

---

The Effects of Object Orientation and Object Type on Children's Interpretation of the Word "Big"

Author(s): John D. Coley and Susan A. Gelman

Source: *Child Development*, Vol. 60, No. 2 (Apr., 1989), pp. 372-380

Published by: Wiley on behalf of the Society for Research in Child Development

Stable URL: <http://www.jstor.org/stable/1130983>

Accessed: 18-09-2017 13:35 UTC

## REFERENCES

Linked references are available on JSTOR for this article:

[http://www.jstor.org/stable/1130983?seq=1&cid=pdf-reference#references\\_tab\\_contents](http://www.jstor.org/stable/1130983?seq=1&cid=pdf-reference#references_tab_contents)

You may need to log in to JSTOR to access the linked references.

---

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact [support@jstor.org](mailto:support@jstor.org).

Your use of the JSTOR archive indicates your acceptance of the Terms & Conditions of Use, available at <http://about.jstor.org/terms>



JSTOR

*Society for Research in Child Development*, Wiley are collaborating with JSTOR to digitize, preserve and extend access to *Child Development*

# The Effects of Object Orientation and Object Type on Children's Interpretation of the Word *Big*

John D. Coley and Susan A. Gelman

University of Michigan

COLEY, JOHN D., and GELMAN, SUSAN A. *The Effects of Object Orientation and Object Type on Children's Interpretation of the Word Big*. CHILD DEVELOPMENT, 1989, 60, 372-380. Previous research indicates that preschool children have persistent difficulty interpreting *big*: 4-5-year-olds typically interpret *big* to mean tall, and 3-year-olds fail to use any consistent interpretation. We propose that children's interpretation may vary depending on 2 contextual factors: type of object and orientation of object. 40 children (ages 3 and 5) each saw 35 pairs of items and, for each pair, were asked to point to "the big one." *Type of object* was varied by showing each child 3 kinds of objects: "people," "brownies," and rectangles. *Orientation of object* was varied by presenting objects either standing perpendicular to the tabletop (vertical condition) or lying flat on the tabletop (horizontal condition). Older children relied on height more consistently than younger children, all subjects relied on area more often in the horizontal condition than in the vertical condition, and 3-year-olds relied on height more when judging the bigness of people than of rectangles matched for size. Taken together, these results demonstrate that contextual factors clearly influence children's responses. These results demonstrate the interplay of cognitive and semantic factors in the process of semantic development.

A puzzling finding of researchers in the domain of semantic development, first reported by Lumsden and Poteat (1968), is that many English-speaking children seem to interpret *big* as if it meant *tall*. In fact, this error apparently increases in frequency between the ages of 3 and 5 (Harris, Morris, & Terwogt, 1986; Maratsos, 1973). This has caused some to speculate that an actual decrement in children's correct use of the word occurs (Gathercole, 1982; Maratsos, 1973).

More recently, Ravn and Gelman (1984) found that, when children's responses are examined with regard to whether they *consistently* adhere to a particular rule, rather than how many are correct, difficulties in comprehending *big* and *little* are evident throughout the age range from 3 to 5 years. More specifically, older children consistently interpret *big* as referring to height (as in earlier work); younger children fail to apply any consistent

interpretation of *big*, sometimes selecting the correct object but sometimes selecting the taller object or the object with the single largest dimension. Thus, 3-year-olds only appeared to be more correct in earlier work because in those studies failure to apply a height interpretation was taken as evidence for a correct interpretation. Ravn and Gelman avoided this problem by simultaneously examining five different possible rules for *big*. Applying a rule-use paradigm to children's choices of "the big one" over a series of stimulus pairs, these researchers found that no 3-year-old met the criterion for consistent use of the correct area rule. They also found that the number of children consistently using any rule increased with age, including the number using a height rule and the number using the correct area rule.

A progression from inconsistent to consistent rule use and a parallel progression

This paper is based on a master's thesis submitted by the first author to the University of Michigan. The research was supported by NICHD grant 1-R29-HD23378-01 and a Spencer Foundation Fellowship to the second author. We gratefully acknowledge the assistance of Marilyn Shatz for many helpful comments and suggestions on earlier drafts, and Karen Ravn for suggestions during the early stages of design. We also thank Mindi Kogan for collecting the data on *tall*. We are especially indebted to the parents, staff, and children of the following schools for their cooperation: Ann Arbor "Y" Day Care Center, Beth Shalom Nursery School, Comtree Co-op Child Care Center, Little Farm Nursery School and Kindergarten, Little Lamb Day Nursery, University of Michigan Children's Centers, and Washtenaw Community College Children's Center. Requests for reprints should be sent to John D. Coley, Developmental Psychology, 3433 Mason Hall, University of Michigan, Ann Arbor, Michigan 48109.

[*Child Development*, 1989, 60, 372-380. © 1989 by the Society for Research in Child Development, Inc. All rights reserved. 0009-3920/89/6002-0006\$01.00]

from incorrect to correct rule use seems a more plausible and equally supported developmental explanation than the previously proposed decrement. From the standpoint of consistent rule-based use of the word *big*, there is no decrement to explain. However, the fact remains that English-speaking children increasingly use *big* as though it referred to height.

Several explanations have been offered for this phenomenon. Maratsos (1973) explained his results in terms of a tendency to "analyze extensionality increasingly along one dimension with age" (p. 751). He argues that the use of the vertical dimension is actively overextended due both to the environmental salience of the vertical dimension and the increased tendency with age toward unidimensional analysis. This explanation assumes that these cognitive pressures lead children to give up the correct definition of *big* in favor of an incorrect one. In contrast, Gathercole (1982) argues for a purely semantic explanation. She argues that the meaning of dimensional adjectives may be analyzed into specific semantic features, and that children import the feature "vertical extent" from their newly learned representation of *tall* to their representation of *big*, thus creating the apparent synonymy. Her proposal derives from Carey's (1978) notion that children's initial representations of word meanings are composed of sets of exemplars—specific objects to which the child has heard the word applied—out of which the relevant semantic features are later abstracted.

Both of these proposed explanations assume that children have a single interpretation of *big* that holds across contexts. In this article we question this assumption, providing evidence that children do not always interpret *big* as though it has only one interpretation. We propose that children's difficulty with *big* stems in part from its complex meaning. Most accounts of the meaning of *big* in the developmental literature suggest that *big* simply means "general spatial extension" (Maratsos, 1973). Similarly, linguists have characterized *big* as "clearly synonymous with large" (Teller, 1969, p. 205) and as meaning "greater in size" (Katz, 1967, p. 187) where size is contrasted with height, among other dimensions.

However, recent adult analyses (Bierwisch, 1967; Lang, 1987a, 1987b) highlight the subtle, context-sensitive nature of the word. One particular point is that the meaning of *big*, for adults, shifts depending on the

object being described. For example, Maloney and Gelman (1987) found that adults rely on height when determining the relative bigness of human figures but rely on area when judging the relative bigness of rectangles. So object identity influences the meaning of *big* for adults and may have similar effects for children.

Spatial orientation is another contextual factor that may affect children's interpretation of *big*. In all the studies discussed above, stimuli (either cardboard cutouts or three-dimensional objects) were presented in an upright, vertical position. This could serve to draw more attention to the already salient dimension of height. If Maratsos is correct and 5-year-olds attend to height more than 3-year-olds, then manipulation of spatial orientation should lead to different interpretations of *big* by manipulating the salience of height.

Furthermore, children's performance on objects at different spatial orientations could provide a direct test between competing explanations. If older children's tendency to rely on height were due to semantic factors only, then their interpretation of *big* should remain constant across contexts, as long as the relevant feature (in this case, height) is available to them. However, Maratsos's position, that nonlinguistic cognitive pressures shape semantic representations, while not directly predicting orientation effects, would certainly be compatible with such effects. To the extent that the biasing dimension, namely, height, is less salient, children should rely on it less often in their interpretation of *big*.

In the present research, we explored how object-category membership and object orientation affect children's interpretation of *big*.

## Method

### Subjects

Twenty 3-year-olds (3-0 to 3-11) and 20 5-year-olds (5-0 to 5-11) participated in the initial study. The children were randomly assigned to either a vertical or a horizontal presentation group, with 10 children of each age per group. The mean age for each group of 3-year-olds was 3-7, and the mean age for each group of 5-year-olds was 5-5.

### Materials

Stimulus materials were 35 pairs of objects falling into three object categories: nine pairs of "brownies," nine pairs of "people," and 17 pairs of rectangles. Each set was designed to distinguish reliably between three

TABLE 1  
STIMULUS DIMENSIONS AND RULE DIFFERENTIATION

Pair	Item A	Item B	Area	Height	Salient Dimension
<b>Brownies:</b>					
B1 .....	6.0 × 6.0	4.0 × 4.0	A	A	A
B2 .....	4.0 × 7.5	5.0 × 3.0	A	B	A
B3 .....	6.0 × 6.0	9.0 × 2.0	A	B	B
B4 .....	10.5 × 2.0	7.0 × 7.0	B	A	A
B5 .....	6.0 × 3.5	5.0 × 9.5	B	A	B
B6 .....	4.0 × 9.0	6.0 × 3.0	A	B	A
B7 .....	5.0 × 5.0	6.0 × 2.0	A	B	B
B8 .....	6.5 × 1.5	4.5 × 4.5	B	A	A
B9 .....	5.5 × 3.0	4.5 × 7.5	B	A	B
<b>People:</b>					
P1 .....	19.0 × 7.5	12.5 × 5.0	A	A	A
P2 .....	12.5 × 22.5	15.0 × 9.0	A	B	A
P3 .....	12.5 × 20.0	22.5 × 5.5	A	B	B
P4 .....	23.0 × 6.5	15.0 × 20.0	B	A	A
P5 .....	10.0 × 5.5	7.5 × 15.0	B	A	B
P6 .....	12.5 × 25.0	15.0 × 10.0	A	B	A
P7 .....	16.0 × 12.5	20.0 × 5.0	A	B	B
P8 .....	15.0 × 5.0	12.5 × 12.5	B	A	A
P9 .....	12.5 × 7.5	10.0 × 20.0	B	A	B
<b>Rectangles:</b>					
R1 .....	12.5 × 10.0	6.0 × 7.5	A	A	A

NOTE.—Measurements (height × width) are in centimeters. Stimulus pairs R2–R9 correspond to stimulus pairs B2–B9; stimulus pairs R10–R17 correspond to stimulus pairs P2–P9.

possible rules for the application of *big*: a correct (area) rule, by which the object with the greatest overall area is judged the big one; a height rule, by which the tallest object is judged the big one; and a salient-dimension rule (after Ravn & Gelman, 1984), by which the object with the largest extent along one dimension—be it height or width—is judged to be the big one. For example, suppose a child were presented with two rectangles, one 5 cm tall and 6 cm wide, and the other 1 cm tall and 8 cm wide. The latter would be bigger according to the salient-dimension rule because it has the largest single dimension. One pair from each category was a pre-test pair, wherein the big one would be chosen as big according to any rule. The rest of the pairs varied systematically so that children's patterns of response would distinguish which rule, if any, was consistently being used. Specifically, for each pair, one object was big according to the correct rule and the other object was big according to the height rule. Across pairs, the object that was big according to the salient-dimension rule alternated between the "big" one and the "tall" one. (See Table 1 for the dimensions of all stimuli and which rules the specific pairs distinguish.)

*Brownies*.—The "brownies" were rectangles cut out of dark brown cork wall tiles; the edges were colored brown to create a realistic brownie-like appearance. This category was chosen because brownies tend to vary in bigness along more than a single dimension; height and width are equally relevant to the bigness of brownies.

*People*.—This category was chosen because some previous work has shown that a height rule may be pervasive (Harris et al., 1986), even among adults (Maloney & Gelman, 1987), in determining the "bigness" of people. The "people" were rectangles cut out of foamcore and decorated with contact paper and felt-tip markers to look as much like people as possible. All "people" had the same features: (1) A waistline was drawn across the width of each person, equidistant between the base and top of the rectangle. (2) A leg line was drawn from the base of the rectangle, equidistant from each side and  $\frac{3}{4}$  of the way to the waistline. (3) "Shoes" were drawn with a black felt-tip marker; these consisted of arcs approximately 0.5 cm high at the apex, covering the area from the edges of the rectangle to the leg line for each leg. (4) Arm lines were drawn  $\frac{1}{2}$  of the way in from each edge,

stretching from the waistline  $\frac{3}{4}$  of the way up to the top of the rectangle. (5) "Hands" were cut out of contact paper and positioned at the point where the arm met the waistline; each hand was a peach-colored arc 1 cm high at the apex, with a width equal to that of the corresponding arm. (6) A head was cut out of peach-colored cardboard and attached to the top of the rectangle equidistant from each side. All heads were identical, so that their addition affected the height and overall area of all stimuli equally. (7) Each pair was decorated with contact paper—all lower halves were blue, four pairs had yellow tops, and five pairs had red tops. The color of the tops within pairs was held constant, and color between pairs was varied to this slight degree to help maintain subject interest.

*Rectangles.*—This category was chosen because it represents a relatively nonmeaningful object class, namely, abstract geometric figures. As such, it provides a baseline for the brownies and people. The rectangles were also cut out of foamcore and were decorated in solid colors: six red pairs, six blue pairs, and five yellow pairs. The color patterns were similar to those described above for the tops on the people and were chosen for similar reasons. Except for the pretest items, each person or brownie pair had a corresponding rectangle pair matched for dimensions so that comparisons could be made as to rule use concerning stimuli that were physically the same sizes but differed as to the category they belonged to.

The following constraints on stimulus size were employed. All brownies approximated the size of real brownies, with a mean area of 25.6 cm<sup>2</sup>. The people were larger than the brownies (mean area of people = 161.1 cm<sup>2</sup>), with the smallest person larger than the biggest brownie. An additional constraint placed on the people was that the width could not exceed twice the height. This was to prevent stimuli from appearing too distorted in shape, and thus "unpersonlike." For each stimulus pair, the bigger one (based on the correct area rule) was between 2.0 and 2.78 times the overall area of the smaller one. This difference is comparable to those used in previous studies (e.g., Maratsos, 1973, who used area ratios ranging from 1.35:1 to 3:1). The single dimension with the greatest extent (the "salient dimension") was in at least a 3:2 ratio to the next largest dimension within each pair, unless the salient dimension was height (based on past findings, height was deemed

salient enough that smaller differences in height are easily noted).

The taller object of each pair, for people and their matched rectangles, was at least 2.5 cm taller, a difference that was clearly evident upon casual inspection. For the brownies, the proportions were preserved, but because the objects had to be smaller overall in order to appear as much like brownies as possible, the actual dimensional differences were smaller. Hence, the taller brownie was at least 1.0 cm taller and averaged 1.7 cm taller. Although this led to within-pair height ratios as low as 6:5, this difference in height is comparable to those used in other studies that have found children using height (e.g., Maratsos, 1973, who used height ratios as low as 10:9).

#### *Procedure*

Each child was shown three kinds of items: people, rectangles, and brownies. Stimulus pairs were presented in category blocks (e.g., a child saw all brownies, then all people, then all rectangles), and category blocks were presented in counterbalanced order. Order of presentation of each pair within each block was random, except for the pretest items, which were presented first in each of their respective blocks. Within each pair, each item appeared on the right and on the left a comparable number of times. There were two conditions of presentation: In the vertical condition, each pair was presented standing perpendicular to the tabletop, with the objects next to each other; in the horizontal condition, each pair was presented lying flat on the table, with the bases of the objects aligned to preserve a common bottom point.

Each child was tested individually in a room away from his or her classroom. Children were seated at a table across from the experimenter. The experimenter said, "We're going to look at some different things, and whenever I show you some things, I want you to look at them and tell me which is the big one, OK? First we're going to look at some brownies [people, rectangles]. Do you know what brownies [people, rectangles] are?" After noting the child's answer, the experimenter showed the subject each pair in succession, saying, "See these brownies [people, rectangles]? Which one is the big one?" For each subsequent category block, the experimenter said, "Now we're going to look at some people [rectangles, brownies], OK?" (etc.). Stimulus orientation (either vertical or horizontal) was held constant for each child. The experimenter noted which object of each

TABLE 2  
NUMBER OF CHILDREN CONSISTENTLY USING EACH RULE, BY CONDITION

	3-Year-Olds	5-Year-Olds	Total
Area rule:			
Vertical .....	1	0	1
Horizontal.....	5	5	10
Height rule:			
Vertical .....	3	10	13
Horizontal.....	0	3	3
Salient-dimension rule:			
Vertical .....	5	0	5
Horizontal.....	2	1	3
No rule:			
Vertical .....	1	0	1
Horizontal.....	3	1	4
Total.....	20	20	40

pair was chosen as “the big one” and also noted any comments accompanying this choice. All children were strongly encouraged to make a choice in each case.

### Results

The effects of the three independent variables—age, object type, and orientation—were examined using three types of analyses, involving (1) percentage of answers based on overall area (percent correct); (2) *consistent* use of area, height, or salient dimension rules for applying *big*, as a function of age and of stimulus orientation; and (3) a comparison of answers for meaningful stimuli (people and brownies) versus size-matched control rectangles. All children demonstrated appropriate conceptual knowledge of “big” by answering all three pretest items correctly.

#### Percent Correct

We performed a  $2 \times 2 \times 3$  ANOVA (age [3,5]  $\times$  orientation [vertical, horizontal]  $\times$  object type [brownies, people, rectangles]), using as dependent measures the percentage of answers based on overall area, which is the same as analyses of “percent correct” used by other researchers on similar data sets (e.g., Maratsos, 1973; Sena & Smith, 1987). Three-year-olds correctly selected the bigger item significantly more often (58.4% correct) than did 5-year-olds (29.0% correct),  $F(1,108) = 30.76$ ,  $p < .001$ . Furthermore, children were more accurate when items were presented lying down (horizontal orientation: 65.9% correct) than when they were presented standing up (vertical orientation: 21.5% correct),  $F(1,108) = 70.09$ ,  $p < .001$ . There were no significant interactions.

#### Consistent Rule Use

In addition to examining percent correct, we also categorized each child as either consistently using one of the three rules (area, height, or salient dimension) at a level significantly above chance, or not consistently using any rule at all (see Ravn & Gelman, 1984). Rather than simply reflecting how often the children’s answers were based on area, this analysis reflects consistent use of one of several possible interpretations of *big*.

In order to be counted as consistently using a rule, a child had to answer at least 23 items according to that rule, out of 32 total (binomial probability  $< .02$ ). Overall, 35 children were classified as consistently using one of the three rules under investigation, and five subjects were classified as using no rule consistently. The results, shown in Table 2, were analyzed using Fisher’s exact tests to examine the effects of age and orientation on consistent rule use.

*Age.*—Five-year-olds were no more likely to use a consistent rule than were 3-year-olds (exact  $p = .194$ ). Among children using some rule consistently, there was no age difference in use of a correct versus some other rule (namely, height or salient dimension) (exact  $p = .716$ ). However, among children using some rule but not the correct rule, 3-year-olds typically used the salient dimension rule, but 5-year-olds typically used the height rule (exact  $p = .002$ ).

*Orientation.*—Children who saw the stimuli presented horizontally were no more likely to use a consistent rule than were children who saw the stimuli presented vertically

TABLE 3  
MEAN NUMBER<sup>a</sup> OF AREA-BASED ANSWERS FOR DIFFERENT OBJECTS

Age	People	People-Rectangles <sup>b</sup>	Brownies	Brownie-Rectangles
3-year-olds . . . .	3.65 (2.70)	5.05 (2.76)	5.30 (2.64)	5.10 (2.75)
5-year-olds . . . .	2.50 (3.63)	2.30 (3.16)	2.30 (3.33)	2.00 (2.00)

NOTE.—Standard deviations are in parentheses.

<sup>a</sup> Out of a possible 8.

<sup>b</sup> “People-Rectangles” are the plain rectangular stimuli matched to the people stimuli for size. “Brownie-Rectangles” are the plain rectangular stimuli matched to the brownie stimuli for size.

(exact  $p = .194$ ). However, among those who used some rule, children consistently used the area rule in the horizontal condition but some other rule (either height or salient dimension) in the vertical condition (exact  $p = .001$ ). Finally, among children who used some rule, but not the correct one, there was no significant difference in the use of a height rule versus a salient dimension rule as a function of orientation (exact  $p = .362$ ).

#### Within-Rule Consistency

To examine further the consistent use of some rule (any rule), we computed, for each child who used some consistent rule, the number of items answered according to that rule, giving us a score ranging from 23 to 32. These scores indicate how consistently the rule users adhered to their rule of choice. We then performed a  $2 \times 2$  ANOVA, age (3,5)  $\times$  orientation (vertical, horizontal) taking as a dependent measure each rule user’s within-rule consistency score. Rule-using 5-year-olds on the average answered more items (30.2) according to their rule of choice than rule-using 3-year-olds (27.7),  $F(1,31) = 4.93$ ,  $p < .05$ . No other main effects or interactions emerged.

#### Effects of Object Type

Although the ANOVA showed no main effects for object type, we used planned, paired  $t$  tests to compare the mean number correct for the people and the brownie stimuli (across orientation) to their respective sets of identically sized control rectangles. These data are presented in Table 3. In this analysis, 3-year-olds used height more often when

judging people than when judging the sized-matched control rectangles,  $t(19) = 2.50$ ,  $p < .05$ . The mean number of area-based answers did not differ between brownies and their corresponding control rectangles for 3-year-olds. The 5-year-olds exhibited no such object-related effects.

#### Use of “Tall”

Given that children were much less likely to rely on height when objects were lying down, the question arose as to how a “height” rule would be applied to objects displayed horizontally, thereby lacking true height. To assess how a height rule would be applied in the horizontal condition, 30 additional subjects (10 3-year-olds, 3-8 to 3-11, mean age 3-9; 10 5-year-olds, 5-1 to 5-11, mean age 5-6; and 10 adults) were shown the same stimuli as in the main experiment,<sup>1</sup> presented lying down with a common baseline preserved. However, these subjects were asked to choose which object was “the tall one.”

Overall, 13 of the 20 children consistently used height (distance from the common baseline to the top of the object) to determine the tallness of the stimuli, five children used salient dimension, one used area, and one used no consistent rule. Additionally, six of 10 adults consistently used height, three used salient dimension, and one used no rule consistently.<sup>2</sup> For each type of item, more subjects used height than any other rule. Note that in contrast to horizontal *big*, only one subject interpreted horizontal *tall* as referring to area. From these results it is clear that most

<sup>1</sup> Children were shown the entire set of items. Adults were shown a subset of the stimuli (items P2, P8; B2, B8; R2, R8, R10, R16), which included the minimum number needed to distinguish among an area, height, or salient dimension interpretation.

<sup>2</sup> For an adult subject to be given credit for using a rule consistently, that subject had to have answered at least seven of eight items according to that rule (binomial probability  $< .05$ ).

### 378 Child Development

subjects, both children and adults, could readily detect height when stimuli were lying horizontally.

#### Discussion

The major findings of the present study are that object orientation and, to a lesser degree, object type influence children's judgments of *big*, highlighting the complex meaning of this word. Moreover, there are developmental changes that suggest increasing efforts by children between 3 and 5 years of age to impose a consistent interpretation onto the word *big*, given input that may not clearly differentiate the meaning of *big* from the meaning of *tall*.

Before turning to the main results, it is important to demonstrate that our findings are consistent with previous results, where they overlap. The present results replicate Maratsos (1973), in that 3-year-olds generated more area-based answers than 5-year-olds. Considering children's correct responses only, 3-year-olds appear to use *big* correctly, whereas 5-year-olds appear to use it incorrectly. However, our findings regarding consistent rule use also clearly support Ravn and Gelman (1984) in that when the data are examined for consistent rule use, there is no age difference with regard to consistent area-based use of *big*. Three-year-olds' performance, although apparently indicating more correct usage, actually reflects less reliance on the incorrect height rule. Three-year-olds were more likely to use the salient dimension rule, while 5-year-olds favored the height rule. Our finding that 3-year-olds use salient dimension has some precedent. Bausano and Jeffrey (1975) found that their 3-year-old subjects did not correctly choose the big object at a level above chance and seemed to base their judgments on one dimension—the dimension along which differences were greatest—instead of taking both dimensions into consideration.

The primary new result of this study is that stimulus orientation had clear effects on consistent rule use. Subjects who saw the stimuli lying flat used the area rule much more frequently than those who saw the stimuli standing up. In contrast, when children were shown the objects lying down but asked for "the tall one" only one subject answered based on area. The fact that subjects performed so well when questioned on *tall* demonstrates that children can accurately apply a height rule to objects which are lying down. Therefore, the orientation effect reflects a

context-sensitive rule for applying *big*, and not simply performance limitations. The *tall* data also suggest that *big* and *tall* are not synonymous for young children. This once again argues that the meaning of *big* is more complex than a featural explanation (e.g., Gathercole, 1982) could provide.

In addition to finding context effects for object orientation, we also found subtle context effects for type of object. Three-year-olds showed some sensitivity to object type, although 5-year-olds did not. The younger children gave height-based answers more frequently for people than for rectangles that matched the people exactly in size. One could attribute this effect to the vertical lines (arms, legs) drawn on the people stimuli, which could have drawn attention to the vertical dimension. However, the horizontal lines (waist, shoes) were at least as clearly marked as the vertical lines. Also, such an explanation would not account for the finding that 5-year-olds were no more likely to use height for people than for matched rectangles.

The object effect, although slight, suggests that *big* does not always have just one meaning. Instead, *big* may be applied to the positive pole of the dimension of usual variation for a given type of object. It has been suggested elsewhere that children's initial meaning of *big* is based on specific stored exemplars (Carey, 1978; Keil & Carroll, 1980). To the extent that different classes of objects tend to vary on different dimensions, they are more likely to be compared along those dimensions. For example, people vary much more in height than they do in width. Thus it makes sense that *big*, when used to refer to people, is more often taken to mean "greater extent on the dimension of height." For other object classes, whose members tend to vary on several dimensions, such as brownies, *big* would more often refer to overall area. This complex and context-sensitive nature could help explain the persistent difficulty children have in mastering the meaning of *big*. Sena and Smith (1987) present a similar view.

These results, along with those of Maloney and Gelman (1987), support the contention that any theory of semantic development that relies solely on the abstraction of semantic features as an explanatory mechanism offers an overly simplified account of the phenomenon. Features cannot adequately describe the meaning of *big* without contextual considerations (see also Lang, 1987a, 1987b). For adults as well as for younger children, contextual factors such as object type and ob-



ject orientation contribute to a meaning for *big* that is not constant across contexts, and therefore not specifiable by a single set of primitive features. In asserting this, we agree with Maratsos (1974), who says that context can affect "the weights of different definitional components of the words for the child" (p. 374).

Overall, our results lead us to suggest that developmental changes in children's use of *big* demonstrate the interplay of cognitive and semantic factors in the process of semantic development. A basic semantic factor appears to be the tendency to strive for a consistent model of the meaning of a word. Cognitive factors seem to have an impact on the actual content of the model. Below we elaborate on each of these factors.

Karmiloff-Smith (1979) argues that children's choice of a given meaning for a word will depend on their capacity to identify the most consistent input pattern through positive examples and their subsequent drive to conserve that pattern. In the case of *big*, initial input may not adequately differentiate it from *tall*; many things described as "big" are also tall, such as trees, houses, and adults. Once the word learner discerns a pattern (e.g., that *big* refers to vertical extent), protection of this newly discovered pattern from contradictory input allows the child to consolidate a word meaning. Counterexamples (in this case, things that are big but not tall) are discounted until children have consolidated a basic meaning for the word; if children were to take each new piece of information into account, they would have no chance to establish a pattern in the first place. Thus, children identify a pattern of application for a given word—a model of its meaning—and base their use of the word on that model. Once this consistent model is established, exceptions can be noted, and can eventually be integrated into the meaning.

Our findings of increased consistency from ages 3 to 5 are compatible with this view. Although the 5-year-olds were not completely consistent (after all, changes in orientation led them to adopt different rules), they were more consistent in their rule use than 3-year-olds in three ways: (1) among those subjects using a rule, older children used their rule of choice more frequently than younger children; (2) unlike 5-year-olds, 3-year-olds used a salient-dimension rule, which is a more variable rule in that it fails to specify one dimension (either horizontal or vertical) to use consistently; and (3) object effects were

evident at age 3 only, not at age 5. The 5-year-olds seem to apply a unidimensional rule overzealously and therefore miss the object-specific nuances evident in adults (Maloney & Gelman, 1987). In this sense, there may be a U-shaped developmental pattern from age 3 to adulthood in consistency of rule use. The task for the 5-year-olds, then, is to refine their model so that it differentiates the situations in which *big* may well refer to height (e.g., people) from those in which it refers to overall area.

As children strive for a consistent semantic model of the meaning of a word, nonlinguistic cognitive forces may well affect which model children choose. Specifically, there could well be something about the dimension of height that gives it special salience for children (Clark, 1973) and therefore increases the chances that children will incorporate height into their model of the meaning for *big*. Also, height of people correlates strongly with age and therefore social status. Children who are growing taller are often confronted with parental statements such as "my, aren't we getting big!" In Piagetian terms, children may become centrated on the height of an object (Flavell, 1963; Piaget, 1962) and therefore neglect other dimensions. This phenomenon may not be diagnostic of a pervasive bias or deficit (see Maratsos, 1973, for a demonstration that children are not bound to one dimension for the interpretation of *heavy*) but rather may indicate an interaction between an existing bias and the ambiguous input peculiar to *big*.

The finding that children persistently use height in the vertical presentation condition is compatible with this view. The orientation effect probably reflects the fact that horizontal presentation lessened the salience of intrinsic height. Thus, a bias to attend to height coupled with overlapping input for *big* and *tall* could lead to height being incorporated into children's model of the meaning of *big*.

These results suggest two immediate directions for future study. First, the question of when children acquire the adult meaning of *big* needs to be addressed. Input might not often specify that *big* refers to overall size instead of height. Counterevidence to a height rule would be rare; few things labeled as *big* for a child would tend not to be big in height. So it may not be until children actually encounter explicit counterexamples that area-based rules for *big* emerge. Second, the present initial finding of an object effect needs to be investigated in more detail, in order to

### 380 Child Development

clarify the extent of object effects in word meanings more generally.

#### References

- Bausano, M. K., & Jeffrey, W. E. (1975). Dimensional salience and judgments of bigness by three-year-old children. *Child Development*, *46*, 988–991.
- Bierwisch, M. (1967). Some semantic universals of German adjectives. *Foundations of Language*, *3*, 1–36.
- Carey, S. (1978). The child as word learner. In M. Halle, J. Bresnan, & G. Miller (Eds.), *Linguistic theory and psychological reality* (pp. 264–293). Cambridge: MIT Press.
- Clark, H. (1973). Space, time, semantics, and the child. In T. E. Moore (Ed.), *Cognitive development and the acquisition of language* (pp. 27–64). New York: Academic Press.
- Flavell, J. H. (1963). *The developmental psychology of Jean Piaget*. New York: Van Nostrand.
- Gathercole, V. A. (1982). Decrements in children's responses to big and tall: A reconsideration of the potential cognitive and semantic causes. *Journal of Experimental Child Psychology*, *34*, 156–173.
- Harris, P. L., Morris, J. E., & Terwogt, M. M. (1986). The early acquisition of spatial adjectives: A cross-linguistic study. *Journal of Child Language*, *13*, 335–352.
- Karmiloff-Smith, A. (1979). *A functional approach to child language: A study of determiners and reference*. Cambridge: Cambridge University Press.
- Katz, J. J. (1967). Recent issues in semantic theory. *Foundations of Language*, *3*, 124–194.
- Keil, F., & Carroll, J. J. (1980). The child's acquisition of tall: Implications for an alternative view of semantic development. *Papers and Reports on Child Language Development*, *19*, 21–28.
- Lang, E. (1987a). *Primary perceptual space and inherent proportion schema—two interacting categorization grids underlying the conceptualization of spatial objects*. Paper presented at the symposium "Verbal Representation of Space" during the International Conference "In Memoriam G. T. Fechner," Leipzig, West Germany.
- Lang, E. (1987b). The semantics of dimensional designation of spatial objects. In M. Bierwisch & E. Lang (Eds.), *Grammatische und Konzeptuelle Aspekte von Dimensionsadjektiven: Studia Grammatica* (Vols. 26 and 27, pp. 287–458). Berlin: Akademie-Verlag.
- Lumsden, E. A., & Poteat, B. (1968). The salience of the vertical dimension in the concept of *big* in five- and six-year-old children. *Journal of Verbal Learning and Verbal Behavior*, *7*, 404–408.
- Maloney, L. T., & Gelman, S. A. (1987). Measuring the influence of context: The interpretation of dimensional adjectives. *Language and Cognitive Processes*, *2*, 205–215.
- Maratsos, M. P. (1973). Decrease in the understanding of the word *big* in preschool children. *Child Development*, *44*, 747–752.
- Maratsos, M. P. (1974). When is a high thing the big one? *Developmental Psychology*, *10*, 367–375.
- Piaget, J. (1962). *Play, dreams and imitation in childhood*. New York: Norton.
- Ravn, K. E., & Gelman, S. A. (1984). Rule usage in children's understanding of *big* and *little*. *Child Development*, *55*, 2141–2150.
- Sena, R., & Smith, L. (1987). *Young children's understanding of the word "big."* Paper presented at the biennial meeting of the Society for Research in Child Development, Baltimore.
- Teller, P. (1969). Some discussion and extension of Manfred Bierwisch's work on German adjectives. *Foundations of Language*, *5*, 185–217.