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Embedding Sensory Preferences into Toys to Enhance Toy Play in Toddlers with Disabilities

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EMBEDDING SENSORY PREFERENCES INTO TOYS TO ENHANCE TOY PLAY IN TODDLERS WITH DISABILITIES

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ABSTRACT

Playing with toys as a means of environmental engagement has long been considered important in early child development (Messer, Rachford, McCarthy, & Yarrow, 1987; Wolery & Werts, 1994). However, children with highly significant disabilities often engage in toy play less frequently than their peers without disabilities (Blasco, Bailey, & Burchinal, 1993; Langley, 1985) and frequently need specialized support to promote toy play (Ivory & McCollum, 1999; Langley, 1985). Preference assessment technology was used to identify preferred sensory attributes. Those sensory attributes were embedded into a toy previously identified as nonpreferred based on selection and amount of toy play. Differences were noted in caregiver opinion of sensory preference when compared to a sensory attribute preference assessment. The initial paired-item presentation consisted of a rotation of 4 toys from the natural environment using a child-directed approach, which consisted of choice, prompting, and praise for completion of functional toy play. An additional condition added the child's preferred sensory attribute to a nonpreferred toy using the above-mentioned procedures. Results indicated that the addition of a preferred sensory attribute increased selection of that toy with 2 of 3 children, and resulted in increased independent functional toy play for all 3 children.

Chapter I

INTRODUCTION

Statement of Problem

A major focus in early intervention is providing supports and services for young children with disabilities. One specific area of concern about young children who have disabilities relates to toy play behavior. Playing with toys as a means of environmental engagement has long been considered important in early child development (Messer, Rachford, McCarthy, & Yarrow, 1987; Wolery, Werts, & Holcombe, 1994). However, children with highly significant disabilities often engage in toy play less frequently than their peers without disabilities (Blasco, Bailey, & Burchinal, 1993; Langley, 1985) and frequently need specialized support to promote toy play (Ivory & McCollum, 1999; Langley, 1985). In consideration of these and related issues, there have been repeated calls for research to identify specific means of increasing toy play among young children with disabilities (Blasco, et al., 1993, Reid, DiCarlo, Schepis, Hawkins, & Stricklin, 2003).

When considering research on methods of increasing toy play, attention is warranted to ensure that identified methods coincide with other recommended practices in early intervention and in particular, child-directed practices. Child-directed practices are based on the interests and initiations of individual children (see Haney & Cavallaro, 1996; Ivory & McCollum, 1999; and Wolery, Werts, & Holcombe, 1994, for discussions). Activities are recommended that are responsive to ongoing child behavior when possible (Wolery, Werts, & Holcombe, 1994). Adults

in the environment (e.g., parents and teachers) should follow the child's lead by prompting with materials the child has initiated toward or materials in which the child has displayed an interest. If specific methods to increase toy play are not designed in consideration of child-directed practices, the methods are not likely to be well received in settings that maintain a child-directed philosophy (Ivory & McCollum, 1999).

One potential means of increasing toy play that appears to coincide with a child-directed approach is to utilize the expanding technology for assessing, and providing choices of, preferred toys. Numerous means of assessing preferences among people with disabilities have been reported, along with multiple benefits of increasing access to preferred items and events (Hughes, Pitkin, & Lorden, 1998). Determining specific toy preferences and increasing access to preferred toys through repeated choices would seem to represent a logical extension of the preference-assessment technology to the potential enhancement of toy play among toddlers with multiple disabilities. Such an approach appears compatible with a child-directed philosophy because it takes into consideration the observed preferences or choices of individual children (cf. Hauser-Cram, Bronson, & Upshur, 1993). However, despite a considerable amount of research on how various types of toys affect child behavior, such as social versus isolate play (see Ivory & McCollum, 1999, for an overview), there has been a lack of research on assessing individual toy preferences of very young children with multiple disabilities.

Background

Use of preference assessment technology is important for a variety of reasons. One reason is that preference assessment technology has been shown to validate relevant likes and dislikes among adults and adolescents with developmental disabilities (see Hughes, et al., 1998, for a review). Young children who are toddler-aged have received little or no attention related to

assessment of preference. Increasing access to preferred items and events has proven beneficial in a number of ways, including reduction of challenging behavior (Ringdahl, Vollmer, Marcus, & Roane, 1997) and generally increasing overall life quality (Hughes et al., 1998). However, consideration must also be given to materials that address individual child objectives targeted to increase toy play. Vanderhayden, Snyder, DiCarlo, Stricklin, and Vagianos (2002) suggest that attributes of materials may influence a child's interest in materials. Relatedly, Roane, Vollmer, Ringdahl, and Marcus (1998) assessed preferences of individuals from preschool-aged through adulthood across general categories of materials, which included tactile and auditory attributes, using a free-operant assessment (providing free access to materials and recording materials chosen). Preferred materials were then used as reinforcers to shape a simple operant response. Research suggests that sensory attributes can be powerful reinforcers. In studies by Rincover (1978) and Rincover, Newsom, and Carr (1979), the authors found that the sensory feedback that maintained self-stimulatory behavior could be used as a reinforcer in the acquisition of new skills.

Many children exhibit sensory seeking behaviors. Although many young children enjoy using their senses, children identified as sensory-seeking are "driven to fulfill thresholds of sensation" and create opportunities to increase input of these sensations (Dunn, 2002, p. 45). Thus, the embedding of preferred sensory attributes into toys that address Individualized Family Service Plan (IFSP) objectives may increase the amount of time a child interacts with the toy. Increased interaction with the toy, supported by adult prompting and monitoring of self-stimulatory behaviors, may lead to increased toy play.

Importance of the Area of Research

Many early intervention and early childhood educators use naturalistic instructional approaches that embed materials necessary for facilitating desired skills within the child's environment. Playing with toys as a means of environmental engagement has long been considered important in early child development (Messer, et al., 1987; Wolery, Werts, & Holcombe, 1994).

As children engage in play with materials, they have opportunities to practice and develop skills. Typically, activities and toys that children find intrinsically motivating, or preferred, require minimal external support (Bricker, 1992). Unfortunately, some children with disabilities do not initiate and interact with materials that provide opportunity to practice targeted skills. In consideration of these and related issues, there have been repeated calls for research to identify specific means of increasing environmental engagement via toy play among young children with disabilities (Blasco, et al., 1993; Reid, et al., 2003; Wolery, Werts, & Holcombe, 1994).

Purpose of the Study

The focus of this investigation was on providing naturalistic teaching methods using materials that have been modified by including preferred sensory attributes. The adult is attentive to child interest, uses prompting, and praises correct responding. This investigation expands on the ideas set forth by naturalistic teaching approaches. Some naturalistic teaching approaches, such as activity-based instruction, promote designing environments that provide children access to developmentally appropriate materials, which can potentially elicit skill development. In addition, adult prompting strategies (e.g., naturalistic teaching) that facilitate play are utilized. In this study, naturalistic teaching strategies were used to select developmentally appropriate toys based on child-specific sensory preferences that target a skill from the child's IFSP.

Systematically examining the effects of the modified toy and naturalistic intervention strategies assisted in determining if toys that have preferred sensory attributes increased the toy play of toddlers in this study.

The potential contribution of this study was to demonstrate a means of increasing toy play among toddlers with disabilities that addresses skills identified on their IFSP, and to do so in a manner that is in accordance with a child-directed philosophy. The specific purpose was to evaluate a means of increasing functional toy play behavior among toddlers with highly significant disabilities by identifying sensory-preferred attributes and embedding those attributes within an age-appropriate toy. Functional toy play has been defined as a child using a toy in the manner the manufacturer intended it to be manipulated (Martens & Hiralall, 1997).

Research Questions

There has been a lack of research on assessing specific toy preferences of young children with disabilities and applying knowledge of preferred toys to increase toy play (Reid et al., 2003). The expanding behavioral technology of systematically assessing preferences and providing access to preferred materials is one potential means of increasing toy play that appears to coincide with a child-directed approach, which is based on the interests and initiations of individual children (Wolery, Werts, & Holcombe, 1994).

This study builds on the use of preference assessment technology by (1) assessing the sensory attributes of materials and determining each child's preferred sensory attribute, and (2) embedding preferred attributes into an age-appropriate toy to determine the effect of embedding the sensory attribute on the child's play with the toy. Sensory attributes will include auditory, tactile, and visual. These sensory categories have been identified in the *Infant/Toddler Sensory Profile* (Dunn, 2002) and have been used in previous preference assessment studies (cf.

Ringdahl, et al., 1997). The ultimate goal will be to provide a highly desirable toy that not only address the preferences of the child, but is age-appropriate. Specifically, the research questions for this study are: Does the embedding of sensory preferences into an age-appropriate toy increase 1) the selection of a targeted toy once modified; and 2) functional manipulation of the toy.

Conceptual Framework

The conceptual framework for the present study is grounded in the behavioral perspective. This perspective assumes that children are born with the capacity to learn and display skills based on their interaction with antecedents and consequences in their environment (Bailey & Wolery, 1992). Reinforcers are events in the environment that follow a behavior and make that behavior more likely to occur again in the future. Reinforcers are based on individual preferences; a reinforcer for one child will not necessarily serve as a reinforcer for another (Bailey & Wolery, 1992).

Bijou and Baer (1978) described the behavioral perspective as being an interactive model. These authors suggested the behavioral perspective assumes the child influences the environment and the environment influences the child. The child influences the environment in the ways in which he interacts with the people and materials present. The environment influences the child in that the more appealing or preferred certain characteristics of the environment are to the child, the more likely the child is to interact with people and materials present in that environment. The behavioral perspective promotes the identification and use of reinforcers to promote learning. The present study seeks to modify a toy present in the environment in an effort to make it more reinforcing to the child to encourage his interaction with that toy.

Recommended practice in early intervention advocates for the use of highly motivating materials (cf. Bricker, 1992; Wolery, Werts, & Holcombe, 1994) that may encourage approach, exploration and interaction. Adult-facilitated strategies, such as prompting and praise, are often needed to assist children with disabilities to more fully participate (Ivory & McCollum, 1999; Langley, 1985).

Multiple Baseline Design

A multiple-baseline design across subjects was used to demonstrate the effects a preferred sensory attribute has on the play behavior of children in the study. A multiple-baseline design begins with baseline observations of each subject. Once a stable rate of behavior is observed, intervention is introduced with the first subject while baseline observations continue for other subjects. Experimental control is demonstrated through changes in the subject's behavior at the point when the intervention is introduced, while the baseline rates of behavior for the other subjects remain relatively unchanged (Kazdin, 1982).

A benefit of this design is that it is not dependent on withdrawing treatment to demonstrate experimental control. The design also allows for introduction of the intervention to one subject at a time to ensure the effectiveness of the intervention. The intervention can be modified, if needed, before being introduced to other subjects.

There are several problems and limitations that should be acknowledged when using a multiple-baseline design. Single-case research demonstrates high internal validity when carefully designed. There are several threats to internal validity that have been identified, which could account for changes in the independent variable (Kazdin, 1982). Each must be ruled out before stating that a study is internally valid. An external event (history) may coincide with intervention, such as a family crisis. The subject may mature, thus acquiring new behavior by

nature of growing older or stronger with time, independent of the intervention. A subject may learn through repeated testing using a specialized assessment. There may be a change in the data based on changes in observer's scoring, rather than in the subject's performance (instrumentation). Additionally, the intervention procedures may not be properly adhered to (diffusion of treatment) across conditions.

Although the goal of single-case experimental research is to demonstrate a relationship between the independent and dependent variables, applied research also seeks to generalize these results beyond the experimental condition. External validity is the degree to which results can be generalized beyond experimental conditions. As with internal validity, there are several threats to external validity that must be considered. The first is whether the effects of the intervention will generalize to other subjects. Another threat to external validity is the generalizability across different settings, change agents, and times (Kazdin, 1982).

Summary

In summary, data were collected on the individual toy play behavior of children identified with sensory seeking behavior. Preference assessment technology was used to determine which sensory attribute children preferred using a modified free-operant presentation format. The sensory attribute identified as preferred was then embedded within an age-appropriate toy. Naturalistic teaching methods were used to prompt children to interact with the toy. The hypothesis was that the preferred sensory attribute would make the toy more appealing to the child and he would be more likely to choose the toy and spend increased amounts of time interacting functionally with the toy. Thus, the increased time spent with the modified target toy would allow staff to prompt the child through a greater number of completed learning opportunities.

Chapter II

LITERATURE REVIEW

The review of the literature is organized across major topics related to the study. The review begins by discussing the importance of early intervention in natural environments for children with identified disabilities, issues about supports for children in the form of teaching strategies, special consideration for children with sensory-seeking behavior, and the use of preference assessment technology.

Natural Environments

The benefits of early intervention for children with disabilities have been well documented (see Castro & Mastropieri, 1986, for a review). Attention has shifted to consideration of how and where interventions are delivered. The trend in early intervention has been to provide services and supports to children with identified disabilities within natural environments (Bricker, 1995; McWilliam & Strain, 1993). Natural environments can be defined as any integrated community setting where the child and family ordinarily spend time (Noonan & McCormick, 1993, p.238). Federal legislation mandates that early intervention services "must be provided in natural environments, including the home and community settings in which children without disabilities participate" (Individuals with Disabilities Education Act, 1997). A variety of settings may be considered natural environments, including, but not limited to, the family's home, a grandparent's home, or a childcare center.

Research has suggested that it is beneficial to provide instruction to children with disabilities within the natural environment, where the skills are likely to be used (Brown, Odom,

Li, & Zercher, 1999; Losardo & Bricker, 1994). Providing intervention in the home is consistent with recommended practices in the field of early intervention (Trivette & Dunst, 2000; Wolery, Werts, & Holcombe, 1994). For intervention to be most effective, it should fit within the child's daily routine (Mahoney & Weller, 1980). Intervention in the home promotes shared responsibility and collaboration between parents and professionals (Trivette & Dunst, 2000).

Teaching Strategies

Terminology used to describe instructional methods or adult strategies within the natural environment has varied considerably. Generally, these "naturalistic approaches" incorporate developmental theory and behavior analysis learning principles (Bricker, 1992, p. 29). Developmental theory suggests that development is a product of maturation and that a child's learning will progress along a sequence (Bailey & Wolery, 1992, p.25). For example, children generally walk around 12 months of age. Behavior analysis learning principles suggest that skills emerge as a result of repeated reinforcing experiences within the environment (Bailey & Wolery, 1992, p.25). For example, a child cries at the grocery store check-out to get a piece of candy. He has learned through repeated visits to the store that his mother will get him the candy to quiet him. Because naturalistic instructional approaches occur within the context of the natural environment, and therefore must consider the child's reciprocal transactions that occur within that environment, they can also be said to take an ecological perspective to intervention (Bailey & Wolery, 1992, p.26). That is, the child must function within the every day, natural environment.

Naturalistic teaching methods are designed to promote opportunities for instruction within the context of naturally occurring routines (McDonnell, 1998). According to McDonnell (1998), the role of the teacher (parent) is to design the environment, and select materials and

activities that will promote children's opportunities to perform specific skills. When the opportunity arises within the environment, the teacher (parent) provides the necessary instructional support to assist the child to complete the skill. Some examples of naturalistic instructional approaches include incidental teaching, milieu teaching, and activity-based instruction.

Incidental teaching. Hart and Risley (1975, p. 411) define incidental teaching as a method that occurs naturally in an unstructured situation. This approach is used in a one-on-one situation by following the child's lead. Cueing strategies are used ranging from no additional cueing to full cues. Incidental teaching methods incorporate the general principles of reinforcement: a child's behavior can be modified by its consequences (Hart & Risley, 1968). In an initial investigation by Hart and Risley (1968) on the use of descriptive adjectives by 15 disadvantaged preschoolers, an intervention was constructed within the context of a preschool classroom that was based on the general principles of reinforcement. Adults provided materials that were interesting to children, then when children initiated toward these materials, adults encouraged them to use color words to describe the material when requesting it. Adults provided color words when children answered incorrectly or did not respond. Verbal praise was given for correct responses. The authors used a multiple baseline across two conditions: access to materials contingent on color naming and not contingent on color naming. Results showed that children's use of color words increased when access to the materials were contingent on the use of color words.

In a second study by Hart and Risley (1974), 12 disadvantaged preschool children were exposed to incidental teaching strategies in order to improve their speech. Incidental teaching was defined as an interaction between a child and an adult that is unstructured whereby the child

initiated toward the adult (either verbal or nonverbal). In this study, adults prompted children when they approached materials. A multiple baseline was used across four conditions: (a) asking the child to request the material by name (e.g., hat), (b) asking the child to request the material by name and a word that described the material (e.g., big hat), (c) asking the child to request the material by use of a color-adjective and noun combination (e.g., red hat), (d) asking the child to request the material by saying how they would use it (e.g., I want a block so I can build). Results showed that when incidental teaching strategies were used, the child's required language in that condition increased.

Hart and Risley (1975) replicated the previously mentioned study by using incidental teaching strategies to teach compound sentence use to typically developing preschoolers during a free-play situation. The specific incidental teaching strategies were as follows: the target child initiates communication, the adult cues the child verbally or nonverbally; if the child does not respond, the adult prompts the child by requesting an imitation of the behavior, requesting a partial imitation (such as part of the sentence) of the behavior or requesting a terminal language behavior (a language behavior already in the child's repertoire). This study used a multiple baseline across three conditions: (a) labeling of objects, (b) compound sentence directed to teachers, (c) compound sentences directed to children. During the compound sentences directed to children condition, the adult followed the same sequence for implementing incidental teaching strategies with the exception of prompting the child to communicate with another child. The use of incidental teaching strategies in this study stimulated spontaneous variety in the children's speech.

Incidental teaching has also been used to increase receptive understanding. In a study by McGee, Krantz, Mason, and McClannahan (1983), two 7-year-old boys with autism were taught

to identify four sets of objects used in a mealtime routine. The incidental teaching package consisted of three steps: gestural prompts, behavior-specific praise, and contingent access to lunch-making supplies. A multiple baseline across objects was used. The results indicated that incidental teaching strategies were successful in increasing the receptive understanding of object labels in the two youths.

McGee, Krantz, Mason, and McClannahan (1985) compared incidental teaching strategies to traditional, highly structured teaching strategies. A simultaneous teaching system (Kazdin, 1977) was used to compare the different teaching strategies. The incidental teaching procedure consisted of the teacher asking the child where the object was after the child had initiated the interaction by naming the object. If the child gestured, but did not answer, the adult placed the child's hands at his side and verbally prompt the child (e.g., "Tell me where"). Errors were corrected by prompts (e.g., "The car is under the box."). Access to desired items was contingent upon responses from the child and reinforcement was given in the form of descriptive verbal praise.

In summary, in the studies examined, incidental teaching strategies have been successful in teaching children functional language skills within the natural environment. All studies focused on one-on-one interaction between the target child and a facilitator (one study used peer tutors). Common components of this approach included: waiting for the child to initiate toward materials, requesting higher levels of communication from the child through modeling and prompting, providing error correction, and giving verbal praise for correct responses.

Milieu teaching. Another approach to naturalistic instruction is milieu teaching (Hart & Rogers-Warren, 1978, p. 199). Milieu teaching is an intervention approach designed to enhance the development of language. This teaching approach proposes that teachers arrange

environments to promote language, assess the child's functional level, and find ways for the child to interact with the environment. Milieu teaching is sometimes used as an umbrella term encompassing a variety of different strategies such as incidental teaching (described earlier), mand-model (issuing a verbal request and modeling the request), time-delay (providing feedback after a specified interval), and modeling (providing a demonstration) (Kaczmarek, Hepting, & Dzubak, 1996).

Kaiser and Hester (1994) used enhanced milieu teaching strategies with 6 preschool children identified with significant language delays. The authors defined enhanced milieu teaching as a mix of milieu teaching (i.e., environmental arrangement and incidental teaching) and responsive modeling of appropriate language. Using a multiple baseline, this study looked at the generalization of language instruction in the natural environment within the classroom setting and during interactions with untrained communication partners. These authors found that children had increased utterances and greater diversity in vocabulary through the use of enhanced milieu teaching strategies. However, the rate of acquisition was variable depending on the individual child. Results suggested that language intervention might need to continue for a moderate number of sessions before dependable changes in frequency of utterances and word use would be noted.

Kaczmarek, et al., (1996) used milieu strategies to teach child communication objectives. Adults arranged the environment to provide communication opportunities. When a child was first learning a new skill, adults modeled the skill and prompted imitation. A mand, or verbal command, was used when the child had begun using the skill predictably. Prompted imitation was used for error correction. Time-delay was used when a child had visual attention to an

object. Verbal reinforcement was given for all correct responses. For the 2 children in the study, communication skills taught via milieu teaching strategies generalized to another classroom.

Siblings were used in dyads with a younger sibling identified with language delay in a study by Hancock and Kaiser (1996). In this study, which was conducted in the home, siblings used two milieu strategies: modeling and mand-modeling in a single-subject multiple baseline design across children. Siblings were taught to apply milieu teaching strategies during play and all dyads had increased communication during this targeted activity. For two of the three dyads, effects of the intervention generalized to a snack routine.

In summary, milieu teaching was shown to be an effective strategy for teaching language in the studies examined. Similar to incidental teaching, this approach also uses a one-on-one approach to intervention between the target child and a facilitator (one study used siblings).

Activity-based instruction. Losardo and Bricker (1994) define activity-based instruction as a "comprehensive approach that directs intervention by specifying the development of functional and generative skills within the context of child-initiated, planned, or routine transactions, using logically occurring antecedents and consequences"(p. 745). Both of the previously mentioned approaches (incidental and milieu teaching) are designed to be used one-on-one in a teacher-child dyad. In contrast, the focus of activity-based instruction is directed to the group, not individual children (although child objectives are considered). Bricker (1992) outlines the structure that should be applied when using an activity-based approach to instruction: (a) activities should be child-initiated, (b) activities should be meaningful to the child, (c) activities should require child participation, (d) activities should not interfere with the normal routine of the environment, (e) activities should be a balance of structured and unstructured activity, (f) activities need to change as child objectives are reached (p. 125-127).

In an activity-based approach, elements in the regular education classroom are adapted to enable the child with disabilities to participate. Classrooms are not designed solely with the individual child's objectives in mind (Wolery, Werts, & Holcombe, 1994). The environment is designed with consideration of developmentally appropriate materials suitable for the ages of the children in the classroom. Child-specific objectives are identified through assessment and opportunities throughout the day and within the environment are created to provide opportunities for the child to master the skill. This information is written on an activity-by-skill matrix, which tells adults what objective will be addressed during a specific time frame within the day.

In a study of 6 preschoolers with developmental delays (Losardo & Bricker, 1994), the use of activity-based instruction was compared to direct instruction on the acquisition and generalization of labeling objects. While they found that the activity-based instructional method was better at promoting generalization of labeling skills outside of the intervention period, direct instruction was determined to be more effective for the initial acquisition of the targeted language skills.

In an evaluation of an early intervention program using an activity-based approach to intervention, Bricker and Gumerlock (1988) studied child outcomes over a two-year period. Twenty-one infants and twenty-five toddlers who participated in the early intervention program were evaluated to determine if progress toward developmental milestones and Individualized Education Plan (IEP) objectives were made. Using the Intervention Efficiency Index (Bagnato & Neisworth, 1980), evaluators determined that substantial progress toward developmental milestones and IEP objectives was made by both infants and toddlers participating.

In summary, activity-based instruction seeks to embed materials needed to address individual child objectives within the natural environment of the child. It is similar to both

incidental teaching and milieu teaching in that aspects of the child's environment are modified and instruction is delivered contingent on child initiation toward materials. Adults elaborate on child interactions, provide error correction, and reinforce behavior. In the studies examined, activity-based instruction was shown to be effective in promoting generalization of skills. However, direct instruction was found to be more effective in one study for the initial acquisition of language skills.

Several naturalistic instructional approaches advocate for embedding materials necessary for facilitating desired skills within the child's environment. These naturalistic instructional approaches also call for some interaction on the part of the facilitating adult. The adult elaborates on the child's behavior and provides reinforcement, usually in the form of social praise. However, it is also noted that some children have impaired abilities in social relatedness (Erba, 2000), and may not find social praise reinforcing.

Sensory-Seeking Behaviors

Some children with disabilities exhibit self-stimulatory behavior (Rotholz & Luce, 1983). Rincover (1978) suggested that the sensory feedback that maintains the self-stimulatory behavior could be used as a reinforcer to promote the acquisition of new behaviors. In a study by Rotholz and Luce (1983), reinforcers were chosen based on their similarity to a self-stimulatory behavior exhibited by each of the targeted children. Their results indicated that access to sensory materials served as a powerful reinforcer.

Children who exhibit sensory-seeking behaviors are likely creating sensations for themselves. Their behavior may tell adults what input they need (Dunn, 2002). Tools such as the *Infant/Toddler Sensory Profile* (Dunn, 2002) can be used to gather information about a child's sensory processing abilities that can help interventionists identify how those patterns support

and/or interfere with a child's performance. This tool was designed to identify strengths and barriers with a child's sensory processing patterns. A 5-point Likert-type scale is used to rate a child's sensory behavior across auditory, visual, tactile, and vestibular stimulation. From this information, a profile is created which identifies the child's sensory behavior as low registration (under reactive to sensation), sensation seeking, sensory sensitivity, or sensation avoiding. If a child is identified as having sensory seeking behavior, those sensory attributes could be used as a reinforcer to teach new behavior. For example, if a child seems to prefer balls, this assessment could help isolate more information on the specific attribute of the ball that the child may be attending. The child may be interested in the visual stimulation he gets when the ball rolls or he may be more interested in the auditory feedback he gets when the ball comes in contact with other objects (such as the floor or furniture). If it is determined the child seems to enjoy balls due to visual stimulation, other materials that also provide visual feedback may also be interesting to him.

McGee, Morrier, and Daly (1999) in a study on incidental teaching approaches, described an early intervention program for toddlers with autism and found that identifying preferred toys for children with autism increased that child's initiations. These authors recommended a monthly sensory preference assessment to determine the preferred attributes of toys that the children find appealing. In a study on increasing social interactions, Gaylord-Ross, Haring, Breen, and Pitts-Conway (1984) found that incorporating highly preferred materials into their instructional component appeared to facilitate generalization of social skills in the presence of preferred materials.

Preference Assessment Technology

A considerable amount of behavioral research has investigated means of identifying preferences among individuals with identified disabilities. Prior investigations in this area have resulted in a broad technology for determining preferred items and activities among people with varying degrees of disabilities (Lancioni, O'Reilly, & Emerson, 1996). Preference assessment technology is consistent with recommended practices in early intervention/early childhood special education in that this technology looks to identify items that are of interest for a child and then to provide the child with access to those items. Activities that children find intrinsically motivating, or preferred, require minimal external support or reward (Bricker, 1992, p. 45). Use of preference can be categorized as an antecedent control technique, which can be used to teach the desired behaviors. An antecedent is defined as an event that precedes a behavior and influences the likelihood of that behavior occurring again in the future (Schloss & Smith, 1998). Providing systematic access to preferred items and activities has been shown to have multiple benefits, including the reduction of challenging behavior (Vollmer, Marcus, & LeBlanc, 1994) and acquisition of functional skills (Green, Reid, White, Halford, Brittain, & Gardner, 1988). Enhancing access to preferred items also has been demonstrated to increase indices of happiness among people who have the most significant disabilities (Green, Gardner, & Reid, 1997).

Single item preference assessment. Preference assessment technology has evolved and become more sophisticated over time. In a study by Pace, Ivancic, Edwards, Iwata, and Page (1985), preferences of individuals with profound mental retardation were assessed by their approach behavior toward each item. This single item presentation identified preferred and nonpreferred items, which were then used to shape arbitrary responses. A potential limitation of

this procedure is that some individuals approach any materials presented which makes determining preferred items difficult.

Paired item preference assessment. In a study by Fischer, Piazza, Bowman, Hagopiam, Owens and Slevin (1992), the authors compared the single-item presentation with a forced choice stimulus preference assessment. In the forced choice procedure, individuals were presented with two items and given access to whichever item they approached first. The forced choice procedure provided a stronger differentiation of preference among items than the single item presentation.

In a study of a four-year-old girl with Rhett syndrome and severe/profound mental retardation, Berg, Peck, Wacker, Harding, McComas, Richman, & Brown (2000) studied the effects of manipulating the sequence of assessment conditions using attention as a reinforcer. The intervention took place in the child's home with her mother present. A two-item preference assessment was conducted to determine if the little girl preferred gaining her mother's attention to gaining access to preferred toys. Preferred toys were nominated by her mother and confirmed using a group choice presentation format. The dependent measure was the percentage of intervals spent in either two concurrently available alternatives: play with her mother or playing alone with toys. A multi-element design was used to evaluate (a) the child's preference between her mother's attention and access to preferred toys and (b) the effects of high and low levels of her mother's attention immediately preceding the choice condition. Results suggested that choice was influenced by the amount of attention the child was shown immediately before the choice was offered. During the initial phase, the little girl chose her mother's attention over preferred toys. During the second phase, where she had attention immediately preceding the choice condition, she chose the preferred toys.

In a study by Waldron-Soler, Martella, Marchand-Martella, and Ebey (2000), the effects of task completion across choice and no-choice conditions of reinforcers was examined. Five 5-year olds in a preschool classroom participated in the study, 3 of which had developmental delay. Parents nominated materials for a preference assessment and a paired-choice method was used to determine highly preferred and less preferred materials. Items approached less than 40% of assessment trials were identified as less preferred materials. The target behavior was number of game board completions per minute for each session while playing a Colors & Shapes Match Me game. A combined alternating treatment within a multiple baseline across participants design was used. During the choice condition, children were told they would have access to a reinforcer upon completion of the game. The reinforcers were three of the less preferred materials from the child's preference assessment. During the no-choice condition, the child was told that the adult would select a reinforcer after game board completion from the same set of less preferred materials (identical to the preceding choice condition). Results indicated that when preference was held constant (access to less preferred materials), there were few to no differences found between the choice and no-choice conditions. Authors note that although less preferred materials were used in this study to reduce ceiling effects, these effects still may have been present.

Multiple Stimulus Preference Assessment. DeLeon and Iwata (1996) compared a paired-stimulus format (PS) (forced choice procedure), a multiple-stimulus format with replacement (MSW), and a multiple-stimulus format without replacement (MSWO) for identifying individual preferences. A paired-stimulus format involves presenting two materials simultaneously and providing access to whichever item the individual approaches first. A multiple-stimulus format involves presenting several materials in front of an individual and allowing access to whichever material s/he approaches first. Repeated presentations in a multiple-stimulus format include all

materials initially presented. A multiple-stimulus presentation without replacement is identical to the multiple-stimulus format, with the exception of removing the initially chosen item and presenting only the remaining items in subsequent presentations. The results of this comparison showed that the MSWO yielded a similar number of identified reinforcers as compared to the PS and took half the time to complete. Items identified through the MSWO served as reinforcers for arbitrary responses.

Carr, Nicolson, and Higbee, (2000) looked at the use of low, medium, and highly preferred materials as a means to achieve a curricular objective in a two-year-old boy diagnosed with autism. A multiple stimulus without replacement (MSWO) preference assessment was used in a one-on-one situation conducted in a therapy room. The average length of MSWO was 4 minutes 49 seconds for the two-year-old. The target behavior for the two-year-old was a curricular objective ("stomp feet"). Results indicated that a medium-preferred reinforcer changed behavior moderately and the highly preferred materials increased behavior more than the medium. Small gains were noted when a low preference material was available as a reinforcer for the curricular objective. A comparison was conducted on the first MSWO and the subsequent two assessments. Results of this comparison suggest that it might be possible to conduct only one MSWO. Authors note the lack of comparison between 3 session MSWO and 5 session MSWO as a potential limitation of the study. Additionally, no data were collected on aberrant behaviors.

Extinction and positive reinforcement were used to prompt response variability in two children with mild developmental delay in a study by Lalli, Zanolli, and Wohn (1994). Multiple stimulus preference assessments revealed that social interaction served as a reinforcer for both children. Researchers looked at variety of single-step pretend play actions with two different toys (airplane and doll). Neither child had appropriate toy play with the targeted materials during

baseline. The intervention consisted of a 15-minute training session on a single-step action with one of the objects using modeling and physical (hand-over-hand) prompts. Each child was trained on one single-step action with each of the objects (airplane and doll). Probe sessions began the day after training occurred. During the probes, adults provided descriptive praise for the first occurrence of the new behavior and the following three occurrences. No attention was given for that behavior after the initial period. This procedure was repeated for all newly trained single step behaviors. Untrained behaviors exhibited during the probe were treated similarly (praise first four occurrences, then give no attention). A multiple probe across children was used to evaluate the effects of extinction on untrained toy play. Results indicated that children varied their responding (single-step play actions) when a previous response was put on extinction (they no longer received praise for that play action). These results suggest that children's creative play behavior can be expanded through the strategic use of extinction and reinforcement.

Brief Stimulus Preference Assessment. Roane, et al. (1998) evaluated a brief stimulus preference assessment for individuals with developmental disabilities. In this preference assessment, materials were placed in front of the individual and s/he was given free access for a period of 5 minutes. Reinforcer assessments were conducted to determine if items rated as highly preferred served as reinforcers. Further, these authors then compared the brief stimulus preference assessment with the paired-item stimulus preference assessment. The results indicated that the brief stimulus preference assessment yielded similar results and required less time to complete than the paired-item preference assessment. This is significant in that the brief stimulus preference assessment mimics conditions present in an early childhood classroom (free access to materials) and takes little time to complete.

Roane, et al. (1998) conducted two experiments on the use of preference assessments with persons who had developmental disabilities. Participants in the study were referred for aberrant behavior and/or assessment for preferred materials to use in their behavior treatment programs. Sessions were conducted in classrooms or therapy rooms. Ten participants with developmental disabilities (ranging in age from 3 to 37 years old) participated in Experiment I. A free-operant preference assessment was conducted for each of the participants with their manipulation of materials (i.e., touching) being recorded (Assessment A). The free-operant condition was conducted at the beginning of each session to determine reinforcers for the session and lasted for a total of 5 minutes. In Assessment B, the room was divided into two squares. One square had a highly preferred material and the other was empty. The child could interact with the preferred material while in the square, but the material was returned to the square when the child left. Four individuals participated in Reinforcer Assessment B. This condition immediately followed a 5-minute free-operant assessment at the beginning of each day. Each day the most preferred item selected from the free-operant condition was compared to the non-preferred or least-preferred item. These materials were used as reinforcers for task completion. During Reinforcer Assessment B, the classroom was divided into two workstations with that same task and instructional format presented at each workstation. The only difference was the item available as a reinforcer at that workstation. Results indicated that the free-operant assessment differentially identified one or more preferred items. Five of the 6 participants spent more time in the preferred stimulus square and none entered the control (empty) square. In Reinforcer Assessment B, the free-operant preference assessment was effective at identifying preferred items for all 4 participants. Authors noted that results of the preference assessment for individual

participants varied across days. Results of Experiment I indicated that brief free-operant assessment can identify preferred items that serve differentially as reinforcers.

In Experiment II of the same study, preferences of 17 participants with developmental disabilities (age range 3 to 31 years old) were assessed using two formats: paired stimulus preference assessment and free-operant preference assessment. Each assessment consisted of 8 to 10 items. When comparing the two preference assessments, only 8 of the 17 participants had a match on the most preferred item on the two assessments. These inconsistencies were explained in light of the participants' change in preferences over time. Thirteen of the participants engaged in problem behavior during the preference assessments with 11 of these occurring in the paired-item preference assessment. This could be attributed to the length of the assessments: the free-operant preference assessment averaged 5 minutes while the paired-item preference assessment averaged 21 minutes. Results suggest that the free-operant preference assessment may be a more practical assessment for obtaining valid results. Further, authors note that free-operant preference assessments more closely match conditions present in an enriched environment, which may be associated with reduced rates of problem behavior. Authors note that the use of a free-operant methodology may result in satiation. Thus, wait time may be necessary between the preference assessment and the beginning of sessions where materials will be used as reinforcers.

In summary, preference assessment technology has been used in a wide variety of formats to identify reinforcers to increase or decrease a variety of behaviors. This technology has been documented as a useful tool in creating and sustaining behavior change. Over time, preference assessment technology has focused on efficiency while ensuring the selected assessment has accurately identified materials that will function as reinforcers for individuals.

Summary of the Literature Review

Most of the reviewed studies on naturalistic teaching addressed the acquisition of language skills/objectives of target children. Although many of these studies purported to employ different naturalistic intervention strategies, they were very similar in their instructional approach. All studies looked at the environment, waited for child initiation, elaborated on the child's response, provided error correction, and verbal praise for correct responses. While several studies made reference to the consideration of child interest, most did not include a protocol for systematically identifying preferences. Literature on choice making has demonstrated that children play more with materials that they choose and the more time children spend engaged with materials, the more opportunity there is for learning to occur (McWilliam & Bailey, 1994). The literature on identifying preferred materials has been demonstrated to increase functional skill development. It seems reasonable to assume that if children's preferred materials are available within their environment, and that the other factors associated with naturalistic teaching strategies are in place, levels of engagement may be increased. These increased opportunities for may set the stage for learning to occur.

For the most part, behavioral research on identifying preferences has focused on adults and school-aged children (see Lancioni et al., 1996, for review). Much less attention has been directed to assessing preferences of preschoolers and toddlers with identified disabilities. In the relatively few cases where the preference assessment technology has been extended to the latter individuals, results have suggested that young children with identified disabilities also can benefit from the developing technology. For example, systematically applying information obtained from preference assessments has lead to important reductions in problem behavior (Ringdahl, et al., 1997; Vollmer et al., 1994).

There has been a lack of research on assessing specific toy preferences of very young children (18 – 36 months) with multiple disabilities and applying knowledge of preferred toys to increase toy play (Reid et al., 2003). If preferred sensory attributes are identified, those attributes could be embedded within toys that address a child's developmental objectives. For example, individual toddler preferences for specific sensory attributes could be assessed and then choices of preferred toys (i.e., those that possess preferred attributes) could be provided. Such an approach would seem compatible with a child-directed philosophy because it is based on the observed interests or preferences of individual children and the children would be choosing the toys with which they play (cf. Hauser-Cram et al., 1993). Identifying sensory attributes children find appealing and embedding those attributes within toys should increase a child's interest in those toys. Thus, children's developmental goals are more likely to be reached. The combination of naturalistic teaching methods and individual child preferences should result in more active engagement with materials and possibly, greater opportunities for increased toy play in young children with identified disabilities.

Chapter III

METHODOLOGY

The focus of the study was to assess preferred sensory attributes of toys and to embed those attributes into an age-appropriate toy. Toys were presented for assessment of sensory preferences within the context of naturalistic teaching methods. Naturalistic teaching methods include engineering environments to provide children access to toys using adult prompting to promote contact or interaction with toys. The study expanded on naturalistic teaching methods by incorporating an individual child-specific sensory preference into a toy to increase functional toy play with that toy. The research hypothesis was that the embedding of a sensory preference would increase the amount of time the child spends with the toy, which should make adult prompting and completed learning trials more likely to occur. A summary table is included in Appendix A outlining all phases of the project.

The study used an antecedent control technique to teach the desired behaviors. The study used a system of prompts delivered in hierarchical order from least to most intrusive (cf., Schloss & Sedlak, 1986). This hierarchy allows for completion of a behavior by providing a prompt sufficiently strong enough to produce the desired response. The prompts are increased only if the child does not produce the desired behavior and increase in amount of assistance provided through completion of the desired behavior. In this model, more intrusive prompts are paired with less intrusive prompts (i.e., physical prompts are paired with verbal instruction). Because more intrusive prompts are only given as needed, a system of least prompts has a built-in fading component (Cooper, 1987c).

One advantage of a least-to-most prompting strategy is that the child is allowed to each presentation of the toy and, consequently, the child's behavior determines the level of prompting needed (Cooper, 1987c). Additionally, a system of least prompts has been documented as an effective teaching strategy with young children (DiCarlo, Reid, & Stricklin, 2003).

Subjects and Setting

In order to demonstrate experimental control in a single-subject research design, a minimum of three subjects is necessary to examine prediction & affirmation of the consequent, verification and replication in the data (Heward, 1987). When baseline data are stable, or occurring in a regular pattern, the researcher can use this data to predict the anticipated outcome of a presently unknown or future measurement. Affirmation of the consequent is the change that occurs when the independent variable is introduced, that differs from the predicted level of responding in the absence of the independent variable. Verification occurs by demonstrating that the prior level of baseline responding would have remained unchanged had the independent variable not been introduced; this is achieved through a reversal to baseline condition, or in the case of a multiple baseline design via continuing baseline of other subjects, settings, or behaviors. Replication is the repeating change when the intervention is introduced. These elements are necessary to demonstrate experimental control (Bailey & Burch, 2002; Heward, 1987; Kazdin, 1982).

Selection criteria for children included: (a) children between the ages of 24 months and 36 months who were eligible for services under IDEA (Individuals with Disabilities Education Act, 1997), (b) children with identified disabilities who exhibit low levels of toy play as reported by parents and caregivers and observed by this investigator, and (c) children who exhibited

sensory-seeking behaviors based on parent report and as identified by *The Infant/Toddler Sensory Profile* (Dunn, 2002).

All children participating in the study were male and had low levels of age-appropriate toy play. Parents and caregivers reported that the children interacted minimally with toys and in an inappropriate/nonfunctional manner. Toy play for toddlers has been documented in the literature as occurring between 70 – 75% of observed intervals during free play with age-appropriate materials (DiCarlo, et al., 2003). All children were observed to play below these levels during baseline observations. Each had an IFSP objective to increase functional toy play with age-appropriate toys.

Parents were interviewed regarding their child's sensory behavior prior to administering *The Infant/Toddler Sensory Profile*. When asked specifically to identify their child's preferred sensory modality, Alex's mother identified visual stimulation, James's mother identified auditory stimulation, and Jeb's mother identified tactile stimulation.

The Infant/Toddler Sensory Profile was used to identify sensory-seeking behaviors of the three boys. It is a questionnaire that asks caregivers to rate a child's behavior across sensory modalities using a 5-point Likert-type scale (i.e., Almost Always to Almost Never). Items within each sensory modality are related to how the child processes information. The Profile asks questions to identify low registration, sensation seeking, sensory sensitivity and sensory avoiding. *The Infant/Toddler Sensory Profile* was completed by the parents of children participating in the study, in addition to an in-depth interview regarding typical child behavior. All children in the study exhibited sensory-seeking behavior.

Alex was 30 months old at the onset of the study. He had a diagnosis of developmental delay. Alex did not use words to communicate, and had scattered cognitive skills up to 15

months old according to the Early Intervention Developmental Profile (EIDP) (Rodgers & D'Eugenio, 1981). Alex attended a private day care center in a major metropolitan area. Alex was the only child in the classroom eligible for special education services and received special instruction, occupational therapy and speech therapy throughout the duration of the study. The classroom was staffed by two teachers and had 22 children between the ages of 2 and 3 years old. The classroom had a manipulative center, which included some blocks, a book center, a dramatic play area with a kitchen set and dress-up materials, a sand/water table, and an art area. Alex typically walked around the classroom in an apparent random pattern or laid on the floor. He seldom approached or picked up toys. Observations were conducted in the manipulative center of the classroom or a nearby area, to minimize distractions.

James was 34 months old at the onset of the study. He had a diagnosis of developmental delay. James did not use words to communicate and had scattered cognitive skills up to 15 months old according to the EIDP. James attended a parochial childcare center in a suburban area. The classroom was staffed by one teacher and had 10 children. James was the only child in the classroom who was eligible for special education services and received special instruction and speech therapy services throughout the duration of the study. The classroom had a manipulative center, a constructive play center, a book center, and a dramatic play center, which included kitchen, dolls, and dress-up materials. James typically walked around the classroom. When he did pick up toys, he usually attempted to put them in his mouth. Observations were conducted within the manipulative area of his classroom or a nearby area, to minimize distractions.

Jeb was 29 months old at the onset of the study. He had a diagnosed chromosome abnormality. He did not use words to communicate and had scattered cognitive skills up to 11

month old according to the EIDP. Jeb was seen in his home. He had a variety of toys that were including manipulative-type materials (e.g., cause/effect, shape sorters), constructive play materials (e.g., legos, mega blocks), and cars/trucks. No art materials or dramatic play materials, other than cars, were present. Jeb interacted briefly with materials in nonfunctional ways. Observations were conducted in the living room, his bedroom, or playroom.

Results of the *Infant/Toddler Sensory Profile* for Alex indicated that he frequently (making sounds with mouth) and occasionally (makes noise with toys) engaged in auditory sensory-seeking behavior; almost always (looks at reflections, prefers fast-paced, brightly colored T.V. shows) and frequently (looks at spinning or moving objects, looks at shiny objects) sought visual sensory-seeking stimulation; frequently (playing with food, seeks out vibrations, uses hands to explore textures) and occasionally (splashes water at bathtime) seeks out tactile stimulation. James' parents reported that he frequently (makes sounds with mouth, makes noise with toys) seeks out auditory stimulation; almost always (looks at moving or spinning objects, looks at shiny objects, looks at reflection in mirror) and frequently (prefers fast-paced, brightly colored T.V. shows) seeks visual stimulation; almost always (enjoys splashing during bath, uses hands to explore textures, frequently (seeks out vibrations), and occasionally (plays with food) seeks out tactile stimulation. Jeb parents reported that he did not have any auditory seeking behaviors. Jeb almost always (enjoys moving or spinning objects, prefers fast-paced, brightly colored T.V. shows) seeks visual stimulation; and almost always (enjoys playing with food, seeks opportunities to feel vibrations, enjoys splashing during bath time, uses hands to explore food and other textures) seeks tactile stimulation. Ratings on *The Infant/Toddler Sensory Profile* were highest in the area of visual stimulation for Alex, visual and tactile stimulation for James, visual and tactile for Jeb (see Table 1).

Table 1.

Results of Parent/Caregiver Ratings of the Infant/Toddler Sensory Profile in the area of sensory-seeking behavior.

	auditory	visual	tactile
Alex	frequently/ occasionally	almost always/ frequently	frequently/occasionally
James	frequently	almost always/ frequently	almost always/ frequently/occasionally
Jeb	almost never	almost always	almost always

Sensory properties of toys. Toys used in the study were deemed as developmentally appropriate for children who are two years of age as identified by the *The Right Stuff,* published by the National Association for the Education of Young Children - NAEYC (Bronson, 1995). Toys were selected based on toys available in the child's natural environment (see Table 2).

From these toys, a toy was modified and/or substituted with a toy that had the child's preferred sensory attribute embedded (i.e., toy that was modified during the intervention phase of the project). Sensory attributes were consistent with the categories (i.e., auditory, visual, tactile) of the *Infant/Toddler Sensory Profile* (Dunn, 2002). Auditory toys included the Jammin' Draw by Fisher Price, Sesame Street Singing Pop-up Pals by Fisher Price, and Little Tykes Emergency Tots Fire Truck. Visual toys included the Ocean Wonders Nesting Pails by Fisher Price, The Classical Chorus Star Stacker by Fisher Price, and Peek-a-Boo Minnie Mouse by Disney. Tactile Toys included the Musical Fingerpaint by Fisher Price, Spectracolor Image Pad by Irwin Toy, and "Farm Friends" Fuzzy Puzzle by Lights, Camera, Interactional, Inc.

Modifications were made to three materials to prevent each toy from having multiple sensory properties, which could confound results. The Sesame Street Singing Pop-up Pals, and The Classical Chorus Star Stacker were modified by clipping wires to eliminate auditory output. The Musical Fingerpaint was presented without batteries to prevent it from having auditory output.

Toys used in the sensory preference assessment were rated by professionals certified in early intervention or a related field. Professionals were asked to rate each toy using a Likert-type scale ranging from most dominant to totally absent (see Appendix B). For example, a toy that was classified as tactile-texture, was perceived as predominantly tactile-texture by professionals.

Table 2.

Toys from natural environment used in toy rotation for individual children.

Child	Toys used in paired-item toy rotation			
Alex	ring stack*	pounding bench	busy box	bus
James	pop-beads	blocks	phone	truck
Jeb	guitar	blocks	phone	fire truck

* this toy was added by the researcher

All toys used were ranked as dominant in the category in which it was selected.

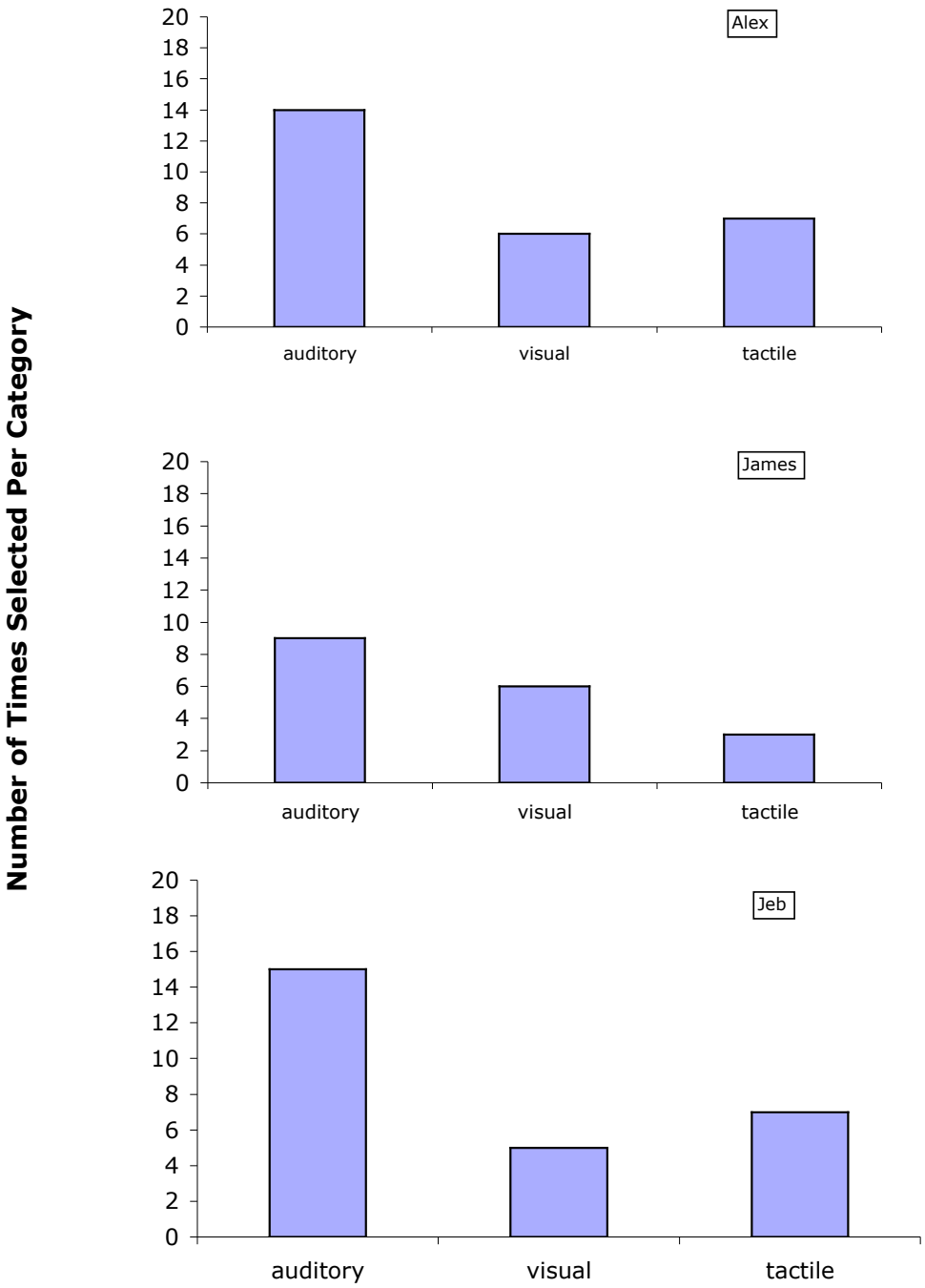
Sensory preference assessment. A brief stimulus preference assessment (Roane, et al., 1998) was conducted to determine which sensory attribute each child found appealing. Three toys that provide auditory stimulation, three toys that provide visual stimulation, and three toys that provide tactile stimulation were included. The investigator demonstrated how to interact with each toy to make the sensory component apparent. In this preference assessment, toys were placed in front of the child and he was given access until he touched one of the toys. Each presentation included one auditory, one visual, and one tactile toy. Sessions were conducted across three days. Each session included nine presentations of the toys, so that each toy was paired with every other toy across categories. Sensory preference was determined by tallying each toy contacted within each sensory category and ranking the results (Figure 1). Alex selected auditory toys most frequently (14); then tactile toys (7), and visual toys (6). James selected auditory toys most frequently (9); then visual toys (6), and tactile toys (3). Jeb also selected auditory toys most frequently (15); then tactile toys (7), and visual toys (5).

Results of the sensory preference assessment suggests that parent report was not a valid indicator of preference for two of the three children. These results coincide with investigations with adults with disabilities (e.g., Green et al., 1988), and children with disabilities (Reid, et al., 2003) that suggest parent/caregiver opinion should not be relied on exclusively for identifying preferences.

Behavior Definitions

The dependent variable was functional toy play. *Functional toy play* was defined as a child using a toy in the manner the manufacturer intended it to be manipulated (Martens &

Figure 1. Number of times each sensory toy was selected per category during the sensory preference assessment.



Hiralall, 1997). The level of adult assistance that was used to produce functional toy play was categorized as independent, verbal, model, and physical. *Independent* was defined as completion of functional toy play in the absence of any adult prompting. *Verbal* was defined as a statement made to the child to perform a specific behavior related to functional toy play (e.g., "Put the ring on top."). *Model* was defined as the adult demonstrating functional toy play. *Physical* was defined as assistance provided to guide the child through functional toy play via adult touching and moving the child's hand. Only the level of prompt that produced the behavior was recorded. Prompts that did not result in the completion of functional toy play were not recorded. Correct prompting by adults was captured in an independent measure of treatment fidelity to ensure that prompting procedures remained constant across all conditions (see Appendix C for Observation Form).

Observation System

Observers were trained through written instructions, practice, and feedback prior to beginning observations. Observation sessions were scored from videotape. The observer videoed all intervention sessions and did not interact with the children during the intervention. Functional toy play was observed and recorded continuously throughout 10-minute sessions using event recording (Cooper, 1987a). An event was defined as an opportunity for functional toy play. An opportunity began when the child touched a toy and ended when the child completed a functional toy play action. The choice of toys offered, toy chosen, and level of prompting necessary to complete functional toy play were recorded within each opportunity. For reliability purposes, the 10-minute sessions were divided into 10, 1-minute intervals.

Interobserver Agreement

Interobserver agreement checks were conducted on 28% of all observation sessions

across baseline and intervention conditions (Cooper, 1987b). Interobserver agreement was calculated using a frequency ratio on a minute-by-minute basis by dividing the smaller number of recordings of a target behavior of one observer by the larger number of the other observer and multiplying by 100% (Kazdin, 1982). The resulting minute-by-minute figures were averaged for each session. Interobserver agreement for the choice condition was 100% for each child across the paired-item presentation and the paired-item + sensory toy condition. Interobserver agreement for independently completed functional toy play was 89% (68% - 100%) for Alex, 79% (71%-85%) for James, and 88% (74% - 100%) for Jeb.

Experimental Conditions

Baseline. The goal of baseline data collection was to determine which toys children select, come in contact with, and manipulate in a functional manner. Naturalistic observation in the environment was conducted to determine each child's choice, contact, and functional toy play. All children were observed in their natural environment. Alex and James were in the manipulative centers of their respective classrooms and Jeb was in his living room, where his mother reported he usually interacted with toys. Teachers and parents were told to do what they would normally do while baseline observations were conducted. Teachers and parents were accustomed to this investigator spending time in both the classrooms and the home. Observations occurred in both classrooms during scheduled free choice time and in Jeb's home when his mother reported she usually played with him.

Paired-item presentation. A paired-item presentation format (Fischer, et. al, 1992) was then used to provide each child a choice between two toys. The investigator served as the interventionist. This procedure was used to ensure that the child came in contact with each material. A rotation of four age-appropriate toys present in the child's environment were rotated

every two minutes throughout each session (Table 2). This procedure was used as the context for instruction. A least-to-most prompting sequence was used to prompt completion of functional toy play. Guidelines for implementation of least-to-most prompting (Wolery & Gast, 1984) were followed: (a) a constant latency of 5 seconds between prompt levels, (b) increased assistance at each prompt level, and (c) praise provided for correct responding. Inappropriate responses were interrupted; therefore, the child was prevented from practicing mistakes, which could strengthen incorrect responding (Schloss & Sedlak, 1986). When a child performed an incorrect response with a material (i.e., spinning a ring stacker on the floor) the adult provided physical assistance to perform the appropriate action with that toy (i.e., placing the ring on the stacker).

The choice procedure involved holding each of the toys and naming both of them as a choice ("Do you want the bus or the ring stack?"). If the child did not reach for a toy, the toy the child looked at last after initial visual contact with each material was selected as the child's choice (Reid, et al., 2003). A new choice was provided every two minutes throughout the session. The child was given a choice between the toy selected last (currently playing with) and the next toy in the rotation. The order in which the toys were presented was altered every session.

Following toy selection, a system of least-to-most assistive prompts was implemented contingent on the child's physical contact. The adult then prompted through completion of functional toy play and praised verbally for correct responding. Consistent with guidelines for least-to-most prompting (Wolery & Gast, 1984), adults will allow 5 seconds wait time between each level of prompting. The least-to-most assistive prompt strategy began with a verbal prompt and then proceeded to a modeling prompt, and then to a physical prompt as necessary. Each successive prompt was provided only if the preceding prompt was not followed by the child's

completed functional play action within 5 seconds. Following completion of the functional play action, the adult provided specific praise for the child's functional play behavior (e.g., "I like how you put the ring on the stacker.").

Results from the paired-item presentation were used to determine a ranking of toys presented to each child. Results were calculated by taking the number of times the toy was selected, and dividing by the number of times the toy was presented and multiplying by 100%. The Classical Chorus Ring Stack was identified for Alex, as he contacted this toy less than 40% during the paired-item presentation. Batteries were added to this toy so it had auditory properties, which were determined as preferred during the sensory preference assessment. The phone was selected for James, as he contacted this toy less than 35% during the paired-item presentation. Results of James' sensory preference assessment indicated that auditory was his preferred sensory attribute. A musical telephone, Baby Smartronics Speak & Teach Phone by Fisher Price, replaced the telephone used during the paired-item condition. For Jeb, the Tonka - Lights and Sound Fire Engine was identified as the target toy, which was selected 49% of the time. Although he selected this toy during the paired-item condition, he contacted it at a low rate as compared to the other toys. Therefore, he was not prompted to play with it. Batteries were added so it had auditory properties, which matched his preferred sensory attribute.

Paired-item presentation + sensory toy. Procedures constituting the paired-item presentation condition remained the same with the addition of the sensory attribute added to the target toy. The investigator presented each child a choice using the above-mentioned procedure. After the child contacted the toy, an adult prompted the child through completion using a least-to-most assistive prompting sequence and provided specific praise upon completion of each functional action. Toys were rotated on a 2-minute schedule throughout each 10-minute session.

Fidelity checks of intervention procedures were conducted periodically to ensure treatment integrity (Heward, 1987); that adult prompts are consistent throughout the project. The fidelity check was a checklist of intervention procedures used during the paired-item condition and the paired-item + sensory toy condition (see Appendix D). Fidelity checks were conducted on 20% of all intervention sessions. The intervention was implemented with 99% fidelity across those sessions sampled.

Experimental Design

A multiple baseline design (see Kazdin, 1982) was used to measure the impact of the intervention (embedding preferred sensory attributes into toys which address a child's objectives) across children. A multiple baseline design has advantages in a natural or clinical setting. When using this design, there is no need to withdraw intervention to demonstrate experimental control. Intervention is introduced with each individual sequentially to assess if behavior changes when the intervention is introduced and to demonstrate functional control of the independent variable. Additionally, the effects of an intervention can be measured and subsequently modified, if necessary, if an intervention is not producing the change expected (Kazdin, 1982).

Chapter IV

RESULTS

As indicated in Figure 2, when choices of toys were offered, children did not seem to have apparent preferences among toys. When sensory attributes were added to the target toys, 2 of the 3 children chose these toys more frequently. During the paired-item presentation, Alex chose the ring stack toy 39% (0-67%), the pounding bench 52% (0-80%), the busy box 46% (0-75%), and the bus 36% (0-67%). When his preferred sensory attribute was added to the ring stack, Alex selected it 89% (75%-100%), the pounding bench 6% (0-33%), the busy box 6% (0 – 33%), and the bus 25% (0 – 50%). During the paired-item presentation, James chose the toy phone 34% (0-67%), the pop-beads 8% (0 – 33%), the truck 59% (50 – 67%), and the blocks 62% (50% - 80%). When his preferred sensory attribute was added to the toy phone, James selected the toy phone 100% (100%-100%), pop-beads 10% (0-50%), the fire truck 7% (0 – 33%), and did not choose the blocks. Jeb selected the fire truck 49% (0-75%) during the paired-item presentation, the guitar 47% (0-67%), the phone 44% (33%-67%), and the blocks 36% (0-67%). During the first 5 sessions of the paired-item + sensory toy, when Jeb's preferred sensory attribute was added to the fire truck he selected it 86% (50% - 100%); however, the last 5 sessions brought the average down to levels observed during the paired-item condition 51% (33% - 100%). During the paired-item + sensory toy condition, Jeb selected the guitar 8% (0-33%), the phone 50% (0-100%), and the blocks 21% (0-67%).

As shown in Figure 3, increases in number of independent functional toy play actions with the target toy were seen across all 3 children relative to baseline when the paired item

Figure 2. Percentage of times each toy in the 4-toy rotation was selected across the paired-item presentation (where no toys had sensory attributes) and during the paired-item presentation + sensory toy condition.

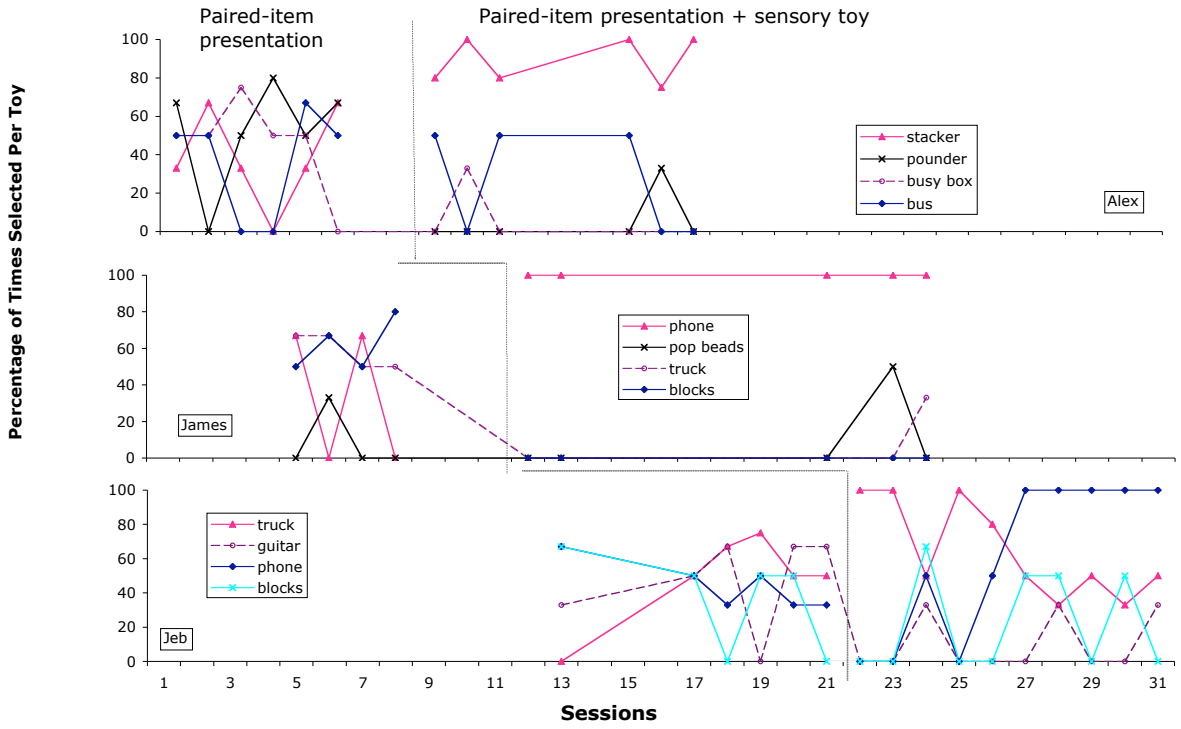
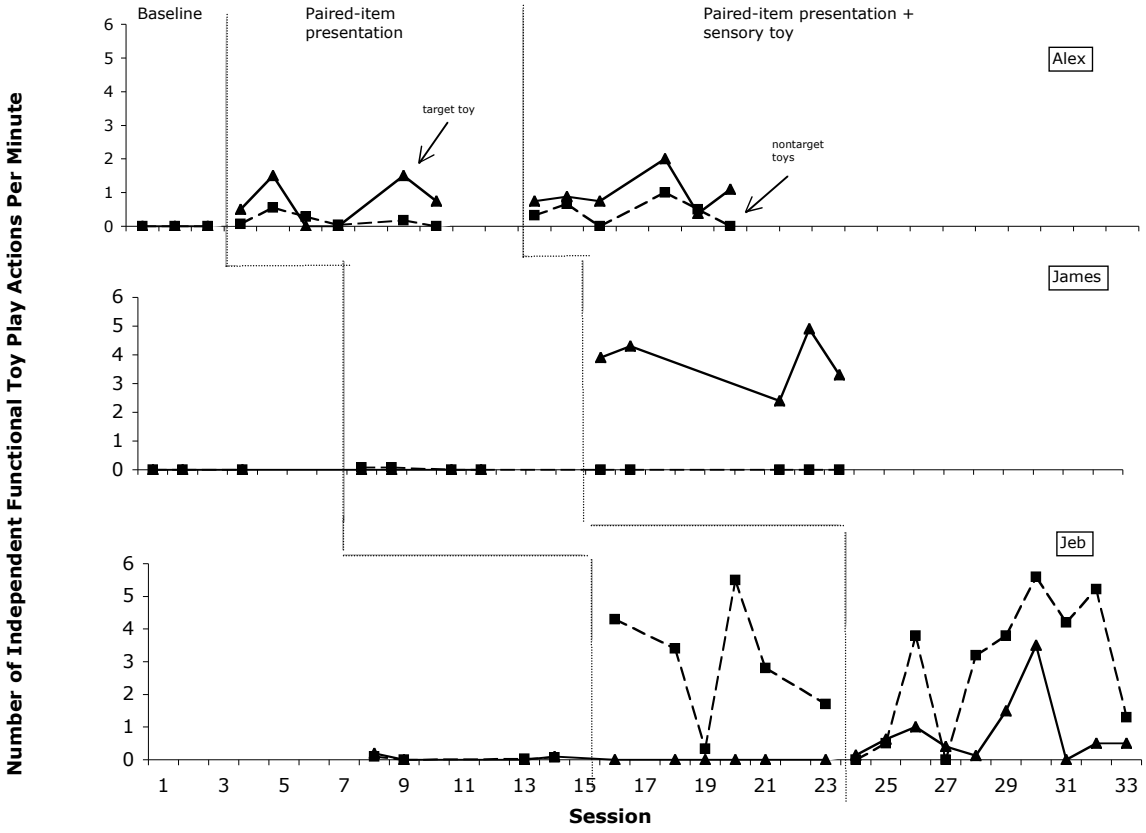


Figure 3. Number of independently completed functional toy play actions per minute for the target toy and for the nontarget toys across baseline, the paired-item presentation and the paired-item + sensory toy condition.



sensory toy condition was implemented. One of the three children, Alex, showed increases in independent functional toy play with the target toy during the paired-item condition. However, neither James nor Jeb demonstrated increases in independent functional toy play with the target toy during the paired-item condition. Specifically, Alex's independent functional toy play with the target toy (ring stack) increased from 0 during baseline, to .71 (0-1.5) during the paired-item presentation. A slight increase in independent functional toy play was seen, .98 (.38-2.0), when the paired-item + sensory toy were added. James's independent functional toy play with the target toy (phone) remained at 0 during baseline and during the paired-item presentation, but increased to 3.76 (2.4-4.9) when preferred sensory attribute was added to the target toy. Jeb's independent functional toy play with the target toy (fire truck) was low during baseline (.08, range 0 - .2). He did not engage in any independent functional toy play in the paired-item condition; however, when his preferred sensory attribute was added to the paired-item presentation, his independent functional toy play increased (.63, range, 0-3.5) with the target toy.

No changes were made to the other toys used in the toy rotation during the paired-item + sensory toy condition. Increases in independent functional toy play with the nontarget toys were mixed across children (see Table 3). Alex's independent functional toy play with the nontarget toys (the pounder, busy box, & bus) was 0 during baseline, increased to .19 (0-.56) during the paired-item presentation, and increased to .42 (0-1) during the paired-item + sensory toy condition. James showed no increase in independent functional toy play with any of the nontarget toys (pop-beads, truck, and blocks); 0 during baseline, .04 (0-.08) during paired-item presentation, and 0 during paired-item presentation + sensory toy condition. Jeb's independent functional toy play with the nontarget toys (phone, guitar, blocks) also increased relative to baseline from .0 (0-.07), to 3.0 (.33-5.5) during the paired-item condition, then to 1.8 (0-5.6)

Table 3

Number of independent functional toy play actions with nontarget toys per minute

	Baseline	Paired-item	Paired-item + sensory toy
Alex			
Pounding bench	0	.02 (0-.13)	.08 (0-.5)
Busy Box	0	.83 (0-2.0)	.33 (0-2.0)
Bus	0	0	.33 (0-1.0)
James			
Pop-beads	0	0	0
Truck	0	.06 (0 -.25)	0
Blocks	0	.06 (0-.25)	0
Jeb			
Guitar	0	.08 (0-.50)	.33 (0–1.5)
Phone	.05 (0-.10)	3.6 (1.0-5.5)	3.4 (0-9.5)
Blocks	.08 (0-.20)	5.4 (0 – 11.0)	1.8 (0-12.5)

during the paired-item + sensory toy condition.

Chapter V

DISCUSSION

While a major focus in early intervention is for children with disabilities to be educated in their natural environment, there is concern over providing specialized support to promote toy play in these environments (Ivory & McCollum, 1999; Langley, 1985). A recommended practice in early intervention is to use child-directed practices that are responsive to child behaviors (Wolery, Werts, & Holcombe, 1994). Assessing preferences and providing opportunities to interact with preferred materials appears to coincide with a child-directed philosophy because it takes into consideration the observed preferences or choices of individual children (cf. Hauser-Cram, Bronson, & Upshur, 1993). Thus, in this study, the intervention supported an adult taking a child's lead within a structured, yet spontaneous, interaction. Previous research suggests that attributes of materials may influence a child's interest in materials (Vanderhayden, 2002) and that sensory attributes could serve as reinforcers for children with self-stimulatory behavior (Rincover, 1978; Rincover, Newsom, and Carr, 1979; Roane, Vollmer, Ringdahl, & Marcus, 1998). Children who exhibit sensory-seeking behaviors have been described as "driven to fulfill thresholds of sensation" (Dunn, 2002, p. 45); thus, the embedding of preferred sensory attributes into toys may increase the amount of time a child interacts with the toy. Results indicated that this belief has merit. The children either selected or interacted with target toys in a functional manner after the sensory attribute was added.

Consistent with previous literature (Green et al., 1988), caregivers report did not appear to be consistent with direct assessment of sensory preferences for 2 of the 3 children. While all 3

children were determined to prefer auditory sensory input, two of the three parents did not report auditory as their child's preferred sensory attribute and one of the parents reported specifically that her child was not interested in auditory toys. While James's mother identified him as preferring auditory toys she also reported that he did not interact with these toys appropriately. The differences in parent/caregiver report and direct assessment suggests that conducting preference assessments may be more accurate in identifying preferred sensory attributes of toys for children with low levels of toy play. In order for a child to participate in an inclusive setting they need to learn to play with toys, so assessing preferences is a very important component to encourage toy play.

Results indicate that the addition of preferred sensory attributes to a toy resulted in consistently higher rates of selection for that toy. One child (Alex) selected the sensory modified toy twice as frequently after the addition of his preferred sensory attribute. The addition of preferred sensory attribute caused one child (James) to select that toy exclusively. The addition of the sensory attribute caused one child (Jeb) to select the target toy more frequently during the first 5 sessions; however, effects of the sensory toy returned to levels observed prior to the addition of the preferred sensory attribute. However, it seems that his initial increased interest and selection of the target toy was sufficient to increase his play with that toy. This suggests that preference should be assessed frequently. Isolation of the preferred sensory attribute has value for increasing consistent responding related to toy selection for children who otherwise might not be able to show a preference in a random toy play situation, which is typical in an inclusive setting.

Results were mixed with respect to completion of independent functional toy play. It appears that Alex responded to the naturalistic teaching methods (rotation of toys and prompting)

during the paired-item condition, and the addition of the sensory toy further increased his independent functional toy play with the target toy. This suggests that the addition of preferred sensory attributes may enhance naturalistic teaching methods that are already in place.

James did not seem to respond to the paired-item condition and demonstrated increased toy play when his preferred sensory attribute was added. The choice procedure and adult prompting was not sufficient to hold his interest; he appeared resistant to adult prompting. The addition of the preferred sensory attribute led to increased toy selection and he became more receptive to adult prompting. This suggests that for children who seem resistant to adult prompting strategies, the addition of a preferred sensory attribute may make them more tolerant of adult assistance to increase functional toy play.

While Jeb exhibited some independent functional play with the nontarget toys during the paired-item condition, when his preferred sensory attribute was added to a seemingly nonpreferred toy, his independent functional toy play increased. Although he selected the target toy at similar rates on average to the paired-item condition, his initial increase appeared sufficient to increase his independent functional toy play with the target toy. This suggests that while the addition of a preferred sensory attribute may cause a child to select a toy more frequently initially, preferences can change and should be reassessed periodically.

All toys used in the paired-item + sensory toy condition were commercially available toys in their original form. The Classical Chorus Ring Stack by Fisher Price, which was used with Alex, provided approximately 3 seconds of auditory feedback when a ring was placed on the stacker; however, when the top of the stacker was touched, it played almost 30 seconds of music continuously. While the music played, Alex did not interact with the toy. Similar behavior was also observed with James. The Baby Smartronics Speak & Teach Phone by Fisher Price,

which was used with James, provided brief auditory feedback when buttons were pushed, but also played approximately 25 seconds of music when a cylinder at the bottom of the phone was spun. James usually did not interact with the toy again until the music stopped. It appeared that the duration of feedback provided by these toys was longer than necessary to produce a response and may have prevented higher rates of responding. It seems reasonable that toys that provided a shorter duration of feedback for each response may promote higher levels of responding.

The increases in independent functional toy play seem noteworthy in that these results suggest that selection of nonpreferred toys can be increased when preferred sensory attributes are added. All children had goals on their IFSPs related to increasing functional toy play with age-appropriate materials. The addition of a preferred sensory attribute assisted in increasing the amount of functional toy play for each child.

A limitation of the present study is that the effects of the addition of the preferred sensory attributes to a toy were not examined in the absence of adult prompting. However, it cannot be determined if independent functional toy play would have increased with the target toy with only the addition of the preferred sensory attribute (in the absence of choice, prompting, and praise). Additional research is warranted to determine the effects of preferred sensory attributes on independent functional toy play in the absence of adult prompting, such as a free play situation.

In summary, it was demonstrated that by modifying a toy with preferred sensory attributes, all 3 children either chose the toy more frequently and/or played with that toy more often. Alex and James chose it more often, and James and Jeb played with it more often. Future research should focus on the application of embedding preferred sensory attributes into other types of activities for toddlers with disabilities who exhibit sensory-seeking behaviors. The above-mentioned intervention procedures are consistent with recommended practice in the field

of early intervention, and the additional application of sensory preference would be a relatively easy intervention for adults to implement within the context of the child's natural environment.

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APPENDICES

APPENDIX A

Method Summary Table

Method Summary Table

Procedures	Example
Conduct baseline observations of child's interaction with toys present in the natural environment	Observe child during free play within the classroom.
Complete *Infant/Toddler Sensory Profile* with parents	Review questionnaire with parents.
Conduct sensory preference assessment	An adult will show child how to use all toys. Child will have access to a total of 9 sensory toys (auditory, tactile, & visual) in groupings of 3. Data were collected on physical contact with toys over 3 days.
Construct a rotation of toys for presentation during the paired-item condition	Compose a list of toys to rotate among during the paired-item condition.
Paired-item condition	Gather group of toys and present them to child 2 at a time on a 2-minute rotation using a least-to-most prompt strategy; praise correct responding.
Sensory toy modification	Add preferred sensory attribute to target toy. For example, if the child preferred auditory, an auditory ring stack would replace the previous ring stack.
Paired-item + sensory toy condition	The auditory ring stack replaced the ring stack in the toy rotation. Other procedures were identical to the paired-item condition.

APPENDIX B

Sensory Attribute Validation Form

Sensory Attribute Validation Form

Toy: _____

The *visual* attributes of this toy are:

5	4	3	2	1
Extremely Prominent	Very Prominent	Prominent	Somewhat Prominent	Totally Absent

The *auditory* attributes of this toy are:

5	4	3	2	1
Extremely Prominent	Very Prominent	Prominent	Somewhat Prominent	Totally Absent

The *tactile* attributes of this toy are:

5	4	3	2	1
Extremely Prominent	Very Prominent	Prominent	Somewhat Prominent	Totally Absent

---

APPENDIX C

Observation Form

Observation Form

Name:_____ Date:____ Time:____ Observer initials:____ Reliability:____

1	Choice	Choice	Choice	Choice	Choice	Choice
	Level of prompt I V M P Not completed	**Level of prompt** I V M P Not completed	**Level of prompt** I V M P Not completed	**Level of prompt** I V M P Not completed	**Level of prompt** I V M P Not completed	**Level of prompt** I V M P Not completed
	VC			PC		
2	Choice	Choice	Choice	Choice	Choice	Choice
	Level of prompt I V M P Not completed	**Level of prompt** I V M P Not completed	**Level of prompt** I V M P Not completed	**Level of prompt** I V M P Not completed	**Level of prompt** I V M P Not completed	**Level of prompt** I V M P Not completed
	VC			PC		
3	Choice	Choice	Choice	Choice	Choice	Choice
	Level of prompt I V M P Not completed	**Level of prompt** I V M P Not completed	**Level of prompt** I V M P Not completed	**Level of prompt** I V M P Not completed	**Level of prompt** I V M P Not completed	**Level of prompt** I V M P Not completed
	VC			PC		
4	Choice	Choice	Choice	Choice	Choice	Choice
	Level of prompt I V M P Not completed	**Level of prompt** I V M P Not completed	**Level of prompt** I V M P Not completed	**Level of prompt** I V M P Not completed	**Level of prompt** I V M P Not completed	**Level of prompt** I V M P Not completed
	VC			PC		
5	Choice	Choice	Choice	Choice	Choice	Choice
	Level of prompt I V M P Not completed	**Level of prompt** I V M P Not completed	**Level of prompt** I V M P Not completed	**Level of prompt** I V M P Not completed	**Level of prompt** I V M P Not completed	Level of prompt I V M P Not completed
	VC			PC		

APPENDIX D

Fidelity Check

Fidelity Check

Date:_____
(+) = completed; (-) = not completed; n/a = not applicable

Steps:					
Provide choice board of 2 toys					
Ask child which toy he would like while naming toys (Do you want to play with the pegboard or with the ring stack?). Make sure that he has had visual contact with each material					
Wait 5 seconds for a response					
The toy the child looks at next is considered the choice. If he uses eye-gaze to make a choice, take his hand to touch the toy selected.					
NOTE: If the child does not make a choice, the adult assists by guiding the child to touch one of the toys. Adult choice noted on data sheet					
Present child with chosen toy					
Use least-to-most prompting AFTER child has contacted a toy. Go through the sequence (more intrusive prompt after less intrusive prompt; no repeated prompts) until the child has completed a functional action					
Use least-to-most prompting for all subsequent prompts					
A new toy is offered every 2min throughout the session					

APPENDIX E

Consent Form

CONSENT FORM

The following describes the information which should be provided in all Consent Forms. It is preferable that the form be divided into the following sections. For anonymous survey research in which an information letter is sent in lieu of a consent form the same information should be provided although the section headers are not necessary. Consent forms must be printed on University of New Orleans letterhead before a protocol will be approved.

1. Title of Research Study

Embedding Sensory Preferences into Materials to Enhance Learning in Toddlers with

Disabilities

2. Project Director

Principal Investigator – Dr. Linda Flynn (504) 280-6541; home (985) 725-0773
Student Investigator – Cynthia F. DiCarlo (504) 430-0636; home (504) 885-5387

3. Purpose of the Research

The purpose of this research project is to identify characteristics of toys (music, texture, lights, etc.) that your child prefers and to add these preferences to other materials to encourage your child to play with a wider variety of materials.

4. Procedures for this Research

An adult working with your child will use their normal instructional strategies to interact with your child. An adult, familiar to your child, will present your child with a variety of materials to choose from in order to determine the characteristics your child prefers. These preferred characteristics would be added to different toys to determine if these characteristics make the toys more appealing to your child.

5. Potential Risks of Discomforts

There are no known risk associated with participation in this project. **If you wish to discuss these or any other discomforts you may experience, you may call the Project Director listed in #2 of this form.**

6. Potential Benefits to You or Others

Your child may benefit from participation in this study by increasing his toy play through the addition of preferred characteristics to a wider variety of materials.

7. Alternative Procedures

The alternative to participation in this study is continuation of early intervention services in the program in which your child is enrolled. **Your participation is entirely voluntary and you may withdraw consent and terminate participation at any time without consequence.**

8. Protection of Confidentiality

Your child's identity will be protected throughout all project activities. Records will be kept in a locked office. Pseudonyms will be used in all dissemination activities.

9. Signatures

I have been fully informed of the above-described procedure with its possible benefits and risks and I have given permission of participation in this study.

_____	_____	_____
Signature of Subject	**Name of Subject (Print)**	**Date**
_____	_____	_____
Signature of Person Obtaining Consent	**Name of Person Obtaining Consent (Print)**	**Date**

APPENDIX F

Institutional Review Board Approval

UNIVERSITY OF NEW ORLEANS
COMMITTEE ON THE USE OF HUMAN SUBJECTS

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Form Number: 12DEC03 *(please refer to this number in all future correspondence concerning this protocol)*

Principal Investigator: Linda Flynn **Title:** Graduate Coordinator

Department: Special Ed. & Habilitative Svces **College:** Education & Human Development

Name of Faculty Supervisor: _____ *(if PI is a student)*

Project Title: **Embedding sensory preferences into materials to enhance learning in toddlers with disabilities**

Date Reviewed: December 8, 2003

Dates of Proposed Project Period: From 12/03 to 12/04
***approval is for one year from approval date only and may be renewed yearly.**

Note: Consent forms and related materials are to be kept by the PI for a period of three years following the completion of the study.

☒ **Full Committee Approval**
☐ **Expedited Approval**
☐ **Continuation**
☐ **Rejected**
☐ **The protocol will be approved following receipt of satisfactory response(s) to the following question(s) within 15 days:**

_____
_____
_____

Committee Signatures:

_____ Scott C. Bauer, Ph.D. (Chair)

_____ Gary Granata, Ph.D.

_____ Betty Lo, M.D.

_____ Hae-Seong Park, Ph.D.

_____ Jayaraman Rao, M.D. (NBDL protocols only)

_____ Laura Scaramella, Ph.D.

_____ Richard B. Speaker, Ph.D.

VITA

Cynthia DiCarlo received B.A. in Sociology from the University of New Orleans in 1992, and a M.Ed. in Early Intervention from the University of New Orleans in 1995. She has worked as a preschool special education teacher in the public school system and with the birth-to-three population in center-based and community-based settings. She has taught associate and graduate level students, and presented at local, state, and national conferences. Currently, Ms. DiCarlo's research interests in the area of early intervention are the utilization of behavioral strategies to enhance the learning of children with disabilities.