

# Challenging the Notion of a Thematic Preference in Young Children

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Many researchers have argued that early cognitive development is characterized by a conceptual preference for thematic over taxonomic relations. However, more recent research indicates that infants and toddlers may not favor thematic relations. To resolve this discrepancy, the conceptual preferences of children ranging from 2 to 4 years of age were examined, using a forced-choice task including a target (e.g., a carrot), a thematic alternative (e.g., a rabbit), and a taxonomic alternative (e.g., a tomato). The effects of age, experimenter's instructions, hierarchical level (basic vs. superordinate), and stimulus medium (pictures vs. objects) were examined systematically. Children revealed no pervasive preference for either thematic or taxonomic relations. This challenges the notion of a developmental shift in conceptual preferences and suggests a more continuous trajectory in early conceptual development.

Within the field of cognitive development, there is a robust finding that preschool-age children have a conceptual preference for thematic over taxonomic relations (Denney, 1974; Greenfield & Scott, 1986; Nelson, 1977; Scott, Serchuk, & Mundy, 1982; Smiley & Brown, 1979). This thematic preference has typically been revealed in forced-choice paradigms in which participants are presented with a target object (e.g., a carrot) and two alternatives, one bearing a thematic or complementary relation to the target (e.g., a rabbit), and the other bearing a taxonomic relation to the target (e.g., a tomato). Under such circumstances, researchers have reported that young children prefer to match the target with the thematic, as opposed to the taxonomic, alternative. Smiley and Brown (1979) have reported that this thematic preference is not uniform throughout the course of development. On the contrary, they describe a non-monotonic, U-shaped developmental function, with preschool-age children and elderly adults demonstrating a thematic preference and participants at the intervening ages favoring taxonomic relations.

The discovery of a thematic preference in preschool-age children was especially influential because it offered a reconciliation

between the empirical finding that children failed to invoke taxonomic systems of organization in many tasks (Bruner, Goodnow, & Austin, 1956; Inhelder & Piaget, 1964; Vygotsky, 1962) and the theoretical position that performance on such tasks masked children's underlying cognitive competence (cf. Gelman, 1978; Gelman & Greeno, 1989). In fact, Smiley and Brown's (1979) study was among the first to demonstrate that preschool-age children do indeed appreciate taxonomic relations among objects, even if this is not their preferred mode of organization.

Although this demonstration of a nonmonotonic shift in conceptual preferences has had a powerful and long-standing impact, there are two independent reasons to question its promise as a current model of conceptual organization. First, considerable work in adult cognition has challenged the view that there are stable conceptual preferences underlying adults' performance in tasks such as decision-making, judgment, and choice behaviors. Instead, the weight of the empirical evidence is consistent with the view that the expression of any particular conceptual preference is context-dependent. The claim is that conceptual preferences are not stable phenomena but are instead constructed flexibly in the process of solving the particular task at hand (Kahneman & Tversky, 1979; Slovic, 1995; Slovic & Lichtenstein, 1983; Tversky & Kahneman, 1981; Tversky & Simonson, 1993).

This body of work is relevant to developmentalists because it suggests that the "conceptual preferences" exhibited by adults and children in a given task may reflect context-dependent processes (including, e.g., the participants' responses to the materials and to the instructions) rather than stable preferences that characterize cognition at a particular developmental level. This issue is especially pertinent because most developmental studies of conceptual preferences have included only a single instruction condition. In the absence of a systematic test of the effects of instructions, it remains unclear whether the "preferences" expressed in these experimental tasks would be expressed consistently across different experimental contexts.

A second reason to question the view that conceptual development entails a series of shifts between thematic and taxonomic

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(or syntagmatic and paradigmatic) conceptual preferences comes from recent research with very young children. In the original demonstrations of a thematic preference in early childhood, the youngest children tested were 3 and 4 years of age (Greenfield & Scott, 1986; Smiley & Brown, 1979). Yet, these results have contributed to a strong implicit assumption that a thematic preference necessarily precedes a taxonomic preference in development and that a thematic preference is characteristic of even younger children as well. For years, this assumption remained unexplored, largely because of the challenges of examining toddlers and infants with relatively limited repertoires of behaviors.

However, over the last decade, as developmental psychologists have shifted their focus to examine the cognitive capacities of infants and toddlers, experimental evidence bearing on this assumption has begun to accumulate (Bauer & Mandler, 1989; Markman, 1994; Waxman & Hall, 1993; Waxman & Kosowski, 1990). Interestingly, although none of these recent studies were designed specifically to address the issue of early conceptual preferences, each study includes data that bears on this issue directly.<sup>1</sup> In the control conditions in each of these experiments, children ranging in age from 15 to 31 months were presented with a target object, a thematic alternative, and a taxonomic alternative in a forced-choice task. The results of these experiments have been somewhat inconsistent. Although there were circumstances under which a thematic preference seemed to surface (Markman, 1994), in the majority of these recent studies (Bauer & Mandler, 1989; Waxman & Hall, 1993; Waxman & Kosowski, 1990), children in the control conditions revealed a strong inclination to select the taxonomic, as opposed to the thematic, alternatives.

Despite the highly taxonomic performance in this age group, there do appear to be individual children who find thematic relations to be highly salient. Dunham and Dunham (1995) have identified stable individual differences in young children's conceptual preferences. However, a stable thematic preference was displayed by only a minority of children. Moreover, Dunham and Dunham's data reveal no shift from one conceptual preference to another. In contrast, their data suggest that this individual preference may be relatively stable across the first 3 years of development.

In summary, these patterns of recent findings challenge directly the assumption of a thematic preference in the early preschool years. Recent work in adult cognition and in cognitive development calls into serious question the view that cognition and cognitive development are characterized by overarching, age-related conceptual preferences; this work also challenges the assumption that a conceptual preference for thematic relations necessarily precedes a taxonomic preference in development.

We therefore propose a different characterization of early conceptual development. We propose that children (like adults) appreciate many different kinds of conceptual relations among objects but reveal a pervasive preference for none. As a corollary, we expect that children (like adults) will adjust their responses flexibly according to the particular task at hand. There are several advantages to this proposal. First, it is consistent with current models of preference in adult cognition. Second, it shifts the focus of the developmental work. Rather than seeking to identify stable conceptual preferences or modes of response

across development, the goal becomes one of determining the contexts or circumstances under which children may express a preference for one particular relation over another (Gelman & Greeno, 1989; Thelen & Smith, 1994). In this way, this proposal provides a framework to bridge the empirical gap between traditional studies that revealed thematic preferences in preschool-age children (Denney, 1974; Greenfield & Scott, 1986; Markman & Hutchinson, 1984; Nelson, 1977; Scott et al., 1982; Smiley & Brown, 1979) and more recent work that challenges the assumption of a thematic preference in toddlers and preschool-age children (Bauer & Mandler, 1989; Waxman & Hall, 1993; Waxman & Kosowski, 1990).

To examine this proposal, we take a systematic look at the patterns of performance of children ranging from 2 to 4 years of age. In Experiments 1 and 2, we examine the performance of 3- and 4-year-old children, devoting particular attention to the effects of age, the experimenter's instructions to the children, the hierarchical level (basic vs. superordinate) of the stimuli presented, and the stimulus medium (pictures vs. objects). The results of these experiments motivate our investigations with 2-year-olds (Experiment 3).

In the experiments reported here, we adapted the standard forced-choice procedure in several ways. One adaptation concerned the instructions that were presented to the children. In most of the traditional studies of conceptual preferences, experimenters have typically shown the child a target and then asked the child which of the alternatives (thematic or taxonomic) "goes with" or "goes best with" it. In contrast, in the more recent studies with infants and toddlers, experimenters have typically asked participants to "find another one" or "find another one just like this one." These different instructions may account for some of the performance differences between preschoolers and toddlers (see Markman & Hutchinson, 1984; Waxman & Kosowski, 1990, for further discussion of this factor). Asking a child, "Which one goes with it?" or "Which one goes best with it?" seems to highlight thematic relations, whereas asking a child to "find another one" seems to call to mind primarily taxonomic relations. Therefore, in this series of experiments, we examine this contextual factor directly, predicting that children will be more likely to select the thematically related alternatives when asked, "Which one goes best with it?" than when asked, "Can you find another one?"

A second factor of interest was the role of the hierarchical relation between the target and taxonomic alternatives. To examine this factor, in half of the trials, the target (e.g., a cookie) was related to the taxonomic alternative (e.g., another cookie) at the basic level; on the remaining trials, the target (e.g., a carrot) was related to the taxonomic alternative at the superordinate level (e.g., a tomato). On the basis of evidence concerning the developmental primacy of the basic level (Mervis & Crisafi, 1982; Rosch, Mervis, Gray, Johnson, & Boyes-Braem, 1976; Waxman, 1990, 1994), we suspected that children would be more likely to choose the taxonomic alternative on basic than on superordinate level trials because the perceptual and functional

<sup>1</sup> The primary focus of Bauer and Mandler (1989) and Waxman and Hall (1993) was to examine the influence of novel words on the conceptual organization of 1- and 2-year-olds. Waxman and Kosowski (1990) and Markman (1994) examined this issue in 2- to 4-year-olds.

similarity between the taxonomic alternative and the target is most pronounced on the basic-level trials. Conversely, we suspected that children would be more likely to choose the thematic alternatives on the superordinate-level trials because on these trials, the perceptual and functional relation between target and taxonomic alternative is less compelling.

Third, we examined the effect of the medium in which the stimuli were presented. In most studies with preschool-age children, pictorial representations of familiar objects have been used as stimuli. In contrast, in most of the more recent studies with infants and toddlers, toy replicas have been used as stimuli. Because children may perform differently on tasks involving pictures versus objects (Becker, Rosner, & Nelson, 1979; Daehler, Lonardo, & Bukatko, 1979; Etaugh & Van Sickle, 1971; Monroe & Lange, 1977; Zaft & Daehler, 1979), we examine children's performance using three-dimensional toy replicas of objects (Experiments 1 and 3) and using two-dimensional pictures of those objects (Experiment 2).

In sum, we examined the performance of children ranging from 2 to 4 years of age, devoting particular attention to the effects of (a) age, (b) the instructions presented to the children, (c) the hierarchical level of the stimuli, and (d) the medium in which the stimuli were presented. To the best of our knowledge, no such systematic evaluation of these factors has yet been carried out.

### Experiment 1

In this experiment, we examined the performance of 3- and 4-year-old children, using three-dimensional toy replicas of familiar objects in a forced-choice task. We examined two contextual factors: (a) the experimenter's instructions, and (b) the hierarchical level at which the target was related to the taxonomic alternative (basic vs. superordinate level).

### Method

#### Participants

Participants were 48 three-year-olds ( $M = 3$  years 6 months, range from 3 years 0 months to 3 years 11 months) and 48 four-year-olds ( $M = 4$  years 7 months range from 4 years 0 months to 5 years 2 months) enrolled in preschool programs serving middle- to upper-middle-class families in Evanston, Illinois. The racial and ethnic composition of the participants (.61, White; .23, African American; .06, Latino; and .09, other minorities) reflects the distribution in the Evanston community in general. Approximately equal numbers of boys and girls participated in each condition at each age. One additional participant was excluded from analysis because of a tendency to pick alternatives from only one side of the table.

#### Stimuli

Stimuli were 42 small objects ranging from 5 cm to 28 cm in height. These were arranged to form 14 sets of 3 objects each. Each set consisted of a target object (e.g., a carrot), a taxonomically related object (e.g., a tomato), and a thematically related object (e.g., a rabbit). In half of the sets, the taxonomic choice was a nonidentical member of the same basic-level category as was the target. For the remaining sets, the taxo-

Table 1  
*Complete List of Stimuli Used in Experiments 1-3*

Target object	Taxonomic alternative	Thematic alternative
Basic level <sup>a</sup>		
1B Chocolate chip cookie	Oreo cookie	Cookie Monster
2B White fish	Orange fish	Fish bowl
3B Tulip	Daffodil	Vase
4B Yellow shampoo	Pink shampoo	Doll
5B White airplane	Red airplane	Person
6B Blue bed	White bed	Smurf
7B Blue car <sup>b</sup>	White car	Key
Superordinate level		
1S Carrot	Tomato	Rabbit
2S Chair	Table	Minnie Mouse
3S Tiger	Panda bear	Cage
4S Grapes	Corn	Plate
5S Sweater	Pants	Snoopy
6S Boat	Car	Person
7S Car <sup>b</sup>	Jeep	Stop sign

<sup>a</sup> Target object and taxonomic alternative on basic level trials were not identical. They differed from one another on a number of characteristics, including color, size, and patterning. <sup>b</sup> These trials were excluded from Experiment 3.

nomic choice was related to the target at a superordinate level. A complete list of stimuli may be found in Table 1.

To ensure that the perceptual similarity between the basic level alternatives and their targets was greater than the similarity of the superordinate level alternatives and their targets, 15 adults were asked to rate the perceptual similarity of each target with its taxonomic alternative (see Table 1). Participants were instructed to rate each pair using a 7-point scale, from 1 (*low*) to 7 (*high*) perceptual similarity. They were told that because these stimuli were to be used in a study with young children, they should ignore their knowledge of the objects and should focus primarily on the appearance of the objects themselves as we presented them. As predicted, the mean similarity rating for the targets paired with their basic level taxonomic alternatives ( $M = 5.75$ ,  $SD = .49$ ), was significantly greater than that between targets and their superordinate level alternatives ( $M = 3.57$ ,  $SD = 1.41$ ),  $t(12) = 4.66$ ,  $p < .001$ .

#### Procedure

Participants in the experiment proper were tested individually in a quiet room within their preschool. Trials were presented in one of two different orders. These orders were determined randomly, with the constraint that no more than two trials from a given hierarchical level were presented consecutively. Each trial consisted of two phases: a demonstration phase and a test phase.

*Demonstration phase.* During the demonstration phase, the target and the two choice objects were placed in a horizontal row before the child, with the target object in the center. The experimenter demonstrated both the thematic and taxonomic relations between the target and the alternatives in a standardized fashion, following Waxman and Hall (1993). To demonstrate the thematic relation, she performed the relation that was appropriate to the objects. For example, she showed the rabbit eating the carrot, saying, "See this?" To demonstrate the taxonomic relation, she tapped the taxonomic alternative and the target objects together, saying, "See this?" For half of the children in each condition, the experimenter demonstrated the taxonomic relation first and the the-

matic relation second on the first trial; for half of the children, she demonstrated the thematic relation first and the taxonomic relation second on the first trial. Thereafter, the demonstrations were presented in alternating fashion. The left-right placement of the choice objects was determined randomly for each trial.

**Test phase.** Immediately following the demonstration phase, the experimenter began the test phase by drawing the child's attention to the target; she then moved the two choice objects toward the child and asked the child to choose between the taxonomic and thematic alternatives.

The children were randomly assigned to one of three conditions, which varied only in the type of instructions that the experimenter offered during the test phase. In the *Goes Best* condition, the experimenter drew the child's attention to the target by tapping and labeling it with its familiar basic-level term, saying, "Look! That's a [label]!" She then moved the two choices toward the child, asking, "Which goes best with the [label]?" The instructions in the *Goes Best* condition are precisely those used by Smiley and Brown (1979). In the *Goes With* condition, the experimenter tapped the target with her hand saying, "See this?" She then asked, "Which one goes with it?" as she moved the choice objects toward the child. In the *Another One* condition, the experimenter tapped the target with her hand saying, "See this?" She then asked, "Can you find another one?" as she moved the choice objects toward the child.

If a child failed to make a clear choice, the experimenter repeated the instruction, while pointing to each of the choice objects in turn in the same order as they were demonstrated. If, after the experimenter repeated the instructions, the child still did not make a clear choice, the experimenter recorded the behavior and moved on to the next trial. After making their selection, children in all conditions were allowed to play freely with all three objects in a triad. This playtime was brief (approximately 30–60 s), and children willingly relinquished the objects at the experimenter's request.

### Coding

The child's response on each trial was recorded. Four different types of responses were possible. These included (a) selecting a thematic alternative, (b) selecting a taxonomic alternative, (c) making no selection, or (d) selecting both alternatives.

### Results

Children made clear choices, selecting one of the two alternatives on 100% of the trials. There was no evidence for a stable, overarching preference for thematic relations. Instead, children's responses varied as a function of age and condition. The mean proportion of thematic responding in each condition is reported in Table 2.

The data were subjected to a three-way analysis of variance (ANOVA), with condition (3) and age (2) as between-subjects factors and with hierarchical level (2) as a within-subjects factor. As predicted, the main effect of condition,  $F(2, 90) = 34.55, p < .0001$ , revealed that children in both the *Goes With* and the *Goes Best* condition were more likely to select the thematic alternatives than were children in *Another One* condition, Tukey's honestly significant difference (HSD), (both  $ps < .001$ ). The difference between the *Goes With* and the *Goes Best* conditions was not significant. There was also a main effect of age,  $F(1, 90) = 9.374, p < .005$ , indicating that as a group, 4-year-olds ( $M = .54, SD = .32$ ) were more likely to select the thematic alternatives than were 3-year-olds ( $M = .40, SD = .28$ ). There were no effects of hierarchical level and no interactions.

**Table 2**  
*Mean Proportion (and Standard Deviation) of Thematic Choices Made by Participants as a Function of Age, Condition, and Hierarchical Level in Experiment 1 (Objects)*

Level	Condition		
	Goes best	Goes with	Another one
3-year-olds			
Basic			
<i>M</i>	.50	.52	.18***
<i>SD</i>	.26	.29	.22
Superordinate			
<i>M</i>	.54	.46	.19***
<i>SD</i>	.21	.30	.21
Combined			
<i>M</i>	.52	.49	.18***
<i>SD</i>	.22	.28	.20
4-year-olds			
Basic			
<i>M</i>	.81***	.62	.19***
<i>SD</i>	.21	.28	.20
Superordinate			
<i>M</i>	.79***	.56	.27**
<i>SD</i>	.23	.24	.24
Combined			
<i>M</i>	.80***	.59	.23***
<i>SD</i>	.19	.25	.20
Combined			
Overall			
<i>M</i>	.66***	.54	.20***
<i>SD</i>	.25	.26	.20

\*\*  $p < .005$ . \*\*\*  $p < .001$ .

We also compared the proportion of thematic responses in each condition to .50 (the chance level of responding). Children in the *Goes Best* condition revealed a thematic preference,  $t(31) = 3.58, p < .001$ . However, this effect, which is consistent with Smiley and Brown's (1979) original findings, was evident only in the 4-year-olds; 3-year-olds in this condition did not differ from chance. Children in the *Goes With* condition selected the thematic alternatives at a rate that was indistinguishable from chance,  $t(31) = .87, p > .05$ . This effect held up for both 3- and 4-year-olds. Children in the *Another One* condition revealed a "taxonomic preference," selecting the thematic alternatives less often than would be predicted by chance,  $t(31) = 8.26, p < .0005$ . This was evident in both 3- and 4-year-olds (see also Dunham & Dunham, 1995).

### Individual Patterns of Response

To gain a more thorough appreciation of performance on this task, we examined each child's individual pattern of response. Following the binomial formula and setting a  $p$  value of .05, children selecting the thematic alternative on 11 or more trials of the 14 trials can be characterized as displaying *consistently thematic* behavior; those selecting the thematic alternative on 3 or fewer trials display *consistently taxonomic* behavior; children

Table 3  
*Number of Individual 3- and 4-Year-Olds Revealing Consistently Thematic Patterns, No Consistent Pattern, or Consistently Taxonomic Patterns of Response in Experiment 1 (Objects)*

Response pattern	Condition		
	Goes best	Goes with	Another one
3-year-olds			
Consistently thematic (thematic $\geq 11$ )	2	4	0
No consistent pattern (3 < thematic < 11)	13	9	5
Consistently taxonomic (thematic $\leq 3$ )	1	3	11
4-year-olds			
Consistently thematic (thematic $\geq 11$ )	11	4	0
No consistent pattern (3 < thematic < 11)	5	10	7
Consistently taxonomic (thematic $\leq 3$ )	0	2	9

falling between these extremes were categorized as revealing no consistent pattern. The distribution of individual patterns for each age and condition is reported in Table 3.

In general, the individual response patterns in each condition mirrored the mean performance reported above. Performance in the *Goes Best* condition revealed an interesting effect of age: At 3 years of age, most children ( $n = 13$ ) displayed no consistent pattern; in contrast, at 4 years of age, most children ( $n = 11$ ) displayed consistently thematic performance. This is consistent with the results reported above. In the *Goes With* condition, neither 3- nor 4-year olds revealed individual patterns that were distinguishable from chance. Finally, in the *Another One* condition, most children revealed consistently taxonomic performance at age 3 ( $n = 11$ ) and at age 4 years ( $n = 9$ ). This suggests that the highly taxonomic performance in this condition reflects consistent taxonomic responding from most children.

In general, we were surprised that there was not a stronger indication of a thematic preference in this experiment. Therefore, to investigate this outcome further, we conducted three additional analyses, looking more specifically at the individual sets of items.

#### *Analysis Based on Individual Items*

First, we conducted a  $2 \times 3 \times 2$  (Hierarchical Level  $\times$  Condition  $\times$  Age) ANOVA using items as a random factor (Clark, 1973). A main effect for condition,  $F(2, 24) = 215.23$ ,  $p < .001$ , revealed that targets were most likely to be matched with thematic alternatives in the goes best condition, followed by the goes with condition, and finally the another one condition, Tukey's HSD (all  $ps < .05$ ). A main effect for age,  $F(1, 12) = 57.40$ ,  $p < .001$ , revealed that targets were more likely to be matched with thematic alternatives by 4- than by 3-year-olds. These main effects, which echo those reported above in the

analysis treating participants as a random factor, were qualified by an interaction between condition and age,  $F(2, 24) = 9.742$ ,  $p < .005$ . In the *Goes Best* and *Goes With* conditions, targets were more likely to be paired with the thematic alternatives by 4- than by 3-year-olds; in the *Another One* condition, there was no effect of age. Finally, a three-way interaction among condition, age and level,  $F(2, 24) = 4.704$ ,  $p < .05$ , suggested that for 4-year-olds in the *Goes Best* and *Goes With* conditions, targets were more likely to be paired with thematic alternatives on superordinate than on basic level trials. There was no effect of hierarchical level for 4-year-olds in the *Another One* condition or for 3-year-olds in any condition.

We next examined participants' performance for each of the 14 stimulus sets (see Table 1). Our motivation for undertaking this closer inspection of the materials was to discover whether there were particular sets on which children revealed a disproportionate tendency to select either the thematic or the taxonomic alternative. To examine this possibility, we identified each individual set on which the mean performance for that set differed by more than 1 standard deviation from the mean (collapsed across sets and conditions) for each age group. For the 3-year-olds, whose mean rate of thematic selection was .41 ( $SD = .06$ ), four sets met this criterion. On two of these sets (5B and 7S), performance was more than 1 standard deviation above the mean rate; on the remaining two sets (6B and 6S), performance was more than 1 standard deviation below the mean rate. For the 4-year-olds, whose mean rate of thematic selection was .54 ( $SD = .08$ ), there were two sets that met this criterion. On one set (7S), performance was more than 1 standard deviation above the mean rate; on the other set (5S), performance was more than 1 standard deviation below the mean rate. This detailed examination suggests that although there was a tendency to favor one relation over another on a few stimulus sets, there was an impressive degree of balance, with an equal number of sets eliciting high and low rates of thematic responding.

Finally, we conducted a control experiment to assess directly children's familiarity with the thematic and taxonomic relations depicted in Experiment 1. We explicitly asked six 4-year-old children to describe the thematic and taxonomic relations.<sup>2</sup> We reasoned that if children could describe these relations, then this would count as evidence of their familiarity. We presented the children with each target (e.g., carrot), paired with (a) its thematic match (e.g., rabbit), and (b) its taxonomic match (e.g., tomato). The order in which pairs were presented was randomized. For each pair, we asked, "Why do these two go together?" Two raters independently judged the nature of the explanations for the entire sample. Agreement between raters was 95.2%.

The children participated readily and successfully. They provided thematically based explanations for 96% of the thematically related pairs (e.g., "Rabbits eat carrots"), and taxonomically based explanations for 79% of the taxonomically related pairs (e.g., "They're both vegetables"). In addition, children

<sup>2</sup> We interviewed only 4-year-olds because pilot testing indicated that 3-year-olds were less able to articulate explanations, even for relations with which they were highly familiar. This is consistent with previous demonstrations that 3-year-olds are unable to articulate the reasons behind their selections in forced-choice tasks (Markman, 1991; Scott et al., 1982; Waxman & Kosowski, 1990).

were more likely to provide taxonomically based explanations for the taxonomic relation when the target and taxonomic alternative were related at the basic (88%) than at the superordinate (69%) level,  $t(5) = 2.70$ ,  $p < .05$ . The results of this control experiment confirmed that both the taxonomic and the thematic relations among the objects presented in Experiment 1 were familiar and accessible to preschool-age children.

Together, these three detailed analyses of individual items indicate that it is unlikely that the absence of a strong thematic preference across ages and conditions in Experiment 1 is attributable to our having selected triads on which the thematic relations were weaker or less accessible than were the taxonomic relations.

### Discussion

The results of Experiment 1 are consistent with the prediction that preschool-age children's performance varies reliably as a function of their age and the instructions with which they were provided. In the *Goes Best* condition, 4-year-olds relied primarily on the thematic alternatives; 3-year-olds revealed no consistent preference. In the *Goes With* condition, neither 3- nor 4-year-olds revealed a consistent preference. In the *Another One* condition, both 3- and 4-year-olds chose primarily the taxonomic alternatives.

These results indicate that a tendency to favor thematic over taxonomic relations is evident in preschool-age children only under a restricted set of circumstances. In particular, a thematic preference was apparent only in 4-year-old children, and only in the condition most similar to that used by Smiley and Brown (1979). Three-year-olds did not favor thematic relations in any condition. However, the 3-year-olds' tendency to choose the taxonomic alternatives in the *Another One* condition suggests that they were sensitive to the different instruction conditions.

Preschool-age children in Experiment 1 revealed an appreciation of both thematic and taxonomic relations; they did not reveal a stable conceptual preference for one type of relation over another. On the contrary, they appeared to adjust their responses rather flexibly, according to the demands of the task at hand.

In Experiment 2, we asked whether the discrepancy between the results of Experiment 1 and those of previous investigations of conceptual preferences is related to the medium in which the stimuli were presented. In most studies of conceptual preferences in preschool-age children, pictorial representations of familiar objects have been used as stimuli. However, in Experiment 1, we used toy replicas as stimuli. Because children may perform differently on tasks involving pictures versus objects (Becker, Rosner, & Nelson, 1979; Daehler, Lonardo, & Bukatko, 1979; Etaugh & Van Sickle, 1971; Monroe & Lange, 1977; Zaft & Daehler, 1979), in Experiment 2 we examined 3- and 4-year-old children's performance using two-dimensional pictures of objects.

### Experiment 2

In virtually all previous studies of the thematic preference in preschool-age children, two-dimensional pictures of objects have served as stimuli (D'Entremont & Dunham, 1992; Dun-

ham & Dunham, 1995; Fenson, Vella, & Kennedy, 1989; Markman & Hutchinson, 1984; Scott et al., 1982; Smiley & Brown, 1979; Waxman & Kosowski, 1990). However, in most of the more recent studies with infants and toddlers, toy replicas of objects have served as stimuli. The use of objects is motivated primarily by the fact that toddlers are more readily engaged in tasks that permit active manipulation of objects than in those that require more passive inspection of pictures. Because we sought to include 2-year-olds in this series of experiments (see Experiment 3), we presented children in Experiment 1 with objects rather than pictures.

Although this change in stimulus medium may indeed increase young children's attention to the tasks, it may have another unintended (and, as yet, unexplored) consequence: The absence of a clear thematic preference in Experiment 1 may be related to the use of objects as opposed to pictures as stimuli. Interestingly, there is a hint in the performance of 15- to 31-month-olds that is consistent with this possibility. In forced-choice tasks involving objects, 15- to 31-month-olds appear to favor taxonomic over thematic alternatives (Bauer & Mandler, 1989; Waxman & Hall, 1993; Waxman & Kosowski, 1990); in tasks involving pictures, children at this age appear to favor thematic alternatives (Markman, 1994).

However, the direct experimental evidence regarding the influence of stimulus medium on children's performance is somewhat contradictory. Much of the literature on this topic centers on the question of perceptual similarity among objects versus pictures. There is considerable evidence suggesting that perceptual similarity may be more salient among objects than it is among pictures, (see, e.g., Daehler, et al., 1979; Etaugh & Van Sickle, 1971; Zaft & Daehler, 1979), but there is also evidence to the contrary (Becker et al., 1979; Monroe & Lange, 1977). This debate is relevant because children may be more likely to select the taxonomic alternative when the perceptual similarity between that alternative and the target is high.

Following this logic, if perceptual similarity is diminished in tasks involving pictures as compared to objects, then the overall rates of taxonomic response should decrease (and thematic responding should increase) in tasks involving pictures as stimuli. On the other hand, because children can act out thematic relations with objects, it is plausible that thematic relations would be more salient in tasks involving objects than pictures. In this case, the overall rates of taxonomic response should increase (and thematic responding should decrease) in tasks involving pictures.

### Method

#### Participants

Participants were 24 three-year-olds ( $M = 3$  years 5 months, range = 2 years 11 months to 3 years 11 months) and 24 four-year-olds ( $M = 4$  years 7 months, range = 4 years 1 month to 4 years 11 months), drawn from the same preschool population as in Experiment 1. At each age, 8 children were assigned to each of the three instruction conditions. Approximately equal numbers of boys and girls participated in each condition at each age.

#### Stimuli

The stimuli were 4 in.  $\times$  6 in. (10.2 cm  $\times$  15.2 cm) color photographs of the objects that were used in Experiment 1, mounted on plain card-

board and laminated. The photographs were taken against a plain, white, reflective background, with relative size cues of the objects preserved.

*Procedure and Coding*

The procedure and coding were identical to that of Experiment 1, with one modification to accommodate the use of pictures. Instead of demonstrating the relations during the demonstration phase, the experimenter placed the three pictures on the table in a row, with the target in the middle. She then moved the target picture so that it touched one of the choice pictures, saying, "See this?" Next, she moved the target picture to touch the other choice, saying, "See this?"

*Results*

As was the case in Experiment 1, children successfully completed the task, making a clear choice on 100% of the trials. The mean proportion of thematic responses for each condition is indicated in Table 4.

Participants' responses were first submitted to a three-way ANOVA with condition (3) and age (2) as between-subjects measures and hierarchical level (2) as a within-subject measure. This analysis revealed a main effect of condition,  $F(2, 42) = 6.39, p < .005$ . As was the case in Experiment 1, children in the *Goes Best* condition were more likely to select the thematic

Table 4  
*Mean Proportion (and Standard Deviation) of Thematic Choices Made by Participants as a Function of Age, Condition, and Hierarchical Level in Experiment 2 (Pictures)*

Level	Condition		
	Goes best	Goes with	Another one
3-year-olds			
Basic			
<i>M</i>	.36	.34	.37
<i>SD</i>	.30	.25	.34
Superordinate			
<i>M</i>	.48	.45	.43
<i>SD</i>	.17	.29	.29
Combined			
<i>M</i>	.42	.39	.40
<i>SD</i>	.21	.24	.30
4-year-olds			
Basic			
<i>M</i>	.70	.50	.21*
<i>SD</i>	.30	.30	.27
Superordinate			
<i>M</i>	.81**	.54	.18**
<i>SD</i>	.13	.21	.20
Combined			
<i>M</i>	.75*	.52	.20**
<i>SD</i>	.19	.23	.19
Combined			
Overall			
<i>M</i>	.59	.46	.30*
<i>SD</i>	.26	.24	.26

\*  $p < .05$ . \*\*  $p < .005$ .

Table 5  
*Number of Individual 3- and 4-Year-Olds Revealing Consistently Thematic Patterns, No Consistent Pattern, or Consistently Taxonomic Patterns of Response in Experiment 2 (Pictures)*

Response pattern	Condition		
	Goes best	Goes with	Another one
3-year-olds			
Consistently thematic (thematic $\geq 11$ )	1	0	1
No consistent pattern (3 < thematic < 11)	6	6	4
Consistently taxonomic (thematic $\leq 3$ )	1	2	3
4-year-olds			
Consistently thematic (thematic $\geq 11$ )	6	2	0
No consistent pattern (3 < thematic < 11)	2	6	3
Consistently taxonomic (thematic $\leq 3$ )	0	0	5

alternatives than were children in the *Another One* condition, Tukey's HSD ( $p < .05$ ). Performance in the *Goes With* condition was intermediate and did not differ reliably from either of the other two conditions, Tukey's HSD (both  $ps > .05$ ). An interaction between condition and age,  $F(2, 42) = 5.61, p < .01$ , indicated that the main effect of condition was driven predominantly by 4-year-olds. For 4-year-olds, the tendency to select the thematic alternatives was greater in the *Goes Best* than in the *Another One* condition. In contrast, for 3-year-olds, there were no reliable differences among the means in each condition.

We next compared performance at each age and in each condition to chance (.50). As in Experiment 1, 4-year-olds in the *Goes Best* condition revealed a thematic preference,  $t(7) = 3.77, p < .01$ , but 3-year-olds in this condition did not differ from chance. In the goes with condition, neither 3- nor 4-year olds selected the thematic alternatives at a rate that was distinguishable from chance. In the another one condition, 4-year-olds revealed a taxonomic preference,  $t(7) = 4.61, p < .005$ , but 3-year-olds did not differ from chance.

*Individual Patterns of Response*

We next examined each individual child's pattern of response. As in Experiment 1, we used the binomial formula, setting a  $p$  value of .05, to ascertain the number of children displaying *consistently thematic* behavior, *consistently taxonomic* behavior, or no consistent pattern. The distribution for each condition and age is reported in Table 5. Across conditions, most 3-year-olds revealed no consistent pattern. In contrast, 4-year-olds revealed different patterns as a function of condition: In the *Goes Best* condition, most 4-year-olds were consistently thematic; in the *Another One* condition, most were consistently taxonomic; and in the *Goes With* condition, most failed to reveal a consistent

response pattern. These individual analyses bolster the results that were based on analyses of group means.

### *Analysis Based on Individual Items*

As in Experiment 1, we conducted two additional analyses to examine the performance on individual trials. A  $2 \times 3 \times 2$  Hierarchical Level  $\times$  Condition  $\times$  Age) ANOVA with items as a random factor revealed a main effect for condition,  $F(2, 24) = 12.79, p < .005$ . Targets were more likely to be matched with thematic alternatives in the *Goes Best* than in the *Another One* condition, Tukey's HSD,  $p < .05$ . Performance in the *Goes With* condition did not differ reliably from the two more extreme conditions. This main effect was qualified by an interaction between condition and age,  $F(2, 24) = 28.26, p < .001$ , indicating that in the *Goes Best* condition, targets were more likely to be paired with the thematic alternatives by 4- than by 3-year-olds; in the *Another One* condition, targets were more likely to be paired with the taxonomic alternatives by 4- than by 3-year-olds; in *Goes With* condition, there was no effect of age.

We next sought to discover whether there were particular sets on which children revealed a disproportionate tendency to select either the thematic or the taxonomic alternative. As in Experiment 1, we identified each individual set on which the mean performance for that set differed by more than 1 standard deviation from the mean performance (collapsed across sets and conditions) for each age group. For 3-year-olds, whose mean rate of thematic selection was .41 ( $SD = .11$ ), 5 of the 14 sets met this criterion. On 2 of these sets (7B and 1S), performance was more than 1 standard deviation above the mean rate; on the remaining 3 sets (1B, 3B, and 5S), performance was more than 1 standard deviation below the mean rate. For the 4-year-olds, whose mean rate of thematic selection was .47 ( $SD = .16$ ), there were 5 sets that met this criterion. On 3 sets (2B, 3S, and 7S), performance was more than 1 standard deviation above the mean rate; on the others (2S and 5S), performance was more than 1 standard deviation below the mean rate. As in Experiment 1, although there was a tendency to favor one relation over another on some stimulus sets, there was an impressive degree of balance, with an approximately equal number of sets eliciting high and low rates of thematic responding. Together, these analyses based upon individual items indicate that the thematic relations were no weaker or less accessible than were the taxonomic relations.

### *Comparison of Experiment 2 (Pictures) and Experiment 1 (Objects)*

In the next analysis, we examine the potential effect of stimulus medium more directly by comparing performance in this experiment (using pictures) with performance in Experiment 1 (using objects). The data from Experiments 1 and 2 were submitted to a four-way ANOVA with stimulus medium (2: objects vs. pictures), condition (3) and age (2) as between-subject measures and hierarchical level (2) as a within-subject measure. There were no main effects or interactions involving stimulus medium. Participants were equally likely to select thematic alternatives with pictures or toy replicas serving as stimuli. A main effect for condition,  $F(2, 132) = 29.56, p < .001$ , revealed that

differences among all three conditions were reliable. A main effect for age,  $F(1, 132) = 7.93, p < .01$ , indicated that 4-year-olds were more likely to select the thematic alternatives than were 3-year-olds. A Condition  $\times$  Age interaction,  $F(2, 132) = 7.77, p < .001$ , revealed that the differences among conditions were greater at 4 than at 3 years of age.

### *Discussion*

In Experiment 2, as in Experiment 1, there was no strong indication for a conceptual preference for thematic relations over taxonomic relations. One difference between the two experiments did emerge: Although 4-year-olds' performance varied as a function of condition in both experiments, this was not the case for the 3-year-olds. These younger children were more sensitive to the differences among conditions in Experiment 1 with toy replicas of objects than they were in Experiment 2 with pictures of objects.

The results of Experiments 1 and 2 challenge the view that preschool thought is characterized by a stable thematic preference. Instead, our results reveal that the expression of a "preference" for one relation over another is largely a function of task demands rather than a consequence of an overarching preferred mode of response.

In the next experiment, we extended our investigation to include younger children to test the possibility that a thematic preference is evident early in development. We selected young 2-year-olds for this investigation because children at this age tend to demonstrate the functional and thematic relations among objects spontaneously (Bates, Benigni, Bretherton, Camaioni, & Volterra, 1979; Sugarman, 1983). We capitalized on this spontaneous behavior in Experiment 3, using it as an approximate index of children's familiarity with the thematic relations depicted in our task.

### *Experiment 3*

In this experiment, we examined the performance of 2-year-old children in a forced-choice procedure, using the three-dimensional toy replicas of objects as stimuli. We manipulated the effects of (a) the experimenter's instructions and (b) the hierarchical level relating the taxonomic alternative to the target. The procedure was comparable to that used in Experiment 1, with only one exception. We included a familiarization phase (immediately preceding the demonstration period), during which the children were allowed to play freely with the objects in each set.

### *Method*

#### *Participants*

Participants were 48 two-year-olds ( $M = 2$  years 1 month; range from 1 year 11 months to 2 years 3 months) who visited our laboratory for a single play session. These children were taken from a pool of predominantly White, middle- to upper-middle-class families recruited through newspaper advertisements in the greater Chicago area. Sixteen children were randomly assigned to each of the three conditions that were used in the previous studies. There were approximately equal numbers of boys and girls in each condition; the mean age was approximately equal across conditions. Seven additional children were excluded, 5



because of failure to complete the task and 2 because of experimenter error.

### Stimuli

The stimuli included 12 of the 14 triads of objects that were presented in Experiment 1. We excluded two trials to accommodate the attention spans of this younger population. Because pilot testing suggested that many children at this age were not familiar with the stop sign, we excluded the set involving that object (7S); to balance the number of basic and superordinate trials, we also excluded a basic-level set involving vehicles (7B), leaving six trials each at the basic and at the superordinate levels.

### Procedure

Participants were tested individually in the laboratory. They were seated in a booster seat directly across a table from the experimenter; caretakers were seated next to the child. The procedure was identical to that in Experiment 1, with one modification. As in Experiments 1 and 2, there was a demonstration phase and a test phase. In addition, we included a familiarization phase prior to the demonstration phase.

**Familiarization phase.** During the familiarization phase, the experimenter presented the three objects and invited the child to play freely with them. Children willingly relinquished the objects after 15 s, at the experimenter's request. The purpose of the familiarization period was twofold. First, pilot testing revealed that 2-year-olds were more interested in playing with the objects than in complying with the experimenter's requests. However, we found that when we provided children with an opportunity to play spontaneously with objects during a brief familiarization period, we effectively reduced their distractibility and increased their cooperation during the demonstration and test periods. Second, we used the children's spontaneous play during the familiarization period as a rough index of their appreciation of the relations among objects in each set.

**Demonstration and test phases.** These followed immediately after familiarization and were identical to those in Experiment 1.

### Coding

Because the 2-year-olds' responses were often more ambiguous than those of the 3- and 4-year-olds, the sessions were videotaped for subsequent coding. The sessions were coded for two behaviors. First, we examined each child's behavior during the familiarization phase for spontaneous demonstrations of thematic play (e.g., putting the carrot to the rabbit's mouth). An act was counted as an instance of thematic play if the children demonstrated the thematic relation on either objects (e.g., putting the carrot to the rabbit's mouth) or on themselves (e.g., putting the carrot to his or her own mouth). Second, responses on each trial were recorded. As in the previous studies, four different types of responses were possible. These included (a) selecting a thematic alternative, (b) selecting a taxonomic alternative, (c) making no selection, or (d) selecting both alternatives. Children who failed to make a clear choice on three or more trials was excluded.<sup>3</sup>

A primary coder analyzed the videotapes of all 48 children. A second coder analyzed a randomly selected 25% of the children. Inter-coder reliability was 96.5% on the forced-choice measure and 98.6% on the thematic play measure.

### Results

Children were readily engaged in this task, making a clear single choice on an average of 96.7% of trials. Data from the

remaining 3.3% of trials, in which no clear choice was apparent, were excluded from the analyses reported below.

### Analysis of the Familiarization Period

The goal of this analysis was to ascertain whether 2-year-olds were familiar with and interested in the thematic relations depicted in our forced-choice task. For each of the 12 triads presented, we calculated the percentage of children who spontaneously demonstrated that thematic relation during the familiarization period. Across trials, the mean percentage was .62 ( $SD = .23$ ), ranging from .30 (Set 4B) to .93 (Set 2B).

It is important to note that our measure of spontaneous demonstrations likely underrepresents the children's familiarity with the thematic relations that were depicted in our task. This is because a child's failure to demonstrate a thematic relation in spontaneous play cannot be taken as evidence of that child's failure to appreciate that relation. Rather, it is plausible to assume that a child who was familiar with a given thematic relation may simply have not chosen to demonstrate it spontaneously in the 15-s familiarization period. Indeed, we suspect that the incidence of thematic behavior would have been even higher if we had elicited thematic behaviors more explicitly or if we had allowed more time for free play during familiarization.

Nevertheless, the data from the familiarization phase reveal that overall, the thematic relations that we presented were sufficiently familiar and interesting to the 2-year-old children to elicit spontaneous demonstrations. This finding sets the stage for the next analysis in which we examine 2-year-old children's performance in the forced-choice task.

### Analysis of Forced Choice

Like preschool children, 2-year-olds revealed no evidence of a conceptual preference for thematic relations in the forced-choice task. However, unlike preschoolers in Experiments 1 and 2, two-year-olds did not perform differently as a function of experimental condition.

The mean proportion of trials on which children in each condition selected the thematic alternative is reported in Table 6. A two-way ANOVA with condition (3) as a between-subjects variable and hierarchical level (2) as a within-subjects variable revealed no significant effects. Further, children in all three conditions selected the thematic alternatives significantly less often than would be expected by chance (.50): *Another One*,  $t(15) = 4.74$ ,  $p < .0005$ ; *Goes With*,  $t(15) = 3.88$ ,  $p < .005$ ; *Goes Best*,  $t(15) = 2.57$ ,  $p < .05$ . This finding—that children as a group tend to select predominantly taxonomic alternatives on this forced-choice task—is consistent with other studies of children ranging from 15 to 31 months of age (Bauer & Mandler, 1989; Waxman & Hall, 1993; Waxman & Kosowski, 1990).

<sup>3</sup> Choice was determined by the first object that the child touched. If the first object touched was the only object touched, or if the child did not touch the other objects during the first 3 s following the first touch, the first object touched was considered the choice for that trial. If the child touched both objects within the same 3-s period, the trial was coded as choosing both. To be included in these analyses, a child had to complete at least 10 sets of 12 trials.

Table 6  
Mean Proportion (and Standard Deviation) of Thematic Choices Made by Participants as a Function of Condition and Hierarchical Level in Experiment 3 (Objects)

Level	Condition		
	Goes best	Goes with	Another one
2-year-olds			
Basic			
<i>M</i>	.33**	.34**	.41*
<i>SD</i>	.19	.18	.10
Superordinate			
<i>M</i>	.49	.44	.34*
<i>SD</i>	.24	.15	.23
Combined			
<i>M</i>	.41*	.39*	.39*
<i>SD</i>	.14	.11	.11

\*  $p < .05$ . \*\*  $p < .005$ .

### Individual Patterns of Performance

As in Experiments 1 and 2, we also examined the individual pattern of performance exhibited by each child. Following the binomial formula and setting a  $p$  value of .05, children selecting the thematic alternative on 10 or more out of 12 trials can be characterized as displaying *consistently thematic* behavior; those selecting the thematic alternative on 2 or fewer trials out of 12 display *consistently taxonomic* behavior; children falling between these extremes were categorized as revealing no consistent pattern. The distribution of individual patterns for each age and condition is reported in Table 7. Although the mean performance in each condition had suggested an inclination on the part of 2-year-old children to favor the taxonomic over the thematic alternatives, very few individual children exhibited a clear taxonomic preference. In fact, very few individual children focused consistently on either the taxonomic or the thematic relations. In future work, it will be important to pursue further this discrepancy between results based on groups versus individual participants (see also Dunham & Dunham, 1995). However, the most relevant point here is that 2-year-olds, like 3- and 4-year-olds, failed to reveal a preference for thematic relations on either analysis.

### Analysis Based on Individual Items

A  $2 \times 3$  (Hierarchical Level  $\times$  Condition) ANOVA with items as a random factor revealed no significant main effects or interactions.

We next examined performance on each trial to discover whether particular sets elicited a disproportionate amount of thematic responding in our 2-year-old sample. We identified each individual set on which the proportion of thematic responding differed by more than 1 standard deviation from the mean (collapsed across sets and conditions). Two sets (2S and 6S) elicited a disproportionately high incidence of thematic responding; two sets (5B and 6B) elicited a disproportionately low incidence of thematic response. Thus, as in the preceding experiments, there was an impressive degree of balance, with

an approximately equal number of sets eliciting high and low rates of thematic responding.

### Integration of Familiarization and Forced Choice

We also examined the hypothesis that a child would be more likely to choose the thematic alternative if that child had just demonstrated the thematic relation during the familiarization phase. However, we found no evidence for this hypothesis: children were no more likely to select the thematic alternative when they had demonstrated that relation than when they had not,  $t(43) = .715$ ,  $p > .05$ .

### Discussion

The results of this experiment reveal that 2-year-old children performed comparably in all three conditions. We suspect that this null effect is jointly related to the fact that (a) 2-year-olds' performance is typically more variable than that of older preschoolers, (b) 2-year-olds participated in fewer trials than did the older preschoolers, and (c) 2-year-olds may not be sensitive to the interpretive differences among the instruction conditions.

In addition, there was no evidence of a thematic preference in any condition. It is unlikely that this is a consequence of the thematic relations being unfamiliar or inaccessible, particularly because the experimenter demonstrated these relations before presenting the forced-choice trial. Even more compelling is the finding that the 2-year-olds themselves often spontaneously demonstrated these thematic relations during the familiarization period, just seconds before the forced-choice task. Finally, children in this experiment were no more likely to choose the thematic alternative on trials for which they had demonstrated the thematic relation than were on those for which they had not.

It is also unlikely that children at this age have a consistent conceptual preference for taxonomic relations. Although as a group children in each condition selected the taxonomic alternatives more frequently than the thematic alternatives in the forced-choice task, this taxonomic preference did not hold up in an analysis of individual children. On the contrary, most individual children failed to reveal a consistent preference for either the taxonomic or the thematic alternatives.

In summary, 2-year-old children's spontaneous play revealed

Table 7  
Number of Individual 2-Year-Olds Revealing Consistently Thematic Patterns, No Consistent Pattern, or Consistently Taxonomic Patterns of Response in Experiment 3 (Objects)

Response pattern	Condition		
	Goes best	Goes with	Another one
Consistently thematic (thematic $\geq 10$ )	0	0	0
No consistent pattern ( $2 < \text{thematic} < 10$ )	15	14	16
Consistently taxonomic (thematic $\leq 2$ )	1	2	0

that they were familiar with and interested in the thematic relations depicted in this task. Nonetheless, they revealed no preference for thematic relations in the forced-choice task. This finding is consistent with the data from Experiments 1 and 2 with older preschool-age children and with other reports based on children ranging from 15 to 31 months of age (Bauer & Mandler, 1989; Waxman & Hall, 1993; Waxman & Kosowski, 1990). Taken together, these results challenge the notion of a conceptual preference for thematic relations in young children.

### General Discussion

The goal of these experiments was to examine the strong, if implicit, assumption that early cognitive development is best characterized by a thematic preference that only later gives way to a taxonomic preference in school-age children. The results of all three experiments call this assumption into serious question. Although participants in our studies were familiar with the thematic relations that were depicted in our tasks, they were not "captured" by these relations. On the contrary, a clear tendency to respond on the basis of thematic over taxonomic relations was evident only in one experimental condition (*Goes Best*) at one age level (4-year-olds).

Thus, we find converging evidence with Smiley and Brown's (1979) pioneering work, but only under the circumstances that most closely resemble those that were used in their original studies. Our data also converge with Smiley and Brown's in that we found that preschool-age children appreciate both thematic and taxonomic relations among objects. However, unlike Smiley and Brown, we have highlighted children's conceptual flexibility rather than confirming the stability of a thematic "preference" or "mode of response" in the preschool years.

Our data suggest that 4-year-old children, and to a lesser extent 3-year-old children, can recruit both thematic and taxonomic relations flexibly in a forced-choice task (see also Waxman, 1990) and can adjust their responses in accordance with the experimenter's instructions. The data from 2-year-olds (Experiment 3) were less straightforward. Although 2-year-olds were less flexible in adjusting their responses in the forced-choice task, they did convey an emerging appreciation of both taxonomic relations (especially during the forced-choice task) and thematic relations (especially during the familiarization period in spontaneous play).

The most important contribution from this series of experiments is the evidence it brings to bear on the assumption of a thematic preference in cognitive development. The absence of a stable thematic mode of response in preschool-age children challenges the view that (a) cognition is characterized by pervasive, age-related conceptual preferences and (b) a preference for thematic relations necessarily precedes a preference for taxonomic relations. Instead, the data provide empirical support for a different characterization of early conceptual development. They reveal a more continuous, monotonic course in early conceptual development, in which children rely upon various kinds of conceptual relations among objects but reveal an overarching preference for none.

This characterization of early development has several advantages. It is compatible with current models of adult cognition suggesting that conceptual preferences are constructed largely in

response to the particular task demands (Kahneman & Tversky, 1979; Slovic, 1995; Slovic & Lichtenstein, 1983; Tversky & Kahneman, 1981; Tversky & Simonson, 1993). Further, because this approach embraces the idea that performance is influenced by task demands, it offers a framework for bridging the empirical gap between traditional studies with preschool-age children (Denney, 1974; Greenfield & Scott, 1986; Nelson, 1977; Scott et al., 1982; Smiley & Brown, 1979) and more recent work with infants and toddlers (Bauer & Mandler, 1989; Waxman & Hall, 1993).

This pattern of results calls for a reconsideration of our assumptions regarding the course of conceptual development. First, the absence of a thematic preference in early development indicates that preschool-age children do not struggle to overcome a compelling preference for thematic relations to derive other, nonthematic categories (cf. Inhelder & Piaget, 1964). Notice, however, that the absence of a thematic preference does not imply (either logically or empirically) the presence of a taxonomic preference in its stead. On the contrary, we argue that preschool-age children do not rely upon a "default" preference for one type of relation over another.

Second, the absence of a thematic preference does not imply that it is a simple task to construct taxonomic systems of organization. Young children appreciate various kinds of relations among objects. Therefore, to construct taxonomic systems of organization, they must direct their attention specifically to this type of relation, despite their interest in other types of relations. Thus, the research reported here does not diminish the importance of continuing to investigate the young child's establishment and use of taxonomic systems of organization.

Third, the absence of a frank thematic preference is relevant to a consideration of the young child as a word learner. Children appreciate various kinds of conceptual relations. This flexibility could, in principle, complicate the task of word learning because it raises the following question: How do children select from among the many logically possible interpretations when mapping a novel word to its meaning? The absence of a thematic preference does not, in itself, ease the logical difficulty of this task. Thus, the results of the experiments reported here in no way diminish the importance of examining the factors that contribute to the child's remarkable success in word learning. These factors include the identification of predispositions inherent in the child (cf. Waxman, 1990, 1994; Markman, 1994) and a description of the social and cultural scaffolding provided by caretakers in the context of word learning (cf. Callanan, 1990, 1991; Nelson, 1985).

Finally, the absence of a thematic preference in any group of children does not preclude the possibility that there may be stable individual differences in conceptual strategies. Dunham and Dunham (1995) conducted a longitudinal study that revealed stable individual differences across children's first 3 years in the extent to which a particular child tended to rely on taxonomic or thematic relations among objects. However, these individual differences do not reflect an exclusive focus on one type of relation over another. As we have shown, a child's tendency to focus on various relations will depend on several factors, including the child's interest in the relations depicted and the context in which they are presented. Moreover, Dunham and Dunham's data support our claim that cognitive de-

velopment is not characterized by age-related conceptual reorganization.

In future work, it will be important to examine further children's performance under a wider range of circumstances. There is no doubt that there will be contexts under which children will favor thematic over taxonomic relations. For example, in the experiments reported here, we included the familiar basic-level label for each target in the *Goes Best* condition because our goal was to replicate Smiley and Brown's (1979) original instructions. However, because there is considerable evidence that labels (nouns) applied to individual objects highlight taxonomic relations (Markman & Hutchinson, 1984; Waxman, 1990; Waxman & Kosowski, 1990), it would be interesting to compare performance in each condition with and without labelling the target. Children in the *Goes Best* condition might reveal a stronger tendency to select the thematic alternatives if targets were not labeled. Yet children in the *Another One* condition might reveal a stronger tendency to select the taxonomic alternatives if the targets were labeled (see Waxman & Hall, 1993). It will also be instructive to examine directly the influence of demonstrating the taxonomic and thematic relations (as in the experiments reported here) prior to the forced-choice task. Finally, to broaden the perspective in this research area, it will be important to examine children's performance in circumstances beyond the forced-choice task. For instance, we found that 2-year-olds were more likely to reveal an appreciation of thematic relations in their spontaneous play than they were in the forced-choice task itself. Extensions like these will clarify further the range of circumstances under which children favor one type of relation over another.

In summary, the results of the three experiments reported here challenge the view that early development is characterized by a pervasive shift from syntagmatic to paradigmatic, or from thematic to taxonomic, modes of responding (Nelson, 1977; Smiley & Brown, 1979). Instead, the data suggest a more continuous developmental function with no frank shift from one conceptual mode to another. From infancy (Bauer & Mandler, 1989; Waxman & Hall, 1993) through the preschool years, children reveal an emerging appreciation of many different kinds of conceptual relations but a pervasive preference for none. On this view, conceptual development has a more continuous trajectory, one that entails enriching, cultivating, and assembling these early relations to build the rich, complex, and flexible systems of knowledge that characterize the adult conceptual systems.

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