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EVALUATING PRESCHOOL CHILDREN'S PREFERENCES FOR MOTIVATIONAL SYSTEMS DURING INSTRUCTION

NICOLE A. HEAL AND GREGORY P. HANLEY

UNIVERSITY OF KANSAS

Preschool teachers rely on several strategies for motivating children to participate in learning activities. In the current study, we evaluated the effectiveness of and preference for three teaching contexts in which embedded, sequential, or no programmed reinforcement was arranged. The embedded context included highly preferred teaching materials, the sequential context included highly preferred edible items for correct responding, and a control context included neither. In addition, an exclusively play-oriented activity was included as a fourth option to determine if one of the direct teaching contexts could compete with a relatively unstructured and exclusively child-led activity. All participants preferred the sequential context (use of high-quality consequences) over the embedded context (use of high-quality teaching materials), 2 of the 4 participants preferred some motivational system to none at all, and the play area was selected over all variants of the instructional contexts during the majority of trials. We found either no or small differences in correct responding in the different instructional contexts; however, rates of undesirable behavior were highest in the least preferred interaction area for 3 of the 4 participants. Implications for the design of effective and preferred teaching environments for young children are discussed.

DESCRIPTORS: choice, concurrent-chains arrangement, embedded reinforcement, instruction, preschoolers, sequential reinforcement

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Determining children's preferences for different classroom contexts is important because, in addition to efficacy measures, preference data may influence the adoption of classroom practices. The acceptability of behavioral interventions has often been determined by inviting teachers or caregivers to complete rating scales or questionnaires (Miltenberger, 1990). However, there are distinct advantages to determining the acceptability of different teaching practices with the learners themselves. For example, Dunlap et al. (1994) showed that incorporating a child's preferences into instructional contexts resulted in less off-task and disruptive behavior. Information about children's preferences may be most important when factors that would typically influence the selection of practices, such as relative efficacy or implementation effort, are similar across practices.

A number of methods have been developed for determining young children's preferences among food, toys, activities, and curriculum materials (DeLeon & Iwata, 1996; Fisher et al., 1992; Foster-Johnson, Ferro, & Dunlap, 1994; Roane, Vollmer, Ringdahl, & Marcus, 1998). In spite of these advancements, procedures for accurately determining preschoolers' preferences for classroom practices or teaching strategies have not been described in the research literature. A general strategy for directly determining preferences for protracted events or behavioral interventions has, however, been described in several studies (Hanley, Iwata, & Lindberg, 1999; Hanley, Piazza, Fisher, Contrucci, & Maglieri, 1997; Hanley, Piazza, Fisher, & Maglieri, 2005), and these procedures may be applicable for determining young children's preferences for classroom practices. Common features in these studies were the use of (a) modified concurrent chains arrangements with (b) individuals who

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Requests for reprints should be addressed to Gregory P. Hanley, Applied Behavioral Science Department, 4023 Dole Center, University of Kansas, Lawrence, Kansas 66045 (e-mail: ghanley@ku.edu).

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could not readily express their biases due to (c) severe language impairments or the complex nature of the assessed events. For example, Hanley et al. (1997, 2005) determined children's preferences among different function-based treatments for problem behavior by recording each child's selections in initial links of concurrent chains in which different treatments were presented in terminal links. In initial links, children pressed colored switches located on a table outside the treatment room. Pressing a switch resulted in exposure to a treatment procedure inside the room, and each switch was associated with a different treatment. Following repeated exposure to this arrangement, children's responding in the initial link differentiated, suggesting preferences among the treatments. In the current study, we applied a similar concurrent-chains arrangement to determine preschoolers' preferences for different teacher-led instructional practices.

Two general strategies for motivating children to participate in teacher-led instruction have been described. First, reinforcers have been embedded within the task itself (Essa, 2003; Herr & Libby, 1990; Mayesky, 1998). Second, reinforcers have been delivered following completion of the task (Daly, Martens, Hamler, Dool, & Eckert, 1999; Freeland & Noell, 1999; Rincover & Newsom, 1985). The relative efficacy of embedded and sequential reinforcement has been evaluated during skills training with adults with severe disabilities (Thompson & Iwata, 2000) and interventions aimed at increasing children's consumption of nonpreferred foods (Kern & Marder, 1996). By keeping the type of reinforcement constant across conditions and manipulating only the manner in which reinforcement was delivered, these studies provided strong evidence for the superiority of the embedded procedure.

However, sequential and embedded motivational systems differ in other ways when integrated within teacher-led instructional activities. With embedded motivational systems, teaching materials that are attractive (e.g., colorful, iconic, multidimensional) and thought to be generally preferred by children are used. Thus, children may automatically derive reinforcement simply by manipulating instructional materials. By contrast, preferred stimuli are systematically identified and then used as consequences for correct responding with the sequential motivational system. Therefore, in addition to the manner in which putative reinforcers are delivered (embedded in materials or provided by a teacher after a correct response), the type and, presumably, quality of reinforcers differ across motivational systems. Although both systems have been evaluated in preschool classrooms (Bryant & Budd, 1982; Driscoll & Nagel, 1999; Gordon & Williams-Browne, 2000; Warren, Rogers-Warren, & Baer, 1976; Zanolli & Daggett, 1998), their relative effectiveness or value to the learners has not yet been determined.

In the current study, either embedded or sequential reinforcement was implemented in two contexts. Thus, the teaching contexts varied along two primary dimensions: the type and timing of reinforcement. We also included an exclusively play-oriented activity devoid of teacher instructions and an instructional context devoid of either motivational system in our evaluation. Thus, four contexts were included as terminal links in our concurrent-chains arrangement: instructions with embedded reinforcement, instructions with sequential reinforcement, instructions only (control), and no instructions (play). We compared measures of children's correct responding and undesirable behavior while they experienced the different teaching conditions to determine their relative effectiveness. We determined children's preferences among the four classroom contexts by allowing and measuring their selections of each context.

METHOD

Participants and Setting

The participants attended a full-day inclusive preschool program that served typically and atypically developing children ranging from 3.5 to 5 years of age. Charlie was 5 years old with a diagnosis of nonspecified developmental delay. James, Amy, and Anne were typically developing 4-year-olds. In addition to obtaining informed consent from parents, assent was obtained from the participants each day prior to conducting sessions. Children were selected for participation based on their and the first author's availability.

Observations took place in a large unoccupied classroom (12 m by 7 m) that contained child-sized tables and chairs, toys, and teaching materials. The four terminal-link interaction areas were located along one wall, three of which contained a table, chair, and teaching materials. There was a shelf with nine toys that were often available in the children's classroom (e.g., wooden blocks, dinosaurs, and connecting blocks) in the fourth interaction area. A different-colored laminated card (60 cm by 75 cm) was placed on the wall in each of the interaction areas. On the opposite wall, there was a table containing four smaller colored cards (15 cm by 10 cm).

Response Measurement and Interobserver Agreement

A second observer simultaneously but independently recorded data on children's selections during 100% of task material and consumable preference assessments. Interobserver agreement was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100%. An agreement was scored when both observers scored the same child selection within a trial. Agreement was 100% across all task material and consumable preference assessments for all children.

During the interaction area preference assessment, observers recorded card selections, which were defined as the first contact of the participant's hand on a card. Interobserver agreement data were collected during at least 50% of all sessions across all participants (range, 50% to 90%). Agreement was scored when both observers recorded the same card selection within a trial; coefficients were calculated as described previously. Agreement was 100% across all participants.

Performance data also were collected during the interaction area preference assessment. A mean task-completion score was generated by assigning points for correct responding to vocal (3 points), model (2 points), or physical (1 point) prompts within each instructional trial. Undesirable behavior was defined as vocal attempts to leave the area (e.g., "Did the timer go off yet?" or "I want to go back over there."), and physical or vocal avoidance of instructions (e.g., pushing materials away or putting his or her head down on the table). All terminal-link interactions were videotaped and later scored in 10-s intervals using handheld computers for Charlie and James. Paper-and-pencil measures were used to record performance data in 20-s intervals during sessions for Amy and Anne. A second observer recorded data simultaneously but independently during at least 28% of all sessions across participants (range, 28% to 70%). For Charlie and James, agreement percentages were calculated by dividing the smaller number of responses recorded in each interval by the larger number of responses and multiplying the result by 100%. Interobserver agreement was 95% (session range, 68% to 100%) for correct responding and 99% (session range, 73% to 100%) for undesirable behaviors, respectively. Agreement was scored when both observers recorded the same responses in each 20-s interval for Amy and Anne. Agreement was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100%. Interobserver agreement was 99% (session range, 87% to 100%) for correct responding and 97% (session range, 67% to 100%) for undesirable behaviors, respectively.

Table 1
Description of Task Materials in Sets 1 and 2

	Skill	Set 1 teaching materials	Set 2 teaching materials
A	Counting: 1–20	Multicolored counting vehicles (cars, trucks, airplanes, and buses)	2 cm by 2 cm natural wooden blocks
B	Patterning: Color	Multicolored peg bears with yellow foam peg board	5 cm by 5 cm multicolored construction paper
C	Patterning: Shape	Orange shapes with faces on the front glued to clothes hangers	White construction paper shapes
D	Patterning: Size	Red and green Martians (big and little) glued to foam pieces	8 cm by 8 cm and 15 cm by 15 cm white construction paper
E F	Writing: Letters[a] Writing: Shapes	20 cm by 28 cm laminated construction paper with decorative edges and wet erase markers	20 cm by 28 cm white construction paper and pencils
G H I	Matching: Numbers Pointing: Numbers Naming: Numbers	Green fish with glitter on the fins glued to a 2 cm by 2 cm blue block, numbers located on the body of the fish or yellow starfish with glitter on the bow glued to a 2 cm by 2 cm yellow block, numbers located on the body of the starfish	5 cm by 5 cm white construction paper, numbers written in black ink
J K	Pointing: Letters[b] Ordering: Letters[b]	8 cm by 15 cm yellow laminated cards with blue dogs on the front glued to foam pieces, letters located on the body of the dog	5 cm by 5 cm white construction paper, letters written in black ink
L M N O	Matching: Letters[a] Pointing: Letters[a] Naming: Letters[a] Ordering: Letters[a]	8 cm by 15 cm purple laminated cards with orange cats on the front glued to foam pieces, letters located on the body of the cat or 8 cm by 10 cm orange laminated cards with green frogs on the front glued to wooden blocks, letters located on the body of the frog	5 cm by 5 cm white construction paper, letters written in black ink
P	Ordering: Name	8 cm by 15 cm blue laminated cards with green and red Martians on the front glued to green Popsicle sticks, letters located on the body of the Martian	5 cm by 5 cm white construction paper, letters written in black ink
Q	Pointing: Sight words	Blue butterflies with glitter on body, green worms with glitter on tail, yellow sunflowers with glitter on tops glued to Popsicle sticks, sight words located on the front of the picture	2 cm by 10 cm white construction paper, sight words written in black ink

[a] Uppercase letters.
[b] Lowercase letters.

Procedure

Task Materials Preference Assessment

Academic tasks were chosen according to each child's skill level, as determined from their individualized classroom curricula. For example, if the child had mastered matching numbers 1 through 20, then the next skill, pointing to numbers 1 through 20, would have been used in the assessment. Two sets of teaching materials were created for each academic task. One set consisted of colorful, iconic, multidimensional materials; the other consisted of simple black-and-white materials (Table 1). A paired-item preference assessment (Fisher et al., 1992) was conducted with the two sets of teaching materials to identify the more and less preferred sets of materials. For each academic task, the two sets of materials were placed on the table, and the child was asked, "Do you want to work on [task name] with these materials or these materials?" The teacher paused for approximately 2 s and then slid the child's chair closer to the table. The child chose a set by touching the materials. Following a child selection, one academic instruction relevant to the teaching materials was delivered. The order of task presentation was random and counterbalanced, and this sequence of events continued until both sets of teaching materials for each academic task were presented once. Two sessions were conducted if selections appeared stable; five sessions were conducted if different materials were selected across the initial two assessments. The most preferred set of teaching materials was used in the embedded context, and the least preferred set of teaching materials was used in the sequential and control contexts.

Consumable Items Preference Assessment

Ten consumable items deemed acceptable by parents and teachers were selected for each child and included in a paired-item preference assessment (Fisher et al., 1992). Each item was paired with every other item once and were presented to the child on separate plates; approach responses (touching one of the two plates) were scored. After a plate had been touched, the child was given with the item. The order of stimulus presentations was random. A hierarchy of preference among the items was obtained for each child, and the three items the child preferred most were used as consequences for correct responding in the sequential context.

Interaction Area Preference Assessment

Description of interaction areas. Based on the results of the preference assessments, three instructional contexts were designed. Highly preferred teaching materials were present and praise was delivered following correct responding in the embedded context, less preferred teaching materials were present and highly preferred consumable items plus praise were delivered following correct responding in the sequential context, and less preferred teaching materials were present and praise was delivered following correct responding in the control context. Finally, various toys that were typically available in the preschool classroom were present in the play area. The play area was included in the preference assessment to determine the conditions under which a child might select a teacher-led instructional activity over an exclusively child-led play activity. Laminated colored cards (60 cm by 75 cm) corresponding to each condition were posted on the wall of each interaction area. For example, a red card was correlated with play, yellow with sequential, blue with embedded, and green with control for James. The color assignments were held constant throughout the interaction area preference assessment for each child.

Interaction area exposure. Exposure sessions were conducted to allow the child to experience the interaction areas in the terminal links and learn the associations between colored cards in the initial links and the corresponding terminal links. Standing behind the child in the initial-link area, the teacher vocally and physically guided the child to touch one of the four cards and then provided access to the correlated area for 5 min. The selection of each session's academic task was counterbalanced and randomly determined for each child, and the same academic task was used across instructional contexts within each session. In addition, the order of link selections was randomly determined and counterbalanced.

Instructions were delivered approximately once every 20 to 30 s in each instructional context. A three-step prompting procedure was used to deliver instructions, and consequences (e.g., praise or praise plus consumable item) were provided following correct responses to the vocal or model prompt. There were no differential consequences for undesirable behavior. To provide similar amounts of teacher attention in all four interaction areas, attention was provided every 20 to 30 s in the play area for Amy and Anne. Teacher attention was nearly continuous in the play area for Charlie and James. After the child experienced each interaction area once, the exposure session was terminated. Four exposure sessions were initially conducted with each participant; one additional exposure session was conducted immediately prior to the second interaction area preference assessment.

Choice sessions. Choice sessions were identical to the exposure sessions, except that the child made independent selections in the initial link, and 3-min access to one of the four interaction areas was arranged in the terminal links. During the choice sessions, the teacher stood behind the child and provided the instruction, "Touch a card." If the child did not respond, the same instruction was repeated twice until 1 min had passed. Sessions were conducted once daily and were terminated after a child made eight selections or refused to make a selection within 1 min of a choice opportunity (this happened once for Charlie and once for James).

Restriction rules. Two restriction rules allowed the identification of a preference hierarchy among the four interaction areas (Hanley, Iwata, Lindberg, & Conners, 2003). First, if an interaction area was selected on 60% or more trials for two consecutive sessions or for two of three sessions, the card correlated with that area was removed from the choice array. Second, if two interaction areas were alternately selected for 60% or more trials across four sessions, then cards correlated with both of the areas were removed. After an initial preference hierarchy was obtained, a second interaction area preference assessment was conducted to determine the reliability of the hierarchy with 3 of the 4 children. All four interaction areas were again available to be selected, an exposure session was conducted, and the children were given the opportunity to make independent selections.

Prevention of bias. The following variables were held constant throughout the study to ensure that interaction area selections were a function of the independent variables. The teacher provided no differential consequences beyond access to the different interaction areas for selections in the initial link. The colored cards in the initial link were sequenced randomly at the start of each session. After each selection, the card located at the far left end was rotated to the far right end. The position of the interaction areas also was sequenced randomly for each session. One teacher conducted all sessions throughout the evaluation. The same teacher also was available in each interaction area to prevent the participant from choosing an interaction area to gain access to a particular teacher. The teacher delivered all instructions in a neutral tone of voice, and the quality of the social praise delivered by the teacher was similar across all interaction areas. Finally, for each child, the same academic task was used across the instructional contexts within each session.

Experimental Design

A concurrent-chains arrangement was used to evaluate preference for the instructional contexts and play area. Multielement and reversal designs were used to evaluate relations between the interaction areas and terminal-link behaviors (i.e., correct responding and undesirable behaviors).

RESULTS

Materials Preference Assessment

The materials preference assessments identified preferred materials for each participant. Charlie showed a relative preference for Set 1 (colorful, iconic, multidimensional) over Set 2 (black-and-white) teaching materials for 15 of the 16 academic tasks. James showed an exclusive preference for Set 1 materials. Skills were selected for inclusion in the interaction area preference assessment based on three criteria: (a) There were highly discrepant selection percentages between Sets 1 and 2, (b) the initial skill in a developmental sequence was selected over a later skill (e.g., pointing to numbers was selected over naming numbers because we generally taught the former prior to the latter), and (c) the skill had not been mastered in the classroom at the onset of the interaction area assessment (e.g., patterning was not used with James because he had previously acquired this skill in the classroom). Therefore, counting, patterning by color, writing shapes, and pointing to numbers were used in Charlie's interaction area preference assessment; counting, writing letters, naming numbers, and naming upper case letters were the four tasks included in James' interaction area preference assessment.

Only two academic tasks were included in Amy's and Anne's materials preference assessments because each had already mastered many of the academic tasks included in Charlie's and James' assessments. Amy showed an exclusive preference for the Set 1 materials, and Anne selected the Set 1 teaching materials on 80% of trials. Naming letters and pointing to sight words were alternately used in Amy's and Anne's interaction area preference assessments. In sum, the selected Set 1 materials were more highly preferred than the selected Set 2 materials for all tasks for all children. Therefore, Set 1 materials were included in the embedded instructional contexts; Set 2 materials were used in the sequential and control contexts.

Consumable Items Preference Assessment

The consumable items preference assessments identified three highly preferred items for each participant (M&Ms®, Kit Kat Bites®, and Gold Fish® for Charlie; Skittles®, Gold Fish®, and jelly beans for James; stickers, Teddy Grahams®, and Froot Loops® for Amy; and Kit Kat Bites®, Froot Loops®, and Fruit Smiles® for Anne). These items were presented as consequences for correct responding in the sequential context.

Interaction Area Preference Assessment

Initial links (preference data). The results of the interaction area preference assessments are shown in Figures 1 and 2. These figures show cumulative trial-by-trial data. Rows of data represent selections towards a single interaction area; columns of panels represent data from single assessments. Restriction of an interaction area is indicated when the data path stops on each panel. Charlie initially allocated the majority of his choices to the sequential context, as indicated by the immediate upward trend in selections for the sequential context and the initial flat data paths for the other contexts. When the sequential context was removed from the array and three interaction areas were available, Charlie allocated almost all of his selections to the play area. When the play area was removed, a preference for the embedded context emerged relative to the control context. The preference assessment was then repeated with Charlie to determine whether the preference hierarchy would be replicated. Although results of the second assessment showed that Charlie initially chose play in lieu of all instructional contexts, the hierarchy among the instructional contexts remained intact in that the sequential context was preferred to the embedded context, and both were selected in lieu of the control context. Therefore, Charlie preferred the sequential motivational system and, at least initially, demonstrated a preference for an instructional context with the sequential motivational system over an exclusively play-oriented activity.

James allocated the majority of his choices to the play area when all four options were available (Figure 1). After the play area was restricted, he allocated his selections relatively evenly between the sequential and embedded contexts. In the second assessment, the preference patterns were replicated (note the similarity in the data paths from the first and second assessments). In sum, James preferred play to all variants of instruction, and he showed a preference for the use of motivational systems relative to their absence (i.e., control), but he did not show a strong preference for either of the motivational systems.

Initially, Anne's selections were variable (Figure 2); however, a preference for the play area eventually emerged. When only the three instructional contexts were available, Anne allocated almost all of her selections to the sequential context. After the sequential context was removed from the array, she alternated her selections between the two remaining instructional contexts. The patterns in the second assessment were somewhat similar to the first; however, Anne often selected the sequential context instead of the play area. When the sequential context was restricted, Anne allocated

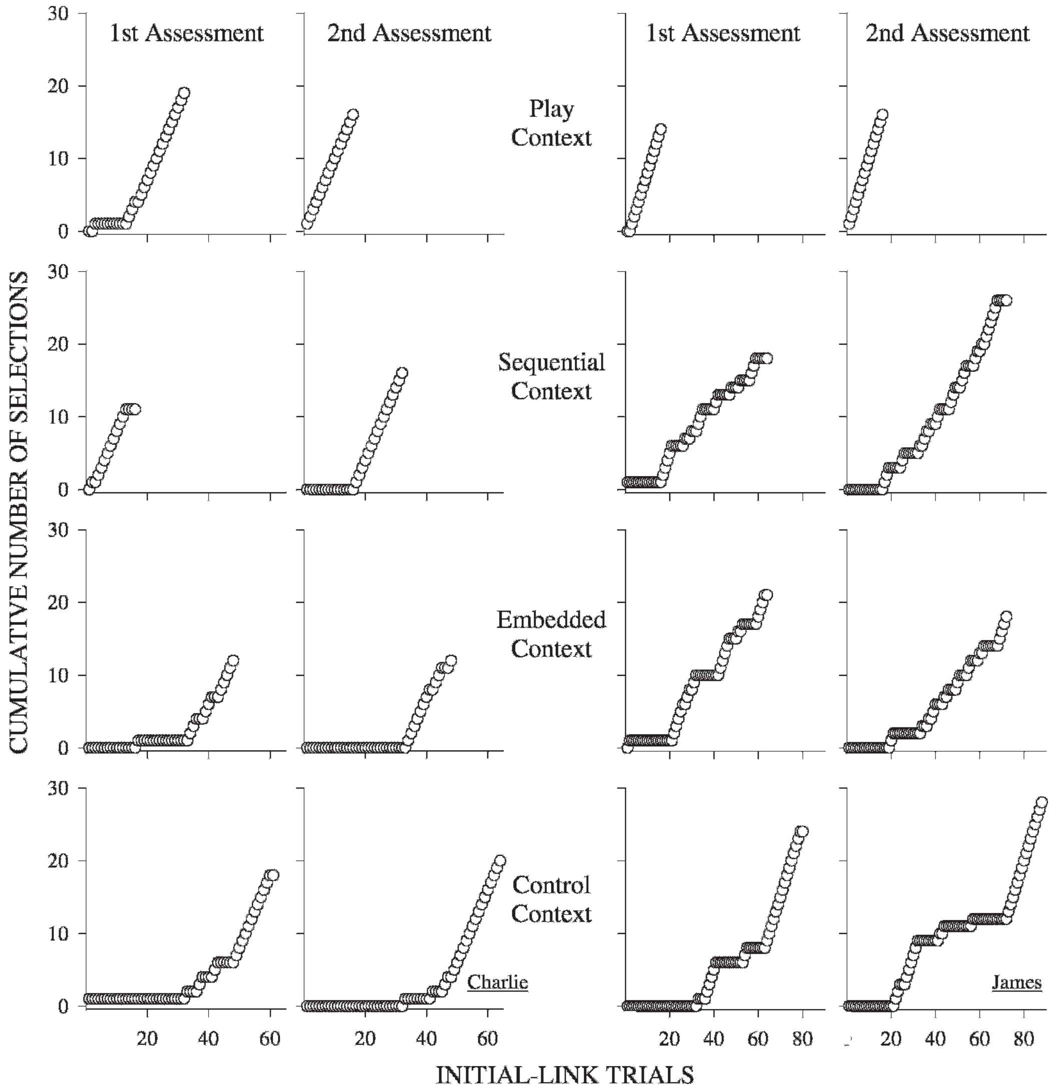

Figure 1. Cumulative number of initial-link selections during the first and second interaction area preference assessments for Charlie (first and second columns) and James (third and fourth columns).

all of her selections to the play area. When the play area was restricted, Anne selected the embedded context.

Amy initially showed variability in her selections (Figure 2), but a preference for the play area emerged. When the play context was restricted, she almost exclusively selected the sequential context. When the sequential context was restricted, she selected the embedded over the control context. The interaction area preference assessment was not repeated with Amy because she declined further participation. In sum, Amy showed a preference for the play area over all of the instructional contexts. Among the instructional contexts, Amy preferred the sequential context.

The top panel of Figure 3 displays a summary of all children's interaction area preference assessments and shows the percentage of selections for each interaction area given the opportunity to select the interaction area. Overall selection percentages indicate that all

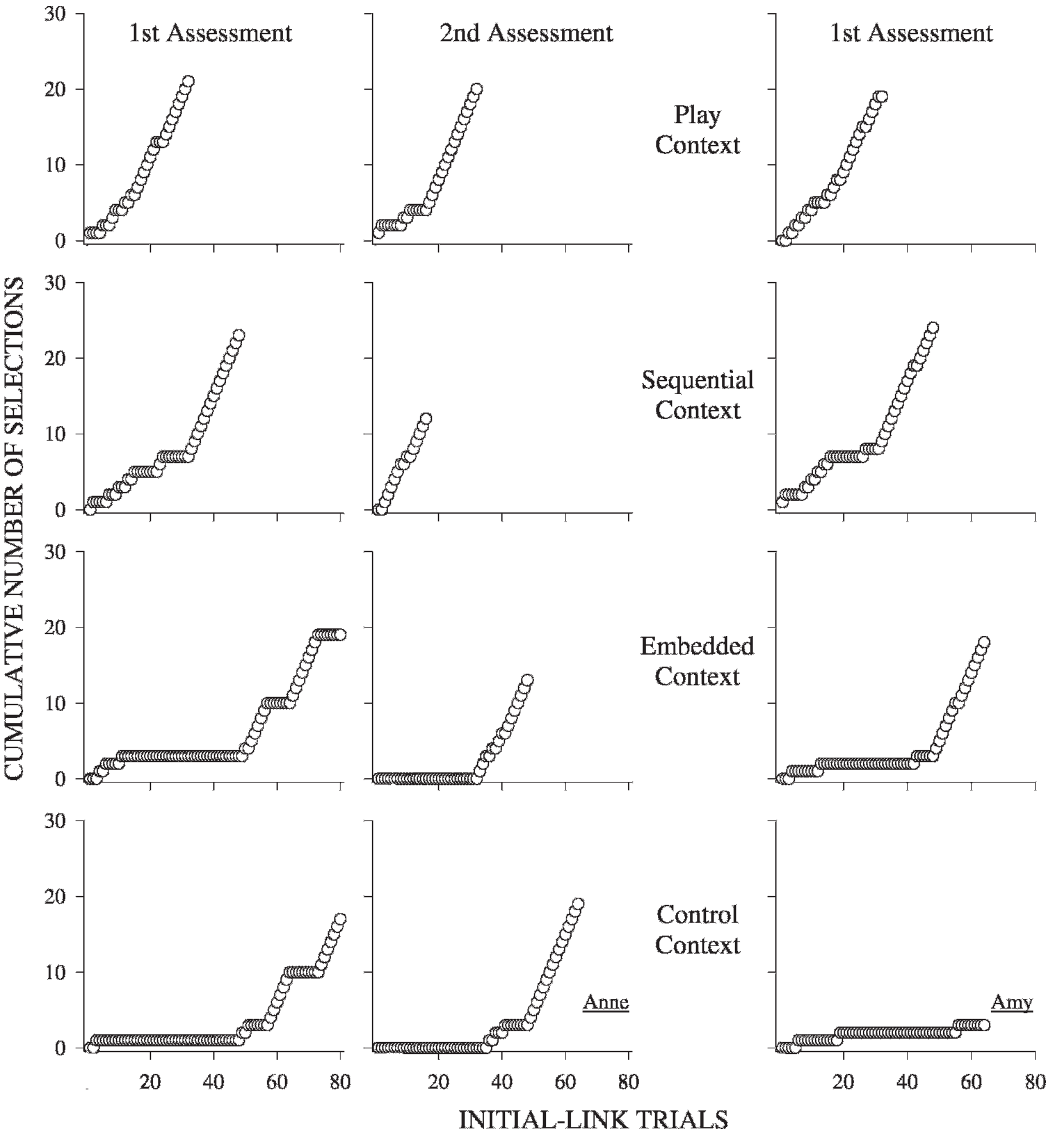

Figure 2. Cumulative number of initial-link selections during the first and second interaction area preference assessments for Anne (first and second columns) and Amy (third column).

children preferred the play area to instructional contexts, all children preferred the sequential context to the embedded context, and 2 of the 4 children preferred the use of some motivational system to none at all.

Terminal link (performance data). Only very small differences were observed in mean task-completion scores (Figure 3) across instructional contexts for all children. Nevertheless, scores were the highest in the sequential context and lowest in the control context for all children. Anne and Amy required less prompting to complete the academic tasks relative to Charlie and James, which was not surprising considering these participants' more extensive histories with the preschool classroom curriculum.

The percentage of intervals with undesirable behaviors is also shown in Figure 3. Charlie engaged in undesirable behaviors during 0%, 6%, 20%, and 23% of the intervals in the play,

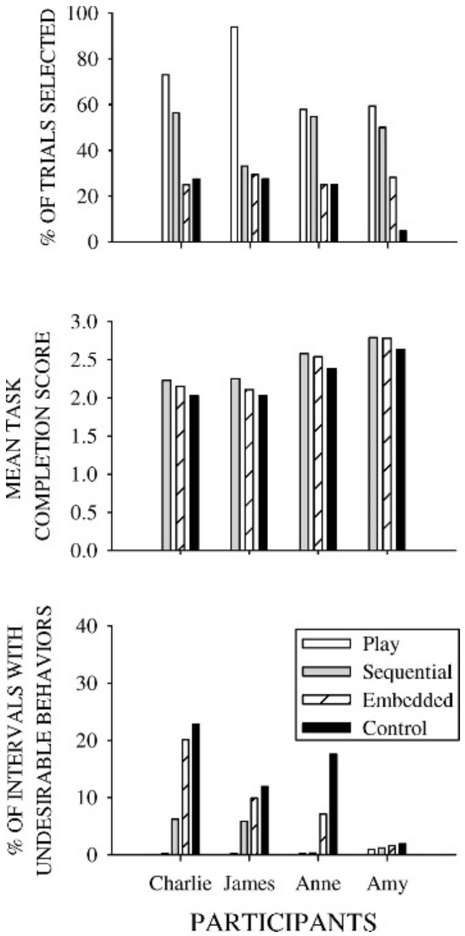

Figure 3. Summaries of initial-link responding (preference indexes; top), mean task-completion scores (middle), and the percentage of intervals with undesirable behaviors (bottom) for all participants during the interaction area preference assessments.

sequential, embedded, and control interaction areas, respectively. For Charlie, there was a negative correlation between the value of the interaction area (evident in the top panel of Figure 3) and undesirable behavior (i.e., the likelihood of undesirable behavior decreased as the preference value increased). This correlation also was apparent with Anne and James, who engaged in undesirable behaviors in 0%, 0.3%, 7%, and 18% and 0%, 6%, 10%, and 12% of the intervals in the play, sequential, embedded, and control interaction areas, respectively. By contrast, Amy engaged in undesirable behaviors at similarly low levels across all interaction areas; therefore, there was no strong correlation between undesirable behavior and the value of the interaction areas.

DISCUSSION

We adapted a concurrent-chains arrangement that has been used to identify children's preferences for behavioral interventions to determine preschool children's preferences for common classroom practices. The 4 children preferred unstructured play to teacher-led instructional contexts that involved different motivational systems. When the play context was unavailable, all children preferred the sequential to the embedded motivational system, and 2 of the 4 children preferred the embedded motivational system to none at all.

This study was primarily concerned with comparing teaching conditions that are commonly found in preschool classrooms. Early childhood textbooks (Eliason & Jenkins, 1986; Graves, Gargiulo, Sluder, & Holmes, 1996; Roopnarine & Johnson, 1993) indicate that potentially reinforcing teaching materials are frequently integrated into early childhood classroom activities, as are enhanced consequences (edible items, stickers, trinkets, etc.) for correct responding. Thus, we selected contexts with high ecological validity; however, we sacrificed some experimental integrity by varying two elements across the sequential and embedded contexts (i.e., both reinforcer type and the manner in which the reinforcers were delivered changed across contexts). Thus, by evaluating children's preferences for practices common to preschool classrooms, we may have demonstrated the rather obvious outcome that children prefer candy and stickers to material reinforcers (i.e., the nature of the delivery of the reinforcement may not have influenced preferences). Nevertheless, because all children preferred the sequential context, we recommend that teachers systematically identify preferred items that both teachers and parents find acceptable and provide these items following correct responding during teacher-led instruction.

In addition to showing that the children preferred the sequential instructional context, our data clearly show a strong preference for play-oriented activities, suggesting that evaluations of the relative effectiveness of and children's preferences for play-based instructional strategies, such as guided-discovery techniques (Bruner, 1961; Mayer, 2004), embedded teaching (Bricker, Pretti-Frontczak, & McComas, 1998), and incidental teaching (Hart & Risley, 1968, 1974, 1975), are warranted. In addition, it seems equally important to discover new and integrate proven tactics, such as systems of least prompts (e.g., Doyle, Wolery, Ault, & Gast, 1988), prompt delay (e.g., Halle, Marshall, & Spradlin, 1979), and errorless teaching (e.g., Duffy & Wishart, 1994) to enhance the value of teacher-led instructional situations.

It was somewhat surprising that the instructional contexts with programmed motivational systems were associated with only marginal improvements in task completion relative to the control instructional context. It is possible that there may be appreciable differences in academic performance engendered by these different instructional contexts to which our measurement system was insensitive. Additional studies comparing the effectiveness of and preference for different teaching tactics may be improved by arranging similarly difficult, but distinct, concept classes with each tactic, and measuring the number of trials required to master each concept class. It is also possible that the incorporation of a system of least prompts across all instructional contexts influenced correct responding to a larger extent than the motivational systems. If so, different effects of the motivational systems may be observed using alternative prompting strategies, such as errorless teaching.

An interesting finding of the current study is that apparently equally effective instructional contexts can be differentially valued by the students who experience them. A child's preference may be an important factor to consider when adopting teaching strategies because children may be more inclined to seek out and less likely to actively avoid learning opportunities provided under highly preferred and properly motivating conditions. The latter benefit was evident in the differing levels of undesirable behavior associated with the preferred areas. This outcome is consistent with Dunlap et al. (1994), who also showed that preferred curricular materials were associated with decreased levels of disruptive classroom behavior.

Although it may seem reasonable to use a child's success or difficulties in an instructional context as indicators of his or her preference for a given context, neither academic performance nor undesirable behavior was a perfect predictor of a child's preference for a context in our study. Academic performance was relatively undifferentiated across contexts, and undesirable behavior would have been an accurate proxy in most but not all cases. Therefore, the current data suggest that if a child's preference for an instructional context is important information, direct and replicable measures of preference should be collected concomitant with the measures of the effectiveness of a context.

Although refinements in this preference assessment technology are warranted, the procedures used in the current study offer some advantages over previous concurrent-chains arrangements for determining preferences for complex events (Hanley et al., 1997, 1999, 2005). For example, whereas previous research conducted assessments of effectiveness and preference sequentially, evaluations of the efficacy of and preference for the teaching contexts were performed simultaneously (and, therefore, more efficiently) in the current study. In addition, preferences among smaller groups of contexts were assessed after the most preferred contexts were identified and removed. This permitted identification of a preference hierarchy among contexts rather than exclusive identification of only the most preferred context. Finally, conducting assessment procedures twice with each participant (except Amy) allowed an evaluation of the extent to which the assessment yielded consistent results.

Simply asking a child which context he or she likes best would be a more efficient way to identify preferences. However, determinations of preference (i.e., measurement of the initial-link responding) took very little time in the current study (children generally chose within 5 s). Exposure to each context in the terminal links was, by contrast, the most time-consuming aspect of the procedures, and this history appears to be a necessary prerequisite for an accurate vocal nomination. Thus, it would be unlikely that children would make meaningful choices among teaching contexts without first experiencing each. Nevertheless, future research should investigate methods for enhancing the efficiency of methods for measuring preferences among classroom contexts. We are currently evaluating procedures to detect changes in preference as a function of a child's continued experience with classroom contexts as well as strategies that permit simultaneous identification of personal preferences of entire classrooms of children.

The National Association for the Education of Young Children (Bredekamp & Copple, 1997) recommends that teachers follow the child's lead in the early childhood environment. This recommendation has led to the integration of a range of child-led instructional strategies in preschool classrooms (guided-discovery techniques, embedded and incidental teaching), some of which have little or no empirical support (e.g., exclusively discovery-oriented practices, Klahr & Nigam, 2004; Mayer, 2004). In the current study, we directly measured children's preferences among the teaching contexts, which provides teachers and researchers with an empirical basis for following the child's lead when designing individualized classroom teaching practices.

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