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COMPARABILITY AND HIERARCHICAL PROCESSING IN MULTIALTERNATIVE CHOICE

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Michael D. Johnson
University of Michigan

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by

Michael D. Johnson

The University of Michigan
School of Business Administration
Ann Arbor, Michigan 48109-1234

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AUTHOR'S NOTE

Michael D. Johnson is Assistant Professor of Marketing at The University of Michigan's School of Business Administration, Ann Arbor, Michigan, 48109-1234. The author thanks Mark Boundy, David DiRita, Daniel Horne, and Mary Ellen Bageris for their assistance at various stages of the project and Richard Bagozzi for his helpful comments on an earlier draft of this manuscript. The financial assistance of The University of Michigan's School of Business Administration is also gratefully acknowledged.

ABSTRACT

Consumer choice research has only recently moved beyond brand based decisions to study more noncomparable or across-category choice alternatives. The present study uses consumers making motivated decisions among actual products to extend our knowledge of noncomparable choice. The results support Johnson's (1984) noncomparable choice strategies, suggest a new strategy, and support consumers' use of hierarchical processing when faced with multiple choice alternatives that vary in comparability.

INTRODUCTION

The majority of consumer choice strategy research has focused on choice among very comparable alternatives, such as different brands in the same product category, within relatively artificial environments. Typically, subjects are provided hypothetical information regarding products on the same, comparable attributes (e.g. a brand X attribute matrix) and simulated choice and information gathering strategies are monitored using information boards (Jacoby, Chestnut, Weigl, and Fisher 1976), verbal protocols (Payne 1976), and/or eye-fixations (Russo and Rosen 1975). These early process tracing studies have provided an important, basic level of knowledge regarding many of the strategies consumers may use (cf. Bettman and Jacoby 1976; Park 1978; Bettman and Zins 1979; Russo and Dosher 1983) as well as how factors such as knowledge (Bettman and Park 1980; Brucks 1985; Sujan 1985), information format (Bettman and Kakkar 1977), and task complexity (Payne 1976; Lussier and Olshavsky 1979) affect strategy use.

On a broader level, however, consumer choice research suffers from at least two limitations, one conceptual and one methodological. On the conceptual side, this research has only recently recognized and studied consumer decisions involving more noncomparable alternatives coming from different product categories (Bettman and Sujan 1987; Johnson 1984, 1986). On the methodological side, existing process tracing research has relied heavily on hypothetical products and simulated choices. Rarely do such studies involve actual products or decisions that directly affect consumers' utility (some notable exceptions include Bettman [1970] and Smead, Wilcox, and Wilkes [1981]). Relying on hypothetical product descriptions and simulated choices may result in systematic differences between experimentally observed and actual choice processing.

This paper addresses these limitations and attempts to expand our understanding of consumer judgment and choice processing in two ways. First, extending recent binary choice research by Johnson (1984), the present study explores how consumers compare and evaluate multiple noncomparable alternatives. As a second goal, the study examines consumers making decisions that directly affect their utility involving actual products. After reviewing recent research on comparability and choice, multialternative choice is conceptualized in the context of both comparable and noncomparable alternatives and the research hypotheses are developed. A methodology is then proposed and used to test these hypotheses.

COMPARABILITY AND CHOICE

Johnson (1984) defines comparability as the degree to which products are described or represented by consumers using the same nonprice attributes. This comparability varies from choice to choice. Brands within a category, described on the same concrete attributes, are very comparable. More abstract product categories, described on the same abstract or category level attributes, are likewise very comparable (Johnson and Fornell 1987). However, when faced with specific alternatives from different product categories, comparability decreases. While, for example, a television may be described by its screen size and picture quality, a stereo is more likely described on its power and sound quality. Noncomparable choices may result from a limited choice set (e.g. one alternative available from more than one category) or from consumers first or separately deciding which alternatives they prefer within each of two or more categories and then, at some point, having to decide between the specific category choices.

Johnson suggested two general strategies that consumers might use when alternatives are noncomparable and described by different concrete attributes. The first is a within-attribute strategy with abstraction, where consumers abstract their representation of the choice alternatives to a level where comparability exists (i.e., where attributes overlap), and then use a within-attribute strategy, such as additive difference (Tversky 1969), to directly compare the alternatives and make a choice. The basic tenet of this strategy is that descriptive, nonprice attributes become common to more and more alternatives as they become more abstract.[1] For example, in order to choose between the stereo and the television, consumers might first describe the two products on relatively abstract attributes, such as versatility or entertainment value, and then directly compare the alternatives on these attributes. The more noncomparable the alternatives, the more abstract the required representation and resulting nonprice comparisons. (Price is one concrete attribute on which even noncomparable alternatives can be directly compared.) A major advantage of the within-attribute strategy with abstraction is that it allows consumers to make relatively easy within-attribute comparisons (Tversky 1969).

1. Abstractness, in this context, is defined as the inverse of how directly an attribute denotes particular objects or events. Concreteness-abstractness is equated in this regard with the specificity-generality of terms and the subordination-superordination of categories (Johnson 1984; Johnson and Fornell 1987; Paivio 1971; Rosch 1975, 1977; Rosch et al. 1976).

Alternatively, consumers may use a purely across-attribute strategy whereby alternatives are processed holistically; concrete attribute values are combined and the resulting overall evaluations are compared. Using an across-attribute strategy, even the most noncomparable of alternatives can be compared on overall worth or "utility." While the across-attribute strategy requires comparison at an extremely abstract level (corresponding to some sort of overall evaluation), consumers do not have to form or recall values on more abstract attributes; the across-attribute strategy can be used directly independent of comparability. The abstraction process in this strategy is the formation of an overall evaluation based on concrete attribute information.

Johnson (1984) hypothesized that consumers use both strategies, the across-attribute strategy and the within-attribute strategy with abstraction, as comparability decreases. Because of the relative ease of within-attribute comparisons, consumers should continue to use within-attribute strategies as choice comparability decreases by forming more abstract representations. Consumers' use of across-attribute strategies and processing should also increase. Because across-attribute strategies can be applied directly to either comparable or noncomparable alternatives while using a within-attribute strategy on noncomparables requires an additional processing stage (i.e., the forming of a more abstract attribute representation), the use of across-attribute strategies should increase as comparability decreases. An increase in across-attribute processing with a decrease in comparability may also result from the abstraction process required to perform the within-attribute strategy. Across-attribute processing of concrete information may be required to form the more abstract attribute values on which within-attribute comparisons occur. Johnson reports the results of two empirical studies that support both predictions. Subjects continued making within-attribute comparisons by using more abstract attribute representations and shifted to more across-attribute processing of concrete information as comparability decreased.

<u>An Alternative Strategy</u>

A third general strategy, not discussed in Johnson's original study, is also possible. This new strategy is a hybrid of the two strategies described above. Using the strategy, consumers may form more abstract product representations and then combine the more abstract attribute values in an across-attribute fashion in order to form and compare overall impressions and make a choice. Two factors, the ready availability of many abstract product attributes and consumers' propensity to evaluate products on a product-by-product basis, support such a strategy.

Recent findings by both Johnson (1984) and Sujan (1985) suggest that consumers are quite able and willing to recall and use more abstract or category-level attributes. In the Johnson (1984) studies, knowledge of the choice alternatives had no effect on the consumers' use of abstract attributes. Novices and experts equally recalled abstract attributes and attribute values on which to compare the noncomparable alternatives. More recently, Sujan (1985) reports both expert and novice consumers using more category level attributes and evaluations for products that were considered relatively prototypical of their category. (Novices processed at this level even when products were relatively atypical while experts switched to more concrete, piecemeal processing.) That consumers across a range of knowledge levels can readily and easily recall relatively abstract, category-level attributes for specific category alternatives is consistent with existing theories and models of consumer knowledge and experience. In Howard's (1977) model of buyer behavior, for example, more abstract, category-level representations are formed early in the consumers' learning process and prior to the formation of more specific brand concepts. By relying on category level knowledge, the less knowledgable or novice subjects in both the Johnson and Sujan studies could have easily recalled more abstract attributes and values on which to base judgments and choices regarding more specific products.

Theories and findings in consumer research also suggest that consumers have a natural propensity to evaluate products on a brand-by-brand basis. Many researchers believe that consumer product knowledge is organized primarily by-categories and by-brands rather than by-attributes, most likely due to the brand-based nature of many consumer-product interactions (Biehal and Chakravarti 1982; Howard 1977; Russo and Johnson 1980). This often results in consumers engaging in across-attribute, or brand-based, processing (Jacoby et al. 1976; Bettman and Park 1980; Biehal and Chakravarti 1982). The ready availability of abstract product attributes combined with a natural propensity to evaluate products on a brand-by-brand rather than attribute-by-attribute basis suggests that an across-attribute strategy based on more abstract attributes may be quite viable.

Another argument for this across-attribute strategy with abstraction rests on the potential that consumers may form more abstract product representations that are only partially comparable. Consumers might recall or construct abstract attributes that capture some, though not all, of the products' concrete attributes. Product comparability may increase without the products becoming completely comparable. A consumer may, for example, describe a television on screen size and a stereo on power (wattage) while describing both products on necessity or practicality. Without a completely comparable representation, however, consumers may simply combine the information in an across-attribute fashion. Many associated abstract attributes may similarly fail to make two alternatives comparable and necessitate across-attribute processing. Noting that a motorcycle is "dangerous" while a television is "informative" does not, for example, allow consumers to directly compare the alternatives.

The experiment described below will test for the existence of all three types of processing strategies described above, the within-attribute strategy with abstraction, the across-attribute strategy, and the across-attribute strategy with abstraction. The degree of within- versus across-attribute processing will also be examined.

COMPARABILITY AND MULTIALTERNATIVE CHOICE

Existing studies of multialternative choice (Payne 1976; Lussier and Olshavsky 1979; Crow, Olshavsky, and Summers 1980) have focused on very comparable alternatives. Only binary choices, meanwhile, were studied in Johnson's initial investigation of noncomparable choice. An important unstudied aspect of noncomparable choice involves those decisions that consumer regularly face involving multiple noncomparable alternatives. Consider, for example, consumers choosing among a set of specific, noncomparable entertainment alternatives (e.g. one of two possible movies or a particular sporting event) or gift choices (e.g. a razor, a blow dryer or a coffee maker). How does the number of alternatives affect the processing of noncomparable alternatives? Stated differently, how do consumers choose among more than two alternatives from more than one product category?

Task Complexity and Choice

Previous research (involving comparable alternatives) has demonstrated how task complexity, particularly the number of alternatives involved in a choice, affects strategy selection. Typically, as the number of choice alternatives grows, subjects make increasing use of either simplified strategies, such as elimination by aspects (Tversky 1972), or phased strategies, in which different strategies are used at different stages or phases of the choice

(Crow, Olshavsky, and Summers 1980; Lussier and Olshavsky 1979; Payne 1976). In a typical phased strategy, a noncompensatory, elimination-type strategy, such as the conjunctive rule (Einhorn 1970) or elimination by aspects, is used early to reduce the choice set. Compensatory within-attribute strategies, such as additive difference, are then used on the remaining alternatives. The use of elimination or phased decision strategies very quickly allows consumers to reduce the number of choice alternatives, and hence the choice problem, to a managable size.

Multiple Noncomparable Alternatives

Choices involving multiple, noncomparable alternatives have not been studied empirically. Recently, however, Johnson (1986) developed theoretical models to estimate the decision error and processing effort associated with each of the two general noncomparable choice strategies described above. The models provide theoretical predictions of strategy selection across task environments. A particularly interesting prediction is that use of the across-attribute strategy, relative to the within-attribute strategy with abstraction, should increase as the number of alternatives in a choice increases. This is because the number of within-attribute comparisons required to perform the within-attribute strategy increases faster than the number of across-attribute combinations required to perform the across-attribute strategy (see Johnson [1986] for details). Therefore, as the number of alternatives increases, there is a relative increase in the number of elementary information processes, or EIP's (Chase 1978), required to perform the within-attribute strategy, making it more effortful, and resulting in the predicted shift toward use of the across-attribute strategy.

While comparability is relatively well-defined in the case of binary alternatives, an interesting problem arises when conceptualizing multiple, noncomparable choice alternatives. Comparability in a binary choice is simply the degree of overlap in the descriptive attributes of the two alternatives. When there are more than two alternatives from more than one category, however, each alternative in the group has some level of comparability with each other alternative which may or may not be equal across pairs. The models in Johnson (1986) assume, for simplicity, that each pair of alternatives in a choice set (where n>2) are comparable at the same level of abstraction. Naturally, this is often not the case. Multialternative, noncomparable choice sets differ both in the degree to which individual pairs in the set are, on average, comparable or noncomparable and in the degree to which the comparability among the pairs is equal or unequal.

To represent these different cases, the notion of "balanced" and "unbalanced" choice sets is introduced. Balance is defined here as the equality in comparability (i.e., attribute overlap) across alternatives in a choice set. A choice set will be considered balanced when all pairs in the set are relatively equal in comparability or "equally different." A set will be considered unbalanced when there are significant differences in comparability across pairs or the pairs are "unequally different." Of course, binary choices are by definition balanced. As an example of a relatively balanced set of noncomparable alternatives, consider a motorcycle, a bicycle, and an automobile. All three pairs of these alternatives are moderately noncomparable such that the minimum level of abstraction at which comparisons can be made is approximately equal. All three can, for example, be compared directly on mobility, frequency of use, versatility, and so on. Now consider a more unbalanced set of alternatives, say a bicycle, a motorcycle, and a washing machine. Because the bicycle and the motorcycle are more comparable than either the washer and the bicycle or the washer and the motorcycle, the group, as a whole, is unbalanced. The bicycle and the motorcycle may be compared on more concrete attributes.

This distinction has important theoretical implications for choice processing. When multiple noncomparable alternatives are balanced, as with multiple comparable alternatives, consumers may proceed using a standard revision process (Russo and Rosen 1975; Lussier and Olshavsky 1979). That is, a choice may be made between any two of the alternatives with the winner being compared to the third and so on. A series of binary choices is made, using either the within- or across-attribute strategies, rejecting an alternative each time a pair is evaluated, until only one alternative remains. Alternatively, multiple alternatives may be compared simultaneously on overlapping abstract attributes or overall evaluations. The important point is that when the choice set is balanced, there is no apparent or obvious tendancy to compare alternatives in any particular order or group them into particular categories. Stated differently, there is very little structure imposed on a choice when noncomparable alternatives are balanced.

As choice sets become unbalanced, and the comparability across product pairs varies, a tendancy to process alternatives in a particular fashion should emerge. Consumers should start to group alternatives into their natural categories in order to facilitate and simplify the choice processing. Because the choice set involving a bicycle, motorcycle, and washer is unbalanced, it is natural for consumers to take advantage of the existing categorical relationships among the alternatives and process the alternatives in a hierarchical fashion. First a decision would be made between the washer and the two modes of transportation. If the washer is chosen the choice is over. If the modes of transportation are chosen over the washer, a choice would then be made between the bicycle and the motorcycle. Compared to balanced, noncomparable choices, unbalanced choices have a more natural hierarchical structure. Consumers should, therefore, process alternatives in a more predictable fashion.

Theoretically, consumers are often seen as organizing and processing consumption alternatives hierarchically (Howard 1977; Bettman 1979). As Simon (1969) argues, a hierarchical approach to problem solving and choice is an extremely efficient way of handling a large number of alternatives. Using the hierarchical relationships among unbalanced alternatives, consumers can simplify the choice problem by efficiently eliminating groups of alternatives rather than by systematically evaluating all possible alternatives in a choice set. The elimination of product groups described here is thus very similar to the elimination-type rules found in existing studies of multialternative choice (cf. Payne 1976; Lussier and Olshavsky 1979). The present discussion simply suggests that hierarchical elimination, in the realm of noncomparable choice alternatives, is more likely the more unbalanced the choice set. (As mentioned earlier, using hierarchical relationships and existing category representations in memory also allows consumers to quickly form more comparable, abstract attribute representations of the alternatives.)

Comparability and Consumer Knowledge

An interesting observation in Johnson's (1984) study was the lack of knowledge effects on choice processing. Recall that both the Johnson and Sujan studies suggest a ready availability of abstract attributes or evaluations for many products across knowledge levels. Where novices and experts are more likely to differ is in their knowledge of the prototypicality of various category members and, hence, the applicability of the abstract attribute values in describing particular brands (Sujan 1985). Although no particular knowledge effects are hypothesized in the present study, knowledge was measured for its possible effects on choice processing. Knowledge was measured for each consumer within each product category used in the study.

The number of categories involved in the study (fourteen) made objective knowledge tests, such as those described by Brucks (1985) and Sujan (1985), experimentally prohibitive. As a simpler alternative, self-ratings of knowledge were obtained from subjects prior to performing the experimental tasks. The scale reported and used by Johnson (1984), which was specifically designed to be comparable across product categories, was adopted here. Although subjective, the scale does measure knowledge in an absolute rather than a relative fashion and covers the entire range of possible knowledge levels.

RESEARCH HYPOTHESES

The preceding discussion suggests four hypotheses that describe the strategies consumers use to compare noncomparables and how the number of choice alternatives, their comparability, and their balance affect choice processing. Hypothesis one tests for the existence of three distinct types of processing that are characteristic of the three noncomparable choice strategies described above: the within-attribute strategy with abstraction, the across-attribute strategy, and the hybrid across-attribute strategy with abstraction. If consumers continue to use within-attribute strategies as comparability decreases by forming and using more abstract product representations, the attributes on which consumers directly compare products should become more abstract as comparability decreases. If consumers also continue to use a straightforward across-attribute strategy, the abstractness of the attributes that consumers combine in an across-attribute fashion should remain relatively concrete with decreases in comparability. (Recall that this strategy does not require consumers to form more abstract representations when products are noncomparable.) In other words, if consumers use both of the Johnson (1984) strategies, a decrease in comparability should differentially affect the abstractness of within-attribute comparisons and across-attribute combinations; decreasing comparability should increase the abstractness of comparisons relative to combinations. Finally, if consumers also make use of the hybrid across-attribute strategy with abstraction, the abstractness of attributes combined in an across-attribute fashion should increase as comparability decreases. These three predictions, a main effect for comparability both on the abstractness of relative comparisons and the abstractness of across-attribute combinations, and a comparability by type of operation (within-attribute comparison versus across-attribute combination) interaction effect on the abstractness of processing, constitute hypothesis one:

> **H1a: The abstractness of attribute comparisons increases as comparability decreases.**
>
> **H1b: The abstractness of attributes combined increases as comparability decreases.**
>
> **H1c: Relative product comparisons become more abstract than attributes combined as comparability decreases.**

Recall that Johnson (1984; 1986) also predicted and found an increase in across-attribute processing relative to within-attribute processing as comparability decreased. Because the within-attribute strategy with abstraction requires another stage of processing, and/or because across-attribute processing may be required in order to form more abstract, comparable product-attribute representations, across-attribute processing should increase. This is hypothesis two:

> **H2: Within-attribute comparisons should decrease relative to across-attribute combinations as alternatives become more noncomparable.**

Hypotheses one and two, simply stated, predict that consumers will continue to use within-attribute strategies by forming more abstract representations while gradually shifting to across-attribute strategies and processing.

A third hypothesis involves the effect of task complexity, particularly the number of noncomparable alternatives, on choice. The use of across-attribute processing, relative to within-attribute processing, should increase as the number of noncomparable (and comparable) alternatives in a choice increases.

> **H3: The use of across-attribute processing relative to within-attribute processing increases as n increases for both comparable and noncomparable choice alternatives.**

As described above, this predicted shift is the result of disproportionately more EIP's (elementary information processes) being required to perform a within-attribute strategy as n increases (Johnson 1986).

A fourth hypothesis stems from the propensity for hierarchical relationships to facilitate or drive the choice process depending on the composition of the noncomparable alternatives. The more unbalanced the comparability of the alternatives, the more salient the hierarchical relationships among the alternatives and the more likely these hierarchies are to influence processing and to be used to eliminate alternatives.

> **H4: The hierarchical elimination of product groups increases with the variability in comparability among alternatives in the choice set.**

The alternative or null hypothesis is that hierarchical elimination, or lack thereof, is equally likely across balanced and unbalanced noncomparable choice sets. Whether balanced or unbalanced, consumers may simply use a standard revision type of process where successive pairs of individual alternatives are compared in no particular order, or consumers' predisposition to view the world hierarchically may result in the same level of hierarchical processing whenever multiple alternatives are involved. In the next section, a methodology is proposed to test the research hypotheses.

METHODOLOGY AND DESIGN

The Task

As mentioned earlier, most research on consumer choice processing has relied on subjects, often students, making simulated choices among hypothetical product descriptions. One goal of the present research is to use more realistic choices to study consumer decision processing among products varying in comparability. This realism should proceed along two lines. First, the experimental choices should have more direct impact on the consumers' utility. Second, such choices should utilize actual products. A recent study by Smead, Wilcox, and Wilkes (1981) highlights the importance of using actual products to study decision processing. These authors found that, compared to the use of product descriptions, actual products lead to more complex and more difficult processing. The task described below is an attempt to retain much of the control provided by the laboratory while at the same time inducing more realism into the choice situation.

In the experiment, consumers were asked to make choices among actual products in a laboratory setting. The decisions were also very real. The subjects made several choices and were told that they would choose from among the products chosen during the experiment for their compensation. This type of task gives consumers an incentive to make actual, as opposed to simulated, choices because the outcomes of the choices directly affect the subjects' compensation for participating in the study. Such choices are less likely to be affected by possible sources of experimental bias or demand characteristics. By having the choice occur in the lab, the experimental procedure also allowed control over the effects of format (i.e., position or placement of the product in the environment; Bettman and Kakkar 1977). Format was controlled by randomly arranging the products on a table for each choice rather than by arranging them by categories.

Using actual products from different categories also creates some problems. One such problem is the possible heterogeneity of utility across the products in a choice set. To provide a minimum of control on this dimension, the products' values were held relatively constant to keep consumers from only considering the more expensive products. Small consumer durables ranging in value from $15 to $20 were used in the study. Retail values in this range were felt to make the products worth consideration and, at the same time, practical compensation. The average retail value of the products used was $18. A second potential problem is prior ownership of the products used in the study. Although prior ownership may affect the outcome of a choice, it should not systematically affect the nature of the choice process.

The independent variables in the experiment included: 1) the comparability of the alternatives in the choice, 2) the number of alternatives involved, and 3) whether the choice alternatives were balanced or unbalanced with respect to comparability. Each of these is described in more detail below. Given the hypotheses outlined above, the dependent measures must capture the within- versus the across-attribute nature of the evaluations, the abstractness of the relative comparisons and the across-attribute combinations themselves, and the hierarchical/nonhierarchical nature of the choice. This information was obtained via concurrent verbal protocols where consumers "think aloud" while making their decisions (Ericsson and Simon 1980).

<u>Comparability and the Number of Alternatives</u>

Three levels of comparability were operationalized to test the hypotheses. Pairs of alternatives were classified as either comparable, moderately noncomparable, or more noncomparable. If the level of abstraction of product comparisons increases as product alternatives become increasingly noncomparable, consumers are likely making use of the within-attribute strategy with abstraction. Following Johnson (1984), higher level classifications were obtained by having a convenience sample of eleven consumers rate similarities among a set of twenty possible small consumer durables. Clusters of similar alternatives were found using both an additive tree (ADDTREE; see Sattath and Tversky 1977) and multidimensional scaling (MINISSA; see Roskam and Lingoes 1970) procedure. Alternatives from the same categories are considered comparable, alternatives from different categories within the same cluster of categories are considered moderately noncomparable, and alternatives from different categories and different clusters are considered more noncomparable.

Adding multialternative choices to the design poses certain problems when operationalizing the choices. If, for example, the experiment calls for ten alternatives at both a moderately noncomparable and more noncomparable level, this requires at least ten category clusters, and at least ten individual categories in one of these clusters. The number of similarity judgments required to operationalize the alternatives quickly becomes prohibitive. In order to keep the operationalization manageable, three levels of multialternative choices will be used, n=2, 4, and 6. These values coincide with those used by Johnson (1986) on which Hypothesis Three is based. The constraint placed on the ADDTREE or MDS solution then becomes the existence of at least six approximately equally different clusters with at least six different categories in one of the clusers. The solutions of both the scaling techniques were successful at meeting this constraint.

Stimulus sets were then operationalized by selecting products from the six distinct clusters in the ADDTREE solution (Kruskal's stress = .042). Upon surveying the availability and price of brands in each product category and given monetary and inventory considerations, certain practical constraints were also encountered. Using these constraints and the six cluster solution, specific choices were operationalized which, 1) represented the three levels of comparability and three choice set sizes, 2) represented both balanced and unbalanced choice situations, 3) contained products as globally valuable as possible, and 4) contained products priced as equally as possible. Enough brands in enough categories were identified to construct stimulus sets in which the products were of very similar retail value and limited value range (reported above). Several specific products were, by necessity, used in more than one choice. However, no individual product brand was presented more than twice in order to minimize learning and familiarity during the course of the experiment. All told, products were selected from fourteen of the original twenty categories for inclusion in the study, six alternatives in one cluster and one to two alternatives in each of the remaining five clusters. The actual products used were Heating Pad from Cluster A, Electric Razor and Blow Dryer from Cluster B, Hand Held Mixer, Coffee Maker, Coffee Grinder, Corn Popper, Wok, and Toaster from Cluster C, Fire Extinguisher and Smoke Detector from Cluster D, Pocket Camera from Cluster E, and Desk Clock and Desk Lamp from Cluster F.

According to this scheme, for example, two coffee makers are considered comparable, a coffee maker and a toaster are moderately noncomparable, and a coffee maker and a pocket camera are more noncomparable. In support of this operationalization, the average inter-cluster distance in the ADDTREE solution for these product categories was 2.5 times the average intra-cluster distance. The multidimensional scaling solution yielded similar results. The MDS analysis suggests five significant dimensions and the five dimensional solution (Kruskal's stress = .043) resulted in an average inter-cluster distance nearly four times the average intra-cluster distance for the test stimuli.

<u>Set Balance and Choice Alternatives</u>

Unbalanced choices were constructed by combining pairs of alternatives that were comparable at more than one of the three levels described above.

While there are a number of possible unbalanced choices, they each represent one of four possible cases. Case 1 involves mixing comparable and moderately noncomparable pairs, case 2 involves mixing comparable and more noncomparable pairs, case 3 involves mixing moderately and more noncomparable pairs, and case 4 involves mixing comparable, moderately noncomparable, and more noncomparable pairs. For both n=4 and n=6 choices, a choice representing each of these cases was operationalized.

Any single measure of comparability involving multiple, noncomparable alternatives may be misleading or problematic when the choice set is unbalanced. Therefore, the nine balanced choices involving each possible comparability (three levels) by number of alternatives (three levels) combination were used to test hypotheses one, two, and three (except H1a - see below). Subjects were also presented with the four possible unbalanced choice cases for both n=4 and n=6 alternative situations. The incidence of hierarchical processing will be compared across the balanced and unbalanced choices for n=4 and n=6 in order to test hypothesis four. (Recall that by definition all n=2 choices are balanced.) This results in a total of seventeen choices being made by each subject. The specific balanced choice sets included: 1) two coffee makers (comparable); 2) a corn popper and a toaster (moderately noncomparable); 3) a smoke detector and a heating pad (more noncomparable); 4) four toasters (comparable); 5) a corn popper, a mixer, a wok, and a coffee maker (moderately noncomparable); 6) a coffee grinder, an electric razor, a heating pad, and a camera (more noncomparable); 7) six smoke detectors (comparable); 8) a toaster, a mixer, a corn popper, a coffee grinder, a wok, and a coffee maker (moderately noncomparable); and 9) a corn popper, a desk lamp, a fire extinguisher, an electric razor, a heating pad, and a pocket camera (more noncomparable). The specific unbalanced choice sets included: 1) two desk clocks and two desk lamps (case 1, n=4); 2) three desk clocks and three desk lamps (case 1, n=6); 3) two cameras and two fire extinguishers (case 2, n=4); 4) three toasters and three blow dryers (case 2, n=6); 5) a desk clock, a desk lamp, a smoke detector, and a fire extinguisher (case 3, n=4); 6) an electric razor, a blow dryer, a mixer, a toaster, a desk clock, and a desk lamp (case 3, n=6); 7) two woks, a mixer, and a desk clock (case 4, n=4); and 8) two toasters, two mixers, and two desk clocks (case 4, n=6). Again, all of these choices were derived using the comparability classifications (described above) under the practical constraints of product availability and a limited product inventory.

Procedure

Subjects were run individually through the task. In the first stage of the experiment the subjects read and signed a consent form and rated their knowledge within each category on the knowledge scale. The subjects were then presented with the various choices, one at a time. The products were placed randomly on a table in front of the subjects, who were instructed to make a personal choice of one of the products in each choice set. Before making their choices, subjects were told that they would be able to keep any one of the products they chose during the course of the experiment. Subjects were instructed to "think aloud" while making their decisions and their responses were tape recorded. The subjects were also videotaped while making their decisions. The video recordings were used to identify products being evaluated that were not identifiable from the audio recordings (e.g. "this one has a nice finish") and as a back up audio recording.

A total of thirty-one subjects were recruited for the study, twenty-five females and six males. The subjects, which represented a convenience sample of nonstudents, included staff members at a large midwestern university. These subjects ranged in age from twenty-four to fifty-five and represented a variety of educational backgrounds. Stimulus sets were hidden from the subjects until each choice was made. The choice sets were presented in one random order to every other subject and the reverse order to the remaining subjects. One subject (Subject 16) was dropped from the study due a to failure to perform the task as instructed. This resulted in thirty useable protocols involving twenty-four female and six male subjects.

Protocol Coding

The general goal of the protocol coding scheme was to extract as much detail as was required to test the research hypotheses. (Adding additional detail would only serve to increase the complexity of the coding task and reduce coding reliability.) Each subject's verbal protocol was transcribed and coded for three distinct aspects of choice processing. The first was the hierarchical nature of the choice. More specifically, coders were instructed to develop trees to describe each choice for each subject. The trees indicated points at which products were eliminated as part of a group. Only products that were mentioned either individually or as part of a group were included in the hierarchies. The second type of information recorded was the set of attributes used in making each decision. Coders were instructed to code only those attributes explicitly mentioned by the subjects and used to describe or evaluate the choice alternatives. Attributes of products not involved in the choice at hand, such as those mentioned by subjects during their recollection of previously or presently owned products, were explicitly excluded from the codes. The final information coded was how each attribute was being used. Each attribute was coded as being either the basis of a relative comparison, an across-attribute combination, or as a stand-alone description of a particular product or group of products. The particular products involved in the comparisons, combinations, and descriptions were recorded. The level of abstraction of the attribute comparisons and combinations together with the relative frequency of these process operations were used to test hypotheses one, two and three. (A detailed copy of the coding scheme is available from the author(s).)

Three judges independently coded the 510 choice protocols (17 choice protocols from each of the thirty subjects). All three judges were naive regarding the research hypotheses. Coding reliabilities were calculated among the judges for each of the three types of information (attributes, attribute use, and choice hierarchies). The coding reliabilities for the existence of particular attributes in the protocols, calculated as the conditional probability of an attribute coded by one judge being coded by a second judge (Johnson 1984), ranged from a low of .54 to a high of .79 (average probability of .69). The coding of attribute use (i.e., whether the attribute was used to make a direct comparison, was combined with one or more other attributes, or was simply used to describe a product) was consistent for 75 percent of the attributes coded in common by judges one and two, 71 percent of the attributes coded in common by judges one and three, and 77 percent of the attributes coded in common by judges two and three. Cohen's Kappa, a measure of reliability of the judges' classifications which varies from zero to one and which equals zero when classifications are completely independent (Bishop, Fienberg and Holland 1975, p. 395) was .58, .53, and .57 respectively for judges one and two, judges one and three, and judges two and three (all significant at $p<.001$).

Reliability of the processing trees was calculated simply with respect to the existence or nonexistence of a hierarchical elimination of products as part of a group or category. Recall that hypothesis three predicts that elimination of entire categories of alternatives should increase from balanced to unbalanced alternatives. Therefore, if the trees revealed the elimination of two or more alternatives as part of a group, the choice was regarded as hierarchical. If mentioned alternatives were evaluated separately and not eliminated as part of a group, the choice was regarded as nonhierarchical. While this dichotomous coding scheme may oversimplify the degree of hierarchical processing in a choice, given the relatively small range in choice set sizes, it appeared to capture the major processing differences. The coding of choices as hierarchical or nonhierarchical was consistent in 89, 89, and 87 percent of the choices respectively for judges one and two, one and three, and two and three. Cohen's Kappa measure of reliability for these three pairs of judges was .68, .70, and .65 (all significant at $p<.001$).

Although coding reliability was reasonably high across the judges, agreement was in general lower than in Johnson's (1984) original empirical study. Several factors may have contributed to this difference. First, there were more products, on average, involved in the choices here. This contributed to the average length of the individual choice protocols and, most likely, the difficulty of the coding. Second, partially because more alternatives were involved, the range of information coded was greater here than in the previous study. The earlier study did not require coding of attribute combinations (which were examined using eye-fixations) or the hierarchical/nonhierarchical nature of product eliminations. This probably contributed to the difficulty of the coding task. Finally, because the present study used actual products rather than product descriptions, the protocols themselves may have been more difficult to interpret (Smead, Wilcox, and Wilkes 1981). Although the video recordings helped resolve many questions, it was still a relatively difficult coding task.

A thorough review of the protocols and the judges' codings (conducted by the author(s) and one of the coders) was very informative in resolving the problems with reliability. The review revealed that each judge simply missed or ignored some attributes that, according to the objective coding instructions, should have been coded. The judges similarly overlooked information regarding attribute use and product eliminations. As a result, using only that information on which all three judges were in complete agreement would ignore a large amount of useful processing data. In almost all cases, if legitimate processing information was present in the protocols it was recognized by two out of the three judges. Therefore, a two out of three rule was adopted in order to form a common code and test the research hypotheses. More specifically, only attributes coded by at least two of the three judges were considered. Comparisons or combinations involving these attributes were only counted if at least two judges agreed. If only two judges coded an attribute and they disagreed about how it was used, the attribute was only assumed to describe the product. Finally, processing was considered hierarchical or nonhierarchical based on two-thirds agreement. The resulting common code was felt to be a very accurate representation of the information present in the consumers' protocols.

ANALYSIS AND RESULTS

Attribute Concreteness-Abstractness

Since no measure of the concreteness-abstractness of product attributes exists, following Johnson (1984) and Johnson and Fornell (1987), attribute concreteness-abstractness was operationalized by having separate, independent judges rate the different attributes elicited by subjects in the experiments (n=2Ø3). A convenience sample of thirty adult, nonstudent judges rated the attributes on an 11-point scale from Ø (very concrete) to 1Ø (very abstract). Concreteness-abstractness was defined as the degree of directness or specificity with which an attribute described an object or product, concrete attributes more directly or specifically describing a product and abstract attributes more completely or generally describing a product. Judgments were collected using a paper and pencil format. The instructions included an intuitive description of concreteness-abstractness, some examples of attributes at different levels of abstractness (not involving those rated by the subjects), and questions at the end of the instructions designed to self test the subjects' understanding of concreteness-abstractness.

Five judges were dropped due to consistent, nonsignificant correlations between their ratings and those of the other judges. (Observations during and after the rating task suggested that these judges did not carefully read the instructions, ignored the self-test questions, and/or gave near random responses.) The ratings across the remaining twenty-five judges were averaged to produce a measure of concreteness-abstractness. The average interjudge correlation among these judges was .47. The resulting concreteness-abstractness measures were very consistent with those used in Johnson (1984) and in Johnson and Fornell (1987). A check of the concreteness-abstractness rating of the twenty-nine common attributes across all three studies supports the reliability of the measure. The average correlation across studies was .93 and ranged from .90 to .95.

Manipulation Check and Lack of Knowledge Effects

Recall that comparability, defined as the overlap in descriptive product attributes, was operationalized using similarity judgments and scaling solutions. As a manipulation check, comparability was also measured using the protocol results. Following Johnson (1984), comparability was measured as the ratio of common attributes to average distinctive attributes mentioned for any given pair of alternatives. (Only attributes mentioned at least twice in connection with any given alternative were included to avoid coding mistakes from affecting the measure.) Notice that this measure equals one when the average number of distinctive attributes per alternative equals the number of common attributes.

The results suggest that the manipulation between moderately and more noncomparable alternatives used here was not as strong as Johnson's original manipulation. The average comparability measures equaled .96, 1.06, and 1.04 respectively for the n=2, 4, and 6 moderately noncomparable choice sets. The corresponding comparabilities for the more noncomparable choices were .52, 1.28, and .80 respectively for n=2, 4, and 6. Overall, comparability across the three choice set sizes averaged 1.08 and .92 respectively for the moderately noncomparable and the more noncomparable choice alternatives. The corresponding averages for the stimuli in Johnson's (1984) experiment one were 1.34 and .80 respectively for the moderately and more noncomparable choices. All of the following analyses retain the three-level comparability manipulation. Although the manipulation check indicates that the difference between the noncomparable levels may not be large, the large similarity differences across these conditions (as revealed by the similarity scaling solutions) may be important.

The average knowledge of the alternatives in each choice set for each subject was calculated and included in the initial versions of all of the analysis models reported below. Knowledge had no significant or near significant effects on the level of abstraction of product comparisons, the degree of across- versus within-attribute processing, or the likelihood of hierarchical eliminations. Given the lack of knowledge predictions and effects, it was excluded from all the models and results reported below.

Hypothesis One

H1a looks specifically at the level of abstraction of the relative comparisons appearing in the protocols. Recall that any single measure of comparability involving multiple, noncomparable alternatives may be misleading or problematic when the choice set is unbalanced. However, the most important consideration in the analysis of relative comparisons is the comparability of the products actually being compared. Recall that the coding scheme detailed the specific alternatives involved in each comparison. Therefore, by assuming that the most noncomparable alternatives in each particular comparison defined the level of comparability of the set (by constraining the level of abstraction at which the alternatives can be compared), the protocols for all of the choices, balanced and unbalanced, were utilized to test H1a. The 510 protocols resulted in 337 relative attribute comparisons. A repeated measures analysis of variance model tested for differences in the level of abstraction of these comparisons with changes in comparability (three levels), choice set size (three levels), and subjects (thirty levels). (The analysis did not distinguish between relative comparisions involving two or more alternatives.)

The results, reported in Table 1, support hypothesis H1a. The abstractness of the comparisons increased significantly from 4.66 for comparable alternatives to 7.55 and 7.46 respectively for moderately noncomparable and more noncomparable alternatives. Level of abstraction also differed significantly with subjects, although choice set size and the set size by comparability interaction had no significant effect. The overall model R^2 was .46. Interestingly, the significant differences in level of comparison between moderately noncomparable and more noncomparable alternatives reported by Johnson (1984) were not replicated here. A Newman-Keuls test for differences in means reveals significant differences ($p<.01$) between comparable and moderately noncomparable and between comparable and more noncomparable alternatives, but not between moderately and more noncomparable alternatives. Moreover, the means are directionally, although very marginally, in the opposite direction from what hypothesis one predicts for these conditions.

The lack of a significant difference between the moderately and more noncomparable products is potentially important. Showing gradual increases in the abstraction of comparisons as comparability decreases is very consistent with the within-attribute strategy with abstraction. Alternatively, just showing a difference between the comparable and the two noncomparable conditions may only suggest that the consumers made more comparisons on overall evaluations at an extremely abstract level when the products were noncomparable. Two considerations reconcile the difference in the results reported here and those reported in Johnson (1984). First, as detailed above, the manipulation between moderately noncomparable and more noncomparable products was not as strong here as in the earlier study. Second, a qualitative look at the abstract comparisons involving the noncomparable product alternatives supports consumers using abstract attributes rather than overall evaluations to compare these products. The most common comparisons for the comparable choice alternatives were on "number of features/accessories" (25), "brand name" (22), "looks" (22), and "size" (19) while the most common comparisons for the combined moderately and more noncomparable choices were on "usefulness" (31), "necessity" (21), "frequency of use" (8), and "use as a gift" (6). While the abstractness of the comparisons increased, they did not resemble overall evaluations. The observed increase in the abstractness of the relative comparisons is thus consistent with consumers using within-attribute strategies based on more abstract product representations.

The nine balanced choice alternatives presented to each subject (three levels of comparability by three choice set sizes) were used to test hypothesis H1b through H3. Using only the balanced alternatives keeps comparability well-defined when analyzing the abstractness of the across-attribute combinations, when comparing the across-attribute combinations and the within-attribute comparisons, and when including choice set size as a variable.

Hypothesis H1b was tested by analyzing the abstractness of the attributes that were processed in an across-attribute fashion. Recall that a third possible strategy that consumers may use to evaluate noncomparables, which is a hybrid of the two strategies originally hypothesized by Johnson (1984), is to form more abstract representations and then combine the abstract attributes for each product to form overall evaluations on which to base a choice. This strategy implies that the abstractness of the attributes being combined by the subjects should increase as comparability decreases. A repeated measures analysis of variance model, similar to that used to test H1a, was used to test H1b. The dependent variable was the level of abstraction of the attributes being combined by the subjects (n=426). The independent variables included comparability (three levels), choice set size (three levels), and a subjects' factor (twenty-seven levels; three subjects' data included too few observations).

The results, reported as the second ANOVA in Table 1, support the existence of the hybrid model. The more noncomparable the products, the more abstract the attributes that subjects combined in an across-attribute fashion. Attribute abstractness was 4.29, 5.04, and 5.13 respectively for comparable, moderately noncomparable and more noncomparable alternatives. Similar to the results for H1a, a Newman-Keuls comparison of means shows significant differences ($p<.05$) between the comparable and the two noncomparable conditions but not between the two noncomparable conditions. The subjects' factor was again significant while size was not significant in affecting abstractness (attribute abstractness was 4.66, 5.00, and 4.93 respectively for n=2, 4, and 6). The overall R^2 for the model was .17.

The observed main effect for comparability does not, however, represent a general result. There was a very significant interaction involving set size and comparability. This interaction, illustrated in FIGURE A, qualifies the empirical support for hypothesis H1b (comparability levels 1, 2, and 3 correspond to the comparable, moderately noncomparable, and more noncomparable alternatives respectively). The most abstract across-attribute processing occured when consumers faced a larger number of noncomparable alternatives while the most concrete processing occured when consumers faced a larger number of comparable alternatives. (The abstractness of combinations did not vary significantly with comparability for n=2.) Decreasing comparability among the larger choice set sizes is driving the observed main effect for comparability. This suggests that the hybrid across-attribute strategy with abstraction may be more likely when consumers choose among a larger number of noncomparable alternatives.

Hypothesis H1c states that comparability and the nature of the processing, within-attribute or across-attribute, should interact in affecting processing abstraction. If consumers use the two strategies suggested by Johnson (1984), the relative comparisions inherent to the within-attribute strategy should become more abstract while across-attribute combinations should remain relatively concrete as comparability increases. A three-factor repeated measures ANOVA, including a subjects' factor (thirty levels), a type of operation factor (two levels: combination v. comparison), and a comparability factor (three levels), tested for significant differences in the abstractness of processing. The results are reported as the third ANOVA in Table 1 and in FIGURE B. The significant comparability main effect is consistent with the separate main effects found for comparisons and combinations under H1a and H1b. The subjects' factor was again significant and the overall model R^2 equalled .25. The important result, which is depicted in FIGURE B, is the significant type of operation by comparability interaction ($F=21.43$; $p<.0001$). The across-attribute combinations remained significantly more concrete when compared to the within-attribute comparisons as comparability decreased supporting H1c.

Overall, the protocol results provide strong support for hypothesis one. The results reported here, involving actual products and motivated choices, combine with those of Johnson (1984), involving simulated products and choices, to provide strong support for the use of within-attribute processing with abstraction and across-attribute processing when products are relatively noncomparable. Consumers use more abstract representations to make relative, within-attribute comparisons while across-attribute processing continues to occur at a relatively concrete level. The significant increase in the abstractness of combinations also suggests that consumers make limited use of across-attribute processing on more abstract attributes when faced with multiple noncomparable alternatives. Unlike the Johnson (1984) study, the present results show no difference in processing abstraction between moderately noncomparable and more noncomparable alternatives. The manipulation check reported above, showing no large difference between the two noncomparable conditions, explains the difference in results across the two studies.

<u>Hypothesis Two</u>

Hypothesis two predicts an increase in across-attribute processing relative to within-attribute processing as comparability decreases. Three repeated measures analysis of variance models were used to test for differences in three dependent variables: the number of within-attribute comparisons made during a choice, the number of across-attribute combinations made, and the difference in the incidence of these two types of processing (the number of within-attribute comparisons minus the number of across-attribute combinations per choice per subject). The independent variables included a subjects' factor (thirty levels), a comparability factor (three levels), and, in order to test hypothesis three later, a factor for choice set size (three levels).

Of primary interest in testing hypothesis two is the relative amount of within- versus across-attribute processing occurring in each choice. Table 1 presents the model results using the n=270 difference measures (Comparisons - Combinations) as the dependent variable. Moving from comparable to noncomparable choice alternatives resulted in a very significant decrease in comparisons minus combinations, indicating greater across-attribute relative to within-attribute processing and support for hypothesis two. The mean differences were .267, -.789, and -.767 respectively for comparable, moderately noncomparable, and more noncomparable alternatives. A Newman-Keuls contrast of the factor level means reveals that the dependent variable differed significantly ($p<.01$) from comparable to noncomparable alternatives, but not between the moderately noncomparable and more noncomparable alternatives. This pattern of results is consistent with those reported under hypothesis one and is again explained by the weak manipulation between the moderately and more noncomparable alternatives.

The average frequencies of comparisons, combinations, and their difference as a function of comparability, presented in FIGURE C, help explain the overall results (comparability levels 1, 2 and 3 again correspond to comparable, moderately noncomparable, and more noncomparable alternatives respectively). The number of comparisons occurring in each choice decreased significantly from the comparable to the noncomparable alternatives (average comparisons equalled 1.02, .28 and .33 respectively for comparable, moderately noncomparable and more noncomparable alternatives; $F=37.46$, $p<.0001$). The number of combinations increased directionally but not significantly with decreases in comparability (average combinations equalled .76, 1.07, and 1.10 respectively for comparable, moderately noncomparable, and more noncomparable alternatives; F=1.85, p=.16). Therefore, while the largest changes occur for the (Comparisons - Combinations) variable, suggesting that both combinations and comparisons appear important, comparisons contribute disproportionately to the overall effect.

Hypothesis Three

We turn now to hypothesis three, which was not supported. As reported in Table 1, choice set size did not affect the type of processing consumers used. The difference measure decreased as predicted, from -.333, to -.400, to -.556 respectively for n=2, 4, and 6, although not significantly. A contrast of the individual factor level means for choice set size also showed no significant differences. The subjects' factor was again significant while there was no set size by comparability interaction. Set size effects were also lacking in the independent analyses for number of comparisons and number of combinations respectively. There was virtually no difference in average number of comparisons (.50, .60 and .53 respectively for n=2, 4 and 6). Number of combinations, meanwhile, increased as predicted (from .83 to 1.00 to 1.09 for n=2, 4 and 6) though not significantly.

A reexamination of the protocols helps explain the lack of size effects. Increasing choice set size did not result in equivalent increases in the number of products actually considered by the subjects. The average number of products mentioned by the subjects was only 1.65, 3.08 and 4.09 respectively for the n=2, 4 and 6 choice sets. While keeping the products' retail values similar did result in consumers considering most of the products, on average, in each choice set, some products were not overtly considered.

Hypothesis Four

Hypothesis four predicts an increase in the likelihood of hierarchical processing (defined as the elimination of product categories or groups) from balanced to unbalanced noncomparable alternatives. Using the 420 balanced and unbalanced choices for n=4 and n=6, a log-linear (logit) model (using weighted least squares to predict minimum chi-square estimates; Grizzle, Starmer and Koch 1969) was used to determine significant differences in the likelihood of hierarchical versus nonhierarchical processing with changes in the independent variables, particularly the balance of the choice set. The independent variables included a subjects' factor (thirty levels), balance (two levels) and choice set size (two levels).

The results (not presented in Table 1) strongly support hypothesis four. The likelihood of eliminating products as part of a group when at least four alternatives were in the original choice set increased significantly (chi-square=40.43; p<.0001) from balanced to unbalanced alternatives. Only 6 out of 180 balanced choice cases, or 3 percent, contained hierarchical eliminations. In contrast, 112 out of 240 unbalanced cases, or forty-seven percent, contained hierarchical eliminations. The remaining independent variables (set size and subjects) as well as the set size by comparability interaction did not significantly affect the likelihood of hierarchical processing.

A separate analysis was computed using the individual choice sets and subjects as the independent variables in order to see if any particular choice sets were driving the support for hypothesis four. The three most significant individual choices as far as inducing hierarchical processing were all unbalanced. The choice set that included two woks, a mixer and a desk clock was most significant (chi-square=4.24; p<.04), the set containing two pocket cameras and two fire extinguishers was next most significant (chi-square=3.63; p<.06), and the only other choice set approaching individual level significance included three desk clocks and three desk lamps (chi-square=2.57; p<.11). A particularly interesting observation here is that all three of these choices included more than one member of one or more traditional or basic level product categories.

This support for hypothesis four is both consistent with and goes beyond findings reported in earlier studies of multialternative choice. The hierarchical processing observed here is very consistent with the elimination-type and phased strategies reported previously (Payne 1976; Lussier and Olshavsky 1979; Crow, Olshavsky and Summers 1980). Moreover, the present study demonstrates how the likelihood of hierarchical processing depends on the balance across the products in a noncomparable choice set.

SUMMARY

This study set out to extend our understanding of consumer choice strategies for comparing noncomparable products. The experimental methodology created motivated choices in a laboratory setting by using actual products both as stimuli and compensation. The results supported three of the four research hypotheses. As predicted by hypothesis one, consumers used more abstract attributes to directly compare more noncomparable alternatives while continuing to use across-attribute processing on relatively concrete attributes. Consumers also appeared to combine more abstract attributes in an across-attribute fashion when faced with multiple noncomparable alternatives. In accordance with hypothesis two, across-attribute processing increased from comparable to noncomparable choices. As argued earlier, across-attribute processing is a very straightforward way to process noncomparable products and it may be necessary in order to form more abstract, comparable representations. Finally, as predicted by hypothesis four, the results support an increase in hierarchical processing as the balance in comparability across multiple products decreases.

Contrary to hypothesis three, the experiment revealed no main effect for choice set size on choice processing. The use of actual, as opposed to hypothetical, products may have contributed to the nonsignificant effects.

When using actual products, consumers do not have to overtly consider or evaluate all of the products in a choice. Consumers in the experiment appeared to eliminate some products at a very early information processing stage. As a result, most but not all of the products in the larger choice sets were overtly considered and evaluated. Such early eliminations are not possible when using hypotheical choices where consumers have to process at least some of the available information before eliminations may occur.

DISCUSSION AND FUTURE RESEARCH

This research demonstrates the importance of attribute concreteness-abstractness as a predictable dimension of consumer choice processing. More specifically, the support for hypotheses one and two replicates Johnson's (1984) earlier results regarding how consumers evaluate and compare more noncomparable or across-category choices. It is important that this replication used actual products and motivated choices. This adds convergent validity to the Johnson (1984) results.

The existence of more abstract across-attribute combinations when choosing among multiple noncomparable alternatives also supports at least limited use of a qualitatively different type of processing than previously observed. In the beginning of this paper it was argued that consumers may use an across-attribute stratey with abstraction because the abstract attributes that consumers can recall may not be sufficient to form a comparable representation on which to base within-attribute comparisons. Extending this argument, the probability of recalling comparable, abstract attributes should decrease as the number of noncomparables in a choice set increases. As the number of noncomparable increases, many of the abstract attribute that are recalled can not be used to compare a larger number of products and, as a result, may be processed in an across-attribute fashion. This would explain the observed interaction between choice set size and comparability. Overall, it appears that consumers process a variety of information, from the concrete to the abstract, in both an across- and within-attribute fashion in order to choose among products varying in comparability. The flexibility in processing observed here is consistent with existing views on the flexible, constructive nature of choice processing in general (cf. Bettman and Zins 1977).

Balance, as a noncomparable choice variable, was also introduced and shown to have predictable affects on choice processing. The subjects in the present study were particularly likely to eliminate products as members of the same product category. This finding is both interesting and consistent with existing research findings. Product categories are very similar to the basic level categories studied in psychology (cf. Rosch 1975, 1977; Rosch et al. 1976). Basic level categories are characterized by their particularly high levels of category inclusiveness or similarity. It is natural, therefore, that consumers use basic level product categories to eliminate products in groups.

Continued exploration of noncomparable, across-category choice strategies appears critically important. Not only are noncomparable choices interesting for consumers to make, they may affect basic consumer resourse allocations. Two recent studies illustrate specifically how these choices may be influenced either by a third party or within a group choice situation. Bettman and Sujan (1987) recently demonstrated how consumers' evaluations of noncomparable alternatives may be altered by the external priming of different abstract decision criteria. The potential to influence such choices, and hence consumers' budget allocations, may thus be quite large. Meanwhile, Corfman and Lehmann (1987) recently used across-category, noncomparable choices to study family purchase decisions and found significant goal disagreement and influence attempts for such choices.

Researchers interested in both comparable and noncomparable choice face important and unanswered future research questions. Neither the Johnson (1984) nor the present study, for example, demonstrates how price, as an attribute, figures into consumers' noncomparable choice strategies. Price is a special attribute on which most products, comparable or noncomparable, can be compared at a concrete level. Because price figures significantly in budget allocation decisions (Hauser and Urban 1986), it may serve as an inital basis for eliminating alternatives from a noncomparable choice set. Price may also be readily mapped into affordability, proacticality, or other more abstract product attributes. The present study purposefully kept price, as an indicator of value, relatively constant to induce more complete processing of the choice alternatives. Subjects did not have to "pay" any dollar price for the products they chose. It seems particularly relevant, therefore, to explore the role of price in noncomparable choice. This will require the development of an experimental methodology in which price is an important attribute and independent of comparability.

Another question concerns the role of knowledge and experience in noncomparable choice. Although knowledge was not a significant factor in the results reported here, it should not be ignored in future research. The test consumers were probably all minimally knowledgable of the products used in the study. Knowledge may become much more important when choosing among more sophisticated noncomparable products (see, for example, Bettman and Sujan 1987). Consumer knowledge difference are likely to be more extreme the more sophisticated the products. Knowledge may, therefore, play a greater role in such choices.

TABLE 1

REPEATED MEASURES ANALYSIS OF VARIANCE

Source	df	Mean square	F	p
Abstractness of Relative Product Comparisons (H1a)				
Between subjects				
Subjects	29	5.158	2.05	.0016
Within subjects				
Comparability	2	245.410	97.39	.0001
Choice Set Size	2	4.035	1.60	.2034
Comparability X Choice Set Size	4	1.170	0.23	.9201
Abstractness of Attributes Combined (H1b)				
Between subjects				
Subjects	26	7.333	1.91	.0053
Within subjects				
Comparability	2	14.626	3.80	.0231
Choice Set Size	2	3.929	1.02	.3609
Comparability X Choice Set Size	4	17.656	4.59	.0012
Abstractness of Comparisons versus Combinations (H1c)				
Between subjects				
Subjects	29	7.405	2.20	.0004
Within subjects				
Type of Operation	1	17.374	5.16	.0235
Comparability	2	114.575	34.05	.0001
Type of Operation X Comparability	2	72.107	21.43	.0001
Comparisons Minus Combinations (H2 and H3)				
Between subjects				
Subjects	29	6.895	2.78	.0001
Within subjects				
Comparability	2	32.737	13.19	.0001
Choice Set Size	2	1.171	0.47	.6246
Comparability X Choice Set Size	4	3.170	1.28	.2795

FIGURE A
Abstractness of Combinations by Choice Set Size

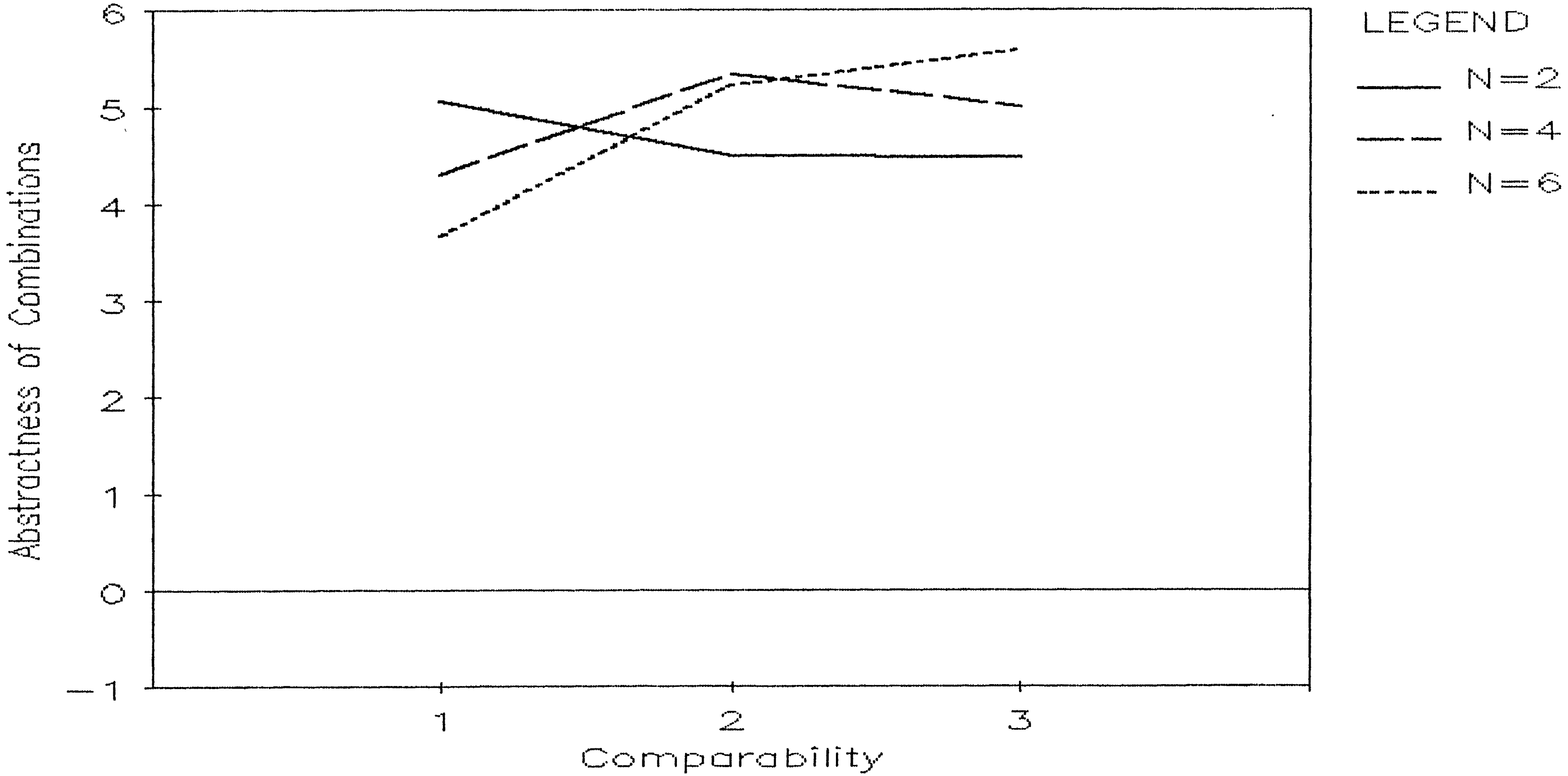


FIGURE B
Attribute Abstraction by Attribute Use

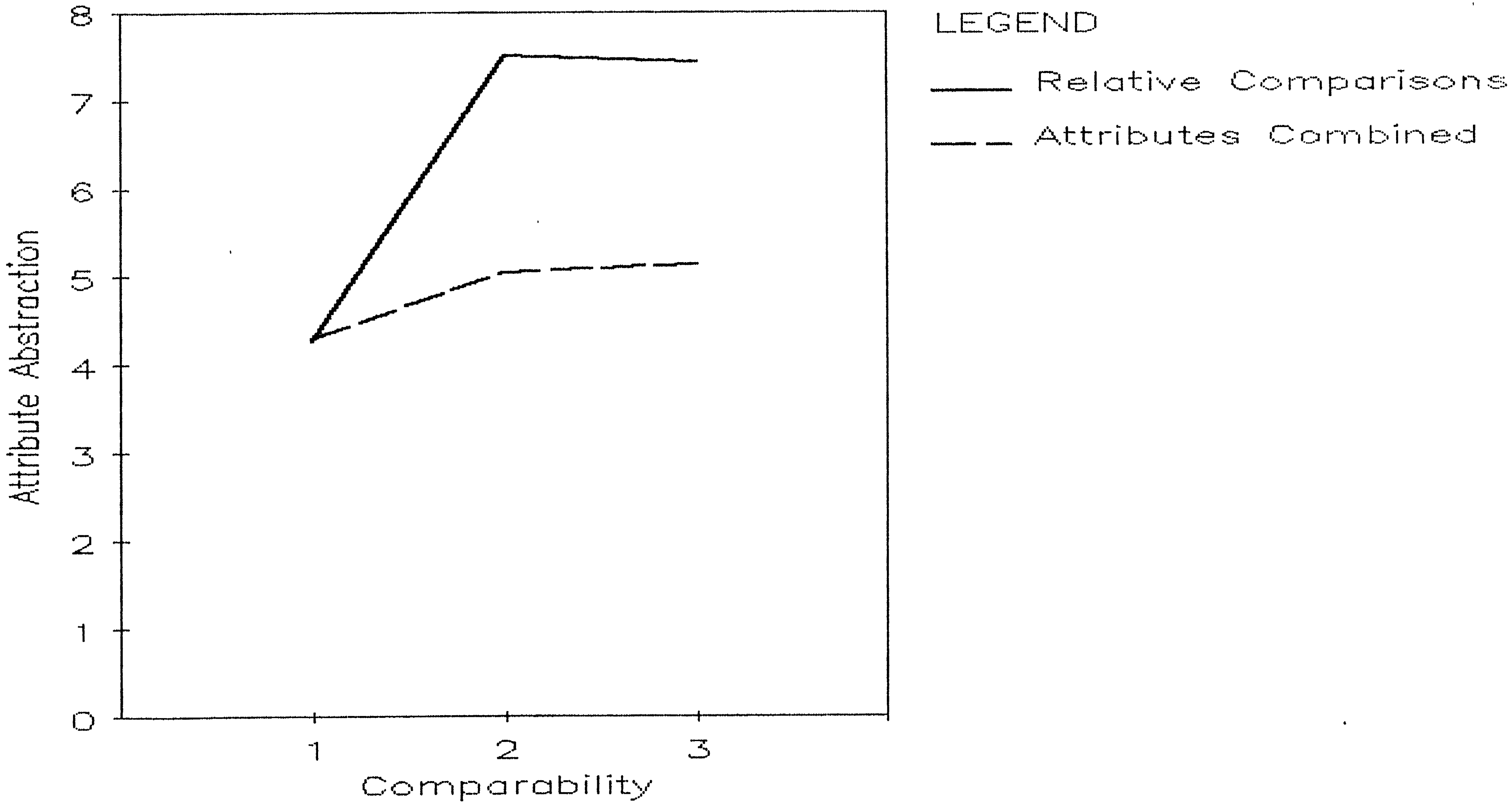
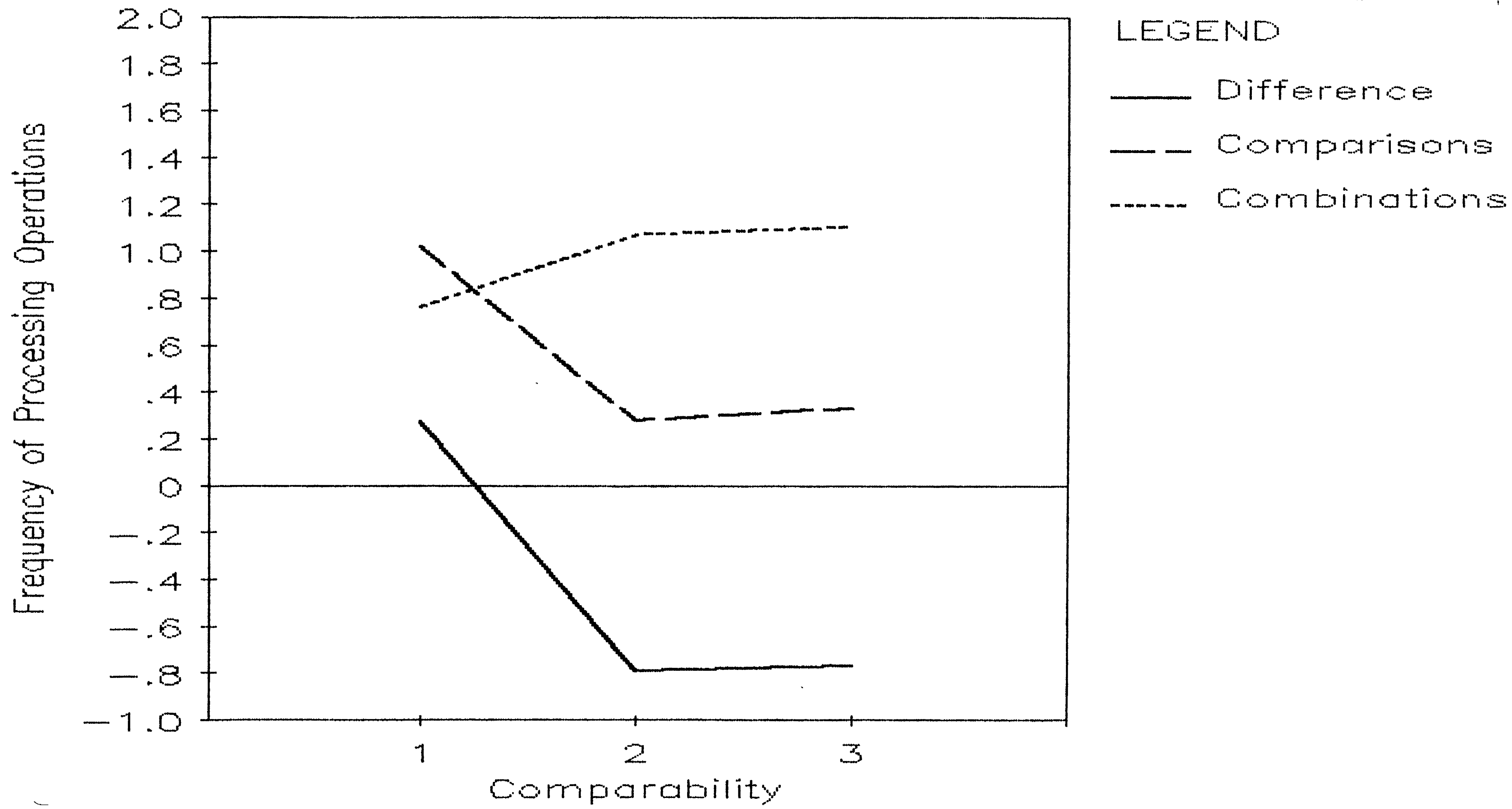


FIGURE C

Attribute Processing by Comparability



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