A NONREACTIVE MEASURE OF INFERENTIAL BELIEFS

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Abstract

Approaches toward measuring inferential beliefs about products are reviewed and a nonreactive measurement procedure is advanced. This procedure is illustrated empirically in a study demonstrating that the cognitive operations involved in deducing inferential beliefs from a set of product claims are automatic and inescapable. Implications for advertising research and for public policy are discussed.
In recent years, there has also been a decrease in the use of concrete, factual claims in advertising and a corresponding increase in the use of abstract claims that are open to multiple interpretations (Shimp, 1979; Shimp and Preston, 1981). Consequently, the problem of identifying misleading advertising has shifted from determining if a particular claim is factually grounded to determining whether or not a specific claim leads consumers to draw inferences about product performance that do not correspond to actual product performance.

The primary focus of this article is on the measurement of consumer inferences. An inference is defined as a conclusion that is derived from a set of premises on the basis of a rule, principle or template that associates the premises to the conclusion in a subjectively logical fashion (Hastie, 1983). Hence, inference formation involves going beyond directly observable events in accordance with the rules of induction (Nisbett and Ross, 1980; Wyer, 1974; Wyer and Carlston, 1979) or deduction (McGuire, 1960; Wyer, 1974; Wyer and Carlston, 1979).

Measuring Inferential Beliefs: A Review of the Marketing Literature

Although many consumer researchers agree that inference processes are important (Bettman, 1979; Dover, 1982; Huber and McCann, 1982; Johnson and Levin, 1985; Meyer, 1981; Mizerski et al., 1979; Olson, 1978; Olson and Dover, 1978), few empirical investigations of consumer inference processes have been conducted. The reason for this is that methodological difficulties may have discouraged researchers from studying this topic. How should inferences be measured? Further, if consumers are unable to access their inferential processes through introspection (Nisbett and Wilson 1977), what process-tracing
methodologies are available to researchers?

Five approaches toward measuring inferential beliefs have been proposed by marketing researchers, the paraphrase, normative-belief, salient-belief, comparative-belief, and psychometric procedures. The paraphrase procedure (Preston, 1967; Preston and Scharbach, 1971) involves exposing subjects to advertising claims and providing them with five test-items for each claim. Two of the test-items are accurate paraphrases (according to the experimenter's definition of accuracy), and the critical test-item is the illogical item. As an example of an illogical item, consider the Bell ad that stated "You'll get a royal welcome when you call Long Distance" (If X then Y). One illogical conversion of this claim is "If you don't call Long Distance you won't get a royal welcome" (If X' the Y'). If subjects judge this illogical item to be an accurate reflection of the stated or implied content of the original claim, the claim is considered misleading.

The normative-belief procedure (Dyer and Kuehl, 1978; Gardner, 1975) involves measuring consumers' normative beliefs about the attributes associated with a particular product class. These measures are compared to measures of consumers' beliefs about the attributes associated with a specific brand, after exposure to an ad pertaining to that brand. Discrepancies between normative product class beliefs and specific brand beliefs suggest that the target ad is potentially misleading.

The salient-belief procedure (Armstrong et al., 1979) involves asking consumers to judge the validity of various test-items that are implied by claims presented in an ad. These judgments are weighted by importance ratings (Wilkie and Pessemier, 1973), where importance is operationalized in terms of the relevance of a belief for a purchase
decision. If consumers' salient-belief scores on a set of false claims differ as a function of exposure or non-exposure to an ad, the ad is considered misleading.

The comparative-belief procedure (Russo et al., 1981) involves measuring the beliefs of consumers who read an explicit claim, who did not read an explicit claim, and who read a corrected (i.e., not misleading) claim. If belief in an implied claim is greater in the explicit-claim group than in the no-claim and corrected-claim groups, then the explicit claim is deemed misleading.

Schmittlein and Morrison (1983) developed a psychometric model that removes the effect of yeasaying or acquiescence bias (Webb et al., 1981) in measuring comprehension. This procedure involves showing consumers explicit claims about a product. Immediately afterward, they are asked to answer some true-false questions pertaining to these claims. The correct answer to some of these questions is true and the correct answer to the remaining questions is false. The average level of true comprehension for a communication, the average level of yeasaying for a communication, and the level of difficulty for each question is estimated by equating the expected proportion of correct answers for true and false questions with the observed proportion of correct answers for true and for false questions, respectively.

The major limitation common to each of these procedures is that they involve directly asking consumers about the various inferences that they may have formed. In responding to this type of inquiry, consumers may either search memory for an answer or they may formulate an answer on the spot. Thus, the measurement procedure itself may prompt inference formation, rather than assessing a pre-existing inference. For example, suppose that consumers were exposed to an ad
stating that Ocean Spray contains more food energy than orange or tomato juice. One false implication of this claim is that Ocean Spray is more nutritious than orange or tomato juice (actually, it's just higher in calories). If a researcher asks "Is Ocean Spray more nutritious than orange and tomato juice?" and a consumer says it is, it is impossible to determine whether this belief was formed before the consumer received the researcher's leading question, or if the question itself induced the consumer to form the false belief.

A Nonreactive Measurement Procedure

Information that is stored in memory is derived from two sources: External sources (e.g., information that was explicitly stated in an ad) and internal sources (e.g., self-generated inferences, elaborations, and arguments). Previously acquired knowledge is often used to fill in missing details in externally-provided information (see Taylor and Crocker, 1981) and explicit and inferred information is often "unitized" (Hayes-Roth, 1977) into a single integrated cognitive representation (Bransford and Franks, 1971; Bransford and Johnson, 1972). This representation is later retrieved in an all-or-none fashion, and, as a consequence, individuals often experience difficulty in distinguishing between information that was presented explicitly and information that was inferred on the basis of the explicitly presented information. This type of confusion can be useful in determining whether or not inferential beliefs were formed prior to measurement. If a consumer forms an inferential belief while reading a product claim, he may subsequently be unable to determine whether or not the inferred piece of information was stated explicitly in the claim. If an inferential belief was not formed, on the other hand, confusion of this nature is unlikely to occur.
It is important to note that confusion between explicitly presented information and information that was inferred on the basis of the explicitly presented information does not occur under all conditions. Sometimes individuals can accurately discriminate between perceived and inferred information that is stored in memory. One factor that may influence an individual's ability to determine whether or not a particular piece of information was inferred is the manner in which that piece of information was encoded, or stored, in memory. According to Kahneman (1973), there is a limit on the amount of capacity that is available for performing various cognitive tasks. Moreover, some cognitive operations require a considerable amount of this limited capacity for their performance, whereas other operations require only a small amount. These cognitive operations are referred to as controlled versus automatic processes, respectively (Schneider and Shiffrin, 1977; Shiffrin and Schneider, 1977). Automatic processes can operate in parallel with other tasks and are not influenced by information load, whereas controlled processes are strongly influenced by manipulations that divide attention (Bargh, 1984; Fisk and Schneider, 1984; Hasher and Zacks, 1979; Schneider and Shiffrin, 1977; Shiffrin and Schneider, 1977). Recent evidence, however, suggests a continuum rather than a qualitative distinction between automatic and controlled processes (Kahneman and Treisman, 1984; Shiffrin, in press).

Consider the task of learning how to drive an automobile. At first, the procedure is quite difficult and a great deal of effort is required (e.g., a controlled process). With sufficient practice, however, driving becomes easy and effortless. This automatization process is useful because it enables the individual to perform other behaviors (e.g., listening to the radio, engaging in a conversation,
etc.) while driving. Performing several tasks simultaneously would not be possible if each of these tasks imposed a large demand on the limited capacity information processing system.

In an impressive series of studies, Johnson demonstrated that accurate discrimination between perceived and inferred information is likely to occur when the processes mediating the derivation of inferred information from perceived information are controlled and effortful (Johnson and Rahe, 1981; Johnson et al., 1979, 1980, 1981). On the other hand, confusion between perceived and inferred information is likely to occur when the processes mediating the derivation of inferred information from perceived information are automatic and effortless.

Thus, when a consumer exhibits confusion about the origin of a piece of information that was not stated explicitly in an ad, a researcher may conclude that this information was inferred by the consumer prior to measurement and that the cognitive mechanisms underlying this inference process were automatic and effortless. The absence of confusion, however, is difficult to interpret. Confusion may fail to occur because (1) the inference was not formed prior to measurement, or (2) the inference was formed prior to measurement via a controlled and effortful process.

The Present Study

In the present study, several sets of product claims were presented to subjects. Each set consisted of two premises of the form "A implies B" and "B implies C" (Loken, 1981; Loken and Wyer, 1983). In addition, a conclusion of the form "A implies C" was presented explicitly in half of the sets and omitted from the remaining sets.

To illustrate, subjects were asked to rate the validity of several product claims of the form "Stresstabs contain B vitamins" (A implies
and "B vitamins give you energy" (B implies C). On the basis of these premises, subjects may infer the missing conclusion that "Stresstabs give you energy" (A implies C).

A recognition-memory technique was employed to determine whether or not subjects drew this inference. This technique involved asking subjects to rate the validity of several sets of propositions, and subsequently asking them to complete a surprise recognition questionnaire. Some of the test-conclusions in this questionnaire were identical to the target-conclusions considered earlier (e.g., targets) and some were foils (i.e., conclusions that had not been presented earlier). Subjects were asked to indicate whether or not they recognized each conclusion and they were also asked to judge how confident they were that each conclusion either had or had not been presented earlier. Of critical concern, then, was the recognition confidence associated with test-conclusions that had not been presented earlier.

Correct Recognition of Conclusions That Had Been Presented

It was reasoned that correct recognition of a conclusion that actually had been presented earlier (a "hit") may reflect a straightforward direct retrieval process. That is, an explicitly presented conclusion may be encoded in a relatively unadulterated fashion when it is first considered. Later, during a recognition task, this cognitive representation may be retrieved directly.

One factor that may influence correct recognition is prior knowledge. Considerable evidence exists showing that prior knowledge facilitates the learning of new information and enhances memory for this information (Bettman 1979, Chase and Simon 1973, Johnson and Russo 1984, Taylor and Crocker 1981, Voss et al. 1980). Thus, recognition
accuracy may be greater for conclusions pertaining to familiar than to unfamiliar products.

False Recognition of Conclusions That Had Not Been Presented

False recognition of a conclusion that had not been presented earlier (a "false alarm"), on the other hand, implies that this conclusion was inferred from previously considered premises, and that the inferred and presented propositions were integrated into a single, coherent cognitive unit. Later, during a recognition task, the entire cognitive unit is retrieved from memory and the subject experiences difficulty in distinguishing between explicit and inferred information. This type of confusion indicates that the inference was formed prior to measurement and that automatic cognitive operations mediated the formation of this inference.

One factor that may influence false recognition is the relatedness of the propositions that imply the missing conclusion. Deductive principles may guide inference processes only when the premises are logically related. To test this prediction, control conditions were constructed for the purpose of comparing false recognition responses to a conclusion when logically related premises were presented (e.g., "A implies B" and "B implies C") to false recognition responses to a conclusion when logically unrelated premises were presented (e.g., "A implies D" and "E implies C"). These premises were presented in a random order, with the constraint that no two premises from the same set may follow each other. Hence, each premise was surrounded by premises from other sets and conclusions sometimes occurred prior to their relevant premises. This procedure was employed to minimize pressures on the subject to engage in deductive reasoning.

To summarize, a 2 (presented or omitted conclusion) X 2 (familiar
or unfamiliar product) X 2 (logically related or unrelated premises) factorial design was employed. Recognition confidence served as the dependent measure. It was predicted (1) that recognition confidence for targets (i.e., presented conclusions) may be greater for conclusions pertaining to familiar products than for conclusions pertaining to unfamiliar products, and (2) that recognition confidence for foils (i.e., omitted conclusions) may be greater for conclusions that are supported by logically related premises than for conclusions that are associated with logically unrelated premises.

Method

Overview

Respondents were 36 undergraduates attending a large midwestern university who volunteered to participate in a study about "beliefs and opinions." Respondents first judged the subjective likelihood with which each of 44 product claims was either true or false. Next they received a set of math problems and were instructed to solve them as quickly and as accurately as possible. This task was employed to prevent rehearsal and eliminate short-term memory effects on the final task, a surprise recognition confidence task.

The Belief Questionnaire

Examples of the product claims contained in the belief questionnaire are presented in Table 1. The belief questionnaire consisted of 16 two-statement sets of logically related premises (e.g., "A implies D" and "E implies C"). Half of these sets contained a conclusion (e.g., "A implies C") and half did not. Further, half of the sets pertained to familiar products (e.g., Nytol, Exedrin, Geritol, Rolaids, Stresstabs, No Doz, Alka Seltzer, and Tylenol) and half pertained to unfamiliar products (e.g., Lemphorin, Allogen, Adrinyl,
Seratol, Myacin, Cedatol, Tolarin, and Gelutal). Postexperimental interviews revealed that subjects did not suspect that these unfamiliar products were fictional.

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Insert Table 1 about here
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Two sets of syllogisms were presented in each cell of the 2 X 2 X 2 experimental design. In addition, four conclusions with no premises were included as filler product claims. These claims pertained to familiar and unfamiliar products not mentioned in the other sets. Subjects were asked to judge the validity of each claim on a scale ranging from -4 (Extremely unlikely to be true) to +4 (Extremely likely to be true).

It should be noted that subjects were asked to judge the product claims without being explicitly asked to learn them or think about them in relation to one another. Moreover, the claims were presented in a random order, and no two claims belonging to the same set occurred together. Hence, subjects experienced no experiment-induced pressure to engage in deductive reasoning or to consider conclusions that had not been presented.

The Recognition Confidence Task

Immediately after completing the belief questionnaire, subjects solved math problems for 10 minutes. This was done to eliminate short-term memory effects. Next they received a surprise recognition task in which they were asked to rate the confidence with which they believed they either had or had not seen each of 16 test-conclusions. Half of these statements had been presented earlier, and half had not. Subjects were asked to indicate how confident they were that they
either had or had not seen each statement earlier in the session on a scale ranging from -4 ("I am extremely certain I have not seen the statement") to +4 ("I am extremely certain I have seen the statement").

Results

A 2 (presented or omitted conclusion) X 2 (familiar or unfamiliar product) X 2 (logically related or unrelated premises) repeated measures analysis of variance was performed on recognition confidence ratings of the conclusion statements. This analysis indicated that recognition confidence was greater when the conclusion had been presented than when it had not been presented, $F(1, 35) = 196.17, p < .001$, when the product was familiar than when it was not familiar, $F(1, 35) = 6.68, p < .02$, and when the premises were logically related than when they were not related, $F(1, 35) = 6.28, p < .02$. Moreover, significant presence X familiarity, $F(1, 35) = 4.65, p < .04$, and presence X relatedness, $F(1, 35) = 7.15, p < .02$, interactions were found. The familiarity X relatedness interaction ($F = 1.95$) and the three-way interaction ($F < 1$) were not significant.

Correct Recognition

Recognition confidence ratings of presented conclusions as a function of product type and premise type are presented in the first and second columns of Table 2. A 2 (familiarity) X 2 (relatedness) repeated measures analysis of variance performed on these ratings yielded a familiarity effect, $F(1, 35) = 8.54, p < .01$, and no other main effects or interactions. As predicted, recognition confidence was greater for conclusions pertaining to familiar products ($M = 1.83$) than for conclusions pertaining to unfamiliar products ($M = .86$).
False Recognition

False recognition confidence ratings as a function of product type and premise type are presented in the third and fourth columns of Table 2. A 2 (familiarity) X 2 (relatedness) repeated measures analysis of variance performed on these ratings revealed a relatedness effect, $F(1, 35) = 16.43, p < .001$, and no other main effects or interactions. As hypothesized, recognition confidence was greater for conclusions that were implied by logically related premises ($M = -1.95$) than for conclusions that were associated with logically unrelated premises ($M = -2.92$). This finding suggests that when logically related product claims are presented, consumers can construe the implications of these claims automatically and effortlessly.

Discussion

Together, the findings indicate that recognition confidence ratings can be useful for extrapolating consumers' inferential beliefs without directly measuring or influencing these beliefs. The present nonreactive measurement procedure enables researchers to measure consumers' inferential beliefs without prompting consumers to engage in inferential reasoning. Instead, inferential beliefs that were formed spontaneously prior to measurement are assessed.

The results are also consistent with the "reality monitoring" model of memory (Johnson and Raye, 1981) which focuses on the processes by which people determine whether a given piece of information retrieved from memory originated from an external source (e.g., it was actually perceived) or an internal source (e.g., it was inferred or
self-generated). People experience little difficulty in determining the origin of a piece of information when it was inferred through an effortful process. When an inference process is not effortful, on the other hand, the perceived vs. inferred discrimination cannot be made confidently.

Some advertisers have taken advantage of consumers' inability to distinguish between perceived and inferred information by designing messages that do not require consumers to engage in effortful inferential reasoning processes (Preston, 1977; Wilkie et al., 1984). Instead, many advertising communications are designed to prompt consumers to draw inferences automatically and effortlessly.

An automatic process is activated "whenever a given set of external initiating stimuli are presented, regardless of a subject's attempt to ignore or bypass the distraction" (Shiffrin and Dumais, 1981, p. 117). Moreover, an automatic process does not require conscious awareness or intention and the operation of an automatic process cannot be prevented or suppressed. Thus, the key feature of an automatic process is its inescapability. Misleading ads that lead consumers to draw invalid inferences automatically, then, are particularly insidious, because consumers are defenseless against such practices. The present nonreactive measurement procedure offers a means for identifying advertising claims that prompt consumers to form invalid inferences automatically. This procedure possesses the advantage of enabling the researcher to determine if a particular inference had been formed before the consumer is exposed to any measures or queries. Further, the present procedure may prove to be a useful technique for addressing empirically difficult but important issues pertaining to how consumers generate inferences about products.
Footnotes

1. Wyer (1974; Wyer and Carlston, 1979) has described the principles of deduction quantitatively:

\[ P_B = P_A P_{a/N} + P_{A'} P_{a/N} \]

where \( P_B \) refers to the subjective probability with which conclusion \( B \) is true; \( P_A \) and \( P_{A'} \) refer to the subjective probabilities with which premise \( A \) is true and not true, respectively; and \( P_{a/N} \) and \( P_{a/N'} \) refer to the conditional subjective probabilities with which \( B \) is true if \( A \) is true and is not true, respectively. A great deal of empirical support for this model has been accumulated (for reviews see Wyer, 1974; Wyer and Carlston, 1979).


2. For details on the Ocean Spray case and on other misleading advertising cases handled by the Federal Trade Commission, see Preston (1977) and Wilkie et al. (1984).
References


Table 1

Examples of the Belief Statement Sets

**Logically Related Propositions**

A implies B: Taking Excedrin will relieve tension headaches.

B implies C: Medication that relieves tension headaches may cause stomach upset.

A implies C: Taking Excedrin may cause stomach upset.

**Logically Unrelated Propositions**

A implies D: Seratol helps relieve insomnia.

E implies C: Intestinal disorders often cause a loss of appetite.

A implies C: Seratol often causes a loss of appetite.
Table 2
Recognition Confidence for Conclusions as a Function of Product Familiarity and Type of Premises

<table>
<thead>
<tr>
<th>Types of premises</th>
<th>Familiar products</th>
<th>Unfamiliar products</th>
<th>Familiar products</th>
<th>Unfamiliar products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Related</td>
<td>1.67</td>
<td>1.06</td>
<td>-1.93</td>
<td>-1.96</td>
</tr>
<tr>
<td>Unrelated</td>
<td>1.99</td>
<td>0.65</td>
<td>-2.74</td>
<td>-3.10</td>
</tr>
</tbody>
</table>

Note. Higher numbers indicate greater recognition confidence.