Age Differences in Product Categorization

DEBORAH ROEDDER JOHN
MITA SUJAN*

This article examines the bases children of different ages use to categorize products. Data from children ages 4 to 10 indicate that the use of perceptual attributes as a basis for categorizing products decreases with age, whereas the use of underlying attributes to categorize products increases with age. These findings provide a conceptual replication of earlier findings from developmental psychology. Moreover, the findings suggest that younger children's failure to consider underlying attributes can be traced to common types of processing deficits. Theoretical implications arising from these observations and directions for future research are discussed.

Understanding how consumers categorize products has recently emerged as an important topic for consumer research (Alba and Chattopadhya 1985; Cohen and Basu 1987; Sujan and Dekleva 1987). Despite this interest, virtually no attention has been directed toward the topic of product categorization in children. Research in this vein would appear to be warranted for a number of conceptual and practical reasons. Conceptually, examining children as a distinct population is necessitated by the fact that findings regarding adult consumers are unlikely to be informative in understanding how children of different ages categorize products. Models of how adult consumers categorize products are unlikely to incorporate the concepts and constructs needed to explain the existence of age differences among children as they grow older and develop into adult consumers. From a more practical viewpoint, a special emphasis on children is warranted due to the fact that children have become an increasingly important market segment in terms of absolute size, spending power, and purchase influence (McNeal 1987). An understanding of how this segment categorizes products may provide the foundation needed to better predict the evaluative judgments and purchase decisions made by children.

Our purpose, then, is to examine how children of different ages categorize products. Specifically, the research provides a conceptual replication of earlier findings from developmental psychology, focusing on the bases or attributes children of different ages use to classify products. In addition, we investigate mechanisms underlying possible age differences in product categorization. Based on evidence obtained in both areas, the article concludes with a discussion of theoretical implications for understanding categorization in children as well as conceptual and methodological considerations for future research.

CONCEPTUAL BACKGROUND

Age Differences in Categorization

Research from developmental psychology supports the existence of age differences in how children form categories. In particular, the findings point to a change in the bases children use to form categories between the ages of 4 and 9 (see Denney 1974; Markman 1980; Markman and Callahan 1983; Whitney and Kunen 1983). During the period from preschool to mid-elementary school, children begin to define categories on the basis of underlying attributes (e.g., Bruner, Olver, and Greenfield 1966; Inhelder and Piaget 1964; Whitney and Kunen 1983) that tap into the "deep" structure of categories (e.g., Chi, Feltovich, and Glaser 1981). Children learn to group objects according to attributes that suggest taxonomic relationships (e.g., belts and socks share the attribute of being items of clothing), attributes that indicate the relationship of categories to one another (e.g., fruit juices and soft drinks differ on the attribute of naturalness), and attributes inherent to the core concept of categories (e.g., taste, more than color, is central to the category of soft drinks). The latter are termed underlying, deep structure, or even functional attributes because they convey the true meaning of a category or the function a category might serve. As such, the formation of categories based on underlying attri-

*Deborah Roedder John is Associate Professor of Marketing, Carlson School of Management, University of Minnesota, Minneapolis, MN 55455. Mita Sujan is Associate Professor of Marketing, School of Business, Pennsylvania State University, University Park, PA 16802. The authors wish to thank Paul Bottum for his assistance in data collection and Marvin Goldberg, Gerry Gorn, and Mike Houston for their comments on an earlier version of this article. This project was supported, in part, by the Carlson School of Management at the University of Minnesota.

butes is generally considered to be indicative of more mature categorization schemes.

Prior to the use of underlying attributes, children's categorization processes are influenced by visual or perceptually salient attributes (Melkman and Deutsch 1977; Melkman, Tversky, and Baratz 1981; Saltz, Soller, and Sigel 1972; Tversky 1985). Perceptual attributes that are visually dominant, such as shape and color, are used to group objects rather than underlying attributes, which must usually be discerned on some other basis, such as direct experience (e.g., attributes such as taste) or social learning (e.g., attributes such as all natural). Although perceptual cues are sometimes informative as indicators of underlying attributes, young children rely on perceptual cues without regard to the correspondence that may or may not exist between these cues and underlying attributes. For example, Saltz et al. (1972) found that young children tended to group pictures of toy animals with pictures of real animals, whereas older children did not. Presumably, younger children responded to the toys as if they were real animals because they shared many perceptual features with real animals. In contrast, older children viewed the stuffed toys as distinct due to the fact that toys are inanimate (underlying attribute) whereas animals are living creatures.

Extending these findings to a marketing context, one might expect younger children to use perceptual cues and older children to use underlying cues to categorize brands. Although this appears to be a straightforward hypothesis, the situation is, in fact, complicated by differences in the type of categorization abilities being examined. Categorization abilities can be assessed by having children group objects at various levels of abstraction: superordinate (e.g., furniture), basic (e.g., chairs), and subordinate levels (e.g., rocking chairs) (Rosch 1973). Research in developmental psychology has focused on children's abilities at abstract levels, particularly the superordinate level. The level of interest in marketing contexts would appear to be much more specific, primarily the subordinate (brand) level and secondarily the basic (product type) level (see Sujan and Dekleva 1987). It is of little consequence, for example, to learn that consumers categorize Product 19 as a type of food (superordinate level); far more interesting, in terms of how consumers evaluate and choose between brands, is their categorization of this product as a type of cereal (basic level) or a type of nutritious cereal (subordinate level).

By changing the focus of interest to a more specific categorization level, different developmental patterns may emerge in a marketing context from those observed in previous research settings. The most likely effect, if any, is a movement toward greater reliance on perceptual cues as one moves from the superordinate level to the subordinate level, thereby increasing the age at which the shift to underlying features takes place or even eliminating the shift from perceptual to underlying features altogether. This possibility is suggested by the fact that subordinate level categories are typically less differentiated from one another than categories at other levels, making it rather difficult to draw category boundaries on the basis of underlying attributes (see Mervis and Crisafi 1982). Reliance on perceptual attributes is apt to be particularly encouraged in the case of consumer brands due to there being relatively few real differences between brands and to marketers' attempts to differentiate brands on the basis of such highly salient visual cues as product shape or package design.

In view of these possibilities, the study presented here examines the robustness of findings regarding developmental differences in the way children categorize objects in a marketing context. In doing so, the following hypotheses are advanced in a manner consistent with previous developmental research.

H1a: The use of underlying attributes as a basis for children's product categorization will increase with age.

H1b: The use of perceptual attributes as a basis for children's product categorization will decline with age.

Explaining Age Differences

One of the emerging views of the shift from perceptual to underlying attributes is that this shift is another manifestation of children's developing awareness of information processing strategies (Bjorklund and Jacobs 1985; Duncan and Kellas 1978; Tversky 1985). That is, older children discover that organizing objects by underlying rather than perçeptual attributes is an effective strategy that enables them to retrieve old information and interpret new information more effectively. Younger children, in contrast, fail to recognize the particular importance of underlying features in this same way. Although younger children often possess considerable knowledge about underlying features of objects, they often rely on more accessible, or more salient, perceptual attributes as a basis for grouping (Anglin 1977; Smiley and Brown 1979).

If this view is correct, that the shift to using underlying attributes represents the emergence of a processing strategy, we suggest that younger children's failure to use this strategy might be attributed to one of two basic types of processing deficits: production deficits and mediational deficits (Flavell 1970). Production deficits are common among young children in the early elementary school grades, whereas mediational deficits are typically found among very young children in the preschool years (for reviews, see Brown 1975; Hagen and Stanovich 1977; Roedder 1981). Children with production deficits do not spontaneously produce a strategy when the situation warrants, but are quite able to do so when explicit

prompts to use the strategy are given. In the categorization context, young children categorizing on the basis of perceptual cues, but able to categorize on the basis of underlying cues when prompted to do so, would be characterized as exhibiting a production deficit. Children with mediational deficits, however, cannot use a specific strategy effectively even when prompted. Prompting appears to be ineffective because these children lack more fundamental skills that might mediate the use of these strategies. In the categorization context, young children using perceptual attributes as a basis for categorization, even when prompted to use underlying cues, would be characterized as exhibiting a mediational deficit.

Evidence supportive of the proposition that young children will exhibit production deficits and very young children will exhibit mediational deficits in categorization tasks is limited to a single study conducted by Horton and Markman (1980). In this study, stimuli from several artificial animal categories, varying on several perceptual and underlying dimensions, were presented to young children ages four to seven. In presenting the stimuli, half of the children received prompts for the objects in the form of descriptive labels that stressed several relevant underlying features for categorizing at the superordinate level. Results from a sorting task indicated that only the older children in the study (first graders and kindergartners) were able to take advantage of the prompts to categorize on the basis of cued underlying features. Prompts failed to enhance the use of underlying cues in children of preschool age.

Although these results lend some credence to the proposition that children's failure to use underlying cues is linked to production and mediational deficits, further evidence would appear necessary to establish the robustness of this finding. Given the earlier discussion of the importance of the subordinate level in marketing contexts, an examination of the effectiveness of categorization prompts at this level would certainly be welcome. In addition, evidence pointing to mediational deficits with different types of categorization cues than the ones used by Horton and Markman would reduce the possibility that deficits could be attributed to ineffective design of the prompt. The study presented here examines these issues by assessing the effectiveness of categorization prompts, different from those employed previously, at the subordinate level for children of different ages. Thus, the following hypotheses are advanced.

H2a: Prompting the use of underlying attributes will eliminate differences in product categorization between older and younger children.

H2b: Prompting the use of underlying attributes will not eliminate differences in product categorization between older and very young children.

METHOD

Subjects

One hundred and twenty children were recruited by a local marketing research firm. Parents received $15 as an incentive for their child to participate. Forty children, with equal numbers of boys and girls, were recruited from each of three age groups: 4–5, 6–7, and 9–10 years. In recruiting, precautions were taken to reduce problems with children's familiarity with the product classes used in the study. Parents were asked whether their child consumed items in both product categories, and recruitment was terminated in those cases where usage was not indicated for at least one of the categories.

A further check on product familiarity administered during the experiment, described in more detail next, necessitated a minor adjustment in the final sample. Four children in the youngest age group were found lacking in familiarity with a number of the brands used in the study. These subjects were dropped from further analysis, yielding a total of 116 subjects: 36 were 4–5 years old, 40 were 6–7, and 40 were 9–10.

Procedure

Upon arriving at the research site, children and their parents were greeted by a field supervisor and introduced to one of several interviewers. After establishing a rapport with the child, the interviewer then escorted the child to one of six interviewing rooms to which children were randomly assigned. Half of the interviewing rooms contained beverages and half of the rooms contained cereals. Each room was partitioned into nine stations so that children's attention could be directed toward one station at a time. Each station contained a triad of three cereal items or three beverage items. The children were taken to the first station, which served as a warm-up task for the experimental procedure, and given the following instructions:

> We are talking to kids like you to find out what you think about different kinds of cereals (drinks). To do this, we are going to play several games. For each game, I am going to show you three different kinds of cereals (drinks) like these. Then, I will tell you the name of each cereal (drink) and ask you some questions about them. We just want to know what you think—there are no right or wrong answers.

Following this, interviewers first pointed to each product and identified it by name. To check for product familiarity, children were then asked to identify each product by name, state whether they had ever heard of it, and indicate whether they had ever tried it. After this, the interviewer turned to the categorization tasks, in which one of the three products was designated as the target item for the triad. In the first task, the free sort task, interviewers pointed to the target

and asked children which of the other two products was "most like this one" and asked the child to explain why. No basis for grouping the products was suggested at this point. The next two tasks, however, did provide such a cue for grouping the products. In these tasks, interviewers pointed to the same target item as before and asked children which of the other products "*tastes* most like this one" (cued underlying sort) and which of the products "*looks* most like this one" (cued perceptual sort). As before, children were also asked to indicate the reason for their selections. In the event that children simply restated the question as a response (e.g., "They taste the same." or "They look the same."), interviewers were instructed to probe further (asking "Why?") for more specific responses (e.g., "They are both green."). Cues for both underlying and perceptual attributes were included, even though the underlying cue was the only one of direct interest, to prevent children from necessarily focusing on taste in judging subsequent triads. The order in which these two cues were specified was randomized.

After the warm-up task, interviewers repeated in a randomly determined order the same procedure for each of the eight remaining product stations. After completing the last station, demographic and product usage information was collected and children were returned to their parents. Parents and children were debriefed and paid. On average, the procedure took 25 to 30 minutes to complete.

Independent Variables

Age. Conceptually, the three age groups selected capture the most dramatic developments in children's categorization abilities, typically occurring between the ages of 5 to 9 (see Markman 1980; Markman and Callahan 1983). Children in this age range are also likely to differ in their responsiveness to categorization cues (see Roedder 1981). That is, the very young children (ages 4–5) should be relatively unaffected by the provision of categorization cues, whereas the younger and older children (ages 6–7 and 9–10) should be responsive to the presence of explicit cues. Accordingly, the three groups were selected to represent the lower part, the middle part, and the upper part of the 4 to 10 age range.

From a methodological perspective, the age range from 4 to 10 also seemed appropriate. Four- to five-year-olds were selected as the youngest group because much younger children would have difficulty understanding directions, verbalizing answers, and would not be familiar with a variety of cereal and beverage products. Nine- to ten-year-olds were selected as the oldest age group to avoid such potential problems as lack of interest in the study and lapsed usage of some of the focal products (e.g., heavily pre-sweetened cereals).

Task. To assess children's categorization abilities, we used a matching task that required children to match a target item to one of two alternatives and to explain their reason for doing so (see Tversky 1985 for similar methodology). This procedure was adopted as a compromise between methods that might have been too demanding for young children and those that might not have been demanding enough to really tap into categorization abilities. The matching task reduces task demands on younger children by minimizing the number of objects that must be compared at one time and by asking for a relatively simple comparison between items ("Which one is like this one?"). When combined with children's rationale for selections, this task also tends to provide more insight into children's abilities than a simple object sorting task that may leave questions about the bases for sorting unanswered (see Whitney and Kunen 1983 for similar arguments).

With these considerations in mind, three variations of the basic matching task were developed: a free sort task with no basis for categorization specified ("Which is most like this one?"), a cued sort task with an underlying attribute specified as the basis for categorization ("Which tastes most like this one?") and another cued sort task with a perceptual attribute specified as the basis for categorization ("Which looks most like this one?"). The wording used for the free sort task was taken directly from developmental research; the wording for the cued sort tasks simply substituted the words taste and look for the appropriate cue type.

These tasks were then pretested on a small sample of children ages 4 to 10. The only major difficulty with the tasks, which occurred with a few of the 4–5 year olds, was an inability to provide a rationale for why they selected a particular item in the triad. To reduce these problems in the final experiment, several prompts were developed to help some of the younger children understand the type of response being requested.[1]

Product Class. Two product classes, cereals and beverages, were examined to assess the robustness of developmental trends in a marketing context. These classes were selected based on the belief that they would be familiar to children of all ages. Inclusion of both cereals and beverages also facilitated a comparison of product class differences in that the beverage category is more differentiated (or superordinate), involving a combination of milk, juices, and soft drinks.

Evidence regarding children's familiarity with both product classes was obtained by asking parents to in-

[1]Prompts consisted of several questions that reworded the request for a why response in a slightly different manner. Examples were (1) "What does this one (selected item) have in common with this one (target item)?" and (2) "Why do these two (target and selected item) go together?"

dicate the frequency with which their children used cereal and beverage items (milk, juice, and soda). As expected, there were no significant age differences in children's usage across these products. Seventy-seven percent of children consumed cereal everyday or very often, while 21 percent consumed it occasionally. Ninety-five percent of children consumed milk everyday or very often, with 5 percent consuming it occasionally. And about 30 percent of the children consumed juice and soda everyday or very often, with about 60 percent consuming them occasionally.

Experimental Stimuli

An initial set of 18 product triads, one warm-up and eight triads for each of the two product classes, was developed. Popular brands in each product category were examined to identify a set of perceptual and underlying attributes that could serve as a basis for judging similarity among brands and would also be familiar to children of all ages. Cereals, for example, were found to vary on the basis of perceptual attributes such as product shape (squares, flakes, circles), product color (tan, brown, multi-color), and package size (regular size or small variety pack) *or* on the basis of underlying attributes such as flavor (fruit-flavored, chocolate-flavored, corn-flavored), sweetness (heavily presweetened or less sweetened), and nutritional value (amount of vitamins or bran). With these attributes in mind, popular brands in each category were then combined in groups of three such that a target brand would be similar to a second brand only on the basis of a perceptual attribute *and* similar to a third brand only on the basis of an underlying attribute. Such a configuration was favored because it would allow one to discern the bases children were using to group brands by simply observing which product they selected from the triad in addition to having their verbal responses for doing so.

This initial set of triads was pretested with 40 children ages 4 to 10. Children were taken through the entire experimental procedure to verify that the brands and attributes selected were indeed familiar to children of these ages. Results indicated that the types of perceptual and underlying attributes used to match pairs of brands in the triads were indeed reflective of the types of attributes mentioned by children when explaining why they judged items to be similar to one another. However, the pretest also revealed that some of the brands included in the triads were unfamiliar to younger children, as measured by their usage of specific cereals and beverages. Interest focused on usage, rather than other possible measures of familiarity, due to the fact that direct product experience was deemed helpful, if not essential, in judging similarity based on taste (the underlying attribute used in the cued sort condition). Unfortunately, many of these brands were needed to construct triads that did not confound the use of underlying and perceptual attributes in brands paired with the target item. Given the importance of minimizing product familiarity differences among children, and the fact that verbal responses were available as a means for determining which bases children were using for categorizing brands, the decision was made to develop a final group of triads using only those brands with a high degree of familiarity among children of all ages, even though the set of brands offered little latitude for not confounding perceptual and underlying cues.

The final set, then, consisted of triads based upon the brands most familiar to children as evidenced in the pretest. Fourteen highly familiar products were used to form product triads in the beverage category (e.g., Coke and Welch's Grape Juice) and 15 familiar brands were used to form product triads in the cereal category (e.g., Cheerios and Rice Krispies). Our success in identifying such brands was reassessed during the course of the final experiment by asking children whether they had ever consumed each item used in the study. Children indicated using an average of 13.4 of the 14 beverage products (13.3, 13.4, 13.7 across the youngest to the oldest age groups, $F(2,55) = 1.8$, n.s.), and an average of 12.3 out of the 15 cereal brands (12.2, 12.2, 12.6 across the three age groups, $F(2,55) < 1$, n.s.). This final check indicated a high degree of familiarity with the items used in the study as well as equivalency across age groups for both product categories.

Triads thus included familiar brands that could be paired with a target item on the basis of one or more perceptual and underlying attributes. For example, one of the cereal triads included Trix (target), Kix, and Froot Loops. Trix and Kix share a similar perceptual attribute (round balls), whereas Trix and Froot Loops share both a common underlying attribute (fruit-flavored taste) and a perceptual attribute (multi-colored product). Triads such as these were displayed at each experimental station using the actual product packages.[2]

Dependent Variables

For each categorization task, children selected the product most similar to the target and specified their reason(s) for doing so. The dependent variables for subsequent analysis were based on the reasons children gave for their selections. Specific product selections were not analyzed due to the fact that they could not be unequivocally classified as indicative of the use of perceptual or underlying attributes.

Children's reasons for sorting products were coded either as based on an underlying attribute (e.g., taste, flavor, ingredient) or on a perceptual attribute (e.g., product shape, package color, package size). Attributes were classified in this manner following common usage in the categorization literature (e.g., Chi et al. 1981). Two independent judges blind to the hypotheses coded responses into one of these catego-

[2]Because most of the packaging cues were visual, such as package color and product pictures, age differences in reading ability were not an issue.

TABLE

MEANS AND STANDARD DEVIATIONS CATEGORIZED BY AGE, TASK, AND PRODUCT CLASS

	Number of underlying cues			Number of perceptual cues		
Categorization task	Very young children (ages 4–5)	Younger children (ages 6–7)	Older children (ages 9–10)	Very young children (ages 4–5)	Younger children (ages 6–7)	Older children (ages 9–10)
Free sort						
Beverages	2.8	3.6	5.7	4.2	3.2	1.4
	(1.8)	(1.6)	(1.7)	(2.0)	(2.2)	(1.8)
Cereals	1.6	2.5	4.3	5.6	4.8	3.2
	(1.3)	(1.1)	(2.0)	(1.4)	(1.4)	(1.7)
Average	2.2	3.0	5.0	4.9	4.0	2.3
Cued underlying sort						
Beverages	3.5	5.4	5.7	2.3	0.7	0.6
	(1.4)	(1.7)	(2.5)	(1.3)	(1.3)	(1.7)
Cereals	2.8	5.6	6.4	3.7	1.2	1.1
	(1.9)	(2.2)	(2.1)	(1.9)	(2.1)	(2.0)
Average	3.2	5.5	6.0	3.0	0.9	0.9
Average across tasks	2.7	4.3	5.5	4.0	2.5	1.6

NOTE: Standard deviations are enclosed in parentheses.

ries or a third "other" category (see the Appendix for the coding scheme and examples). None of the classes of statements subsumed under the "other" category was large enough to warrant a more detailed analysis of this category. Using this scheme, 87.9 percent of the responses could be coded as either underlying or perceptual attributes. Agreement between the two judges, computed at 0.81 using Cohen's kappa coefficient, indicated few coding disagreements. Disagreements were examined by a third judge (also blind to the hypotheses) and resolved by a discussion among the three judges.

For each child, the number of times an underlying attribute was used and the number of times a perceptual attribute was used as a categorization reason were counted for each categorization task. Because there were eight product triads per categorization task, the count for either perceptual attributes or underlying attributes could vary between 0 and 8. Both measures, the number of times perceptual attributes were mentioned and the number of times underlying attributes were mentioned, were used due to the fact that they were not completely correlated given the presence of the third "other" category.

RESULTS

Means and standard deviations for children's use of perceptual attributes and underlying attributes, grouped by age, product class, and task, are presented in the Table. A preliminary examination of this table indicates that children of different ages used different types of attributes in categorizing products. Older children ages 9–10 used underlying cues in a ratio of about 2:1 relative to perceptual cues, whereas the very young children ages 4–5 used perceptual cues in a ratio of about 2:1 relative to underlying cues. Children in the middle age group, referred to here as younger children ages 6–7, responded in between these extremes. These tendencies appear to be robust within each age group as evidenced by the relatively small and equal variances across age groups. Such a pattern makes it highly unlikely that the "poor" performance exhibited by the 4- to 5-year-old group could be attributed to the very poor performance of a small subset of subjects or that the "good" performance exhibited by the 9- to 10-year-old group could be attributed to superior performance by a small subset of these subjects. However, the tendency to use a particular type of categorization cue does not appear to be robust across product categories. The data show a greater use of perceptual attributes for cereals than for beverages for all age groups in the study.

To examine these trends in more detail, children's responses were analyzed in a 3 (age group: 4–5, 6–7, 9–10) × 2 (product class: cereals, beverages) × 2 (task: free sort, cued underlying sort) ANOVA design. Age and product class were between-subject factors whereas task was a within-subject factor. Given the mixed design, three error terms were computed and the appropriate error term was used to test each hypothesis. Separate ANOVAs were run for the two dependent measures: use of perceptual attributes and use of underlying attributes.

Hypothesis 1

The first hypothesis stated that children would use underlying attributes more (Hypothesis 1a) and perceptual attributes less (Hypothesis 1b) as they grow older. The findings support this hypothesis in that the main effect for age was significant, both for the use of

underlying cues ($F(2,110) = 32.8$, $p < 0.01$) and the use of perceptual cues ($F(2,110) = 24.0$, $p < 0.01$). For the free sort task, comparisons across the three age groups for underlying cues indicate that older children used underlying cues significantly more than younger children did (5.0 versus 3.0, $t(1,220) = 4.8$, $p < 0.01$). Younger children, in turn, used underlying cues significantly more than the very young age group did (3.0 versus 2.2, $t(1,220) = 1.9$, $p < 0.05$). Comparisons across the three age groups for perceptual cues reveal exactly the opposite pattern. The older children used perceptual cues significantly less frequently than the younger children did (2.3 versus 4.0, $t(1,220) = 4.3$, $p < 0.01$), and the younger children used perceptual cues significantly less than the very young children did (4.0 versus 4.9, $t(1,220) = 2.3$, $p < 0.01$). Thus, there is support for both Hypotheses 1a and 1b in that the use of underlying cues to categorize products increases with age while the use of perceptual cues to categorize products decreases with age.

Hypothesis 2

The second hypothesis predicted that the provision of prompts to use underlying attributes would eliminate differences between older and younger children (Hypothesis 2a) but not between the older and the very young children (Hypothesis 2b). General support for this hypothesis was found in the presence of significant age by task interactions for the use of perceptual attributes ($F(2,110) = 7.7$, $p < 0.01$) as well as underlying attributes ($F(2,110) = 6.2$, $p < 0.01$). Comparisons between age groups provided more direct support. An analysis of children's responses in the cued sort task prompting the use of underlying attributes indicates that both the younger and older children used underlying attributes to categorize (5.5 versus 6.0) and that there was no significant difference between these two age groups in the use of underlying attributes ($t(1,220) = 1.2$, n.s.). However, the very young children continued to use underlying attributes significantly less than the older children (3.2 versus 6.0, $t(1,220) = 6.7$, $p < 0.01$) and significantly less than the younger children (3.2 versus 5.5, $t(1,220) = 5.5$, $p < 0.01$).[3] Thus, there is substantial support for the idea that young children with production deficits can be induced to categorize products in the same way as older children, but that very young children with mediational deficits cannot be prompted to do so.

[3]The 4- to 5-year-olds, when asked to focus on underlying attributes, somewhat increased their use of these attributes compared to the free sort task (3.2 versus 2.2, $t(1,110) = 2.4$, $p < 0.01$) and reduced their use of perceptual attributes compared to the free sort task (3.0 versus 4.9, $t(1,110) = 6.6$, $p < 0.01$). However, compared to the older children ages 9–10, they still depend less on underlying features (3.2 versus 6.0, $t(1,220) = 6.7$, $p < 0.01$) and more on perceptual features (3.0 versus 0.9, $t(1,220) = 3.9$, $p < 0.01$). Thus, they continued to exhibit deficiencies in categorizing.

DISCUSSION

Our findings indicate that children of different ages use different bases for categorizing products. Younger children use perceptual attributes to classify products, whereas older children rely more on underlying attributes in the categorization process. Moreover, our findings implicate two different types of deficits that underlie younger children's failure to consider underlying attributes. Production deficiencies, which can be alleviated by prompting the use of underlying attributes, appear to be common among children in the early elementary school years. Mediational deficiencies, which cannot be overcome by prompting or giving further instructions, appear to be the source of the problem for children in the preschool years.

These data provide a starting point for assessing the robustness of previous findings in this area. The first issue in this regard is whether the same developmental trends found in psychological investigations, which have focused on abstract levels of categorization, would emerge in a marketing context, which requires a focus on more specific levels of categorization. Findings from both settings affirm the existence of age differences in the use of perceptual and underlying cues, but diverge with respect to the absolute use of underlying versus perceptual cues in older children. Previous developmental evidence suggests a greater use of underlying cues by older children than that observed in this study. Among older children tested here, there was a noticeable reliance on perceptual cues as a basis for categorization, especially in judging products in the cereal category. Thus, it appears that categorizing at the subordinate level may be more difficult than categorizing at more abstract levels and that conclusions regarding the widespread use of underlying cues among older children may need to be tempered a bit when focusing on the subordinate level (see also Mervis and Crisafi 1982).

A second issue in assessing robustness is whether the same developmental trends would emerge across product categories. Findings from both categories converge in uncovering age differences among children in their relative use of underlying and perceptual cues, but diverge in the absolute degree to which these cues are relied upon in the categorization process. In each age group, perceptual cues were more commonly used for the cereal category than for the beverage category. Although there may be many differences between these two product categories, rendering any explanation of product category differences somewhat preliminary at this point, it seems possible that variations in product differentiation in the two categories may have been a contributing factor. Cereals familiar to children vary relatively little in major factors such as taste (most are sweet) and usage situation (mainly at breakfast). Beverages, in contrast, are more differentiated on the same factors of taste (sweet, sour, tart) and usage (breakfast, meals,

snacks). These findings parallel the observation that perceptual cues are also used more frequently in less differentiated subordinate level categories than in more differentiated superordinate level categories. Differences of this nature point to a need when applying findings from one domain to another to consider more carefully the stimulus differences between settings.

Beyond issues of generalizability, the findings presented here also raise questions regarding the source of processing deficits in children. In particular, the question of why mediational deficits occur in very young children certainly requires further examination. Methodological artifacts, prompted by excessive task demands or unfamiliar stimuli, would appear to be an unlikely explanation. Although task demands do exert an influence in this area, as in virtually every other area of developmental research (John and Cole 1986), their influence was diminished in this study by using objects that were typical exemplars of their categories (Mervis 1980) and by involving relatively simple comparisons among objects (Whitney and Kunen 1983). Requiring children to verbalize reasons for their similarity judgments may have placed greater demands on the very young children, but a supplemental analysis of the few triads in which children's similarity judgments could be used as direct evidence of categorizing by perceptual or underlying cues, without resort to verbalization, indicates the same trends reported earlier for the verbal measures.[4]

Similarly, the problem of knowledge deficits among the very young children was diminished by using product categories with an equivalent frequency of usage among children of all ages and by using familiar brands with equivalent usage among children of all ages. Although product usage cannot be equated with product knowledge in general, usage is a reasonably good surrogate measure and control for knowledge of the attribute (taste) examined here. Moreover, our results parallel those from studies using artificial stimuli, in which knowledge confounds are ruled out altogether.

In view of these facts, it would appear that the source of mediational deficits among very young children lies in real processing differences between these children and their older counterparts. One possibility is that young children are so "perceptually bound" that they find it difficult to suppress highly salient visual cues to focus on underlying attributes. A second possibility is that, even though they are able to focus on underlying attributes, they do not yet have the cognitive abilities needed to consistently execute such strategies. It may be that these children have difficulty extracting features not directly observable, holding this information in memory, and comparing objects on these features accordingly. And yet a third possibility is that very young children rely on a naive form of causal reasoning that "things that look alike taste alike," no matter what the actual degree of correlation really is and despite their direct experience to the contrary. Research examining these, or additional, explanations is needed to further our understanding of age differences in product categorization.

[4]For example, in one beverage triad, a can of 7-Up (target product), a can of orange soda, and a large bottle of Sprite were displayed. For this triad, it seemed that selecting orange soda as most similar to 7-Up could be done only on the basis of perceptual similarity (both in cans) and selecting Sprite as most similar could be done only on the basis of underlying similarity (taste). For the free sort task, 55 percent of the very young children, 80 percent of the younger children, and 100 percent of the older children paired Sprite with 7-Up, indicating the changing use of perceptual and underlying features with age. It was not possible to conduct a formal analysis based on product selection because, for most triads, each product in the triad was similar to the other two both in terms of perceptual and underlying features.

APPENDIX

Coding Scheme

Perceptual Cues. These are concrete attributes and the presence (or absence) of perceptual cues can be assessed based on direct, visual observation. Examples of such cues are (1) package related visual cues such as characters/symbols on the package ("They both have Bucky Badger on them."), food illustration ("There are strawberries in this."—pointing to package), size ("Both are large."), color ("This one is green."), and shape ("Round cans, the other is a box."), and (2) product-related visual cues such as shape ("They are both Os.") and color ("They are both dark brown.").

Underlying Cues. These are more abstract attributes and convey a deeper understanding of the category or product. These attributes generally cannot be assessed through visual inspection and need to be learned through either direct experiences or socialization. Examples of such cues are product taste ("Tastes tart."), product benefit ("This is nutritious for me."), and ingredient ("These don't have sugar.").

Other Cues. These are attributes that cannot be classified under the other two categories. Such attributes include simple statements of affect or liking ("I like it."), usage ("I never use it."), and miscellaneous responses ("I don't know.").

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