

Logical Reasoning in the Supermarket: Adult Females' Use of a Proportional Reasoning Strategy in an Everyday Context

Noel Capon

Graduate School of Management, University of California, Los Angeles

Deanna Kuhn

Laboratory of Human Development, Harvard University

Adult female shoppers in a supermarket were asked to determine which of two sizes of a common item sold in the store was the better buy. Only 32% were able to use a proportional reasoning strategy to determine the correct choice when the size ratio was a simple one (2:3). Performance declined even further (20% correct) when the ratio was more complex.

This study is part of a program of research exploring the implications of variability in adults' logical reasoning strategies for their functioning in everyday life situations. That such effects may be pronounced is suggested by a growing number of research reports indicating that not all subjects in an adult population perform at the highest stage in Piaget's developmental sequence, the stage of formal operations. Possible effects of this adult variability on everyday functioning remain largely unstudied, however, because studies of logical reasoning typically have taken place only in formal test situations and have employed assessment instruments of questionable relevance to subjects' everyday concerns. A few studies have been concerned with the relevance issue (Kuhn & Brannock, 1977; Sinnott, 1975), but none has attempted to assess formal reasoning in any of the actual naturalistic settings in which it might be expected to occur.

Subjects were 50 female shoppers at a supermarket in a low- to middle-income area in the San Fernando valley area of Southern California. Each subject was shown two bottles of Schilling garlic powder. The label on the smaller bottle bore two weight indications, 1.25 ozs. (ounces) and 35 g. The larger bottle was similarly marked 2.37 ozs. and 67 g. A price of 77¢ was marked on the larger bottle. A similar marking of 51¢

on the smaller bottle was crossed off and a sale tag marked 41¢ attached. The subject was supplied with paper and pencil. The interviewer said, "Suppose this were a product you used a lot of. When you went to the store to buy some, you found you had a choice between these two sizes. How could you tell which one is the better buy?" If the subject responded in the vein that "you would have to figure it out," the interviewer asked the subject to go ahead and do that. If the subject said that either "the bigger one" or "the one on sale" was a better buy, she was asked, "How could you check to make sure the (sale/bigger) one is actually the better buy?" To investigate the hypothesis that some subjects might utilize a proportional reasoning strategy only in the context of a very simple problem (i.e., simple size ratio), a second problem was introduced. The subject was shown two cans of Arrid XX deodorant, one marked 8 ozs. and priced \$1.36 and the other marked 12 ozs. and priced \$2.11. The sale tag distractor was omitted. The procedure was identical to that used for the garlic powder.

Subjects' responses fell into six major categories, presented below in a rough order of sophistication. All responses were categorized by two raters, with 96% agreement.

Category 1: Extraneous, Task-Extrinsic

The subject did not utilize the given data even when encouraged to do so. Reasoning was based on factors extrinsic to the task objective, for example, "I always buy the large sizes; I don't like to shop often."

Requests for reprints should be sent to Deanna Kuhn, Laboratory of Human Development, Graduate School of Education, Harvard University, Cambridge, Massachusetts 02138.

Category 2: Extraneous, Task-Intrinsic

The subject likewise did not utilize the price or weight data, but reasoning was oriented to the task objective. The subject indicated either that the one labeled sale or the larger size is a better buy, for example, "The big one must be cheaper." In seven instances (five in the garlic powder problem and two in the deodorant problem), subjects gave this category of response initially and then shifted to a higher category following probing ("How could you check to make sure?"). These responses were classified in the higher category.

Category 3: Partial, Noninferential

The subject applied some set of operations to at least some of the data but was unable to proceed. For example, one subject noted, "4 ozs. added to the small one equals half more."

Category 4: Subtraction

Strategies in this category were characterized by the predominant use of subtraction operations. For example, one subject stated, "With the bigger one you get 32 more grams for 36 more cents," concluding that the larger was the better buy.

Category 5: Weight Ratio Diagnosis

Strategies in this category involved a diagnosis of the ratio of the two weights. In the deodorant problem, conceptually correct calculations following this diagnosis were various, for example, multiplying the price of the smaller product by $\frac{1}{2}$ and comparing to the price of the larger or subtracting the smaller price from the larger and comparing to half the price of the smaller. A similar approach was possible in the garlic powder problem that was based on an approximate ratio of 2:1, for example, "Well, almost twice as much for less than twice the price; the big one is cheaper."

Category 6: Direct Ratio

Strategies in this category involved the calculation of direct ratios using either price per unit weight or weight per unit price as the basis of comparison.

The categories that emerged in this study are consonant with findings from other studies, notably the failure to coordinate dimensions at the lower levels discussed by Piaget, and the prevalence of subtraction strategies.

Table 1
Response Frequencies in Each Category for the Two Problems

Problem	Category					
	1	2	3	4	5	6
Garlic powder	2	12	9	2	11	14
Deodorant	7	8	8	7	7	13

The response frequencies in each category are shown in Table 1. Of the 50 subjects, 37 scored at the same level on the two problems; 7 had scores differing by one level and 6 had scores differing by two levels. Performance on the two problems was thus roughly comparable, with the qualification that a Category 5 solution more often yielded a correct answer on the deodorant problem, since the simple 2:3 ratio facilitated a precise calculation. Two of the Category 5 responses on the deodorant problem were in fact incorrect due to an incorrect inference following a correct calculation. Similarly in Category 6, 4 of the 14 subjects on one problem and 2 of the 11 on the other made an incorrect inference as to which size was the better buy, following a correct calculation. (Incorrect solutions due to arithmetic errors were not penalized.)

In a 1966 study by Friedman, women were asked to choose the most economical brands for several different products. The author found a large number of errors, which he attributed to questionable packaging practices and poorly presented information (e.g., too small print). The present results suggest there may be a more basic reason underlying such errors.

The present data do not contradict the notion that performance is enhanced when the problem context is concrete and familiar. They do, however, suggest that formal operational reasoning among adults is far from universal even under these favorable assessment conditions. To be sure, we cannot be certain that the maximum reasoning capacities of all subjects were elicited in the present study, although we attempted to maximize subjects' display of their competence. Nevertheless, it seems fair to conclude that the reasoning strategy assessed in this instance was in any case not readily accessible and available for use by many of the subjects in the present study. Thus, the present findings suggest that there does in fact exist significant variability in level of logical reasoning among an adult population and, furthermore, that this variability has sufficient practical implication to warrant our further attention.

One might question whether the variability demonstrated in the present study is indeed of serious practical significance. Perhaps unit pricing, for example, is an adequate remedy for the deficiencies revealed in this study. We would argue against this view. Unless individuals have the ability to know for themselves how to use the kind of cognitive strategy investigated here, control of the consumer's purchasing behavior remains to some significant degree in the hands of others. Thus, why adults have not mastered such strategies and how such mastery might be facilitated seem topics worthy of our concern.

References

- Friedman, M. Consumer confusion in the selection of supermarket products. *Journal of Applied Psychology*, 1966, *50*, 529-534.
- Kuhn, D., & Brannock, J. Development of the isolation of variables scheme in experimental and "natural experiment" contexts. *Developmental Psychology*, 1977, *13*, 9-14.
- Sinnott, J. Everyday thinking and Piagetian operativity in adults. *Human Development*, 1975, *18*, 430-443.

Received September 21, 1978 ■