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SPECIAL ISSUE ON

SEARCHING FOR EVIDENCE ON CONTROVERSIAL BEHAVIORAL INTERVENTIONS FOR INDIVIDUALS WITH AUTISM SPECTRUM DISORDERS

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Mission Statement

The mission of the Behavior Development Bulletin journal is to provide behavior analysts with peer reviewed scientific information of interest to the behavior community, including research in cognitive development, child emotional development, developmental theory and socialization. Since its inception, the BDB journal has published articles of an inter - and multidisciplinary nature including areas of socio-biology and behavioral methodology. The BDB journal is especially relevant to behavior analysts who study the developmental processes responsible for behavior changes and their progressive organization. The BDB journal hopes to provide answers by looking at the biological and environmental factors that affect behavioral development, while maintaining primarily interest in the role of environmental contingencies in behavior change.

Editorial for the Special Issue on Autism

Smita Mehta

Autism spectrum disorders has received increased attention in recent years due to a significant increase in the prevalence rate (from 15,580 in 1992 to 141,022 in 2003) for children between 6-21 years of age (US Department of Education, 2004). The Center for Disease Control predicted that one in every 150 8-year old children was diagnosed with an ASD (2002). ASD has also been identified as an area of focus by the federal government as is evident from increased funding opportunities and priority allocations. In addition, attention from the popular media with coverage on the characteristics, needs and methods for educating children with autism has not gone unnoticed by the general public. Therefore, the emphasis on the use of evidence-based practices to teach and intervene with individuals with ASD is just as critical for shaping applied practice (Iovannone, Dunlap, Huber, & Kincaid, 2003; Simpson, 2005; Wilczynski, 2006).

I was very pleased to be asked by Martha Pelaez, Chief Editor, to serve as a Guest Editor for the Behavior Development Bulletin (BDB) for this SPECIAL issue and would like to thank Joe Cautilli for his editorial support and facilitating the electronic publication of this issue. The theme for this issue is "*Searching for Evidence on Controversial Behavioral Interventions for Individuals with Autism Spectrum Disorders.*" While the theme is specific, the issues are broad enough to include conceptual and applied aspects for intervening with individuals with autism spectrum disorders (ASD). In this issue, there are five excellent articles that were reviewed independently and critically by at least two additional reviewers prior to publication. These articles cover a range of topics that address various areas relevant to the study of autism.

Ala'i-Rosales, Zeug, and Baynham describe an observational system for monitoring reinforcer diversity and event engagement during naturalistic teaching portions of an early intervention program for two children with autism. They argue that developing measurement systems that allow educators to understand the development and acquisition of new interests, tends to increase the likelihood that evidence-based practices will emerge.

Two studies present interventions used for individuals with self-injurious behavior. Humenik, Curran, Luiselli and Child evaluated the effect of choice-making on the self-injurious behavior (SIB) of a child with autism by manipulating several antecedent conditions. The results showed that choice-making was highly effective in reducing SIB compared to the no-choice condition. In another study, Doughty and Doughty evaluated the effect of a weighted vest for an adolescent whose self-injurious behavior was maintained by sensory reinforcement. Results showed that in most conditions, the vest did not decrease self injury. In conditions wherein the vest decreased self injury, it was found that the effects were not due to deep-pressure therapy.

In a contrast from specific interventions for specific target behaviors, Osborne and Reed describe the outcomes of various components of an eclectic teaching intervention for young children with ASD as is prevalent in U.K. They report an analysis of a reinforcement-based intervention on the children's gains in intellectual and educational functioning over a nine to ten month period.

Finally, Tsao presents a summary of the current literature by examining the impact of autism on the social, language, and play behaviors of children. In addition, the article provides a review of the current intervention practices that address the challenges in play and social interactions of children with autism. Lastly, the article outlines common trends among effective interventions.

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The Development of Interests in Children with Autism: A Method to Establish Baselines for Analyses and Evaluation

SHAHLA ALA'I-ROSALES AND NICOLE M. ZEUG, THE UNIVERSITY OF NORTH TEXAS AND TANYA Y. BAYNHAM, UNIVERSITY OF KANSAS

By definition, children with autism have limited interests. While considerable efforts have been directed toward the social and communication difficulties faced by children with autism, less attention has been directed towards understanding the development and acquisition of new interests. Such understanding may help autism interventionists establish increasingly diverse and complex interests thereby increasing reinforcing events, learning opportunities, activity participation, and social engagement. This paper describes an observational system for monitoring reinforcer diversity and event engagement during naturalistic teaching portions of an early intervention program. Data are presented for two children. It is suggested that such measures are necessary for two reasons. First, given the lack of empirical support and the importance of reinforcers, there is a need for measurement systems to monitor the development of interests in early intervention programs for children with autism. Second, there is a paucity of research addressing expansion of interests. Developing measurement systems increases the likelihood that evidence-based practices will emerge. Hopefully, these efforts will increase our knowledge, increase child preference for instruction, and open avenues for enhanced instructional and life opportunities based on expanded interests.

By definition, children with autism have restricted activities and interests and appear to be motivated by a limited number of unusual events rather than motivated by the wide variety of events common to their peers without disabilities (American Psychiatric Association, 2000). It has long been recognized that the limited or unusual motivation observed in children with autism is a central concern having implications for intervention and for long-term outcome (e.g., Lovaas, et al., 1966; Ferster, 1961; Koegel & Egel, 1979). The purpose of this paper is to provide rationales for expanding the interests of children within early intervention programs, to highlight promising practices for expanding interests, and to offer a preliminary method for establishing baselines that capture the development of interests and allow practitioners to objectively evaluate the effects of their efforts to diversify the interests of the children they serve.

THE IMPORTANCE OF DIVERSE INTERESTS AND ACTIVITIES

Many child development theories, including behavioral systems theories, suggest that one of the ways children develop is through their engagement in play and through their continuously expanding interests, allowing contact with new environmental stimuli that result in further potential for increased knowledge and advanced skill repertoires (Novak & Peláez, 2004). In fact, when introducing the concept of acquired reinforcers, Novak and Peláez suggest that, "It is partly the unique set of reinforcers a person acquires that determines that person's special repertoire of behaviors (pp. 194, 2004)." In other words, our behaviors appear to be strongly tied to our interests or preferences for events. One conceptual and pragmatic model for understanding the effects of varied interests on children is the "behavioral cusp" (Rosales-Ruiz & Baer, 1997). The term behavioral cusp describes the outcomes of any behavior-change procedure that produces broad, pervasive, or especially important changes in the child's environments, reinforcers or opportunities. Increased rates and diversification of interests and the subsequent opportunities that emerge could be viewed as behavioral cusps in children with autism (Ala'i-Rosales, Smith, & Elden-Smith, 2008). At the most fundamental level it is

possible that understanding how to increase the diversity and number of interests in children with autism can have important implications for their overall development, ranging from occupying one's time in safe and productive ways to having meaningful activities to share with loved ones. Furthermore, as interventionists, one of our primary instructional tools is the systematic and careful arrangement of reinforcing events (e.g., Anderson & Romancyk, 1999; Cooper, Heron, & Heward, 2007). This can become challenging when the learner has a limited number of interests.

In summary, the benefits of monitoring and developing new and diverse reinforcers, especially related to social attention, would be useful in all teaching environments and may foster important and pervasive changes in the child's overall development.

THE DEVELOPMENT OF NEW INTERESTS

Although there has been a considerable body of autism intervention research directed towards understanding the variables that produce the development of verbal behavior (c.f., Goldstien, 2002) and social behavior (c.f., McConnell, 2002), there is limited information about how to produce new interests (e.g., Wolery & Garfinkle, 2002; Wolery, Barton, & Hine, 2005). This area, however, has received attention in research regarding diagnostic classification and definition. In the 2005 edition of the Handbook of Autism, Chawarska and Volkmar (2005) provide an overview of the research aimed at understanding the developmental differences between very young children with autism and children without autism. Although the research is emerging and there are methodological limitations, Chawarska and Volkmar (2005) summarized several areas that may be important markers for the development of measures and procedures to expand interests. For example, in the first year of life children with autism are less likely than typically developing children to look at objects held by others, have little interest in interactive games that other children enjoy; in the second and third years of life children with autism engage in little functional play and no pretend play, are not likely to share an interest with another person, are more likely to use objects in unusual and repetitive ways not observed in their non-disabled counterparts, and engage in little functional play and no pretend play (pp. 230). In addition to helping basic researchers understand the nature of autism, these data can inform applied researchers and early interventionists. For example, if low rates of interactive games and pretend play and high rates of solitary activity and preservation are common in young children with autism, then an early interventionists/applied researchers may want to develop procedures (and systems to evaluate the effectiveness of the procedures) to increase interactive games, pretend play and the diversity of activity engagement.

INTERESTS EXPANSION GOALS IN EARLY INTENSIVE BEHAVIORAL INTERVENTION (EIBI) PROGRAMS

EIBI Outcome Research. Although there are variations in configurations, delivery and emphasis, the current goals of behavioral early intervention are quite similar and consistent. That is, EIBI research demonstrations that describe their curricula (and books based on those research procedures) stress several skill areas of importance: learning to learn (imitation, observing, listening); communication and language; social and play; self help; and academics (e.g., Lovaas, 1981/2003; Leaf & McEachin, 1999; Howard, et al., 2005; Maurice, Green, & Luce, 1996; Maurice, Green, & Fox, 2001; Smith, Groen, & Wynn, 2000). None of these descriptions directly address conditioning new interests or providing measures to evaluate the development of interests. And with a few exceptions (Leaf & McEachin,1999; Ahearn, 2001), none offer extensive programming or procedures for systematically increasing the diversity and complexity of high preference activities. It may be the case that for

some children, the total intervention package creates conditions that result in activities and interests similar to their peers without autism; or it may not be the case. Without any systematic measures to allow analysis or evaluation it is not clear what, if anything, changes. Although the expansion of interests has not been a central consideration in EIBI, there is an emerging body of procedural suggestions and some preliminary research.

PROCEDURAL SUGGESTIONS AND PROMISING PRACTICES.

There are no practices for systematically establishing and expanding new interests that would meet any established criteria for an "evidence-based practice." That is, there are no well controlled studies that that have been replicated with multiple children, by multiple research laboratories (for various research evaluation criteria, see Green, 1996; Horner et al. , 2005; Dunst, Trivette, & Cutspec, 2002). There are a few books that offer suggestions for increasing the play and leisure skills in children with autism (e.g., Coyne, Nyberg, & Vandenburg, 1999; Wolfburg, 1999) and a growing body of promising research on teaching plays skills (c.f., Stahmer, Ingersoll, & Carter, 2003). It is important to note, however, that unless a preference or reinforcer assessment is conducted the taught "play skill" may not actually be "play" as the term is typically defined. Most agree that play means the child chooses the activity, in the absence of programmed prompts or consequences, and has positive affect while engaged in the activity (c.f., Rogers, Cook & Meryl, 2005)). Although some studies have anecdotally reported increased preference and acceptance (e.g., Cameron, Shapiro, & Ainsleigh, 2005), there are no studies that appear to teach play skills and that also formally assess preference or reinforcing function of these newly acquired skills.

In addition to increasing the number and diversity of play activities, interests can be expanded in other ways. Again, this body of research in no way constitutes "evidence based practice" but does offer practitioners promising starting points based on conceptual analyses or basic research. For example, procedures to modify children's tolerance and acceptance of sensory stimuli has been addressed in a limited number of studies (e.g., Ellis, et al, 2005; Keogel, Openden & Koegel, 2004; Love, Matson & West, 1990); expansion of children's food preferences has been addressed in a few studies (c.f., Ahearn, 2001); there are a number of studies analyzing the effects of setting event manipulations on preferences that may have direct bearing on expanding the interests of children with autism (e.g., Charlop-Christy & Haymes, 1998; Dunlap & Koegel, 1980; Hanely, Iwata, & Lindberg, 1999; Klatt, Sherman, & Sheldon, 2000) and, finally, methods to directly condition new events have sporadically appeared in the literature (e.g., Adroin, et al., 2004; Nuzzolo-Gomez, 2002), the most notable being Lovaas' early efforts to establish social attention as a reinforcer (1966).

In summary, the proposed goals in expanding interests and activities in EIBI are two-fold: 1) to increase the number of events that function as reinforcers in order to improve the quantity and quality of our instruction and to 2) help establish an ever increasing number of events that hold interest and increased life opportunities for happiness and discovery for the child with autism. As interventionists serving young children with autism we have several legal and/or ethical mandates (e.g., IDEA, BACB Guidelines for Ethical Conduct) that oblige us to measure socially important goals and to evaluate the efforts of our interventions on those goal behaviors.

CREATING MEASURES OF EMERGING "INTERESTS" IN EIBI PROGRAMS

To the best of our knowledge there is no EIBI measurement system designed for continuous of assessment of children's developing interests (number, novelty, and diversity). Because our purpose was to create an observational system

that captures changing "interests", the literature on preference and reinforcer assessment and the literature maximizing motivation in natural environment teaching, informed the development of our observation protocols. The research on preference and reinforcer assessment is robust (c.f., Cooper, Heron, & Heward, 2007; Hagopian, Long, & Rush, 2004) and offers several useful methods, such as the importance of frequent assessment and the changing nature of what will function as a reinforcer or interest during any given set of stimulus conditions (e.g., Mason, McGee, Farmer-Dougan, & Risley, 1989) and the utility of observing children's specific preferences through direct observation of engagement under freeplay conditions (e.g. Reid, DiCarlo, Schepis, Hawkins & Stricklin, 2003). The research on the use of motivation in naturalistic teaching (c.f, Delprato, 2001; Keogel & Koegel, 2006; Noonan & McCormick, 2007) was also useful in that functional communication training was a target for both of the children described here and one of the first ways we began to measure interests was during request, or "mand", training; our presumption was that if they communicated for it, it was probably a preference, an interest.

The measurement systems described and presented here were developed to help teams evaluate the levels and trends of interests of the children with autism enrolled in the campus early intervention program. As with most children with autism, the children in the two case examples presented here started in the program with very limited interests.

GENERAL METHOD

Participants

Daniel and Tanner were both preschool children diagnosed with autism by diagnosticians not associated with the university early intervention program. Both children were participating in a campus early intervention program designed for young children with autism that was supervised by a Board Certified Behavior Analyst (first author). The intervention teams consisted of the parents and graduate students in Behavior Analysis with an autism special interest emphasis. Expanded descriptions of each child are provided in each "Case Example".

Settings

Data were collected during regular intervention sessions. Sessions took place for both children at home (primarily playrooms and outdoor play areas) and in an on-campus intervention playroom.

Procedures

Goals related to the expansion of activities and interests were developed as a part of each child's comprehensive intervention program. During the course of intervention period presented here, their other teaching programs included: rapport and social approach, functional communication, motor and vocal imitation, receptive and expressive labeling, toy and social play, self-help, preacademic skills, and instruction following. During the initial phases of intervention, the emphasis was on rapport building, functional communication training and increasing engagement with activities and with others. As treatment progressed, the remaining EIBI programs described earlier were introduced. The communication training is of particular interest here since that is were the primary data indicating "interest" is obtained. We also added "expansion" treatment programs for both boys. For both Tanner and Daniel, naturalistic teaching arrangements were utilized in communication training (e.g., Hart & Risley, 1968/1975; Kaiser, 1998; Koegel & Koegel, 2006; McGee, Krantz & McClannahan, 1985). Various materials were continuously available during sessions, with high preference items out of reach or in containers. Based on criterion related attempts and approximations (e.g., Koegel, O'Dell, & Dunlap, 1988) these items were contingently provided (e.g. Saunders & Sailer; 1979; Koegel & Williams, 1980; Williams,

Koegel & Egel, 1981). For Daniel, three sets of play area toys were systematically rotated and the different sets were made available approximately every two weeks (e.g., McGee, Morrier, & Daly, 2000).

The "expanding interest" programs for Tanner and Daniel consisted of the availability and systematic presentation of existing and novel events (toys, food, and social activities) during every intervention sessions as suggested by Coyne, Nyberg, & Vandenburg (1999). During each session each interventionist was prompted to "bring/find about three new (novel) things" that were similar to (in terms of the presumed reinforcing properties) or different from the existing interest items for which we had data (e.g., on a given session a teacher might try playing chase, offer peaches, and present match box cars as the new events). These items were presented using a quota system (try 3 each session), were available during play periods and could potentially be requested during communication training. If either of the boys requested the item using the established response criteria it was delivered (e.g., the video was turned on if they made an approximation to the word video, such as "vee-yo") and if they engaged in an event every effort was made to reinforce that engagement (e.g., handing them extra balls for the air pop game)

Measures

All data were collected during intervention sessions by in home interventionists (supervised by the second and third authors). Data were collected in two different conditions: during communication training and during play periods (these were also instructional periods but were child-initiated through event selection rather than teacher-initiated through instructions). The play periods were interspersed through about half of each 120-minute sessions. Data were collected using paper data sheets and pencils. The total number of different events and the types of events were recorded. The specific measures and recording systems are described in each case example.

Case Example 1: Tanner

Tanner was 29 months old at the onset of intervention and lived with his mother and two older siblings. He was of Asian and Caucasian descent. Prior to intervention Tanner was diagnosed with severe and profound autism, was completely non-vocal and had no conventional means of communication. At the onset of services, he had an extremely limited number of things that he was interested in and that could potentially be used as reinforcers. With the exception of one particular video clip and opening and closing doll house doors, the other items he did select or engage with were not considered safe for him or for use during instruction (e.g., knives, cigarette carton cellophane, climbing on stoves). He received home intervention approximately 15 hrs per week and attended a typical three hour preschool program for three mornings per week.

From the onset of services, data were collected on the items that Tanner requested during communication training. Communication training occurred throughout each intervention session, that is, as long as he was not in the middle of a teacher directed task he was free to request a high preference item. On the session's data sheet, interventionists wrote the name of the each item Tanner requested (subsequent requests for that item were tallied) and the data sheets were later analyzed by session to determine when a new item was added to the pool of requested items. For example, in early sessions when the number of interests were severely restricted he only asked for video (at first with any sound and then with an approximation to the actual word), as sessions progressed he continued to request video but might also request a "spin" in a large play disc. The first time a new item appeared (such as the disc) it was added to the novel interest list.

Figure 1

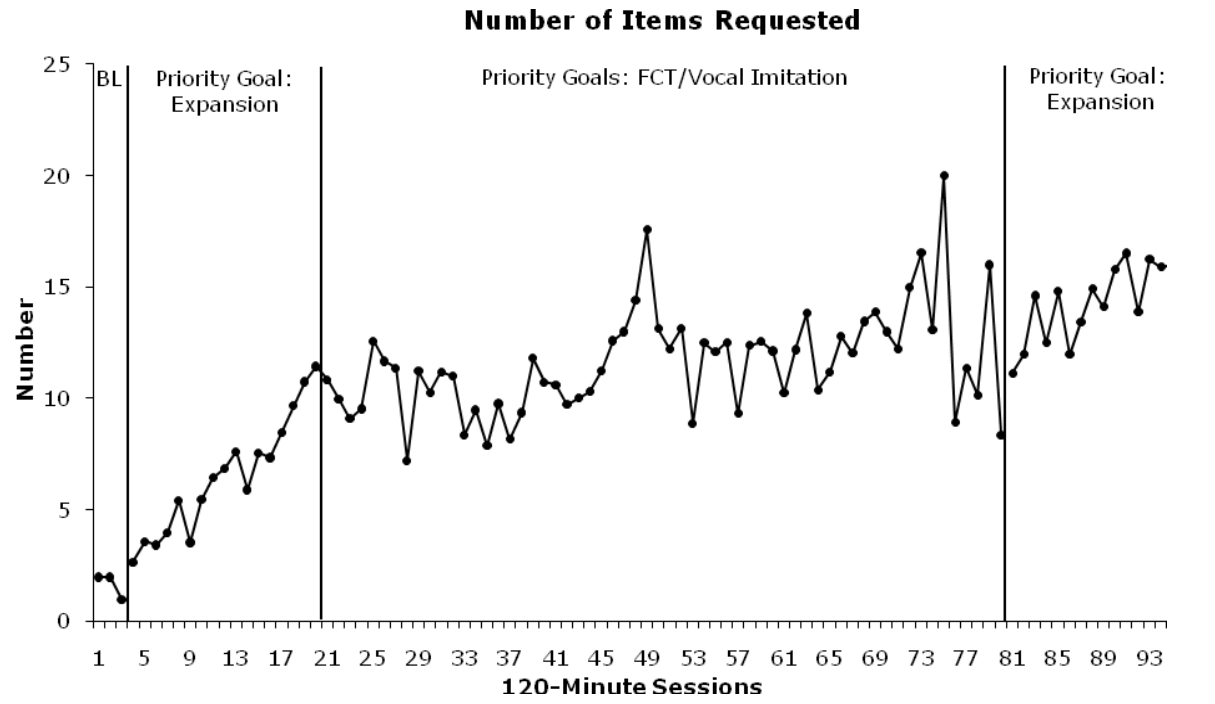


Figure 1 illustrates the number of novel items that Tanner requested over the course of 95 consecutive sessions. During the first few sessions of intervention his interests were very limited (1-3 items were requested) and the shaping of eye contact and vocalizations had just begun. Beginning in the 4th session a concerted effort (as described in the general procedures) was made to increase the number of novel events he requested. It should be noted that all the other teaching programs were also in effect, that he was learning to vocalize for access to events and the interventionists were also becoming better shapers. During this period (sessions 4-20) the number of novel items requested rose dramatically, from 3 items to 12 items. After this period, and in part because we were satisfied with the steady and consistent increase in novel events, the emphasis of his program shifted to imitations and increasing the intelligibility of the words he was using to request. Although interventionists still introduced new items and the events were recorded, it was not considered a priority program again until session 81. At that time the program priority was on teaching play skills. Throughout these last two periods he continued to request novel events but not at the same rate of change as in the first period.

After observing the benefits of this additional measure to the battery of data in an early intervention program and evaluating variables that might be of importance, we considered modification to the behaviors we were counting. For the next participant, we continued counting the number of new events requested during communication training but added additional measures.

Case Example 2: Daniel

At the time services began Daniel was also a 29-month-old and diagnosed with autism. He was of Hispanic and Caucasian descent and lived at home with his mother and father. Upon entry he exhibited some eye contact, had some vocal approximations to words, and simple cause-effect play skills with a moderate number of toys (his mother had taught many of these skills through the campus parent training program). He had no imitation skills,

conventional communication skills, and would only attend to activities for a minute before moving on to the next event. He was a very active toddler who loved to run around in circles and up and down hallways. He also liked to repeatedly put small objects inside larger objects and to line objects up in rows. The clinic-based therapy took place in a playroom, outside, and in the hallways (he liked playing chase down the long corridors). He received about 25 hours per week of intervention.

At the onset of intervention, Daniel had a limited number of items that he would engage with and frequently would not engage with novel items. Therefore, as with Tanner, data were collected on a number of novel events requested. However, several issues arose in our analysis of Tanner's data: What was the cumulative number of events over the course of the analysis? Was he consistently being presented with novel items by the staff (even when this was not a priority program)? Did he become increasingly more accepting of novel items? Were there differences in the development of different classes of items? And, did the communication data just reflect learning to request all the items he was already interested in but had no means to access? Would unprompted engagement data reflect different patterns in comparison to the communication data? For those reasons, additional measures and analyses were added for the next child, Daniel, we served.

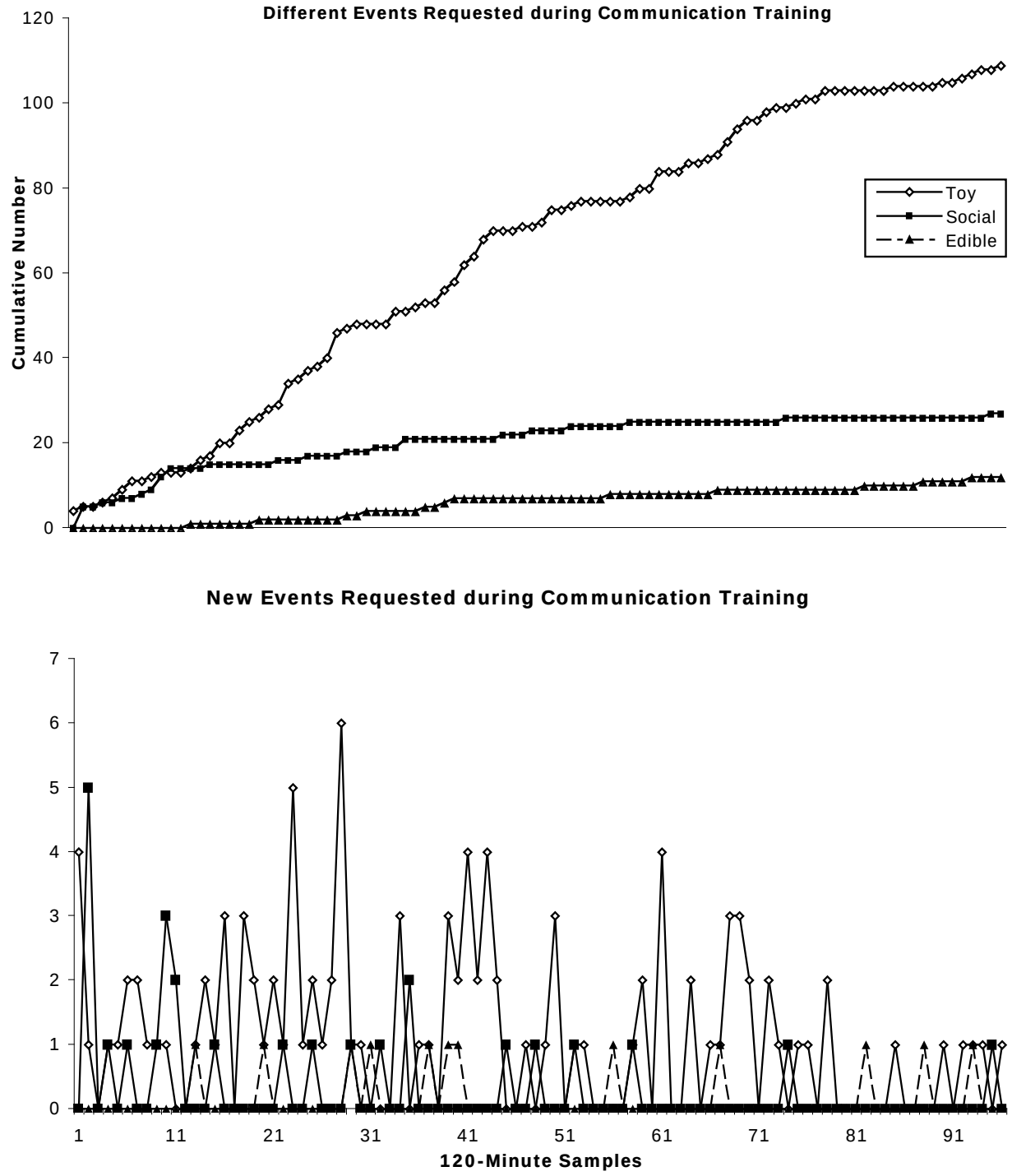
We looked at both the number of requests for new items requested but we also counted the cumulative number of new events, the types of events and the number of events sampled and rejected. New events sampled were defined as a novel stimulus that he engaged with, touched or manipulated, for more than 2 s upon presentation. New events rejected were defined as presented stimuli that he did not touch or manipulate for more than 2 s. New events sampled/rejected were separated as toys, social or edibles. Items requested were defined as toys, social or edibles that he requested during functional communication training in the form of vocal approximations.

Figure 2 displays the cumulative number of different events requested during communication training and the number of the new events sampled and rejected, both separated by toys, social and edibles, across 96,120-min (2 hr) sessions. The cumulative increase of the data path for total items engaged with and separated by stimuli type is higher initially and decreases starting around the 53rd session. This was around the time we began to focus on more teacher initiated instruction. The majority of the new events were different toys and a few of the new events were social activities (e.g., tickle games). Very few of the new events were edibles which may have had to do with his very restricted interests in foods (that were later addressed) and because toy play seemed an appropriate type of event to increase during play and communication interactions. Figure 3 contains an analysis of the cumulative new events independently engaged and rejected during play periods and are organized by total events (top graph) and by type (2nd and 3rd graphs). The overall numbers are higher than in communication training (items requested) but do not have the same sharp slopes, but rather a steady increase over the course of the period of observation. As was observed in the requesting conditions, new toys were offered and accepted more often than edibles or socials. Furthermore the proportion of engagement was higher than rejections.

GENERAL DISCUSSION

Our purpose was to develop measures that would reflect changes in interests, as indicated by requests and engagement. Both boys showed increases in the number of new events requested throughout the intervention period reported here. With further measures, we were able to observe similar increases in the number of events engaged in as well as observe differences in the types of events for the second child, Daniel. It was clear from analysis of the

Figure 2

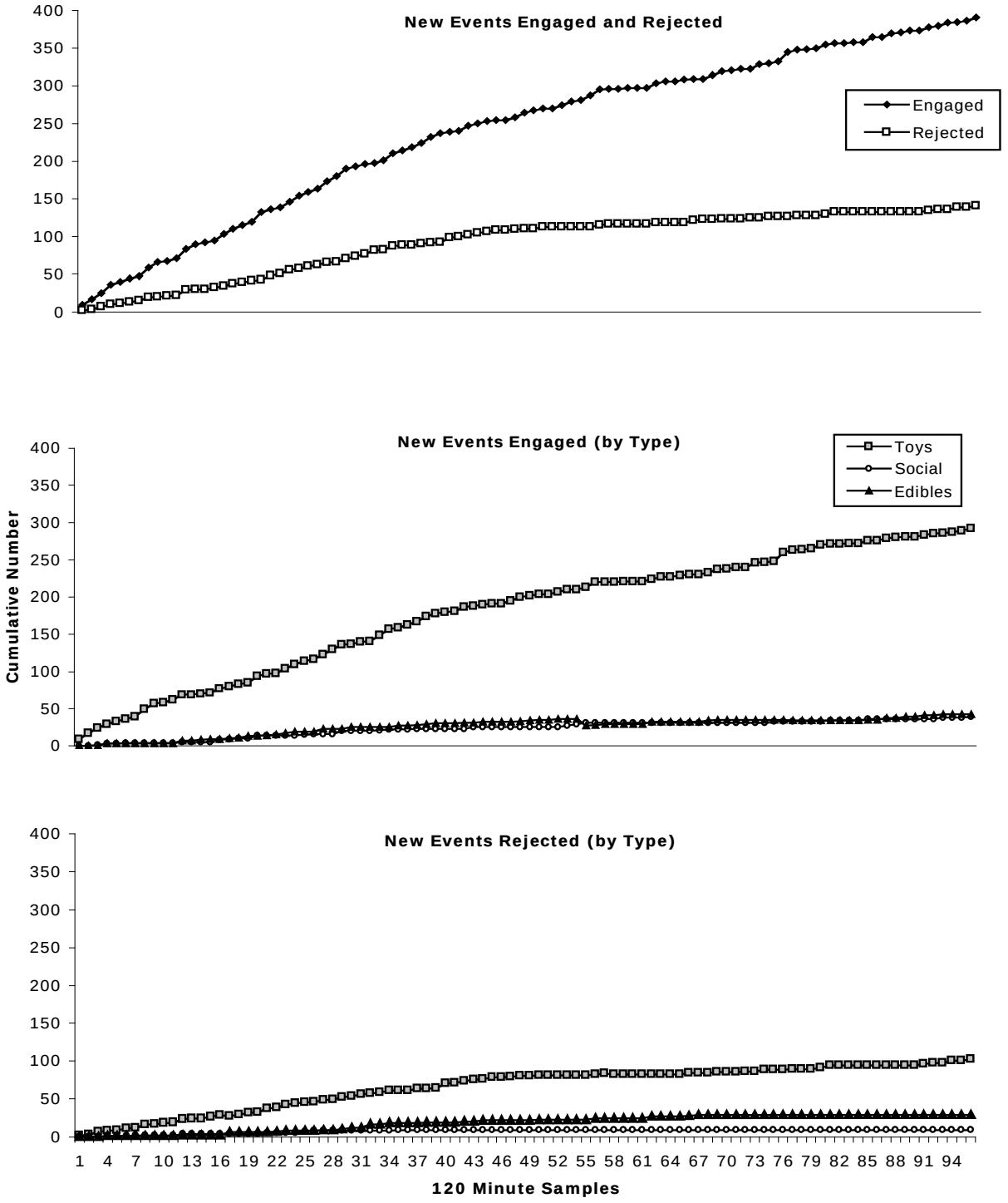


data that we were making progress in terms of his toy play, but social events and diverse edible items should be priorities for future interventions. As we learned from Tanner's data collection and analysis, we also learned from Daniel's. Future efforts will add indices of happiness or enjoyment (eg. Green & Reid, 1996), one of the criteria for an event to actually be considered "play" (e.g., Rogers, Cook & Meryl, 2005) as it appeared at times during the engagement counts that Daniel engaged in activities without pleasant affect and that it may have been likely that he was avoiding other activities rather than attracted to the event itself. Additionally, we observed that some of the activities remained constant but that what he did with the materials increased in complexity. Future systems should incorporate some kind of method for recording changes in the actions as has been suggested by researchers specializing in play skill instruction (e.g., Lifter, Ellis, Cannon & Anderson, 2005). The addition of such measures presents challenges for practitioners in that data collection typically occurs during instruction (as in the present analysis) and additional data collection can be cumbersome. The benefits, however, may warrant gathering of such information.

If theorists are correct (Novak & Peláez, 2004) in that play and diverse reinforcers are important for future development then it follows that we should begin to study the development of interests and activities. The systematic collection of this information will aid in increasing the diversity of reinforcers available for effective teaching interactions and help us begin to understand what factors account for changes in the activity of children with autism, especially those changes that appear to be behavioral cusps (Rosales-Ruiz & Baer, 1997).

Our intent was not to imply nor demonstrate a functional relationship between the observed changes and the increase in events that appear to be new interests. It is possible that the "expansion programs" (based on the promising practices described earlier) we implemented could have contributed to the observed increases. Other factors, however, are likely. Both boys were in an early intervention program that involved intensive systematic skill instruction. The literature reports that the outcomes of these types of instruction can produce groups of behaviors that are similar their typically developing peers (e.g., Fenske, Zalenski, Krantz & McClannahan, 1985; Lovaas, 1987; Koegel, Koegel, Harrower, & Carter,1999; Wolf, Risley & Mees, 1964). Presumably, those children, after treatment, displayed more typical types and ranges of interests. It is quite likely that something about the constellation and delivery of the EIBI interventions accounts for the changes in interests. At the same time, not all children have such favorable outcomes and it is possible that the continuation of restricted activities and interests may play a role. However, without measures it is impossible to know what the nature and course of the changes were and if the data presented here are similar or different than what occurs in other early intervention packages with children that enter treatment with similar or different skills and interests. Which is part of our point. Unlike the areas of social and communication skills, there is very little guidance available regarding the development of interests. We need measurement tools to help us understand the changes.

Figure 3



This paper presents a preliminary attempt to develop a measurement system that allows observation of changes. It is our hope that this is methodological contribution serves as a stimulus for practitioners and researchers to understand more about acquired interests,

especially in children with autism. Such a system would be useful to interventionists for two reasons. First, given the limited information as to how new interests develop and the paucity of evidence-based practices to stimulate that development, interventionists are obliged to measure in order to develop and evaluate their own procedures for expanding and maintaining a diverse and rich array of interests in the children they serve. Second, in doing so the likelihood that evidence-based practices will emerge is increased. The beloved Todd Risely asked, "Do you have enough tools to see reality clearly and change it for the better? You will never know unless you try (pp. 234, 2001)." This is one attempt to expand the toolbox of those serving children with autism. Hopefully, these efforts will help increase our knowledge of acquired interests, increase child preference for instruction, and open avenues for enhanced instructional and life opportunities.

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Intervention for Self-Injury in a Child with Autism: Effects of Choice and Continuous Access to Preferred Stimuli

Amy L. Humenik, Julie Curran, James K. Luiselli, and Stephanie N. Child, May Institute

We evaluated several antecedent intervention procedures for severe self-injurious behavior (SIB) in a child with autism. During a baseline phase the child had continuous access to toys and food within a "no demand" instructional context. In subsequent phases the child could choose or not choose specific foods that were made available continuously. Choice-making was highly effective in reducing SIB compared to the no-choice condition. Clinical and research issues when implementing antecedent intervention are discussed.

Some children with autism have self-injurious behavior (SIB) such as striking the body with hands or objects, hitting head against a fixed surface, and biting or scratching skin (American Psychiatric Association, 2000; Matson & LoVullo, 2008). The most serious effect of chronic SIB is tissue damage, disfigurement, and health risks due to infection and body trauma. Also, many children with autism and SIB are referred to specialized treatment settings outside of more mainstream educational environments. Regardless of where services are provided, high-frequency SIB interferes with a child's learning and is socially stigmatizing.

Intervention based on the principles of applied behavior analysis has been effective in reducing and sometimes eliminating SIB (Hoch, Long, McPeak, & Rojahn, 2004; Luiselli, in press). The emergence of functional behavioral assessment (FBA) and functional analysis (FA) has made it possible to identify environmental influences on SIB and subsequently formulate an individually tailored treatment plan (Hanley, Iwata, & McCord, 2003). Whereas early intervention research on SIB relied on punishment strategies, more contemporary approaches have emphasized positive behavior-change methods (Luiselli, 2004). In particular, several studies have shown that children's SIB can be treated successfully through antecedent intervention. For example, frequency of SIB has been reduced by presenting pleasurable stimuli non-contingently (Carr & LeBlanc, 2006), eliminating aversive instructional interactions (Miltenberger, 2006), and providing continuous access to preferred stimulation (Ringdahl, Vollmer, Marcus, & Roane, 1997). The therapeutic rationale for these and similar procedures is to influence responding by manipulating the conditions that provoke or set the occasion for SIB (Luiselli, 2006; Smith & Iwata, 1997).

In the present study, we evaluated antecedent intervention for severe SIB in a child with autism. Pre-intervention functional behavioral assessment suggested that the child's SIB was maintained by social and non-social sources of reinforcement. Because an already existing consequence-control procedure was in effect, we sought to reduce the probability of SIB by implementing procedures in a "no demand" context while the child had continuous access to preferred stimuli. The study also evaluated the addition of choice-making as a method of intervention for SIB (Romaniuk & Miltenberger, 2001).

Correspondence to:
James J. Luiselli, Ed.D., ABPP, BCBA
May Institute
41 Pacella Park Drive
Randolph, MA 02368
Telephone: 781-437-1205
Fax: 781-440-0400
Email: jluiselli@mayinstitute.org

METHOD

Participant and Setting

Ava was a 7-year old girl diagnosed with autistic disorder. As a consequence of documented child neglect within her biological family, a state agency assumed protective custody and enrolled Ava in a private residential school for students who had developmental disabilities. Ava communicated using single words and physical gestures but her language was difficult to interpret and often repetitive. She had been unresponsive to developmental and intellectual testing, with skills estimated at a 3-4 year old level. Ava required continuous adult supervision to keep her engaged during instruction and to assist her in completing self-care routines. At the residential school she attended a classroom each weekday and lived in a community-based group home.

The most serious problem posed by Ava was high-frequency SIB in the form of striking her face and head with one or both hands. Preliminary measurement before the study indicated that Ava hit or attempted to hit herself in excess of 300 times daily. As a result of chronic SIB, she often had skin abrasions, inflamed areas, and open sores on her face. In an effort to protect Ava from her SIB, staff implemented a response blocking procedure (described below) throughout her waking hours.

In addition to SIB, Ava had a complex medical history including allergies and sleep disturbance. Although she could feed herself, she ate inconsistently during meals and showed erratic food preferences. She had been treated previously by a pediatric psychopharmacologist and at the time of the study was prescribed an atypical neuroleptic medication (risperdol). There were no medication changes during the study.

Measurement

Frequency of SIB was recorded during a 30-minute session conducted in a 12ft x 12ft room at the residential school. The room contained a small table, chairs, and all materials required to conduct the session. During sessions Ava sat at a small table next to a teacher. One to two observers were also present in the room. Sessions were scheduled at approximately the same time each day (between 9:30-10:00am) three to four days per week.

SIB was defined as Ava striking or attempting to strike her face and head with the open palm or closed fist of either hand. Attempted SIB responses were those blocked successfully by the teacher. A session was divided into three, 10-minute intervals that coincided with different intervention conditions (described below). The observer timed the duration of each 10-minute interval and using a frequency count, recorded SIB on a precoded form. At the conclusion of each session, the observer summed the frequency of SIB per 10-minute interval.

Interobserver Agreement

To assess interobserver agreement (IOA), a second person recorded data simultaneously with the primary observer during 35% of sessions distributed across all phases of the study. IOA was computed for each 10-minute interval in the session by dividing the smaller recorded frequency by the larger recorded frequency and multiplying by 100. Average IOA was 94% (range: 82-100%).

Experimental Design and Procedures

Procedures were evaluated in an ABCB experimental design: A = baseline, B = choice and continuous access to food, and C = no choice and continuous access to food. Several conditions were established during all phases. As noted previously, there was a response blocking procedure in effect to prevent Ava from injuring herself. The procedure consisted

of the teacher placing her hands in front of Ava's face/head so that attempted SIB was interrupted (Lerman, Kelley, Vorndran, & Van Camp, 2003). The teacher implemented response blocking without speaking to Ava and withdrew her hands as soon as attempted SIB had stopped.

Another condition during all phases was allowing Ava to sit at the table without instructional demands. That is, other than implementing phase-specific procedures, the teacher did not present Ava with tasks or ask her to perform responses. Instead, the teacher simply allowed Ava to manipulate the toys and food that were made available.

Identification of Preferences

Before the study, the first and second authors observed Ava in her classroom to identify stimuli that appeared to be pleasurable. They documented staff interacting with Ava, noting stimuli that were presented as positive reinforcement and those Ava contacted spontaneously. They also asked the classroom staff to nominate toys and foods they judged to be Ava's "favorites." Based on the information gathered through observation and staff opinions, several toys (peg board, bead stringing, books, objects that produced noise) and several foods (potato chips, chocolate crackers, "chewy" candy) were included in the study.

Functional Behavioral Assessment

In addition to identifying stimulus preferences, the first and second authors also conducted functional behavioral assessment before the study. They observed Ava in her classroom, recording situations and interactions that appeared to be associated with SIB, as well as conditions in which SIB occurred infrequently. The classroom staff were surveyed to obtain their opinions about behavior function, for example, through questions such as, "When is SIB most likely to be displayed?" and "Does Ava have SIB during specific activities?" These indirect and descriptive methods of assessment suggested that Ava performed SIB "to gain attention," to avoid or escape work "she did not want to do," and at times, as a form of stereotypy independent of social consequences. So assessed, we hypothesized that SIB was influenced by social and non-social influences.

Procedures

Baseline. At the start of each session, the teacher randomly selected one toy and two foods for one of the three, 10-minute intervals. When the interval began, the teacher presented the toy or food (small pieces in a bowl) to Ava, placing them on the table, and allowing her continuous access during the interval. When the interval expired the teacher removed the toy or food, waited approximately 60s, and then presented the next stimulus. The teacher did not interact with Ava other than blocking attempted SIB. The session concluded when the third 10-minute interval expired.

Choice and Continuous Access to Food.

Preceding each 10-minute interval, the teacher showed Ava an array of three foods. Ava was instructed to "pick one" and the selected item (small pieces in a bowl) was given to her for the duration of the interval. Like the baseline phase, she had continuous access to the food. When the interval expired the food was removed, the teacher waited approximately 60s, and then presented the three-food array. Other than blocking attempted SIB, the teacher did not interact with Ava. The session concluded when the third 10-minute interval had elapsed.

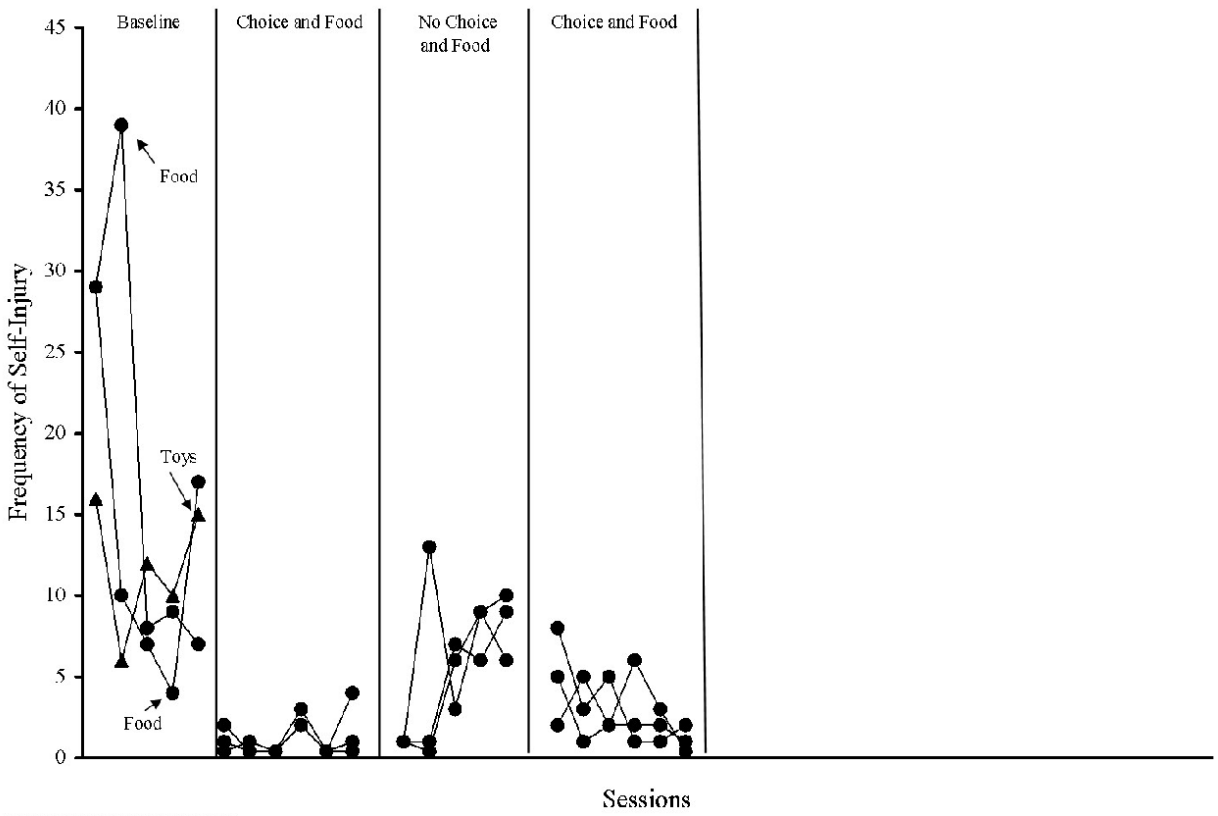
No Choice and Continuous Access to Food.

This phase was identical to baseline with the exception that only food and no toys were presented to Ava. The three foods that Ava selected most frequently during the preceding choice phase were presented during the no choice condition.

RESULTS

Figure 1 shows the frequency of SIB recorded during each of the three 10-minute intervals per session. In the baseline phase, SIB initially was high but then decreased under the toy and food conditions. On average SIB was more frequent when Ava had access to toys (M = 12.3) compared to food (M = 8.7). Allowing Ava to choose a food preceding each 10-minute interval was associated with reduced SIB in all sessions (M = 1.0). With contingent access to food but without choice, SIB increased steadily (M = 5.5) and decreased when choice was introduced a second time (M = 2.8).

Figure 1 Frequency of self-injury during 10-minute intervals per session.



DISCUSSION

The present study began by giving the child continuous access to toys and food within a "no-demand" instructional context. Under these conditions Ava had less frequent SIB in the food condition. Accordingly, toys were removed from the evaluation and food was presented exclusively during sessions. Notably, allowing Ava to choose food items instead of the teacher presenting them improved the effectiveness of intervention. Although choice-making has been implemented as a behavior-change procedure (Cannella, O'Reilly, & Lancioni, 2005), to our knowledge the present study is the first demonstration of its effect on SIB.

Our preintervention functional behavioral assessment suggested that Ava's SIB was maintained by social and non-social consequences. In particular, we hypothesized that under demand conditions such as direct instruction, SIB was escape motivated. Social attention from staff also seemed to be reinforcing. Regarding non-social influences, it appeared that SIB, at times, was automatically reinforced. Having Ava in a "no-demand" context and with continuous access to

preferred stimuli was intended to reduce her motivation to escape and to provide alternative and competing sources of reinforcement. Choice-making, we propose, was effective because it enabled Ava to contact her favorite (most preferred) foods. One question, not explored in the study, is whether allowing Ava to request food throughout the session would have had the same result as providing food continuously.

The study had several limitations. First, we did not include a baseline phase without response blocking and continuous access to preferred stimuli. Although it could be argued that a "true" baseline evaluation should not include potentially effective intervention methods, we could not justify the study without protecting Ava (response blocking) and minimizing her exposure to aversive interactions. Note that the first two baseline sessions were associated with high- frequency SIB that subsequently decreased within successive sessions. Observing this trend, we decided to maintain the baseline procedures until responding achieved a steady-state.

Another limitation is that we did not conduct a functional analysis (Iwata, Dorsey, Slifer, Bauman, & Richman, 1994) but instead, relied on descriptive and indirect assessment through observation, data analysis, and interviews. Our functional behavioral assessment suggested that Ava's SIB was multiply determined but absent experimental manipulation, sources of control can only be inferred and not confirmed. Similarly, Ava's preferences were identified through observation and staff opinion and not a formal stimulus preference assessment (Pace, Ivancic, Edwards, Iwata, & page, 1985). Perhaps the choice-making intervention might be considered a method of preference assessment because the foods presented to Ava were the ones she selected before each 10-minute interval.

When the study concluded we applied a modified intervention in Ava's classroom where she could choose foods that were given to her on a fixed-time (FT) schedule during an instructional activity. The results initially were promising but subsequently less impressive as the FT schedule advanced beyond 30-45s and instruction became more demanding. The change in intervention was our attempt to evaluate procedures under more naturalistic conditions by (1) implementing them in a classroom, (2) fading preferred stimuli from continuous access to fixed-time presentation, and (3) eliminating the previous no-demand context. Any of these alterations may have affected the modified intervention. Also at that time, Ava had transitioned to another classroom and the prescribing physician had added another medication (clonidine).

Although a preliminary analysis, the present study demonstrated how several antecedent intervention procedures can be combined to reduce high-frequency SIB in a child with autism. Acknowledging the simulated conditions of the study, we found that choice-making was the instrumental component of intervention. Choice, combined with context modifications (e.g., removal of demand conditions, environmental enrichment, noncontingent reinforcement) may be an initial strategy to gain control over SIB that has multiple functions (Smith, Iwata, Vollmer, & Zarcone, 1993). Future research should continue to explore variations of this intervention methodology and the extension of procedures outside of individualized treatment sessions.

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Evaluation of Body-Pressure Intervention for Self Injury in Autism

Shannon S. Doughty[1] and Adam H. Doughty[2,3], Parsons State Hospital and Training Center[1], University of Kansas[2], and College of Charleston[3]

Weighted vests sometimes are recommended by occupational therapists, and other professionals who work with behavior analysts, to decrease inappropriate behavior (e.g., self-injury) in children with autism. If these claims were reliable, then the use of such vests would be a powerful and easily implemented intervention. However, the utility of using weighted vests as an intervention for problem behavior in autism has not been examined thoroughly in controlled research studies. We investigated the effects of a weighted vest on sensory-maintained self injury in an adolescent with autism across various environmental conditions. In most conditions, the vest did not decrease self injury. In conditions wherein the vest decreased self injury, it was found that the effects were not due to the deep-pressure therapy per se.

There is an increasing interest in developing interventions for problem behavior in autism due in part to the recent rise in diagnosis of the disorder (e.g., Yeargin-Allsopp, Rice, Karapurkar, Doernberg, Boyle, & Murphy, 2003). Self injury is the problem behavior that is of primary concern in this population (Bodfish & Lewis, 2002). Self injury can have damaging effects both in the short and long term. In addition to the physical effects of self injury, such behavior also prevents the successful application of teaching techniques. Effective interventions for self injury associated with autism, therefore, can be beneficial along several lines. A hallmark feature of interventions designed by applied behavior analysts is the emphasis placed on an understanding of the function of the problem behavior (e.g., Carr, 1977; Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994). Self injury, in some cases, is maintained by the automatic stimulation provided by the behavior itself and, thus, is said to be stereotypical.

Because individuals with autism often are treated in a multi-disciplinary setting, including by applied behavior analysts and occupational therapists, and given the interest in sensory stimulation by occupational therapists, interventions for sensory-maintained self injury allow for collaboration across service providers. Occupational therapists interested in reducing problem behavior in autism often attribute the causes of such problem behavior to sensory disturbances. Accordingly, sensory-integration therapy is used to treat problem behavior. This therapy involves providing physiological stimulation through tactile, visual, auditory, propioceptive, and/or vestibular means. This stimulation includes, but is not limited to: swinging, auditory integration therapy, rocking, holding, brushing, “sensory diets,” and deep-pressure therapies, such as the use of a weighted vest (Case-Smith & Bryan, 1999; Mason & Iwata, 1990).

Collaboration across service providers from different perspectives (e.g., applied behavior analysts and occupational therapists) may be challenged by their different training histories and their different technical vocabularies. Nevertheless, bringing different perspectives to bear on a common problem may enhance treatment, through a variation and selection process, so long as a common ground for judging the treatment is agreed upon. We believe this common ground ought to be a reliance on evidence-based practice (e.g., Horner et al., 2005; Richman, Reese, & Daniels, 1999).

There is limited research involving sensory-integration therapy in general, or involving its components specifically (Case-Smith & Bryan, 1999). Nevertheless, in one report 99% of occupational therapists surveyed considered themselves to have a “sensory-integration” orientation (Watling, Deitz, Kanny, &

McLaughlin, 1999) and, therefore, might use more controversial or relatively undocumented techniques such as a weighted vest to reduce problem behavior. It is difficult to interpret many of the studies involving deep-pressure therapy, as well as other sensory-integration techniques, because of their methodological limitations, such as their use of AB designs (e.g., Case-Smith & Bryan, 1999; VandenBerg, 2001; Zisserman, 1992). In a study employing an ABA design, Fertel-Daly, Bedell, and Hinojosa (2001) found inconclusive results because in some cases problem behavior was not substantially different across phases and in other cases there was not a reversal of behavior during the return to baseline conditions.

Mason and Iwata (1990) addressed several of the methodological limitations of the studies described above and assessed the effects of sensory-integration therapy on self-injury in three individuals with intellectual disabilities. Sensory-integration therapy resulted in an increase in problem behavior for one individual and a decrease in problem behavior for the other two individuals. This latter decrease, however, was not the result of the sensory-integration therapy per se. Instead, the decrease in problem behavior was the result of increased attention (one participant), or decreased demands (the other participant), effects that often are inherent in the application of sensory-integration therapy. These results illustrate the importance of carefully arranging environmental conditions to isolate the key components of any intervention, especially one that is understudied, popular, and composed of several components (i.e., sensory-integration therapy).

Although Mason and Iwata (1990) did not examine the efficacy of weighted vests per se, their work calls for intense scrutiny into any intervention that relies on the use of such vests. This scrutiny also is occasioned by the fact that weighted vests often are prescribed by occupational therapists despite controversy surrounding their efficacy and potential confounds such as those found in Mason and Iwata. There also is little standardization in research or treatment. For example, there are no guidelines regarding when the vest should be worn, how long it should be worn, and how much, relative to the person's body weight, it should weigh (cf. Fertel-Daly et al., 2001; VandenBerg, 2001). In other words, much of the "evidence" supporting the use of weighted vests in the treatment of problem behavior is in the form of anecdotes and arguments from authority.

The present study was conducted to assess the efficacy of a weighted vest at decreasing sensory-maintained self injury in an adolescent with autism. The adolescent was a resident of a state-run facility and served by a multidisciplinary team experienced with individuals with autism. A weighted vest was suggested by a speech and language pathologist consulting with an occupational therapist. Because, as stated above, there is limited evidence to support this practice, we investigated the effects of this vest under a variety of environmental conditions. Following such an investigation, recommendations regarding treatment could be based on empirical evidence as opposed to arguments based on authority and anecdotal reports.

METHOD

Participant

Ernie was a 14-year, 6-month-old male and three-year resident of a state-run facility. He weighed approximately 96.25 pounds at the start of the study. Ernie was diagnosed with autism, severe mental retardation, and Tourette's Syndrome. He was nonvocal and had few signs or other methods of expressive language, though he had some receptive language (e.g., "Ernie, go to the bathroom.") Ernie had a history of severe self injury since he was a toddler. The greatest concern was his head banging and chin hitting, which often resulted in contusions, tissue damage, swelling, and bleeding. Ernie took the anticonvulsant Depakene at a constant level prior to and throughout the duration of the study for the

purposes of behavior management and control of possible seizures. A number of interventions for his self injury had been attempted, including wearing protective gear such as a helmet and chin guard. No prior intervention was successful in reducing Ernie's SIB to clinically significant levels. Reportedly, Ernie's self injury had improved somewhat since his admission to the facility, but the rate of this behavior had stabilized with no further progress noted. In the months prior to the start of the study, self injury had increased and was at its highest level in over 12 months. Because of this elevation, speech and occupational therapists recommended implementing the weighted vest as a means of reducing Ernie's self injury.

Apparatus

The weighted vest was approximately 4.5 pounds. Because there is little standardization regarding the use of such a vest, a weight criterion of approximately 5% of Ernie's body was selected. This criterion was selected because it was used by VandenBerg (2001) and also recommended by an occupational therapist. The vest wrapped around Ernie's neck, and its weight was applied to the chest area equally on both sides.

Data Collection, Operational Definitions, and Interobserver Agreement

Self injury was measured in all sessions and defined as fist-to-chin contact, fist-to-body contact, self-slapping, self-biting, falling to the floor, and contacting his head to any solid object or person. It was counted as a frequency measure and frequency was recorded using pen-and paper methods. In the preference assessment (see below), preference was defined as reaching towards one of two objects. Prior to initiating data collection, observers were trained to criterion of 80% or higher agreement on the occurrence or nonoccurrence of the behavior. Reliability was collected in vivo on 50% of analog sessions (see below) and 75% of sessions in the weighted vest analysis (see below). Mean percent agreement on the occurrence of self injury in analog and weighted-vest conditions was 96.9% and 87.6%, respectively. Observers always agreed on indices of preference during the preference assessment.

DESIGN

There were three phases: an analog functional analysis, a weighted-vest analysis, and a preference assessment. In each phase, sessions were conducted at approximately the same time each day in Ernie's room. The room contained one bed, one table, two chairs, two dressers, and a locked closet. Access to the dresser drawers was blocked. Approximately three sessions occurred per day.

Analog Functional Analysis

An analog functional analysis similar to that described by Iwata et al. (1982/1994) first was conducted to determine the environmental variables maintaining self injury. The functional analysis is described briefly here; more details can be obtained by reading Iwata et al. or from the authors of the present study. Five session types (task [or demand], attention, tangible, alone, and control) alternated in a multi-element design, and each session lasted 10 min. The task condition programs for 20 s of escape from demands contingent on problem behavior. An increase in problem behavior in this condition supports the notion that escape reinforces problem behavior (i.e., negative reinforcement). The attention condition programs for brief (i.e., 3-5 s) of attention contingent on problem behavior. An increase in problem behavior in this condition supports the notion that positive social reinforcement reinforces problem behavior. The tangible condition programs for 20 s access to a preferred item or activity contingent on problem behavior. An increase in problem behavior in this condition supports the notion that access to positive nonsocial reinforcement is in effect. High rates of problem behavior in

the alone condition (where the individual is alone in an empty room) and/or high rates across conditions help to contribute to the conclusion that the problem behavior is maintained by sensory stimulation. High rates of problem behavior in the control condition also suggest that the behavior is maintained by sensory stimulation.

Weighted-vest Analysis

An analysis then was conducted to assess the utility of the vest at reducing self injury. Eight session types were presented one time each in each of two phases (without intervening vest time and with intervening vest time, described below). Each session lasted 15 min, and the order of sessions was determined randomly. During the attention conditions, continuous attention was provided by staff in the form of general conversation (e.g., "Ernie, guess what we're going to do today?" and "It's so nice out and we're going to have so much fun.") During the alone conditions, Ernie was left alone with no attention, tasks, or tangibles. During the control conditions, the staff responded to all initiations, and, otherwise, Ernie received attention every 20 seconds for 3-5 seconds. During the control conditions, no tasks were presented, and there were no tangibles present. During the task conditions, academic tasks with which Ernie was familiar (e.g., letter matching) were presented every three to five seconds. If Ernie responded correctly, brief praise was delivered. If he responded incorrectly or failed to respond, he was shown the correct response, and then given 1-3 seconds to attempt the response. If he responded incorrectly or failed to respond, he was physically prompted to complete the task. Self injury was ignored during all sessions; however, severe self injury was blocked briefly and without comment.

In the conditions described above (i.e., attention, alone, control, task), there were both vest and no-vest sessions. In vest sessions, Ernie wore the vest for the entire session. Any attempts to remove the vest were blocked (such attempts were rare). No-vest sessions were differed from vest sessions only insofar as Ernie did not wear or have access to the vest. Ten minute breaks intervened within the first eight sessions during which Ernie had unstructured time without interaction with the therapist. During the second eight sessions, the 10-min breaks were identical except Ernie wore the vest before a vest session. This time spent wearing the vest occurred to determine whether the vest required any sort of "warm-up effect." Three final probe sessions were conducted to determine whether wearing the vest influenced self injury through its deep-therapeutic effects per se, or simply by having access to any preferred tangible (cf. Mason & Iwata, 1990), and the vest was serving in the role of the preferred tangible. These three probe sessions were identical to the vest sessions in the attention conditions except, instead of having noncontingent, continuous access to the vest, Ernie had noncontingent, continuous access to another preferred tangible (a different tangible in each session selected by Ernie prior to that session).

Preference Assessment

Finally, a preference assessment based on the procedures described by Fisher et al. (1992) was conducted to determine whether Ernie preferred the vest to other preferred tangibles. Tangibles included the vest and the other items employed in the tangible conditions. Items were presented in pairs such that each item was presented once with every other item. Pairs of items were placed in front of Ernie, approximately 0.5 m from him and approximately 0.7 m apart. After selecting one of the two items, the unchosen item was removed, and Ernie was permitted 20 s to interact with the item or to wear the vest. Attempts to approach both stimuli simultaneously were blocked physically.

RESULTS

Analog Functional Analysis

Figure 1 shows that self injury occurred in all five conditions. Self injury occurred frequently and was similar across the task, alone, and tangible conditions. Indicators that Ernie's self injury was sensory maintained were (1) its frequent occurrence in the alone condition, (2) its occurrence across all conditions, and (3) its occurrence in tangible and task conditions during those intervals when he had access to preferred tangibles as well as escape intervals. The relatively high frequency of self injury in the task condition indicates that escape from tasks also may maintain Ernie's self injury. Nevertheless, because Ernie's self injury primarily was maintained by sensory reinforcement, according to the sensory-integration literature, as well as anecdotal reports about sensory integration and deep-pressure therapy, he was an appropriate candidate for a weighted-vest intervention.

Weighted-vest Analysis

Figure 2 shows the results of the weighted vest analysis. The darker (black and white) symbols indicate vest sessions, whereas the lighter (gray and white) symbols indicate no-vest sessions, and the shape of the symbols indicates the type of condition. There was no differential rate of self injury, or clinically significant reduction in self injury, across the different conditions as a function of the vest being worn, with one exception. In the attention condition, the rate of self injury in the vest sessions was lower than in the no-vest sessions (also see Figure 3). The three probe sessions were conducted to determine whether this difference in self injury was due to the deep-therapeutic effects of the vest per se, or whether comparable effects would occur with noncontingent, continuous access to any preferred tangible. The results of these sessions also show less frequent self injury and mirror the results observed in the vest sessions of the attention condition. Table 1 shows self injury in three 5-minute blocks across each session. There was no reliable decrease in self injury across the vest sessions. There, therefore, is no indication that longer access to the vest would have resulted in clinically significant decreases in self injury. Figure 3 provides a summary of the results shown in Figure 2 by displaying the overall mean rates of self injury across all sessions. The findings confirm the absence of a clinically significant reduction in self injury as a function of the vest in and of itself.

Preference Assessment

The vest was determined to be a highly preferred item, though not the most preferred item presented.

DISCUSSION

Consistent with Mason and Iwata (1990), the only beneficial effects (i.e., problem behavior reduction) correlated with a sensory-integration technique (in this study, a weighted vest) were not due to sensory-integration processes. Instead, any minor beneficial effects of Ernie's weighted vest were due to the vest being a highly preferred item. The fact that the vest was a highly preferred item for Ernie suggests that perhaps children in other studies (e.g., VandenBerg, 2001) have requested their vests for similar reasons. Whereas other reports involving weighted vests (Fertel-Daly et al., 1991; VandenBerg, 2001) have examined their effects on on-task behavior, we did not include such a measurement reliably. However, on-task behavior occurred infrequently in the task conditions with and without the vest because (1) self injury occurred frequently in these sessions and (2) self injury and on-task behavior were physically incompatible.

There were two primary results in the present study. First, the weighted vest did not result in any reliable and/or systematic reductions in sensory-maintained self injury that, second, could be attributed to sensory-integration therapy per se. Regarding the first result, it is noteworthy that we assessed self injury, with and without the vest, across a range of environmental conditions. By conducting such

an assessment, it was verified that such an intervention did not influence self injury consistently. Regarding the second result, it is noteworthy that we included the final probe sessions. By including these probes, it was determined that the effects observed with the vest were not due to its deep-therapeutic impact. Thus, it is recommended that future work involving the assessment of sensory-integration therapy and autism take advantage of the present procedures.

Following the conclusion of the probe sessions, Ernie underwent functional communication training (Carr & Durand, 1985) and learned to request access to the vest. In other words, access to the vest functioned as a reinforcer. This finding is noteworthy because (1) very few items served as reinforcers for Ernie and, (2) as noted above, he had few communication responses.

Many applied behavior analysts design and conduct interventions, for people both with and without autism, in multi-disciplinary settings. The area of autism treatment is known for attracting interventions that are not grounded in empirical evidence (Foxx, Jacobson, & Mulick, 2004). In the context of autism treatment, successful collaboration in multi-disciplinary settings requires agreed-upon guidelines for distinguishing between effective and ineffective practices. In keeping with others (e.g., Richman et al., 1999), we recommend that professionals read “effective practices” as “evidence-based practices.”

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Authors' Note

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An Evaluation of the Role of Reinforcement-Based Interventions in Determining the Effectiveness of 'Eclectic' Approaches for Teaching Children with Autism Spectrum Disorders

Lisa A. Osborne and Phil Reed

Swansea University, U.K.

The current report analyzed the independent contribution of various components of an eclectic teaching intervention for young children with Autism Spectrum Disorders over a nine to ten month period. The results demonstrated that there was a strong independent impact of the number of hour of reinforcement-based intervention on the children's gains in intellectual and educational functioning. There was an independent impact of special nursery group teaching on the children's adaptive behavior. These results suggest that the effectiveness of 'eclectic' interventions may depend on the individual components of that approach, especially the degree of reinforcement-based teaching received.

There have been numerous studies regarding the effectiveness of early teaching interventions for Autism Spectrum Disorders (ASD; e.g., Eldevik, Eikeseth, Jahr, & Smith, 2006; Lovaas, 1987; Ozonoff & Cathcart, 1998; Reed, Osborne, & Corness, 2007; Rogers, 1998; Sallows & Graupner, 2005). Much current debate has centered on Applied Behavior Analysis (ABA) as an intervention. This approach has been outlined in a variety of sources (e.g., Lovaas, 1981; Lovaas & Smith, 1989). The outcome-effectiveness of this intervention reported by Lovaas (1987) was remarkable; children undergoing this approach made gains of up to 30 IQ points, and just under half of these children were not noticeably different from normally-developing children after three years of the intervention. The gains noted for a group of children receiving a high intensity intervention (40 hours/week) were much more pronounced than in those children undergoing the same treatment for less time per week (10 hours/week or less). The relatively high intensity of the program (i.e., 40 hours/week) has been taken as axiomatic to the success of the program by many adherents to this approach (see Lovaas, 1987; Mudford, Martin, Eikeseth, & Bibby, 2001). Although some studies have replicated the relative benefits of high intensity programs (e.g., over 30 hours/week) compared to low intensity programs (e.g., Smith, Eikeseth, Klevstrand, & Lovaas, 1997; Smith, Annette, & Wynn, 2000), other studies have shown that gains are made with less than 30 hours per week (Sheinkopf & Siegel, 1998).

Irrespective of the empirical strength of outcome intervention studies for ABA approaches, alternatives to ABA interventions for ASD are widely employed. For example, Humphrey and Parkinson (2006) cited twenty-four different types of approach that are currently in use for children with ASD. These approaches include: 'interactive methods', such as the Option approach, or music therapy; 'communicative interventions', such as the Picture Exchange Communication System (PECS), or facilitated communication; and the 'integration approach', which combines a range of different strategies to produce interventions, such as Alternative Program for Preschoolers and their Parents (LEAP), or the Walden preschool program.

In fact, the majority of schools across the United Kingdom use an 'eclectic' approach for intervention for children with ASD (see Jordan, Jones, & Murray, 1998). The term 'eclectic intervention' will be used here to refer to the use of a combination of different intervention approaches (see Reed, Osborne, & Corness,

2007). Eclectic interventions do not follow a specific ethos, or strategy, as do many 'brand name' approaches, but rather they combine different aspects of existing strategies. For example, an approach might combine two approaches, such as TEACCH with ABA (e.g., Farrell, Trigonaki & Webster, 2005), or it could use more methods, such as speech therapy, occupational therapy, physiotherapy, and portage (e.g., Drew, Baird, Baron-Cohen, Cox, Slonims, Wheelwright, Swettenham, Berry & Charman, 2002). Such combinations of interventions do not necessarily derive from an assessment of the data on the outcome effectiveness of the individual components of the eclectic approach, nor from the established effectiveness of any such combinations. This may not be regarded as ideal in a scientific sense, but it is a common approach to the development of intervention (often thought of as potentially effective, see Jordan et al., 1998) and often tailored to suit the training and abilities of the staff delivering the interventions within an education authority.

Some positive results have been documented for many of the strategies employed within an eclectic intervention. For example, within the eclectic intervention studied by Akstinas (2006), PECS was included, and improvements in speech and social behavior, as well as a reduction in problematic behavior, was evident for some participants (Charlop-Christy, Carpenter, Le, LeBlanc, & Kellet, 2002). Additionally, Social Stories has been reported to both decrease disruptive behavior (Crozier & Tincani, 2005), and to increase appropriate social interaction (Scattone, Tingstrom, & Wilczynski, 2006). Speech and Language Therapy is commonly found within an eclectic intervention (e.g., Gabriels, Hill, Pierce, Rogers, & Wehner 2001; Howard, Sparkman, Cohen, Green & Stainslaw, 2005; Sallows & Graupner, 2005; Scheinkopf & Sigel 1998; Stahmer & Ingersoll 2004), and the number of hours of SLT received at an early age is a predictor of later language skills (Stone & Yoder, 2001). However, very few, if any, of the interventions implicated in eclectic approaches, have the same degree of support as ABA a single intervention (see Reed et al., 2007).

This raises the question of how effective combining these less effective approaches into an 'eclectic' intervention would be for individuals with ASD. The extent to which 'eclectic' approaches, when taken as a whole, work for ASD is not well documented. Currently, there is limited research on 'eclectic' interventions as an experimental condition, and often they are implemented as a comparison for ABA approaches in outcome effectiveness research. Gains made by such eclectic controls are often below that of the experimental intervention, which would suggest eclectic intervention may not be as beneficial as the ABA approaches used (e.g., Howard et al., 2005; Sallows & Graupner, 2005).

It should be mentioned that there are some accounts where an 'eclectic' approach is the primary, or only, intervention studied, and findings have appeared to be positive (e.g. Akstinas, 2006; Osborne, McHugh, Saunders, & Reed, 2008). In this latter study, Osborne et al. (2008) noted that children undergoing an 'eclectic' intervention produced gains of approximately ten IQ points over a nine to ten month period, comparable to some gains made on ABA approaches. What is unclear, however, is the degree to which the various components of the 'eclectic' interventions studied impact on the behavioral gains noted in these reports. The current report offers a more detailed analysis of these data, and hopes to be able to evaluate the degree to which various components of this eclectic approach may have contributed to these gains.

METHOD

Participants

Sixty-five children with ASD (59 male and 6 female) were identified in conjunction with

Local Education Authorities in the South East of England. All of the families of these children, who were contacted, agreed to participate in the study. Participants were selected on the basis of three criteria, the children had to be: 2:6 to 4:0 years old; at the start of their first teaching intervention; and independently diagnosed with ASD by specialist pediatricians (typically using clinical judgment, supported by psychometric testing), following initial referral from a general medical practitioner. All diagnoses were made prior to participating in, and the commencement of, this study. In addition to these independent diagnoses of ASD, all of these children had a statement of Special Educational Needs related to their ASD from their Local Education Authorities. These independent diagnoses were supported in the present study by the use of the Gilliam Autism Rating Scale (GARS). The GARS measure showed that the mean (standard deviation) of the overall GARS score for this sample was 93.8 (+ 13.4), indicating that this sample was of a slightly milder than average autistic severity. The children had a mean IQ at baseline (as measured by the Psycho-Educational Profile (PEP-R) of 53.2 (+ 16.8), and a general cognitive ability, as measured by the British Abilities Scale (BAS), of 55.9 (+ 14.3). Their adaptive behavioral functioning, as measured by the Vineland Adaptive Behavior Scales, was 56.5 (+ 6.7) at baseline.

MEASURES

Gilliam Autism Rating Scale: The GARS (Gilliam, 1995) comprises four sub-scales, each describing behaviors symptomatic of autism (Stereotyped Behaviors, Communication, Social Interaction, and Developmental Disturbances). The raw scores from these sub-scales can be converted into standard scores (mean = 10, standard deviation = 3). These sub-scales combine to give an overall Autism Quotient; higher scores meaning greater autistic severity (mean = 100 [average autistic severity], standard deviation = 15). In terms of assessing the probability that an individual has ASD, an Autism Quotient score of between 90 to 110 means an 'average' probability of ASD, a score below 89 means that there is a 'below average' probability of ASD, and a score below 79 means that there is a 'low' probability that the individual has ASD (Gilliam, 1995). The scale is appropriate for persons aged 3 to 22 years old, and is completed by parents or professionals in about 10 minutes. Its internal reliability (Cronbach's alpha) is 0.96, and it has high criterion validity with the Autism Behavior Checklist (0.94).

Psycho-Educational Profile – Revised: The PEP-R (Schopler, Reichler, Bashford, Lansing, & Marcus, 1990) is a developmental test designed for assessing both the typical strengths and characteristic weaknesses of children with ASD. The test measures functioning in seven developmental domains: Imitation, Perception, Fine Motor Skills, Gross Motor Skills, Eye-Hand Coordination, Nonverbal Conceptual Ability, and Verbal Conceptual Ability. The mental age required to perform these tests ranges from 1 to 72 months. The PEP-R also gives an overall developmental functioning score, that can be converted into an overall score (e.g., [mental age/chronological age] x 100). The internal reliability of the PEP-R for children with ASD ranges from 0.85 (Perception) to 0.98 (Cognitive Verbal Performance), and it has high criterion validity with some other tests for intelligence, such as the Merrill Palmer Scale of Mental tests (0.85). The PEP-R was used as its low floor and high ceiling made it appropriate to administer to the current sample both at baseline and at follow-up.

British Abilities Scale: The BAS II (Elliott, Smith, & McCulloch, 1996) is a battery of tests of cognitive abilities, which index educational achievement. It is suitable for use with children and adolescents from 2:6 to 17:11 years old. For the current purposes, the Early Years Battery was employed, which is designed for children under the age of 6 years. The present use of the test concerned educational achievement, so the Verbal Comprehension, Early Number Concepts, Picture Matching, and Naming Vocabulary sub-scales were used.

These sub-scales allow the calculation of a General Cognitive Ability scale (mean = 100, standard deviation = 15), which represents early educational achievement.

Vineland Adaptive Behavior Scale: The VABS (Sparrow, Balla, & Cicchetti, 1990) is a semi-structured interview, administered to a parent, or other caregiver, of the child. It can be used from birth to 5:11 years, making it suitable for the present cohort. The VABS assesses children's day-to-day adaptive functioning. Scores from four domains of adaptive behavior were used in the present study (Communication, Daily Living Skills, Socialization, and Motor Skills). The raw scores can be converted to standard scores, and a Composite Overall score can be derived, based on the sum of the sub-scale standard scores (mean = 100; standard deviation = 15). The internal reliability of the Overall Composite score is 0.93.

INTERVENTIONS

The setting for the interventions ranged across many different provisions in the south east of England, that is, not all of the children attended the same classroom setting. The teachers or tutors delivering the interventions were asked to complete a questionnaire concerning the nature of the intervention that the child was receiving. The teachers or tutors were asked to complete these forms at the start of the intervention (at baseline) and then, again, after nine to ten months (at follow-up). These questionnaires were completed at the same times as both the baseline, and the follow-up, child assessments were made. Finally, the parents were also asked to complete a questionnaire regarding the characteristics of the programs that their children had experienced. From all of these questionnaires, the overall nature of the interventions received by the children could be documented (see Table 1).

Table 1: Description of interventions

	Min	Max	Mean (SD)
Intervention Hrs/Wk	2	40	15.6 (9.2)
1:1 Hrs/Wk	0	38	11.1 (9.5)
Group Hrs/Wk	0	22	4.9 (5.9)

Intervention Type	N (%)	Total	N (%)
Reinforcement	49 (75%)	1	21 (32%)
Nursery Placement	36 (55%)	2	27 (42%)
Speech & Language	31 (48%)	3	16 (25%)
Parent Education	11 (17%)	4	1 (1%)

Table 1 displays the descriptive statistics for the interventions received by the children, focusing on the number of hours per week delivered by the intervention, broken down by hours provided in a 1:1 situation, or in a group setting. The bottom panel of Table1 shows the percentage of children receiving each of four broad types of teaching intervention (i.e., reinforcement-based, special nursery, speech and language therapy, and parent education programs), and the frequencies of children receiving one, or more, of these types of intervention.

These approaches were Local Education Authority responses to provision for children with ASD, and most programs could be termed 'eclectic' interventions (for 51/65 children), in that they did not adhere to one particular form, or 'brand name', of intervention (often being the Local Education Authorities' own tailored approaches), and these approaches differed from authority to authority. Inspection of the bottom right panel of Table 1 shows that nearly 80% of children received at least two forms of teaching intervention.

The mean number of hours per week that the teaching interventions were given for was 16. Most of the children (75%) received an intervention that had a main focus of 1:1 teaching (mean 11 hours per week) that was delivered by teachers, tutors, and/or parents. Many children (55%) received teaching in small groups (mean 5 hours per week), delivered by a teacher, tutor, and/or parents. However, most children (74%) received a mixture of both 1:1 and small group work, albeit in different proportions to one another.

This variation in therapeutic approaches reflects the general 'eclectic' experience of the population being studied. This study was focused on the types of intervention that typically occur for children with ASD in order to increase its external validity, and, therefore, these interventions had a highly 'eclectic' nature. Nevertheless, the interventions described could be characterized by several common features which are described below. Table 2 shows the range of, and mean, hours for each of the four broad types of intervention received by this sample. That is, of those who received the form of teaching noted, these data describe the typical levels of input. However, it must be emphasized that, given the 'eclectic' nature of the provision, any particular individual may have received more than one of these types of teaching intervention.

Table 2: Description of the temporal inputs (hours per week) of the four broad types of teaching interventions

	Min	Max	Mean	(SD)
Reinforcement	1	35	13.5	10.7
Nursery Placement	1	23	8.1	5.5
Speech & Language	1	3	1.2	0.7
Parent Training	1	10	4.2	2.3

Reinforcement-Based Interventions: These programs all shared several key features. Most were home-based, and offered almost exclusively 1:1 teaching for the child with ASD, and the intensity (hours per week) of the interventions were typically quite high (see Table 2). Sessions would vary in length from about 30 minutes to three hours, and would comprise anything from one to 14 tasks per session, (depending upon the particular needs of the child). These tasks would last typically about 5 – 10 minutes each, and would be repeated until some criterion performance was reached. Each task would be separated by a 5 – 10 minute break, or down-time. The programs used an antecedent (question/task), behavior (response), sometimes prompted, if necessary, and a consequence, procedure, as outlined in the various manuals. Reinforcement was usually a tangible, such as food, but could also be praise and activities, depending on what was effective with the individual child. No aversive stimuli were used in any of the programs. All of these programs were overseen by appropriately trained supervisors, or teachers, and the interventions were conducted by appropriately trained tutors, or parents, in accordance with the appropriate intervention manuals associated with the approach offered.

Nursery Placements: Each of the classes in the nursery provisions were relatively small, with about 6 to 8 children in each class. All curricula and practices had been approved by Ofsted reports (U.K. Government inspection reports that are given regularly to all schools). Each class was under the supervision of a teacher with postgraduate qualifications in teaching, and specialist training in Special Educational Needs. In addition to the teacher, each class had two or three learning support assistants, who would help to work with the children in small groups. Thus, most of the teaching was conducted in small groups, rather than individually (about four times as much group work as individual work).

The children attended the nursery for a number of 2 to 3 hour sessions per week, depending on the severity of the child's ASD (see Table 2 for the range of time-inputs). Typically, a session would start, and end, with children in a group, with the teacher at the

front. The teacher usually guided a song, or other introduction, and the children were encouraged to turn-take in answering their names, or responding, often involving doing an individual activity (e.g., picking up a name card, shaking an instrument, etc.), whilst the others were encouraged to respond, and comment. A key feature was the use of materials and methods appealing to children with ASD, such as brightly colored visual materials, glitter, water, paint, sand, or musical instruments. During all of this time, the adults encouraged, and prompted, social interaction, turn-taking, shared-attention, and commenting from the children. Much of the school environment, and many of the tasks given to the children, were presented in a highly structured manner, as outlined by the TEACCH methodology.

Speech and Language Therapy: This intervention was, of course, different across provision in public schools, and from private therapists, although many programmes have the same basic components. The therapy was usually delivered in the home, or a special class in the school. The children were usually in small groups (2 to 3), of similar age, and autistic severity, and the session would last from 30 to 60 minutes, once a week, or a fortnight. Where possible, the children were encouraged to have a few minutes of conversation, to loosen up their speech muscles, and promote social interaction. The rest of the session was spent performing an activity, such as playing a game, crafts, drawing, or singing. These activities focused on improving the children's communication skills, using several techniques, which were tailored to each individual's problem areas. The children sometimes used mirrors to look into their mouths as they practiced sounds, to ensure that their tongue, teeth, and lips, were used appropriately for speech sounds. A child's speech was sometimes recorded, and played back, so that the child could hear what he, or she, was saying.

At the end of the session, the children were usually given a reward for good behaviour. This could be a sticker, a pencil, or a small toy. They were also given worksheets to complete at home with their parents. The worksheets usually involved verbal interaction, through games and colouring activities. Parental involvement, and reinforcement, played an integral part in a child's progress.

Parent Education: Parent education was either provided by Local Education Authorities, or voluntary organizations, such as The National Autistic Society (NAS). Most programs initially attempted to educate parents about the characteristics of a child with ASD, and then attempted to provide the parents with skills in order to help them manage their child's behaviors. For example, the EarlyBird Program, provided by the NAS, is a three-month program, which combines group training sessions for parents, with individual home visits, when video feedback is used to help parents apply what they have learned, whilst working with their child. In this program, parents have a weekly commitment to a 2 hour training session, or a home visit, and to ongoing work with their child at home during a three-month program. Such a model was similar to many Local Education Authority approaches, and those offered by several ABA-type programs, whose main focus was, typically, on developing behavior management skills in parents.

PROCEDURE

The children were identified by the Local Education Authorities, their parents were contacted by the researchers, and, on choosing to participate, parental consent was received. All of the tests described above for autistic severity (GARS), intellectual functioning (PEP-R), educational functioning (BAS), and adaptive behavioral and social functioning (VABS) were administered to all of the children at baseline and then, again, at follow-up, after a nine to ten month period.

The children were visited by an Educational Psychologist, who was blind to the nature of the intervention, and the baseline child measures were taken (GARS, PEP-R, BAS, and VABS). Parents were contacted, at this

time, and asked to give some background regarding their child, as well as a brief history of their child's provision, which they did independently from the researchers. The questionnaires were sent out by mail to the parents, along with an information letter, and a pre-paid, addressed return envelope. The information letter provided contact details, offering parents the opportunity to seek help and guidance, if required, regarding the completion of the questionnaires, however, it was extremely rare that any parents contacted the researchers in order to ask advice about answering specific questions. On completion, the parents used the pre-paid envelope to return the questionnaires to the researchers. As an added incentive for returning this information, the parents were automatically entered into a prize draw, the winner of which received £50 for toys or books for their child. This incentive was specified in the information letter. If parents had not returned the questionnaires after a period of time, they were contacted by a researcher, via telephone, and reminded, and given the opportunity to return the completed questionnaires.

After nine to ten months, the follow-up child measures were taken by the same Educational Psychologist. All parents, and the teachers and tutors delivering the interventions, were asked to complete separate questionnaires concerning the nature of the interventions, and to return them by mail, as described above.

RESULTS

The change scores over the nine to ten month period, for the three child outcome variables, were calculated (follow-up score minus baseline score). These mean (standard deviation) change scores were: 8.1 (+ 14.3) for intellectual functioning (PEP-R), 8.7 (+ 10.8) for educational functioning (BAS), and 1.1 (+ 5.7) for adaptive behavioral functioning.

For each child, the number of hours in each of the four types of teaching intervention that were given per week, was used as a predictor of the change in each of the three outcome measures: intellectual functioning (PEP-R), educational functioning (BAS), and adaptive behavioral functioning (VABS). Semi-partial correlations were performed to assess the relationship between the amount of each of the four types of teaching intervention received, and the amount of change in the three outcome measures. This procedure was used in preference to examining the standardized beta coefficients from a multiple regression to avoid any potential problems that may arise from relationships existing between the predictor variables. In these circumstances, standardized beta coefficients are not an appropriate estimate of the individual contribution of predictor variables (Darlington, 1990; Howell, 1997). Moreover, semi-partial correlations are a more conservative, and cautious, estimate of the relationship than are partial correlations, and are to be preferred for this reason (Tabachnick & Fidell, 1989).

Inspection of Table 3 shows that the number of hours of reinforcement-based intervention was a significant independent predictor of gain in each of the three child outcomes. The number

Table 3: Semi-partial correlations between the number of hours of each type of teaching intervention received by the children and the gains made in the three outcome measures: intellectual functioning (PEP-R), educational functioning (BAS), and adaptive behavioral functioning (VABS)

	PEP-R	BAS	VABS
Reinforcement Hours	0.345**	0.374**	0.276*
Special Nursery Hours	0.276*	0.218	0.430***
Speech and Language Hours	0.045	0.075	- 0.007
Parent Education Hours	0.115	0.128	0.267*

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

of hours of special nursery provision per week predicted gains in intellectual functioning, and in adaptive behavioral functioning, and the extent of parent education predicted gains in adaptive behavioral gains. However, it should be noted that given the number of comparisons being made in these analyses, caution should be used in interpreting any statistical significance at a level less than $p < 0.01$.

DISCUSSION

The current report attempted to determine the individual impact of various components of an 'eclectic' teaching intervention on gains made by the children receiving this intervention. As a small number of reports have noted that such 'eclectic' interventions can produce gains for children with ASD (see Osborne et al., 2008), albeit mostly smaller than those gains noted for ABA interventions (see Reed et al., 2007), it was thought important to be able to determine which components of these 'eclectic' interventions are most effective.

The results obtained showed that a variety of the components of such an 'eclectic' intervention can be effective, but to different degrees, and on different aspects of the children's functioning and behaviors. It is clear that the number of hours of reinforcement-based intervention significantly predicted gain in both intellectual functioning and educational functioning, and the special nursery predicted gains in adaptive behavioral functioning. Although there were other relationships that were statistically significant, they may be treated with some caution due to the number of comparisons being employed.

Thus, it appears that for intellectual and educational improvements, it was the reinforcement-based intervention hours that independently predicted child gains. This would seem to corroborate the many reports of the effectiveness and superiority of ABA approaches in these domains (e.g., Lovaas, 1987; Reed et al., 2007). However, certainly for these particular children, the reinforcement-based approach did not impact on adaptive behavioral functioning (which includes social-communication skills) as strongly as special nursery input. This is a finding previously noted by Reed et al. (2007). It may be that the group-based teaching involved in special nursery played some role in this strong association. This is not to claim that ABA or reinforcement-based approaches could not offer such an advantage if children were more typically taught in social settings, as occurs in many ABA-schools, but that in this sample this was not noted. The current sample is reasonably typically of the approaches found in the U.K., and there is no reason to assume these children differ significantly in this respect from the population. Of course, studying intervention intensity through quantity, as measured by time input, does not reflect all of the possible aspects of an intervention (e.g., quality). However, although some have criticized the use of time intensity as a measure (National Research Council, 2001), often no alternative metrics are suggested. In fact, there are very few measures of intensity of an intervention, other than time (but see Keohane, 1997), and few of these can easily be applied in a community setting. Moreover, time input has been the subject of several recent reports (e.g., Eldevik et al., 2006; Reed et al., 2007), so this metric (albeit not all encompassing) was used in the current study. In summary, the present results suggest that even within 'eclectic' approaches, the impact of reinforcement-based approaches should not be underestimated. While it it is possible that other forms of intervention have benefits to offer, especially in the areas of social-communication and adaptive behavioral functioning, far greater research into the effective components of eclectic approaches is needed prior to endorsement of any of these strategies as being effective over and above ABA approaches.

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Social, Language, and Play Behaviors of Children with Autism

Ling-Ling Tsao

Children with autism appear to lack social motivation, social understanding, and flexibility, and limit use of functional language, all of which are required for the development of play. Although several theoretical deficit hypotheses exist, none has been strongly supported by empirical work. This article aims to summarize the current literature as it relates to the social, language, and play behaviors of children with autism and to provide an overview of currently available interventions reflecting the variety of objectives. In addition, some common trends among those interventions are discussed.

Introduction

Learning is a key function in life; children learn through play. Many theorists have studied the origins of play and tried to explain how it facilitates human development (Saracho & Spodek, 1995). For example, Jean Piaget considered play as a major tool for facilitating or supports children's mental development. Piaget believed that the type of play in which children engage requires a particular level of cognitive sophistication, and that is the reason why each different type of play is found at a specific stage of developmental milestones. Play also has been regarded as an important strategy for educators to facilitate children's development in cognitive, social/emotional, motor, and language areas (Bodrova & Leong, 1996). Because of the benefits of play in typical development, a growing interest in the area of autism and play is emerging (Thomas & Smith, 2004).

Children with autism have very different play behavior. Much research has found that children with autism demonstrated significantly less play in the symbolic category (e.g., DeMyer, 1967; Wing, Gould, Yeates, & Brierley, 1977; Ungerer & Sigman, 1981). They did not use toys in a creative and complex manner; instead, their play was repetitive and stereotyped and lacked the innovation typically found in normal symbolic play. Therefore, it is a commonly held belief that play skills of children with autism are impaired (Jarrold, 1997; Lewis, 2003).

Today, the feature of autism has been conceptualized in a triad of symptoms (i.e., socialization, communication, and imagination) which is also reflected in the formal diagnostic criteria for the condition (Jarrold, 2003). The essential features of autistic disorder in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR; American Psychiatric Association, 2000) include (a) impairment in social interaction manifested by impairment in the use of nonverbal behaviors, failure to develop peer relationships; lack of spontaneous sharing, and/or lack of social/emotional reciprocity; (b) impairments in communication, manifested by delay in or lack of the development of spoken language, impairments in the ability to initiate or sustain a conversation, repetitive and idiosyncratic use of language, and/or lack of make believe play or social imitative play; and (c) restricted repetitive and stereotyped patterns of behavior, interests, and activities, manifested in preoccupation with restricted patterns of interests, inflexible adherence to routines, and/or persistent preoccupation with parts of objects.

It is believed that children with autism appear to lack social motivation, social understanding, and flexibility as well as limiting the use of functional language, all which are required for the development of play (Thomas & Smith, 2004). Although several theories of deficit hypotheses (e.g., meta-representational

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impairment, social impairment, central executive impairments or some other combinations) have been offered to explain the challenges in the social, language, and play behaviors of children with autism, none is finalized or confirmed (see Jarrold, Boucher, & Smith, 1993 for a review). Therefore, the aim of this article is to summarize current understanding of the impact of autism on the social, language, and play behaviors of children, to review the current intervention practices addressing the challenges in play and social interactions of children with autism, and to outline the common trends among effective interventions.

Social, Language, and Play Behaviors

From infancy, humans are social beings. They gaze at people, turn toward voices, grasp a finger, and even smile. In contrast, young children with autism have difficulty learning to engage in everyday interactions with adults or other children. These problems are first seen in the absence of joint attention (Charman, 2003). Joint attention is the coordination of attention between people and objects, and in normal development it begins to emerge between 6 and 18 months of age (Adamson & Bakeman, 1991; Butterworth & Jarrett, 1991; Carpenter, Nagell, & Tomasello, 1998). Within the context of joint attention episodes, young children begin to communicate intention by using sounds and gestures and pointing and vocalizing to direct attention to objects. Joint attention not only correlates with early social communication learning but also with later language ability in typically developing children (Carpenter, Nagell, & Tomasello, 1998; Leekam, Lopez, & Moore, 2000; Mundy, Sigman, & Kasari, 1994; Whalen & Schreibman, 2003). Its function is both social, reflecting the infant's motivation to interact with adults about interesting objects, and communicative, namely for requesting (Jones & Carr, 2004).

Children with autism are limited in their abilities to share attention with other individuals for any purpose other than to obtain something they want; those who fail to share attention also have difficulty in their social interactions (Sigman & Kasari, 1995). In a home videotape study of first birthday parties of young children later diagnosed with autism, mental retardation, or typical development, Osterling, Dawson, and Munson (2002) found one year old infants who later were diagnosed with autism could be distinguished from 1-year-olds with typical development and those who later were diagnosed with mental retardation by demonstrating specific social communicative behaviors, such as less joint attention and looking at people, and orienting to their names less frequently. Another influential and oft-cited study by Mundy, Sigman, Ungerer, and Sherman (1986) compared children with autism to their developmentally matched peers both with mental retardation and typical development. In this study, children with autism engaged significantly less in eye contact to share enjoyment with the examiner during toy play. They were also less likely to respond to complex social interactions, such as requesting to take turns or following directions. Additionally, Robins, Fein, Barton, and Green (2001) found joint attention, social relatedness, and communication as the behaviors that most discriminated young children with autism or pervasive developmental disorders from other children in their study. Mundy, Sigman, and Kasari (1990) examined the relationship between joint attention and later language development and found children with autism displayed a deficit in nonverbal joint attention skills, and the gestural joint attention appeared to be more predictive for autistic children's development of language 13 months later. Children with autism who show some joint attention early in life develop language skills that are superior to children with autism who do not develop joint attention (Sigman & Kasari, 1995). Indeed, a relationship has been identified between impairment in joint attention and language development on children with autism (Dawson, Toth, Abbott, Osterling, Munson, Estes, & Liaws, 2004;

Mundy, et al., 1990; Wetherby, Prizant, & Hutchinson, 1998).

In a word, joint attention is theoretically related to two core areas of disturbance in autism: social and language development (Bakeman & Adamson, 1984; Moore & Dunham, 1995; Mundy, 1995). Because children engaged in social and language exchange do so within the context of joint attention interactions (Jones & Carr, 2004), these types of exchanges (which involve joint attention, eye gaze, nonverbal communication, and positive affect sharing) fail to develop in children with autism as they do in typical child development (Carpenter & Tomasello, 2000; Moore, Hobson, & Lee, 1997). As a result, the importance of joint attention in typically developing children and the lack in children with autism has interested researchers for use in diagnosis and intervention for autism (Bruinsma, Koegel, & Koegel, 2004).

Further, one deficit in symbolic capacity among children with autism is the limited development of symbolic or pretend play skills (Baron-Cohen, 1987; Wing, et al., 1977; Wulff, 1985). Some children are attracted to repetitively playing with the same objects or doing the same activities. Other children rarely produce pretend play, such as activating dolls as agents or inventing imaginary objects or roles (Wolfberg, 1999). Without specific guidance, they are less likely to engage in appropriate play with objects or peers. Jarrold (2003) concluded children with autism "tend" not to engage in pretend play and are less likely to do so. Children with autism may have an understanding and capacity to pretend but fail to show it spontaneously; they could "produce something that looks like pretend play under certain circumstances, but have difficulty in the fluent, flexible, and creative production of pretend play" (Jarrold, 2003, p. 384). Although current theories try to address the roots of the deficits and common causal factors, again, little is clearly known whether these problems reflect a basic inability to pretend or some other unknown factors potentially affects the ease with which pretend play can be generated (Jarrold, 2003, p. 384). Therefore, interventions that focus on teaching play skills or using play as a meaningful context for social and language interventions could become an important and necessary part of an overall intervention program (e.g., Carter, 2001; Zercher, Hunt, Schuler, & Webster, 2001).

Joint attention, communication, initiating and responding have emerged as areas in which children with autism are likely to lag behind typically developing children. Providing early intervention is crucial to maximizing outcomes for young children with autism because evidence indicates that the earlier an intervention can begin, the better the outcomes may be (Woods & Wetherby, 2003). Early interventions designed for children with autism vary greatly in the specific approaches advocated. Despite this diversity in practice, most interventions focus on socialization, communication, and imagination as targets for children with autism ((McConnell, 2002; Wetherby, et al., 1998).

Interventions

Although the intervention goals vary by study, the core concepts being addressed are clear. Social, language, and symbolic play skills are the most common targets of early intervention programs for children with autism (National Research Council, 2001). For example, the associations between joint attention and language and social development suggest that decreasing the deficit in joint attention would result in positive changes in these other two areas as well (Mundy & Crowson, 1997). Some interventions have been designed to enhance joint attention by examining how different social or play contexts might influence joint attention in children with autism; others have included procedures, such as social skills training that could indirectly strengthen joint attention (Jones & Carr, 2004).

Likewise, research has identified a number of core deficits of social communication as targets for early intervention in young children with autism (Murdock, Cost, & Tieso, 2007). Indeed, social communication skills are associated with not only verbal and/or

nonverbal repertoires but also many overarching aspects of socialization. As stated previously, there is great variability in the extent to which interventions address core characteristics of children with autism.

Interventions used to teach communication/language skills. A wide range of different approaches in communication/language interventions for children with autism has been designed and studied. Three major types of interventions designed to promote communication skills of children with autism include functional communication training to replace problem behavior, increases in the initiation of verbal and nonverbal communication, and increases in the core social and communication skills (Woods & Wetherby, 2003). One of the earliest interventions for children with autism to share their vocal qualities and other aspects of language was discrete trial training (e.g., Lovaas, 1977), a behavior modification technique. Discrete trial training (DTT) involves breaking a skill into discrete components and using mass trials to practice until the skill is mastered. Research has demonstrated the effectiveness for behavioral approaches using naturalistic teaching strategies to promote communication abilities for children with autism. These strategies involve incidental teaching (e.g., McGee, Morrier, & Daly, 1999), scripting conversation and fading scripts (e.g., Krantz & McClannahan, 1993, 1998), choice making (e.g., Carter, 2001), and pivotal response training (e.g., Koegel, 1995; Koegel, Camarata, Koegel, Ben-Tall, & Smith, 1998).

For example, Krantz and McClannahan (1993) used scripts to facilitate social initiations of four children with autism. They taught children scripted interactions that included 10 statements and questions in which children with autism addressed the other children by name and asked, “Would you like some candy or chips?” Children with autism were given manual guidance to read these sentences from cards and then the guidance was faded gradually. Three out of four children with autism increased social interactions with peers and generalized the skills to a different setting, time, teacher, and activity. In a subsequent study, Krantz and McClannahan (1998) extended script fading procedures to three preschool boys with minimal reading skills by embedding social scripts in their photographic activity schedules. After learning to use the scripts, children with autism increased their verbal elaboration and unscripted interactions.

Interventions used to teach social skills. For children with autism, a variety of social interaction interventions and strategies have been found to be effective in increasing social interactions either with adults or with other children. For example, social goals identified in interactions with adults may focus on joint attention, turn taking, imitation, responding by gaze to adult initiations, and initiating social interactions with adults (e.g., Whalen & Schreibman, 2003). Effective social interaction with peers is another dimension of children’s social development. Therefore, appropriate initiations and responses, cooperative/pro-social behaviors, maintenance in verbal communication, and facility in play are usually targeted as goals of peer-related social interventions (e.g., Odom & Ogawa, 1992). Key features of effective interventions have been described in the literature (see Stichter, Randolph, Gage, & Schmidt, 2007 for details); generally speaking, successful strategies for intervention include peer mediated interventions (Rogers 2000), teaching skills within children’s natural context and environments (National Research Council, 2001), and play related activities (Vaughn, Kim, Morris, Sloan, Hughes, Elbaum, & Sridhar, 2003).

For instance, Goldstein, Kaczmarek, Pennington, and Shafer (1992) taught peers to use three classes of behaviors (i.e., comments, acknowledgment, and attention) instead of requests, questions, and suggestions for sharing and playing with children with autism. The technique improved social interactions between children with autism and their typically

developing peers who were successfully taught to facilitate social interactions. This study also opened a door for peer-mediated social interventions for researchers to consider various forms of communication patterns between children with and without disabilities.

Interventions used to teach play skills. Several techniques have been established to increase and improve play skills in children with autism ranging from highly structured to more naturalistic strategies. The most well known and well researched behavioral technique using direct instruction of play behavior is the discrete trial training approach; its efficacy has been demonstrated for teaching many types of play from simple object manipulation (e.g., Nuzzolo-Gomez, Leonard, Ortiz, Rivera, & Greer, 2002) to complex play themes (e.g., Lifter, Sulzer-Azaroff, Anderson, & Cowdery, 1993).

For example, Goldstein and Cisar (1992) taught three socio-dramatic scripts to preschool children with autism and their two typically developing peers while also observing the effect on social communication behaviors. The three scripts in the Goldstein and Cisar (1992) study included pet shop, magic show, and carnival with appropriate materials available in the play area. Each script specified an individual role for each child and corresponding behaviors for social interactions. As children learned and followed the scripts, their social interactions also increased.

To summarize, the element of effective strategies for prompting social, language, and play skills of children with autism is to incorporate social, language, or communication skill training in play contexts involving typically developing peers within highly structured interactions, and using specific teaching methods originally grounded in behavioral approaches (e.g., pivotal response training) in natural environments. Moreover, the most important effects in those research studies indicate a functional relationship between social, language or communication, and play. Social interactions targeted as an intervention goal can also serve a training function in other seemingly different skills such as social play. Children with autism, by definition, demonstrate impairments in relationships to peers by low rates of both initiation and response; this is most marked in interactions for the purpose of sharing experiences and establishing joint attention. On the other hand, language and/or communication might be a necessary prerequisite for building peer interactions. Between social and language communication, play could serve as a bridge and a means to promote effective interventions for children with autism.

Common Trends

Interestingly, many effective interventions have taken a behavioral approach in that they are highly structured and emphasize the function of reinforcement in shaping behavior and also employ a developmental approach in teaching procedures (Luckett, Bundy, & Roberts, 2007). For example, Stahmer (1995) and Thorp, Stahmer, and Schreibman (1995) used the activity or materials themselves as reinforcement rather than developing/using extrinsic reinforcement. Another common trend surrounding treatment of children with autism is the transactional implementation. Researchers have raised questions such as: does a child need to learn to play in order to socialize or to socialize in order to play (e.g., Wolfberg, 1999; Jordan, 2003)? Therefore, instead of searching for a “chicken or egg” answer, interventions should aim to collectively target many areas of impairment in a natural child-centered environment in order to develop an empirically supported relationship among different domains based on the perspective of interdependency and interconnectedness between major areas of impairment in autism such as language, social, and play (Prizant, Wetherby, & Rydell, 2000).

Involving typically developing peers in natural settings. Peer-mediated intervention procedures provide social skills training and

other manipulations (typically prompts and praise in social play situations) to children which are designed to improve social interactions and skills for young children with autism (McConnell, 2002). Peer-mediated social interventions have been proven as effective approaches for children with autism (Goldstein, et al., 1992; Harrower & Dunlap, 2001; Peck & Sasso, 1997). Generally speaking, classroom teachers often select one or more socially competent peers to be a "buddy" of children with disabilities, including autism. Some simple behavioral strategies, such as asking a child to play, sharing a toy, or suggesting play activities are systematically taught to socially competent peers in separate training settings (English, Goldstein, Shafer, & Kaczmarek, 1997; Kohler & Strain, 1999; Odom & Brown, 1993; Odom & Strain, 1986; Utley, Mortweet, & Greenwood, 1997). Peers are also taught to be persistent in order to obtain a response to the initiation that they make. After the training sessions, one or more trained peers are paired with the child with a disability in various classroom activities. In classroom settings the peers are encouraged by adults to model, reinforce, and/or prompt appropriate social behaviors for the children with disabilities (Goldstein et al., 1992; Strain & Odom, 1986). For example, Goldstein, et al. (1992) used an adapted peer-mediated intervention for children with autism, resulting in improved social/play interactions between children with autism and their typically developing peers. Using typically developing children as behavioral change agents benefits not only on the social and play skills of child with autism but also their peers by encouraging social situations and teaching them to play with children with autism (Terpstra, Higgins, & Pierce, 2002). Among six types of interventions that should have priority for teaching children with autism are: social interaction which should be delivered throughout the day in various settings (natural environments), functional communication that should be the primary focus of early education, and play skills teachings that indeed should focus on play with peers have been recommended by National Research Council (2001).

Transactional implementation with behavioral techniques. This set of interventions includes treatments for children with ASD that lead them to display increases in social interaction as a function of training in seemingly different skills. Researchers have designed interventions to promote social skills by training play-related skills, such as increasing imitative play, socio-dramatic play, scripts and social stories (Beyer & Gammeltoft, 2000). Attempts to promote positive and appropriate play behaviors by children with ASD have involved the use of specific instructions, such as social scripts in socio-dramatic play interventions.

For example, the scripts are not only used in teaching socio-dramatic play skills for children with autism (e.g., Goldstein & Cisar, 1992), but are also applied to enhance the abilities of children with autism to socially interact with their peers. Using scripts to teach play and social skills can be an effective method whether the script is trained through adult prompting or written out for the child to follow (Terpstra et al., 2002).

Extensive literature has accumulated to demonstrate the success of using naturalistic and motivational procedures, namely pivotal response training (Vismara & Lyons, 2007). Pivotal response training (PRT) was developed to increase motivation in children with autism (Koegel, O'Dell, & Koegel, 1987). The pivotal behavior is one that is central to many areas of functioning (e.g., communication or social interaction). Positively affecting the pivotal behavior produces positive effects for other behaviors (Terpstra et al., 2002). For example, Stahmer (1995) assessed the feasibility of using PRT to teach symbolic play to seven children with autism and examined the changes in interaction skills after the training. Children with autism engaged in complex and creative symbolic play actions after specific symbolic play training using PRT, and their social

interaction skills also improved. In another study conducted by Pierce and Schreibman (1995), two 10-year-old children with autism were taught to engage in a variety of complex social behaviors using peer mediated PRT. After the intervention, researchers found children with autism maintained extended interactions with typically developing peers, initiated play and conversations, and increased engagement in language and joint attention behaviors. Thus, even without a direct teaching joint attention, one benefit of social skills intervention may be to increase joint attention which has further positive effects on social functioning. In sum, PRT focuses on increasing motivation to learn among children with ASD by incorporating choices, reinforcing goal-directed attempts, using appropriate multiple exemplars, and providing natural consequences (Koegel et al., 1987). It also has been used as a strategy for increasing language (e.g., word use), conversational and play initiations, and percentage of time children with autism spend engaged in positive social interactions (Pierce & Schreibman, 1995, 1997; Thorp et al., 1995).
Discussion

It is well established that the social, language, and play behaviors of children with autism are impaired (Lewis, 2003). Little is clearly known as to whether these difficulties reflect a basic inability to interact socially or play with peers or if the impairments potentially affect the ease with which those behaviors would normally be generated (e.g., Jarrold, 2003). Nevertheless, naturalistic behavioral interventions have been designed to address the limitations of the traditional behavioral approach by incorporating behavioral techniques known to facilitate learning with techniques used for improving early social communicative behavior in typically developing children (Ingersoll & Schreibman, 2006).

In any case, teaching children with autism to play has proven beneficial (Luckett et al., 2007). First and most important in the literature, play is regarded as increasing developmental potential and providing a medium for development of other skills, most relating to social interaction and communication. Research has provided evidence that play provides a base for building language in typical child development. Play (Caplan & Caplan, 1973). McCune–Nicolich and Bruskin (1982) suggest that language and play share joint functions by age 2. When children pretend play, they are involved in the communicative function of sharing objects with others. Children's ability to communicate about important aspects of pretend play is also related to their language development (Brown, Prescott, Richards, & Paterson, 1997; McKimmey, 1993). It has been argued that symbolic play and language share a common cognitive base because of the manifestations of mental representation or the ability to use symbols to stand for something else (Clift, Stagnitti, & DeMello, 1998; Fischer & Corrigan, 1981). Different kinds of play require different levels of cognitive sophistication, thus the reason that each different type of play is found at a specific stage of cognitive development (Diamond & Hestenes, 1997). Similarly, children's various play behaviors reflect differences in social acceptance. Within a play context, children can practice language, interpret the social communicative bids of others and ultimately gain social language skills through the interventions (Sigman & McGovern, 2005).

Play is clearly an important part of childhood. When children lack normal play skills, they can suffer developmentally in many ways. Teaching social play from early dyadic interactions to symbolic play offers an opportunity to prevent or ameliorate many secondary consequences of autism (Jordan, 2003). Therefore, play should be regarded as a serious intervention goal/outcome as well as a means of intervention for children with autism (Boucher & Wolfberg, 2003; National Research Council, 2001). Improving the play skills of children with autism, whether for social or non-social play would give them a sense of mastery and increase their pleasure and motivation to play

and these are justifiable goals in themselves (Boucher, 1999). Play is the means of interventions for children with autism because of its normality in child development. Moreover, play should be the intervention goal for children with autism because of its unique triangularity with social, language, and communication development.

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