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Object interest in autism spectrum disorder:

A treatment comparison

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Abstract

A randomized control trial comparing two social communication treatments for children with autism spectrum disorder examined the effect of treatment on object interest. Thirty-two children, 18–60 months, were randomly assigned to the Picture Exchange Communication System (PECS) or Responsive Education and Prelinguistic Milieu Teaching (RPMT) condition. Assessment of object interest was conducted in an unstructured play session with different toys, activities, adult, and location than experienced in treatment. Results indicated children in the RPMT condition showed greater increases in object interest as compared to children in the PECS condition. Because child characteristics such as interest in objects may influence response to interventions using object play as contexts for treatment, it is important to improve our understanding of whether intervention can affect object interest.

Keywords

autism; intervention; object interest; play; randomised; RPMT

Children with autism spectrum disorder (ASD) display differences in early exploratory and object play skills, such as a tendency to show interest in a limited number of objects (Pierce and Courchesne, 2001). Children with ASD also have been shown to face challenges in disengaging from their current focus of attention in order to shift attention to a peripheral stimulus (Landry and Bryson, 2004; Zwaigenbaum et al., 2005). Zwaigenbaum and colleagues (2005) proposed that young children with ASD may have ‘sticky attention’, or difficulty in disengaging from one visual stimulus to orient toward another (Hood and Atkinson, 1993). This characteristic may make it less likely that children with ASD will attend to and engage with a variety of objects, notice attention-directing social cues, or direct communication acts toward social partners. Indeed, Bruckner and Yoder (2007) found

that, when controlling for initial play level, restricted object use in young children with ASD was inversely related to several important social communication skills, such as response to joint attention (RJA) and the ability to coordinate attention between object and person.

During the earliest stages of language development, these types of social communication skills support lexical learning by allowing children to follow into and direct the attentional focus of a communication partner (Tomasello, 1995). For example, in naturalistic contexts, adults often do not label the object that is the child's current focus of attention (Harris et al., 1983). Response to joint attention, the ability to monitor and respond to adult nonverbal cues such as looking and pointing, allows children to make accurate associations between novel labels produced by the adult and the object, event or action to which these labels refer (Baldwin and Tomasello, 1998).

Coordinated attention, the use of gaze and gesture within a prelinguistic communication act, enables children to indicate their focus of attention to a conversational partner. In fact, mothers of children with developmental delays are more likely to judge their children's prelinguistic behaviors as communicative if these gestural acts are accompanied by coordinated attention (Yoder and Munson, 1995). When parents recognize that a child has communicated intentionally, they may respond by mapping, or putting into words the presumed meaning of the child's communication act (Yoder et al., 1998). Thus, responding to the adult's focus of attention or communicating intentionally allows a child to access linguistic information which supports the process of early word learning.

Siller and Sigman (2008) demonstrated that, after controlling for initial language and cognitive levels, rate of language growth in children with autism was uniquely predicted by parents' responsiveness to their children's attention and activity during play. Children with ASD who have interest in many different objects or who play with objects in many different ways provide their parents with more opportunities to use a variety of vocabulary words to describe what their child is doing during play. Thus, children with ASD who demonstrate restricted interest in objects may be less likely to benefit from adult verbal input and other learning opportunities that occur during episodes of triadic interaction.

Early intervention strategies for young children often take place within the context of play. Play-based interventions may be more efficient in facilitating outcomes for some children because they often target multiple domains (e.g., play and communication), and may be better aligned with the integrated developmental processes of early childhood. In addition to providing adults with more opportunities to use language-facilitation strategies, children who engage with a variety of objects during play-based intervention sessions may have an increased number of potential reinforcers that can be provided in response to child production of targeted behaviors. Identifying treatments for young children with ASD that increase interest in a variety of objects may have implications for the development of social-communication skills, because play with objects often serves as a context for language learning.

Yoder and Stone (2006a) compared the effects of two interventions on the social communication skills of 36 preschoolers with ASD. One method, Responsive Education and

Prelinguistic Milieu Teaching (RPMT), used play-based routines as the context for development of communication skills. The second method, the Picture Exchange Communication System (PECS), used a series of prompting procedures to teach children to use a picture symbol (or several symbols) to engage in a communicative exchange with a partner. Results indicated that, for children with initially low levels of object exploration, the RPMT condition led to higher rates of growth in the number of non-imitative spoken words as compared to the PECS condition (Yoder and Stone, 2006a).

One explanation for the differential effects of treatment predicted by initial object exploration is that RPMT facilitates development of early object play skills in young children with ASD, thereby increasing children's opportunities for development of communication and later language skills. In contrast, the PECS method does not model and actively encourage object play. The current study addresses this hypothesis through analysis of the main effects of RPMT over PECS on the object interest of this same group of preschoolers with ASD. The authors hypothesized that RPMT would lead to a greater increase of object interest in participants as compared to the PECS.

Method

Participants

Analyses for the current article were based on data from 32 children with diagnoses of autistic disorder or pervasive developmental disorder not otherwise specified (PDD-NOS) who were enrolled in a randomized control trial comparing the effects of RPMT vs. PECS. Children were between the ages of 18 and 60 months, used less than 10 words during initial communication samples, and demonstrated no evidence of hearing impairment, or severe sensory or motor deficits (see Yoder and Stone, 2006b, for further details regarding inclusion criteria and sampling procedures).

Design and procedures

Children were randomly assigned to one of two treatment conditions. The RPMT group included 16 children with a mean age of 32 months ($SD = 6$); the PECS group included 16 children with a mean age of 36 months ($SD = 10$). Intervention for both groups occurred three times a week for 20 minutes per session, lasted for six months, and was implemented by trained therapists. In addition to parent observation of therapy sessions, a parent component was included in both treatments. This study was conducted in compliance with the Institutional Review Board.

Treatment description

Picture exchange communication system (PECS)—PECS is a communication intervention developed by Bondy and Frost (1994) for children with ASD, and focuses on skills such as requesting and responding to questions. PECS uses a series of treatment phases, prompting procedures, and contingent reinforcement to teach children to communicate by giving a picture of a desired object to a message recipient. For a more detailed description of the PECS curriculum, see Bondy and Frost (1994). The PECS curriculum was followed and implemented by two trained speech/language pathologists. To

increase the likelihood of across-person generalization, the clinicians exchanged roles as message recipient and physical prompter once a child reached criteria on a particular phase. Therapists did not model or prompt play with the requested objects during the PECS intervention. The parent component of the PECS treatment involved demonstration and discussion of ways to promote the use of the PECS outside of the treatment setting, but did not involve discussion of how to facilitate play. See Yoder and Stone (2006b) for further details regarding treatment.

Fidelity of treatment (FOT) data were collected once a month for the PECS treatment group using a rating scale indicating the presence and quality of phase-specific treatment techniques. Twenty percent of the FOT data was coded by an independent, blind observer. Mean interobserver agreement for the PECS condition was .99 ($SD = .1$) (Yoder and Stone, 2006b).

Responsive education and prelinguistic milieu teaching (RPMT)—RPMT is an intervention that was developed to increase intentional communication in young children with developmental delays (Yoder and Warren, 1998, 2001, 2002). RPMT uses adult models and prompted play with objects as part of the joint-action routines that serve as the context to prompt and reinforce children's use of communication behaviors. In the RPMT treatment condition, two trained therapists worked with each child during the week to encourage across-person generalization. The parent component of the RPMT condition involved teaching parents to use play routines to prompt and reinforce communication behaviors outside of the treatment setting. See Yoder and Warren (2002) for further details regarding implementation of RPMT.

Fidelity of treatment data were collected once a month for the RPMT treatment group using a 3-point rating scale of therapists' implementation of intervention strategies. Twenty-percent of the FOT data was coded by an independent, blind observer. Mean interobserver agreement for the RPMT treatment group was .99 ($SD = .006$) (Yoder and Stone, 2006b).

Measures

Assessment of play skills occurred at the pre- and posttreatment time periods using a 15-minute unstructured free play session conducted at a table with an examiner. Play sessions were administered by research assistants blind to group assignment. During the assessment, the following developmentally appropriate objects were made available to children for play: telephone, car, doll, blanket, brush, bottle, teapot, spoon, cups, and rhythm sticks. The examiner did not demonstrate actions on objects, but did imitate children's play to maintain child engagement. Examiners commented on their own or the children's actions, but did not use verbal prompts for communication or play behaviors (Yoder and Stone, 2006b). The unstructured play context used a different adult, interaction style, toys, activities, and location than were used during treatment sessions; thus serving as a rigorous measure of far-transfer generalization.

Object interest, the dependent variable at posttreatment and covariate at pretreatment, was defined as the number of toys on which children used non-imitative, differentiated play actions (i.e., nonexploratory, purposeful manipulation of a toy). Object interest was event

coded using an adaptation of the software program Playcoder (Tapp and Yoder, 2003) which allowed coders to (a) select a toy from the list of toys used for the play session, and then (b) select from a list of anticipated actions that could be performed on that toy. The list of anticipated actions included both undifferentiated and differentiated play actions (Lifter, 2000; Lifter et al., 1993). Undifferentiated actions, such as mouthing, shaking, and banging, do not provide evidence that the child understands what to do with the toy. Differentiated actions, on the other hand, are play actions that demonstrate some understanding of the properties of the toy (e.g., stacking blocks, feeding the doll). Play sessions were coded by a graduate student trained by the first author. Both of the coders were blind to group assignment.

Interobserver reliability was estimated between the two coders using generalizability (G) coefficients (Cronbach, 1972). Twenty percent of play sessions at both time points were randomly selected and independently coded for interobserver reliability by the first author. The G coefficients for object interest were above .90 at both time points. G coefficients greater than .6 are considered acceptable (Mitchell, 1979).

Results

Preliminary analyses

To determine whether treatment groups were equivalent in the larger study, group differences were compared on ten pretreatment variables, including expressive language standard scores, derived from the *Mullen Scales of Early Learning* (MSEL; Mullen, 1995), IQ, derived from the MSEL, and indices of autism severity, derived from the *Autism Diagnostic Observation Schedule* (ADOS; Lord et al., 2000). Children in the RPMT group scored significantly higher than children in the PECS group on the expressive language standard score of the MSEL subscale, $t(30) = 2.4, p = .02$. Mullen expressive language standard scores also correlated significantly with posttreatment object interest, the dependent variable, $r = .42, p = .02$. Object interest at the pretreatment period, while not significantly different between the groups, was correlated significantly with posttreatment object interest, $r = .42, p = .02$. Pretreatment object interest was not correlated with pretreatment Mullen expressive language standard scores, $r = .11, p = .55$, indicating that both pretreatment variables contributed unique variance to the outcome variable.

Fidelity of treatment was measured on a scale with a possible maximum value of three. The RPMT condition obtained a mean fidelity of treatment rating of 2.99 (.017), and the PECS condition obtained a mean fidelity of treatment rating of 2.88 (.09) (Yoder and Stone, 2006b).

Primary analysis

An analysis of covariance was conducted using posttreatment object interest as the outcome measure and entering pretreatment object interest as a covariate. Additionally, another analysis was conducted adding Mullen expressive language standard scores as a second covariate. Neither covariate statistically interacted with group (i.e., the assumption of homogeneity of slopes was met for both covariates). After controlling for the initial object

interest and expressive language, the between group difference in object interest at the posttreatment period was statistically significant and had a moderate effect size. See Table 1 for details of the results.

Discussion

Many children with ASD show interest in a restricted range of objects. This deficit has important implications for the subsequent acquisition of social communication skills that develop within a triadic context and involve coordinating attention with objects and people. The current study demonstrated that object interest in young children with ASD could be enhanced through participation in a prelinguistic communication intervention. One value of detecting this effect in a treatment comparison study is that amount of attention to the child is controlled. The superior intervention, Responsive Education and Prelinguistic Milieu Teaching, used routines with objects as the enabling context for prompting and rewarding child acts of intentional communication. Importantly, the gains in object interest generalized across person, materials, activity, and location, simultaneously. To our knowledge, this is the first demonstration that an educational treatment can have an effect on generalized object interest. Additionally, interest in objects is rarely measured in children with ASD. Perhaps the paucity of attention shown to object interest lies in part with an under appreciation of its importance to remediating the core deficits of ASD.

Bruner and colleagues (Bruner and Sherwood, 1983; Scaife and Bruner, 1975) argued that object-based routines provide a context within which children learn a variety of skills that are important for the development of spoken language and early communication. Because such routines are repetitive and predictable, the nonverbal context of the routine supports the child's understanding of the language that is used within the routine. Familiarity with and participation in an object-based routine with a communicative partner scaffolds and maintains episodes of shared attention to an object and can provide many opportunities for communication to a child who is learning to be an intentional communicator. For example, after learning the routine of rolling a ball back and forth, the child may initiate the routine (e.g., by bringing a ball to the adult) or take a turn in an ongoing routine (e.g., rolling the ball back to the adult). In addition, the adult can use strategies, such as time delay, to provide the child with opportunities to request that the routine be continued (e.g., the adult holds the ball expectantly and waits for the child to use eye gaze paired with a gesture and/or vocalization). Following a child request, the adult can use a noun, verb, or function word to linguistically encode the presumed meaning of the child's prelinguistic communication act (i.e., linguistic mapping: 'You want the ball!'). Many types of objects can be incorporated into an object-based routine as long as the routine includes a playful, turn-taking interaction in which the child and adult share a common focus on the toy. For very young children with ASD, this often includes toys that roll or toys that offer opportunities for putting objects into (and taking objects out of) a container.

Because a shared action routine supports an ongoing triadic interaction with the child, adults can infuse the routine with positive affect, describe what the child is doing (e.g., 'Wow, you rolled the ball to mommy!') and can model declarative behaviors for the child (e.g., points, gives, and shows). Siller and Sigman (2002) demonstrated that preschool-aged children with

autism whose parents modeled declaratives during play showed significant gains one year later in their own abilities to initiate joint attention. In addition, this same study revealed that children whose parents followed into and talked about the child's focus of attention during play had better language skills as teenagers than children whose parents did not provide such follow-in descriptive talking. Children who are able to engage with a variety of objects and who can use many different play actions provide their parents with more opportunities to describe what the child is doing using a diverse set of vocabulary words.

Finally, when establishing an object-based routine, adults can demonstrate how objects are used. These demonstrations can include relational/combinatorial play actions (e.g., putting pieces in a puzzle) as well as demonstrating the conventional ways in which objects are used (e.g., giving a baby a drink). Learning such as this may increase the action repertoire of a child who may characteristically use a small collection of stereotyped and repetitive actions. The relational and functional use of objects can then be incorporated by children into their own play and can contribute to the subsequent use of place holders and the development of empty-handed gestures and symbolic representation.

In summary, children with ASD who play with a variety of objects have more opportunities for social communication and language learning through routines and interactions with adults that center on the objects in which children demonstrate interest. More interest and knowledge of objects allows adults more opportunities to model a greater diversity of words and phrases to describe what children are experiencing within a play context. For children with constrained interest in objects, these social communication and language learning opportunities are limited, impacting subsequent development in these areas. Therefore, the development and implementation of interventions that increase children's object interest may be an integral step in acquisition of spoken language in individuals with ASD.

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Table 1

Group differences on post-treatment object interest after controlling for pre-treatment object interest with and without controlling for pretreatment expressive language

	Pre-treatment object interest and expressive language impairment entered as a covariate	Only pre-treatment object interest entered as a covariate
PECS estimated marginal means (<i>SD</i>)	5.20 (3.68)	4.89 (3.6)
RPMT estimated marginal means (<i>SD</i>)	6.86 (3.68)	7.17 (3.6)
Significance tests (1-tailed) and effect sizes	$t = 1.72; p = .045; d = .45$	$t = 2.54; p = .017; d = .63$

Note. PECS = Picture Exchange Communication System; RPMT = Responsive Education and Prelinguistic Milieu Teaching.