical or vocal, increased the effectiveness of that consequence as a reinforcer. Results suggested differences in the relative reinforcing efficacy of components of social interaction. Additionally, combining components to form compound stimuli produced idiosyncratic differences in relative rates of responding.

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1. Introduction

It is well documented that children diagnosed with autism spectrum disorder (ASD) have deficits in social interactions (McConnell, 2002). Social interaction is a reciprocal process in which children effectively initiate and respond to social stimuli presented by their peers (Shores, 1987). Deficits in social interactions that children with ASD display may lead to limitations in effective communication, decreased social participation, and compromised social relationships. Despite having deficits in social interactions, there is evidence that at least some children with ASD demonstrate clear preferences for certain kinds of social interactions over others, and these interactions can serve as reinforcers (Clay, Samaha, Bloom, Bogoev, & Boyle, 2013; Kelly, Roscoe, Hanley, & Schlichenmeyer, 2014; Nuernberger, Smith, Czapar, & Klatt, 2012; Smaby, MacDonald, Ahearn, & Dube, 2007).

Some researchers have suggested that social stimuli may be less effective as reinforcers for some children with ASD (Dube, MacDonald, Mansfield, Holcomb, & Ahearn, 2004; Ferster, 1961; Vollmer & Hackenberg, 2001), and some children may find particular forms of social stimuli to be aversive (Hagopian, Wilson, & Wilder, 2001). This may be due to the complexity of social stimuli (e.g., facial features) to which children with ASD have difficulty attending (Deruelle, Rondan, Gepner, & Tardif,

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2004). One way to conceptualize the complexity of social stimuli might be to consider social interactions as compound stimuli with multiple components. For example, praise delivered by a teacher may consist of several divisible elements such facial expression (e.g., smiling or not smiling), tone of voice, spoken words, and physical contact.

Preference and reinforcer assessments involving social interactions have often consisted of the simultaneous delivery of compound stimuli. For example, Smaby et al. (2007) evaluated preference for and reinforcing efficacy of social consequences with three children diagnosed with ASD. In their study, two of the three tested social interactions (i.e., tickles and head rubs) consisted of the delivery of both physical and vocal components. For example, the therapist said, "Head rubs" while moving one hand back and forth on top of the child's head. Results suggested that these complex social interactions functioned as reinforcers, and children responded at higher rates for some social interactions than others. Nuernberger et al. (2012) also evaluated preference in three children with ASD across a total of 12 different social interactions with 10 of the interactions including both a physical and vocal component. For example, *Swing* consisted of the child being swung in a blanket (i.e., physical) while the experimenter sang to the child (i.e., vocal). Following a multiple-stimulus-without-replacement preference assessment, the experimenters conducted a reinforcer assessment. Nuernberger et al. identified preference hierarchies across the social interactions and found the preference assessment results to be predictive of what social interactions served as reinforcers.

Vollmer and Hackenberg (1991) suggested "functional subtypes" of social interactions that come in a variety of forms (e.g., facial expressions, physical contact, and vocalizations) and that could be identified based on their effectiveness as social consequences. It is possible that these functional subtypes, or classes, have differing effects on the behavior of children with ASD. Unfortunately, previous literature has often combined these, perhaps functionally disparate, components (e.g., simultaneously delivering physical and vocal components) in their assessments of preference and reinforcing efficacy. Therefore, it remains to be seen if some components may be more preferred and reinforcing than others for children with ASD.

Other researchers have found that preference for different classes of stimuli may emerge when items from multiple classes of stimuli are included in a single preference assessment. For example, DeLeon, Iwata, and Roscoe (1997) identified items from two different classes of stimuli (i.e., leisure and edible) and included them in preference assessments. The authors found edible items ranked consistently higher than leisure items for 8 of 14 participants. Another way of interpreting this finding is that preference was higher for a specific stimulus class (i.e., edibles over leisure items) for a majority of the participants. Subsequent researchers have further identified and categorized components within stimulus classes. For example, Ciccone, Graff, and Ahearn (2015) divided edible stimuli into chocolate, salty and crunchy, gummy, as well as into fruit and vegetable classes. They conducted paired-stimulus preference assessments for six individuals with developmental disabilities, and their results indicated preference by stimulus class. For example, salty items generally were preferred over chocolate items, and chocolate items generally were preferred over gummy items. Ciccone et al. subsequently conducted reinforcer assessments and found that a randomly selected stimulus from the highest-ranked category maintained more responding than a randomly selected stimulus from the lowest-ranked category.

The collective findings from these studies suggest that the identification of preferred classes of stimuli could be an important indicator of preference and reinforcing efficacy of other stimuli. For example, if a class of social stimuli (e.g., vocal sounds) is more preferred than another class of social stimuli (e.g., physical touch) and stimuli from that class serve as more potent reinforcers, it may be possible to infer preferences and reinforcing efficacies of unassessed stimuli from the same stimulus class. This could be useful when a stimulus with known preference and known reinforcing efficacy is currently unavailable, in which case the clinician could select an alternative stimulus from the same stimulus class without conducting additional assessments and without jeopardizing the child's academic performance.

In beginning to identify classes of social stimuli that may have functional similarities for children with ASD, it is important to consider that sensory impairments and sensory differences from typically developing children have been widely reported in the literature (Adrien, Ornitz, Barthelemy, Sauvage, & Lelord, 1987, Adrien et al., 1992, 1993; Baranek, 1999; Dahlgren & Gillberg, 1989; Kientz & Dunn, 1997; Ornitz, 1989; Ornitz, Lane, Sugiyama, & de Traversay, 1993; Osterling & Dawson, 1994). Differences across auditory (Bettison, 1996; Dahlgren & Gillberg, 1989; Gillberg & Coleman, 1996; Rimland & Edelson, 1995), tactile (Baranek, Foster, & Berkson, 1997; Cesaroni & Garber, 1991), and taste/smell (Hoshino et al., 1982; Tomchek & Dunn, 2007; Wiggins, Robins, Bakeman, & Adamson, 2009) sensory modalities have all been reported in children with ASD. These differences suggest the need for assessing preference and reinforcing efficacy of stimuli across sensory modalities. For example, edible, vocal, and physical stimuli are commonly assessed in preference and reinforcer assessments and might serve as appropriate functional subtypes for individuals with ASD.

The purpose of this study was to (a) assess preference for different components of social interactions (i.e., edible delivery, physical interaction, and vocal interaction), (b) assess relative preference for classes of components of social interactions, and (c) evaluate the reinforcing efficacy of specific components when delivered alone or when combined with other components.

2. Methods

2.1. Participants, setting, and materials

Two individuals diagnosed with ASD participated. They were recruited through flyers and referred by a behavior analyst through a local university clinic providing behavior services in northern Utah. Dante was a 5-year-old boy who could communicate vocally in full sentences. He had a two-year history of early intensive behavioral intervention. Annie was a

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