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Developing Heuristic-Based Quality Judgements: Attention Blocking in Consumer Choice[*]

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Abstract

Through a series of experiments we illustrate how the sequential order in which consumers receive information can influence the way this information is processed and affect consumers' decisions. Specifically, when participants initially receive information regarding brand/quality or price/quality associations, these associations can block consumers' attention to more relevant quality-determining physical attributes. Moreover, this process of attention blocking can carry-over to affect quality judgements pertaining to similarly branded or priced products beyond the product in which blocking was initiated. This implies that consumers judgements of quality may be heavily dependent on "first impressions" which develop into brand and price heuristics.

KEYWORDS: Consumer Behavior, Consumer Learning, Marketing Strategy

1 Introduction

Consumers' purchasing decisions are often based on perceptions and predictions of product quality. These quality judgements are in turn dependent on product attributes and their relation to the potential utility a consumer may derive from that product. While most consumers would agree that it is the more fundamental, underlying physical and reputational characteristics that determine a product's value, it is often an unwieldy task for consumers to process all the available attribute information.

Therefore, consumers often rely on simple decision-making strategies when evaluating products. For example, consumers may infer from a product's price that its physical attributes are of higher quality (since the inputs to production may be more expensive). Alternately, consumers may consider a brand name as an umbrella concept under which various attributes are assumed to accompany the product. As a result of these inferred attributes, consumers often use brand or price information in making product assessments. Consequently, consumers' attention to brand and price information may block the use of other (potentially more fundamental) information in judging a product's quality. To this end, we explore how the process of attention blocking and the sequential order in which information is received affect judgements about product quality. We find that initial brand and price information can not only block attention to subsequent information about product quality, but that this information may affect judgements regarding similar products.

Most consumers agree that it is not brand name or price that in and of themselves determine quality. It is therefore puzzling that many consumers' decisions rely on this information even in the presence of available, often contradictory, information on more quality-relevant product attributes. In essence, brand and price information are often heuristically used in evaluating products and block consumers' attention to other quality-determining product characteristics. As a result, consumers often fail to correctly differentiate between products of varying qualities. This failure may have significant welfare effects via the direct cost of the product (e.g. paying a premium for branded goods over identical generic products or lesser known brands) and the indirect costs of products not fully satisfying a consumers utility expectations (e.g. the product may not effectively match with a consumer's preferences). Since consumers often rely on brand and price information as ersatz rules of decision-making, consumers may never deviate from these purchasing strategies, implying that the attribute/quality relationship of other substitute products may never be fully learned. This type of decision-making may be particularly relevant in contexts where consumers are initially inexperienced or have little information about a product's attributes and their relation to quality.

Research in psychology has demonstrated that individuals often rely on heuristics when coping with even moderately complex learning tasks. One consequence of heuristic based learning is the phenomenon known as attention blocking: once an individual learns to associate a cue with an outcome, this association tends to block subsequent attempts to pair new cues with that same outcome. This phenomenon has been reported in experiments with animals (Kamin, 1969) and more recent studies with humans (Dickinson et al., 1984; Waldmann and Holyoak, 1992). Essentially, blocking arises from individuals reliance on "first impressions" rather than engaging more sophisticated learning strategies.[1]

We suggest that this attention blocking is present in consumer decision-making. Specifically, once consumers learn an initial attribute/quality association regarding a particular product, this association subsequently blocks consumers' attention to other, more fundamental attribute/quality relationships. For example, if consumers initially associate a particular brand name with high quality, this association may block consumers from iden-

[1] As such, blocking is an example of the more general concept of bounded rationality: individual decision makers have limits to their cognitive abilities which motivates the use of simple learning strategies. See Conlisk (1996) and Rabin (1998).

tifying the physical characteristics of competing products that are also indicative of high quality. This implies that firms may utilize attention blocking in their marketing strategies: if blocking exists in consumer choice contexts, a firm can pair a unique attribute of its product, for example a brand name, with (perceived) high quality. This association blocks competitors' attempts to associate other attributes (particularly those favoring their products) with high quality in the minds of consumers.

Attention blocking in a consumer learning context has been explored by other researchers. For example, in a series of experiments VanOsselaer and Alba (2000) demonstrated that if a consumer learns to associate a particular brand with a quality level, subsequent information combining more reliable physical attributes with a quality level are often ignored. In other words, a properly placed brand message (e.g. brand X is high quality) can block subsequent learning about product attributes (e.g., attribute A is a characteristic of a high quality product).

We expand on this research by not only demonstrating attention blocking in a consumer learning environment, but by demonstrating how both brand and price information can be used in the blocking process. Furthermore, we demonstrate how attention blocking initiated by brand and price information can extend beyond a single product to affect quality judgements about other, similarly branded or priced products. Thus, attention blocking may underly many of the simple heuristics and consumer folk wisdoms embodied in ideas such as "Always drive a Chevy," and "You get what you pay for." In terms of strategic marketing, our results imply that incumbent firms can maintain larger market shares for longer periods of time by exploiting the attention blocking present in brand advertising.

The remainder of the paper is organized as follows, section 2 briefly reviews the literature on multi-attribute learning and attention blocking in consumer decision-making. Sections 3 and 4 presents our hypotheses and experiments in attention blocking: brand blocking and price blocking. In each, we demonstrate that pre-exposure to either a brand/quality or price/quality association can block subsequent learning of more fundamental quality information based on a product's physical characteristics. The final sections discuss our results and provide a brief conclusion.

2 Multi-Attribute Cues and Attention Blocking

Attention blocking can be thought of as arising in situations where consumers are confronted with a (moderately) complex decision environment in which they must predict outcomes based on observable cues. In such a setting, individuals may use the sequential nature in which cue/outcome associations were encountered to help organize their processes of judgement. Thus, one may expect attention blocking to be present in situations where consumers are confronted with many cues in attempts to discern a product's quality.

One of the first studies of how consumers learn multi-attribute rules of judgement is that of Meyer (1987). While there is a considerable literature in psychology exploring how humans learn multiple cues, Meyer's innovation was to explore how multiple attribute cues work in a consumer learning context and experimentally investigate how many times product attribute cues needed to be paired with quality messages for consumers to learn which cues predicted various qualities. Specifically, subjects were presented with various copper alloys described by their attributes: material vendor, quench method, furnace type, and oven temperature. Subjects were then given feedback about the quality of the specific combination of attributes (i.e. product profiles) they had encountered.[2] Results suggested that consumers needed as few as four attribute/quality pairings to learn a cue/quality association for a new product.

[2]Copper alloy was chosen as a product to minimize the influence of prior learning and previous experience with the product under study.

While Meyer (1987) demonstrated that consumers could be relatively sophisticated in their learning, his study ignored the sequential aspects of consumer learning. In particular, evidence from experimental psychology suggests that individuals often learn cue/outcome relationships differently based on the sequence in which information is received (see Kruschke, 1996, 2001). Specifically, there is ample evidence that initial cue/outcome information can block individuals' attention to subsequent cue/outcome information. For example, in a seminal study on attention blocking in animals, Kamin (1969) found that once an organism learns to associate one predictive cue with an outcome, that cue can block subsequently encountered predictive cues: once a tone (conditioned stimulus) was paired with a shock (unconditioned stimulus), organisms could not subsequently learn to associate another stimulus (a light) with the shock in trials that co-presented the tone and the light with the shock. In other words, the tone had *blocked* learning that the light was also a good predictor of the shock. The results from this early study of attention blocking have been extended to human learning tasks with more subtle unconditioned stimuli (Dickinson et al., 1984; Waldmann and Holyoak, 1992).

Building on these ideas, Alba and Hutchinson (1991) sought not only to determine the relationship between product attribute exposures and quality but also identify the underlying factors that contribute to the ease or difficulty of learning. These experiments presented subjects with attribute information regarding stereo speakers and asked subjects to discern the attribute/quality relation. Results suggested that increasing the number of attributes made discerning attribute/quality relationships more difficult. More interestingly, consumers displayed little evidence of holistic learning, indicating that consumers often relied on a single (potentially inappropriate) attribute to infer quality.

Combining work on attention blocking and the learning of multi-attribute judgement rules, VanOsselaer and Alba (2000) experimentally tested if brand information could block subsequently presented attribute information in quality assessments. Specifically, they

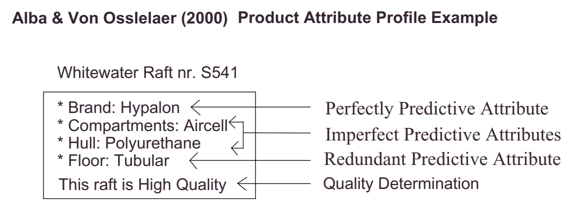

Figure 1: VanOsselaer and Alba (2000) Example Profile

tested if the brand/quality relationship is learned prior to an attribute/quality relationship, can knowing the former inhibit learning the latter. Such a finding would imply that consumers might differentiate between physically identical products that were branded differently.

In these experiments, subjects in control and the experimental treatments each received eight product profile exposures featuring a list of product attributes and a quality determination. Figure 1 illustrates an example of a product profile featured in the experiment. Each profile contained four attributes (brand, compartments, hull, and floor), each of which took on one of two values (e.g. compartments could be either aircell or closed-cell). Brand was experimentally portrayed as a perfect predictor of quality: one brand (Hypalon) was always in a high quality profile and another brand (Riken) was always in a low quality profile. Compartments and hull were not predictive features (neither featured a consistent value paired with high or low quality) and floor was a redundant predictive attribute (one value was exclusively paired with one quality level in all profiles). Thus, either learning the brand/quality relation or the floor/quality relation would allow consumers to perfectly predict product quality.

In the experimental treatment, participants were pre-exposed to four additional profiles featuring a perfectly predictive attribute (brand or floor) and the two non-predictive attributes (compartments and hull). VanOsselaer and Alba (2000) found that individuals in the experimental treatment ignored the subsequent (redundant) predictive feature in subsequent product profiles. Thus, an initially learned brand/quality relationship was able to block individuals learning the redundant floor/quality relationship, thereby demonstrating attention blocking in a consumer learning context.[3]

3 Theory and Hypothesis

The literature on multi-attribute decision rules has motivated a more recent body of work exploring the *process* by which consumers learn cue/outcome relationships. Two broad categories of models have been put forth.[4] In the first class of models, built on the theory of Human Associative Memory (HAM), it is argued that consumers learn by updating the link between a cue and an outcome (i.e. a brand and a quality determination), whenever both are encountered simultaneously. As the number of co-current cue/outcome presentations increases, so does the relative strength of the link.

A second class of models, adaptive network (AN) models, offer an alternate view of consumer learning, suggesting the process by which cue/outcome relationships are updated is influenced by the presence of other associations. That is, cues are not learned independently, but interact and often compete to become partnered with an outcome. Further, once a cue has been perfectly linked with an outcome, learning ceases (VanOsselaer and Alba, 2000). Notice, according to AN models, the frequency of cue/outcome pairings is not necessarily predictive of the relative strength between links (Kruschke, 2001). Given each set of theories predicts different ways in which consumers process information, our understanding of which class of models describes consumer learning is of critical importance.

VanOsselaer and Janiszewski (2000) explore which of these learning theories most aptly

[3]VanOsselaer and Alba (2000) also found that brand blocking (i.e. brand blocking attention to floor) to be stronger than attribute blocking (i.e. floor blocking attention to brand).

[4]See VanOsselaer and Janiszewski (2000) for a detailed overview of this literature.

describes consumer learning in multi-attribute environments. Results indicate that when consumers are specifically instructed to form an opinion about a cue/outcome relationship, they exhibited learning consistent with AN models. However, when there was no specific processing goal, consumers tended to rely on HAM type learning. The authors concluded that both HAM and AN models of learning are supported in consumer learning and emphasize the importance of the processing goal in predicting how consumers evaluate products.

The debate between these two theories of learning has important implications for our understanding of consumer behavior. The AN class of models suggest consumers might rely heavily on initially encoded information, often called online processing. Conversely, the HAM class of models suggest that consumers retrieve all relevant cues from memory when evaluating a product. Notice, the cue interaction implied by AN models underlies the blocking phenomenon. That is, initial encountered brand/quality associations are learned by consumers but future presentations of attribute information with brand information is ignored as the consumer has already developed a means to predict quality. VanOsselaer and Alba (2000) found strong evidence of the blocking phenomenon in a consumer learning context, supporting a forward looking process consistent with AN models of learning. Thus, our first hypothesis is that initially learned relationships between brand or price and quality can prevent consumers from learning other, potentially more fundamental, attribute quality relationships. That is, we posit our experimental results provide evidence in support of the AN theory of consumer learning.

After learning an initial brand/quality or price/quality relationship, the ensuing blocking may affect judgements regarding other, similarly branded or priced products. Indeed, a large literature demonstrates how initially encountered information plays an important role in determining the categories that individuals use to simplify decision making (see

Fryer and Jackson, 2002; Macrae and Bodenhausen, 2000; Smith et al., 1992).[5] Similarly, if initially encountered attribute/quality relationships are strong and consumers are making decisions in the face of familiar stimuli, initially learned relationships may be paramount in decision making, serving as heuristics that reduce cognitive and information processing costs (Tversky and Kahneman, 1982b).

Gürhan-Canli (2003) incorporate research from social cognition to suggest people form impressions differently when dealing with single products versus groups of products. Specifically, people tend to rely on HAM learning when dealing with groups and AN learning when forming associations about individuals. This can be explained by motivation and complexity. First, groups are not expected to behave consistently, so consumers are less motivated to form specific behavioral hypotheses. Secondly, it is more costly to form an initial impression about a group (due to increased information and processing) than it is an individual. Thus, the use of AN learning suggests individuals may be subject to primacy effects (i.e. attention blocking).

An understanding of attention blocking in consumer is choice is critical to our understanding of what drives consumer learning regarding individual and family brands.[6] Thus, our second hypothesis is that once attention blocking is initiated with respect to a particular attribute/quality relationship (e.g. brand or price), consumers may utilize this attribute/quality relationship when judging other products that share the attribute for which blocking was initiated. Practically, this means that there may exist a "carry-over" effect in which a consumer may use, say, one product's brand/quality association to judge other products. However, consistent with recent theoretical research, we expect a

[5]Recent research on brand extensions has focused on the importance of consumers viewing brands as categories. See, for example, Boush (1993), Broniarczyk and Alba (1994), Joiner and Loken (1998).

[6]VanOsselaer and Alba (2003) identify support for AN models in the evaluation of brand extensions: both attributes and brands were associated with a specific quality determination, surrogate attributes competed for prominence in the minds of consumers.

diminished reliance on first-impressions when evaluating product extensions (i.e. groups of products).

4 Attention Blocking and Consumer Decision-Making

In this section we present two experiments examining attention blocking in a consumer learning context. These experiments demonstrate how learned brand/quality and price/quality associations can block learning of more fundamental attribute/quality relationships. In addition, we test the extent to which these initially learned associations carry over to quality judgements about other, similarly branded or priced products. To support our analysis, we report results from exit questionnaires regarding participants perceptions of which attributes (i.e. brand, price, or other product characteristics) determine product quality.

These experiments differ from previous experiments in several ways. First, in addition to demonstrating the robustness of attention blocking in consumer decision-making (VanOsselaer and Alba, 2000), our experiments provide evidence of the strength of attention blocking as it affects judgements about other products. The implication here is that once a consumer's attention is blocked by an initially learned brand/quality, that relationship can carry over and affect judgements about other products. Thus, attention blocking may result in consumers seemingly adopting certain brand or price based heuristics when judging product quality and making purchasing decisions. Secondly, to our knowledge, our experiments are the first to test if initially learned price/quality associations can block the learning of attribute/quality relationships.

4.1 Brand Blocking - Experiment 1

The primary goal of experiment 1 was to explore if attention blocking phenomenon can be implemented in a consumer learning context. Two secondary goals were (i) to explore

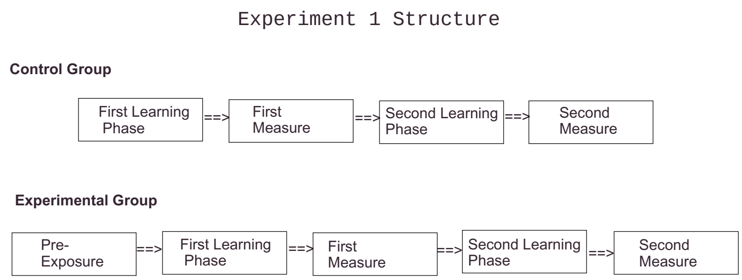

Figure 2: Experiment 1 Structure

how consumers utilize brand and attribute information to determine product quality and (*ii*) to investigate if attention blocking extends beyond a single product. If the blocking phenomenon exists, one expects consumers who are pre-exposed to brand information to disproportionately rely on this information in lieu of physical attribute cues when predicting product quality. If blocking carries to subsequent products, these same consumers should overly rely on brand information when making judgements about other, similarly branded products.

Experimental Design

In experiment 1, participants were randomly assigned to either control or experimental treatments, each consisting of two learning phases and two measure phases. The experimental group also received a pre-exposure phase prior to the first learning phase. Figure 2 illustrates the structure of experiment 1.

Participants in the experimental group began with a pre-exposure phase consisting of eight product profiles. Each profile contained 3 mountain axe attributes (brand, length, and head) which each took on one of two possible values.[7]

[7]Mountain axes (pre-exposure and first learning phases) and mountain boots (second learning phase) were chosen as products of study in order to limit the extent to which individuals' previous experience

In the pre-exposure phase a high quality brand (Raven) was always paired with the statement "This axe is high quality." A low quality statement ("This axe is low quality.") was always paired with a second brand, Charlet Moser. Length (65 or 85 cm) and head material (carbon steel or forged steel) alternated equally between two qualities, neither being consistently paired with a specific quality determination. Figure 3 presents the eight product profiles appearing in the pre-exposure phase.

The first learning phase was identical to the pre-exposure phase with the addition of another attribute in each profile: spike material. This attribute took on one of two values: cast steel (which was always paired with a high quality statement) and aluminum (which was always paired with a low quality statement). Spike material was therefore a (redundant) perfect predictor of quality as its values were consistently paired with a quality. However, for the experimental group this was not the first perfect predictor encountered. Figure 4 presents the eight profiles from the first learning phase.

The first measure phase was intended to discern which cue(s) individuals relied upon when making quality judgements. This phase consisted of eight measures: product profiles for which participants were asked to assess the product's quality. Individuals were asked to evaluate the profiles and provide an assessment of either high or low quality. Four of the measures (non-confounding measures) presented the previously indicated high quality brand (Raven) and the high quality spike material (cast steel) and were thus identical to

or prior knowledge would influence learning and quality judgements. Moreover, given the recreational opportunities in the surrounding area, these represent goods participants could potentially purchase. The attributes and attribute values used in the experiment were taken from a product catalog of a local retailer.

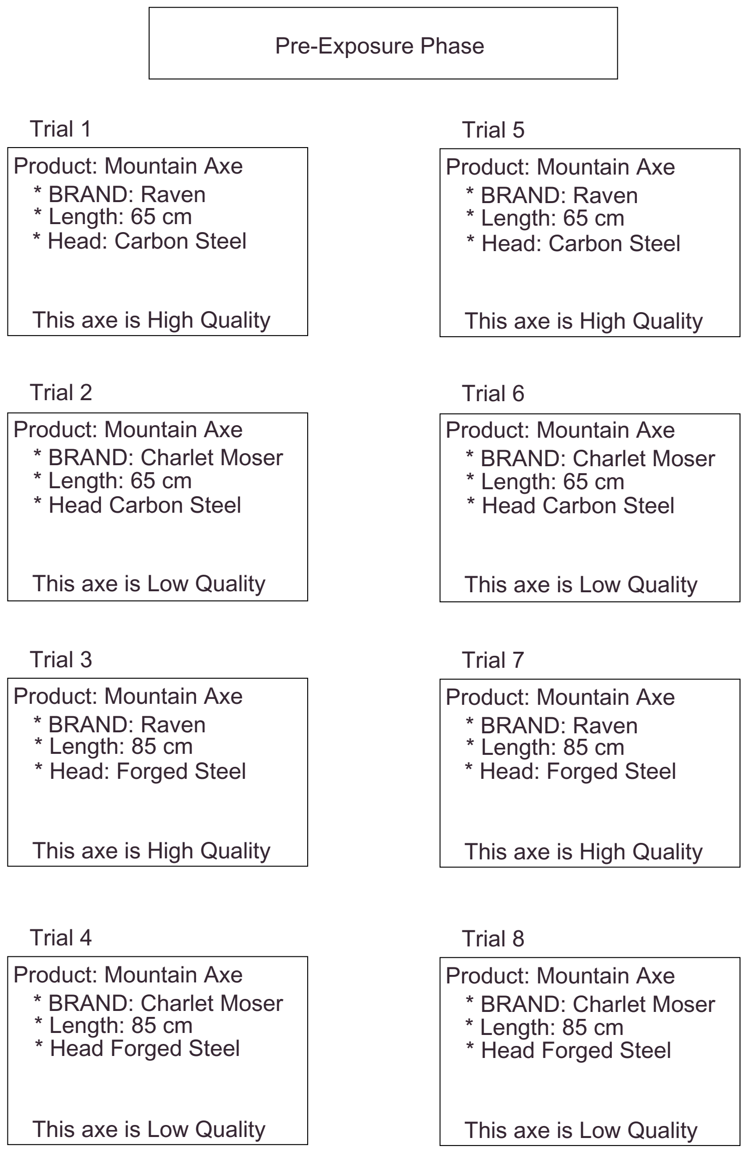

Figure 3: Schematic representation of experiment 1 stimuli, pre-exposure phase.

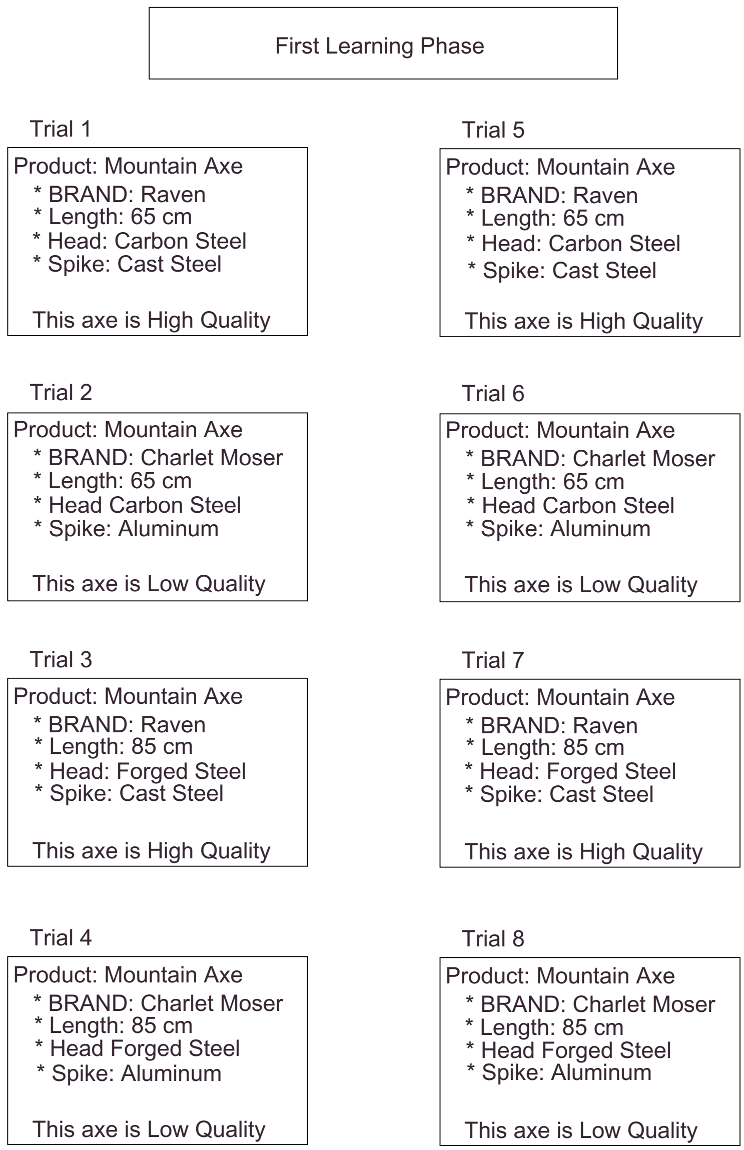

Figure 4: Schematic representation of stimuli for experiment 1, first learning phase.

profiles participants encountered in the first learning phase. The remaining four measures (confounding measures) combined a high quality brand with low quality spike material and vice versa. In the case of confounding measures, spike material was considered the true predictor of product quality, making its previously encountered quality association appropriate for use in making quality judgements.[8]

The second learning phase was identical to the first in structure but utilized a different product (mountain boots) with unique product attributes but similar brand information. The Raven brand continued to be associated with high quality and Charlet Moser continued to be associated with low quality. The attribute mid-sole material served as a (redundant) perfect predictor of quality: dual density micro-pore was associated with high quality while pro-flex plus was associated with low quality. The attributes weight (1.58 or 2.28 kg) and upper boot material (Idro-Perwanger Rought-Out Leather or Reversed Anfibo Leather) were not associated with a quality level and appeared in both high and low quality product profiles. Figure 5 presents the eight product profiles used in the second learning phase.

The second measure phase was similar to the first but utilized mountain boot profiles for which participants were asked to make quality assessments. Again it was necessary to rely solely on the redundant perfect predictor, in this case mid-sole material, to correctly answer all eight measures.

[8]We use the terms correct and incorrect to classify individuals' quality judgements: judgements coinciding with a non-brand attribute/quality relationship are termed correct; judgements coinciding with a brand/quality association but not coinciding with a non-brand attribute/quality relationship are termed incorrect. Note that either perfect predictor (brand or spike material) is sufficient to predict quality in a non-confounding measure. In a confounding measure, participants needed to use the (redundant) perfect predictor (e.g. spike material) to correctly judge a product's quality.

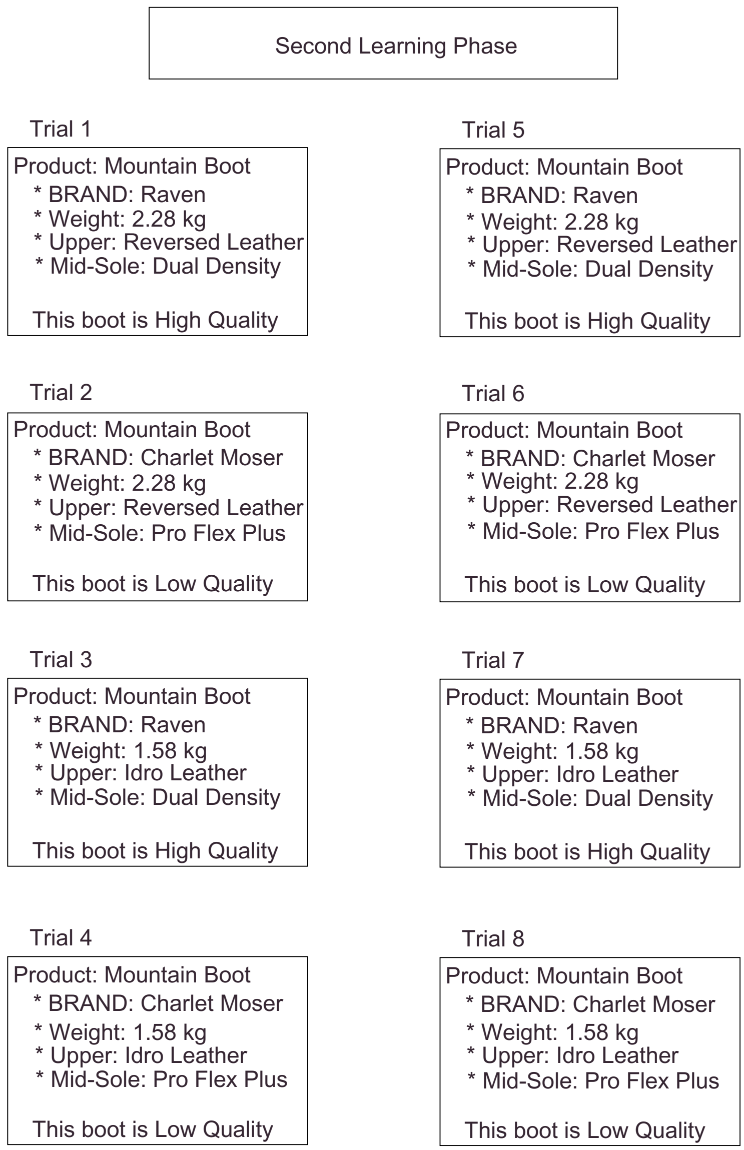

Figure 5: Schematic representation of stimuli for experiment 1, second learning phase.

Procedure & Measures

The experiments were programmed in E-Prime (Schneider et al., 2002).[9] Participants were seated at individual computer stations and separated from one another by dividers. The instructions informed the subjects of the experiment:

> You will be presented with several product profiles for mountain axes. These profiles will list the attributes of various axes and a quality rating. Your task is to learn how to associate these attributes with the quality of a mountain axe. After viewing this information, you will be asked to classify mountain axes as either high or low quality based on their attributes.

Subjects in the control (experimental) treatment were then presented with 8 (16: 8 pre-exposure phase, 8 first learning phase) mountain axe attribute/quality profiles. In all phases of the experiment, profiles and the ordering of attributes within a profile were presented in random order. Subjects could move from one profile to the next at their own pace.

After viewing this information, dependent measures (i.e. quality assessments based on a given product profile) were collected. The dependent measures consisted of eight additional profiles constructed in a 2 x 2 x 2 combination of the two levels of the brand predictive cue (brand), the attribute predictive cue (spike material), and the imperfect predictors (head material and length). Eight dependent measures (quality judgements: high or low) were collected for each profile.

Of the eight profiles used to measure participants learning, four were non-confounding in that they presented a brand-spike material combination that participants had previously encountered in the first learning phase. Four of the profiles were confounding in that they

[9] Copies of the E-Prime scripts are available from the authors upon request.

presented a previously associated high quality brand with a low quality predictive attribute and vice versa (e.g. Raven and aluminum spike).

After classifying the eight mountain axe measures, the experiment continued with exposure to mountain boot profiles. Participants in each treatment were exposed to eight mountain boot attribute/quality profiles. Subsequently, dependent measures were collected in the same manner as that used for mountain axes. Again, four of the measures were non-confounding (presenting a consistent high or low quality brand/mid-sole material combination) and four were confounding (presenting a high quality brand with a low quality mid-sole material).

At the conclusion of the experiment participants were asked to complete a brief questionnaire. The questionnaire asked participants to rank (from 1 to 5) how important they perceived each cue (brand, length, head material and spike material) in judging the quality of a product.[10] These rankings provided insight into the cue/quality relationship learned by participants in each treatment.

Participants

Participants were recruited from the student body at our university. A total of 40 individuals participated in the experiment, each randomly assigned to either the control ($n = 19$) or experimental ($n = 21$) condition. To provide saliency to individuals' decision-making in the experiment, participants received \$0.65 for each correct quality assignment made during the measure phases (maximum earnings \$10.00). The experiment lasted approximately 30 minutes.

[10]The questionnaire also asked a small amount of non-identifying demographic information: gender, age, experience with mountain axes, and experience with mountain boots. In our analysis, we found no fixed effects associated with these participant characteristics.

Results

We use participants' classification of confounding profiles to measure the presence of attention blocking with respect to brand. When encountering a confounding product profile, participants should rely on the previously provided information to assess product quality. In the control treatment, participants were exposed to eight product profiles (in each of the first and second learning phases) while participants in the experimental treatment received an additional eight profiles highlighting brand as the perfect predictor of quality. If attention blocking is present, participants in the experimental treatment would not have appropriately identified the relationship between the redundant predictor (spike or midsole material). These participants would have therefore relied disproportionately on brand information in judging quality when confronted with a confounding profile. If we consider a product's physical characteristics as the true indicators of quality, blocking implies that individuals in the experimental group would incorrectly classify more confounding profiles than would individuals in the control group. Generically, individuals in the control treatment should, on average, classify one half of confounding profiles correctly (by randomly using brand or the physical attribute to judge quality). On the other hand, individuals in the experimental treatment, relying more heavily on brand information (due to the pre-exposure phase), should classify more than half of confounding profiles incorrectly.

The results of experiment 1 indicate that brand blocking was robust for the first product (mountain axe) but diminished with the second product (mountain boots). Tables 1 and 2 present the average number of correct and incorrect quality judgements made by participants in each treatment. The measures were designed such that if a participant relied solely on brand information to judge quality, they would incorrectly classify all confounding profiles and therefore correctly classifying 50% of the profiles in each measure phase. If a participant was equally weighting brand and the perfect predictor in making quality judgements they would, on average, incorrectly classify two of the confounding profiles,

Table 1: Average percentage (std. dev.) of correct answers in experiment 1.

	Phase 1	Phase 2
Control Group	77% (17.7%)	74% (22.9%)
Experimental Group	58% (17.3%)	64%(21.4%)

thereby correctly classifying 75% of eight profiles in each measure phase. (An individuals ignoring brand information and utilizing only the perfect predictor in quality judgements would correctly classify all profiles in each measure phase). Thus, we expect the experimental treatment to correctly classify 50% of profiles and the control treatment to correctly classify 75% of profiles (under the assumption that blocking causes the experimental treatment to rely solely on brand information while control subjects utilize brand and attribute information equally in judging quality). The results indicate that in both phases the experimental group correctly classified fewer profiles than the control group. On average, the control group correctly classified 77% and 74% of profiles in the first and second measure phases. The experimental group correctly classified only 58% and 64% in the two phases.

Dividing the measures into confounding (those that pair a previously associated high quality brand with a low quality attribute and vice versa) and non-confounding indicates that the experimental group was not only incorrectly classifying more profiles than the control group, but was making the majority of incorrect classifications when predicting the quality in confounding measures. (See Table 2.) In addition to re-enforcing the difference in judging quality, this result supports the hypothesis that participants were not making random quality assignments (which would have resulted in an equal number of confounding and non-confounding cues incorrect). Given the large differences in incorrect confounding cues between treatments (35% in the control treatment and 70% in the experimental

Table 2: Percentage incorrect confounding and non-confounding cues in experiment 1.

	% Confounding Cues Incorrect	% Non-Confounding Cues Incorrect
Phase 1 Control	35% (35%)	5.2% (9%)
Phase 2 Control	48.6% (45%)	2.6% (7.8%)
Phase 1 Experimental	70.24% (39%)	9% (14%)
Phase 2 Experimental	61% (45%)	5% (15%)

treatment for phase 1), we infer that blocking is present in this learning environment: individuals in the experimental treatment disproportionately used brand to judge quality as other characteristics had been blocked by the pre-exposure phase.

ANOVA and Wilcoxon (Mann-Whitney) tests indicate a significant difference between the fraction of incorrectly classified confounding profiles across treatments in the first measure phase (3). We take this as strong evidence that pre-exposure to the brand/quality relationship resulted in blocking individuals' attention to the redundant predictive attribute's relationship to quality (i.e. the spike material/quality relationship).

As seen in tables 2 and 3, the effect of the pre-exposure phase is greatly diminished in second measure phase: there is no significant difference in the quality classification of mountain boots across treatments. Thus, it appears that brand blocking with respect to one product does not carry over to similarly branded products (i.e. the brand/quality association from mountain axes does not affect learning attribute/quality relationships regarding mountain boots). However, this analysis does not give a complete picture of this potential "carry-over" effect from attention blocking.

Table 3: Effects of treatment (control versus experimental) on number of incorrect quality judgements in first and second measure phases for confounding and non-confounding profiles in experiment 1.

	ANOVA	Wilcoxon
Phase 1: incorrect non-confounding	$F = 0.03$	$Z = -0.303$
	$p = 0.86$	$p = 0.76$
Phase 1: incorrect confounding	$\mathbf{F = 8.32}$	$\mathbf{Z = -2.784}$
	$\mathbf{p = 0.01}$	$\mathbf{p = 0.0054}$
Phase 2: incorrect non-confounding	$F = 0.70$	$Z = -1.150$
	$p = 0.41$	$p = 0.25$
Phase 2: incorrect confounding	$F = 0.71$	$Z = -0.448$
	$p = 0.41$	$p = 0.65$

To test for this effect further, we analyze participants' judgements across the first and second measure phases. If individuals who were strongly blocked in the first learning phase tended to be strongly blocked in the second learning phase, this would suggest that blocking can be extended beyond a single product. Thus, we conduct two probit estimates. First, we ask what is the probability an individual is "fully blocked" (i.e. focuses exclusively on brand information in making quality judgements) given her treatment (control versus experimental). We find a strong and significant relationship between full blocking and treatment: individuals in the experimental treatment were much more likely to use brand exclusively in judging quality ($\beta = 1.31$, $p < 0.01$). We then conduct a second probit estimate to discern the probability of being fully blocked in phase 2 (i.e. incorrectly classifying all confounding mountain boot profiles) given that one was fully blocked in phase 1. This provides us with a measure of how robust brand blocking is across different products.[11] Again, we find a strong and significant relationship between blocking in phase 1 and blocking in phase 2 ($\beta = 0.72$, $p < 0.05$). This implies that, while attention blocking diminishes with greater exposure to complete product profiles (Table 2), attention blocking in consumer learning extends beyond the product with which blocking originated.

As further evidence of brand blocking carrying over to other products, we analyzed the questionnaire in which participants ranked each attribute for each product in terms of its importance in judging quality. While participants in both treatments correctly learned the brand/quality relationship to which they were exposed, participants in the experimental treatment failed to identify the redundant attribute (spike or mid-sole material) as important in discerning quality. Recall that all participants (regardless of treatment) received profiles in which brand information was consistently paired with quality information. Thus all participants should rate brand as highly predictive of quality. However, participants in the experimental treatment significantly misperceived the relationship between the redundant predictor and quality for each product, even though the pre-exposure phase pertained only to the first product. ANOVA and Wilcoxon test results reject the hypothesis of no difference in ranking the redundant attribute across treatments (see Table 4). Just as attention blocking would predict, participants in the experimental treatment failed to identify the redundant predictor (spike/mid sole) as predictive of quality. This is further evidence not only of attention blocking, but of the potential for blocking in learning about one product to influence learning about other products. This may be interpreted as evidence that if consumer learning is blocked, the blocking cue/outcome association may be used as a simple heuristic or rule of thumb for more generally judging product quality.

[11] Our focus on only full blocking provides the weakest possible evidence of a carry-over effect associated with blocking. Allowing for different degrees of blocking (one-fourth, one-half, or three-fourths blocked) yields a greater effect of phase 1 blocking on phase 2 quality judgements.

Table 4: Effects of treatment (control versus experimental) on participants' perceived importance of various attributes on product quality in experiment 1.

	ANOVA	Wilcoxon
Boot brand	$F = 1.86$	$Z = -1.46$
	$p = 0.18$	$p = 0.15$
Spike material	$\mathbf{F = 16.19}$	$\mathbf{Z = 3.19}$
	$\mathbf{p < 0.001}$	$\mathbf{p = 0.0014}$
Axe brand	$F = 0.70$	$Z = -1.01$
	$p = 0.41$	$p = 0.315$
Mid-sole material	$\mathbf{F = 9.28}$	$\mathbf{Z = 2.57}$
	$\mathbf{p = 0.004}$	$\mathbf{p = 0.01}$

4.2 Price Blocking - Experiment 2

Building on experiment 1, experiment 2 explored whether attention blocking could be initiated using price (rather than brand) information.[12] Thus, our experiment focusing on price information examines whether attention blocking and the carry over effect to other products are unique to brand information or are more generalizable. If the blocking phenomenon exists, one would expect consumers who are pre-exposed to a price/quality association to disproportionately rely on this information in lieu of attribute cues when predicting product quality. If blocking carries over to subsequent products, these same consumers should rely on price information when making judgements about other, similarly priced products.

[12]Previous research has focused on consumers prevalent use of brand information, suggesting that brand information may have greater saliency in judging products. See Dacin and Smith (1994) and Joiner and Loken (1998).

Figure 6: Schematic representation of stimuli for experiment 2.

Experimental Design

Experiment 2 proceeded in an analogous manner as experiment 1 except price information replaced brand information in the product profiles. Specifically, a high price replaced a high quality brand and a low price replaced a low quality brand. Consequently, a high priced product was always associated with a high quality statement and a low priced product was always associated with low quality.

Participants in the experimental group began with a pre-exposure phase consisting of eight product profiles.[13] Each profile contained three mountain axe attributes: price, length, and head. In the pre-exposure phase a high price ($160.00) was always paired with the statement "This axe is high quality." A low quality statement ("This axe is low quality") was always paired with a low price, $65.00.[14] Figure 6 presents examples of product profiles found in experiment 2.

The first learning phase was identical to the pre-exposure phase with the addition of another attribute in each profile: spike material. As in experiment 1, this attribute took on one of two values: cast steel (which was always paired with a high quality statement)

[13]Figure 2 illustrates the general structure of the experiments.

[14]Length (65cm or 85cm) and head material (carbon steel or forged steel) alternated equally between two qualities, neither being consistently paired with a specific quality determination.

and aluminum (which was always paired with a low quality statement). Spike material was therefore a (redundant) perfect predictor of quality.[15]

In the first measure phase individuals were asked to evaluate the profiles and indicate if they thought the product was of high or low quality. Four of the measures (non-confounding measures) were identical to previously encountered profiles pairing the high price ($160.00) with the high quality spike material (cast steel). The remaining four measures (confounding measures) combined a high price with low quality spike material and vice versa. In the case of confounding measures, spike material was considered the true predictor making its previously associated attribute/quality association the correct relationship to use in making quality judgements.

The second learning phase was identical to the first in structure but utilized mountain boots with unique product attributes and price information. The high price ($450.00) continued to be associated with high quality and the low price ($225.00) continued to be associated with low quality.[16]

The second measure phase was similar to the first but utilized mountain boot profiles for which participants were asked to make quality assessments. Again it was necessary to rely solely on the redundant perfect predictor (mid-sole material) to correctly answer all eight measures.

[15] Spike material was redundant because its values were consistently paired with a quality level but it was not the first perfect predictor encountered for the experimental treatment.

[16] The attribute mid-sole material continued to serve as a (redundant) perfect predictor of quality: dual density micro-pore was associated with high quality while pro-flex plus was associated with low quality. The attributes weight (1.58 or 2.28 kg) and upper boot material (Idro-Perwanger Rought-Out Leather or Reversed Anfibo Leather) were not associated with a quality level and appeared in both high and low quality product profiles.

Procedure & Measures

The physical setup and instructions for experiment 2 was identical to experiment 1. Subjects in the control (experimental) treatment were presented with 8 (16: 8 pre-exposure phase, 8 first learning phase) attribute/quality profiles regarding mountain axes. Again, dependent measures were collected. The dependent measures were constructed as in experiment 1 with four non-confounding (e.g. high price, high quality spike material) and four confounding (e.g. high price, low quality spike material)

After the pre-exposure and first learning phases, dependent measures (i.e. quality assessments based on a given product profile) were collected. The dependent measures consisted of eight additional profiles constructed as in experiment 1 using a 2 x 2 x 2 combination of the price predictive cue, the attribute predictive cue (spike material) and the imperfect predictors. As before, four measures were non-confounding (presenting a consistent price/mid-sole material combination) and four measures were confounding (e.g. presenting a high price with a low quality mid-sole material).

After classifying the eight mountain axes measures, the experiment continued with eight exposures to mountain boot profiles. Subsequently, dependent measures were collected in the same manner as that used for mountain axes.

At the conclusion of the experiment subjects were asked to complete a questionnaire similar to that in experiment 1. The questionnaire asked individuals to rank (from 1 to 5) how important they perceived each cue (price, length, head material and spike material) in judging the quality of a each product.

Subjects

Participants were recruited from the student body at our university. A total of 37 individuals participated in the experiment, each randomly assigned to either the control ($n = 18$) or experimental ($n = 19$) condition. Participants received $0.65 for each correct quality

Table 5: Average percentage (std. dev.)of correct answers in experiment 2.

	Phase 1	Phase 2
Control Group	82% (18.2%)	85% (17.9%)
Experimental Group	58% (16.5%)	68%(23.3%)

assignment made during the measure phases (maximum earnings $10.00). The experiment lasted approximately 30 minutes.

Results

The results of experiment 2 indicate that price blocking was robust for the first product (mountain axe) and the second product (mountain boots). Tables 5 and 6 present the average number of correct and incorrect quality judgements made by participants in each treatment.[17] Results indicate that in both phases the experimental group correctly classified fewer profiles than the control group. The control group correctly classified 82% and 85% in the first and second measure phases. The experimental group correctly classified 58% and 68% in each measure phases.

Table 6 indicates that the majority of misclassifications in the experimental group occurred when participants were faced with confounding measures.[18] Relative to participants

[17]Recall we expect (on average) the experimental group to correctly classify 50% of profiles and the control group to correctly classify 75% of profiles under the assumption that blocking causes the experimental group to completely rely on price while control subjects utilize price and attribute information equally to judge quality.

[18]In addition to re-enforcing the difference in judging quality, this result supports the hypothesis that participants were not making random quality assignments. This would have resulted in an equal number of confounding and non-confounding cues incorrect.

Table 6: Percentage Incorrect Confounding and Non-Confounding Cues in Experiment 2.

	% Confounding Cues Incorrect	% Non-Confounding Cues Incorrect
Phase 1 Control	33% (33%)	2.7% (8.1%)
Phase 2 Control	26.25% (36%)	4.2% (9.5%)
Phase 1 Experimental	80.26% (31%)	1.3% (5.6%)
Phase 2 Experimental	61.84% (44%)	2.6% (7.8%)

in the control treatment, individuals in the experimental treatment used price information significantly more than information regarding physical attributes when judging quality. The large differences in incorrect confounding cues between treatments (33% in the control treatment and 80.25% in the experimental treatment for phase 1) imply that attention blocking is present in this learning environment: individuals in the experimental treatment disproportionably used price to judge quality as other characteristics had been blocked by the pre-exposure phase. In contrast with experiment 1, there is a large difference in the number of incorrect confounding cues between treatments for phase 2 (61.75% in the control treatment and 26.25% in the experimental treatment). This can be interpreted as evidence price blocking extends beyond a single product.

ANOVA and Wilcoxon tests (Table 7) all indicate a significant difference between the fraction of incorrectly classified confounding profiles across treatments in the first (mountain axes) and second (mountain boots) measure phases. We take this as strong evidence that pre-exposure to the price/quality relationship blocked individuals' attention to the redundant predictive attribute's relationship to quality (i.e. the spike material/quality relationship). The significant difference indicated by all three tests for phase 2 confound-

Table 7: Effects of treatment (control versus experimental) on number of incorrect quality judgements in first and second measure phases for confounding and non-confounding profiles.

	ANOVA	Wilcoxon
Phase 1: incorrect non-confounding	$F = 0.41$	$Z = 0.64$
	$p = 0.52$	$p = 0.52$
Phase 1: incorrect confounding	$\mathbf{F = 19.27}$	$\mathbf{Z = -3.6}$
	$\mathbf{p = 0.0001}$	$\mathbf{p = 0.003}$
Phase 2: incorrect non-confounding	$F = 0.28$	$Z = 0.539$
	$p = 0.56$	$p = 0.59$
Phase 2: incorrect confounding	$\mathbf{F = 7.25}$	$\mathbf{Z = -2.4}$
	$\mathbf{p = 0.01}$	$\mathbf{p = 0.015}$

ing measures is strong evidence that the blocking phenomenon has extended to another product.

Following experiment 1, we conduct two probit estimates. In the first we find a strong and significant relationship between full blocking and treatment: individuals in the experimental treatment were much more likely to use price exclusively in judging quality ($\beta = 1.7$, $p < 0.01$).[19] We conduct a second probit estimate to discern the probability of being fully blocked in phase 2 (i.e. incorrectly classifying all confounding mountain boot profiles) given that one was fully blocked in phase 1. Again, we find a strong and significant relationship between blocking in phase 1 and blocking in phase 2 ($\beta = 1.58$, $p < 0.01$). This

[19]No individuals in the control group incorrectly classified all four confounding profiles in either measure phase.

is still further evidence in favor of price blocking in consumer learning extending beyond the product with which blocking originated.

Results from the questionnaire in which participants ranked each attribute in terms of its importance in judging quality support our interpretation. Participants in the experimental treatment significantly misperceived the relationship between the redundant predictor and quality for each product, even though the pre-exposure phase pertained only to the first product. ANOVA and Wilcoxon test results reject the hypothesis of no difference in ranking the redundant attribute across treatments (see Table 8). As in experiment 1, participants in the experimental treatment failed to learn the redundant predictor's relationship to quality: an initial price/quality association can block consumers from learning other attribute/quality relationships and can affect judgements of other products beyond that in which blocking originated. As before, we interpret this as evidence that if consumer learning is blocked, the blocking cue/outcome association may be used as a simple heuristic or rule of thumb for more generally judging product quality.

5 General Discussion

The experiments discussed above provide evidence of attention blocking in consumer decision-making contexts. Most purchasing decisions involve consumers making judgements about product quality. Thus the perceived quality of a product plays an important role in consumption decisions regarding that product. While potentially developing a cost saving heuristic, attention blocking implies that consumers' perceptions of quality may not accurately represent the true quality of a product but rather be the result of initial attribute/quality associations potentially learned under conditions of incomplete information about product attributes.

Table 8: Effects of treatment (control versus experimental) on participants' perceived importance of various attributes on product quality in experiment 2.

	ANOVA	Wilcoxon
Boot price	$F = 2.29$	$\mathbf{Z = -2.024}$
	$p = 0.143$	$\mathbf{p = 0.049}$
Spike material	$\mathbf{F = 16.59}$	$\mathbf{Z = 3.1}$
	$\mathbf{p < 0.001}$	$\mathbf{p = 0.0017}$
Axe price	$F = 2.75$	$Z = -1.52$
	$p = 0.12$	$p = 0.15$
Mid-sole material	$\mathbf{F = 10.54}$	$\mathbf{Z = 2.72}$
	$\mathbf{p = 0.0033}$	$\mathbf{p = 0.0065}$

Inherently, a product's quality rests not on the name (i.e. brand) or price, but rather on the physical attributes determining its utility to consumers. One way to interpret a product's brand is as an allegory or emblem representing a host of physical and reputational product attributes. Rather than expend cognitive resources in recalling all a product's attributes when making quality judgements, consumers may simply use brand information. Similarly, consumers may use price information to judge quality, implicitly assuming that higher quality physical attributes are reflected by a higher price. The key here is that brand and price information may be heuristically used by consumers to reduce decision-making costs associated with judging product quality. However, when better information regarding quality becomes available, consumers should account for this information, recognizing that it is not brand or price that in and of themselves determine a product's quality.

What our experiments demonstrate is that initially encountered brand and price information can influence subsequent quality judgements in a seemingly simple decision environment where better information of product quality is available. Further, consumers know that the initially encountered brand/quality and price/quality associations were presented in the absence of full information about the product's attributes. (Recall that participants in the experimental treatment saw only three product attributes in the pre-exposure phase but four attributes in the first and second learning phases.) The decision-making observed in our experiments follows what attention blocking would suggest: initially encountered brand and price information blocked participants' attention to more relevant information regarding physical attributes when judging quality. This was confirmed not only by individuals behavior during the experiment, but also by their survey responses regarding what attributes they considered most important in judging a product's quality.

Perhaps more surprisingly, our evidence suggests that participants initially received brand/quality and price/quality associations carried over to affect their judgements about different, but similarly branded and priced, products.[20] It appears that attention blocking in a consumer decision-making context may manifest itself as more fundamental "rules" that consumers follow in making quality judgement, and therefore purchasing decisions. For example, the fact that participants in the experimental treatment relied extensively on price information when judging quality implies that the pre-exposure phase in experiment 2 motivated a perception of "you get what you pay for." This perception was then adopted as a simple heuristic in making subsequent quality judgements. The fact that this heuristic was utilized in the second measure phase in which the quality of mountain boots was assessed implies that the heuristics implied by attention blocking can be very robust.

We consider this strong evidence of attention blocking in a consumer decision-making environment. While there are other potential explanations for the use of brand and price heuristics, they are unable to fully explain our results. For example, if memory load (i.e. participants relying on brand when they could not recall other attributes) or lack

[20]Relatedly, Dacin and Smith (1994) and Joiner and Loken (1998) find that consumers often generalize from a particular good to similarly branded goods. Also see Tybout (2002).

of involvement in decision-making (potentially due to the low payoffs for each correct classification) were the root cause of these heuristics, one would have expected to observe more mis-classifications by participants in the control treatment: since each group observed the same number of per-profile attributes in the first and second learning phases and faced the same payoffs, one would have expected a smaller difference in the number of errors across treatments. Moreover, results form the questionnaires do not support these alternate theories. Participants in the control treatment correctly identified the (redundant) perfect predictor as indicative of quality while participants in the experimental treatment did not. This is further evidence of attention blocking as memory load and involvement arguments for decision-making in this environment would have predicted no difference in questionnaire responses.

Alternately, one may reason that the hypothetical nature of participants' decisions (they were not actually buying the products) may have reduced the levels of involvement and biased the results. However, we suggest that our experimental design increased the level of involvement of the participants and was significantly more straightforward than real world scenarios. Specifically, participants knew in advance they were participating in a study investigating decision-making. In addition, participants faced only two alternative products with a small number of clearly demarcated attributes. Finally, participants could view the profiles for any length of time they felt was necessary. We contrast this setting with decision-making in the marketplace where consumers face a multitude of alternative products and larger menus of attributes (which are often presented in a manner making comparisons difficult). Since consumers often employ decision heuristics to save time and cognitive effort, any experimentally induced increase in cognitive attention will decrease the likelihood of blocking. Thus, we suggest that the nature of the experiment only served to reduce the blocking phenomenon, making our findings potentially more robust than suggested by the analysis.

Psychological Explanations

Several potential explanations exist for the blocking we observe in our experiments.

Previous research has demonstrated that individuals dislike holding competing hypothesis (Mynatt et al., 1993). Thus, when participants in our experiments are confronted with confounding measures, they have difficulty considering the contradictory brand and physical attribute information in assessing quality. The pre-exposures encountered in our experimental treatments are quickly used by participants to eliminate one hypothesis, blocking the physical atribute/quality association from individuals' decision processes in judging quality. Relatedly, individuals prefer cognitive consistency (Aronson, 1994, 1992). Thus, pre-exposure to brand/quality and price/quality associations provides participants with a means of rationalizing away the conflicting information encountered in confounding measures.

Alternately, there is ample evidence that individuals use too little or too much information in assessing causal relationships (Shaklee and Fischhoff, 1982; Tversky and Kahneman, 1974, 1982a). In our experimental treatments, participants may simply have let the frequency of information presented in product profiles guide their quality assessments. Thus, participants in our experimental treatments focused disproportionately on brand and price as indicative of quality, thereby blocking the use of physical attribute information in quality judgements.

Finally, recall that participants were guided and motivated to learn attribute/quality associations at the experiments' outset. Thus, following VanOsselaer and Janiszewski (2001), participants used forward-looking, adaptive learning processes and the relationships between various attributes and quality were learned interdependently (Kruschke and Johansen, 1999). This leads to attention blocking as initially encountered attribute/quality information creates associations in participants' minds. Subsequently encountered attributes (i.e. the redundant perfect predictor) are therefore blocked in the learning process.

In the end, these explanations support our results: pre-exposure to information served to guide subsequent decision-making and learning in a profound manner. This demonstrates how robust attention blocking is in consumers' perceptions of quality. Our results imply that the seemingly heuristic based decision-making observed in many purchasing decisions may be largely driven by initially learned cue/outcome associations which block the degree to which attention is paid to other (potentially more appropriate) cue/outcome relationships.

Implications for Marketing and Advertising

Our results have strong implications for our understanding of consumer decision-making and marketing strategies. In particular, the presence of attention blocking emphasizes the importance of the initial messages producers send to consumers about their products. In a competitive output market, these initial quality messages may create constructs around which consumers organize their judgements about a product's innate quality. These messages may provide producers with a competitive edge that would not exist in the absence of blocking. Thus, novel brands may have additional advantages in markets (Schmalensee, 1982), advantages created by their ability to block consumers attention to the physical attribute/quality relationships embedded in competing products.

Further, attention blocking provides an alternative explanation for the types of advertising observed, an explanation based on the bounded nature of human cognition rather than on information transmission (Grossman and Shapiro, 1984), signalling hypotheses (Milgrom and Roberts, 1986; Nelson, 1970), or "prestige effects" (Ackerberg, 2002). The fact that blocking may transcend the initially encountered product and extend to judgements about similarly branded and priced products implies that producers can leverage their initial quality messages to consumers across new markets and products. Indeed Sullivan (38) finds empirical support for this idea: Early brand extensions had lower survival probabilities than new-name products and late-entering brand extensions. Consistent with our results, new products are better able to induce attention blocking while late extensions are better able to leverage attention blocking created by existing, similarly branded product. This further emphasizes the importance of strategic advertising and attention blocking in firms' marketing strategies.

6 Conclusion

In this paper, we experimentally demonstrated how attention blocking can manifest itself in consumer choice contexts. In addition to replicating and demonstrating the robustness of previous work in brand-based attention blocking (VanOsselaer and Alba, 2000), we illustrate how price/quality associations can block consumers' attention to quality-determining physical attributes.

Interestingly, our results demonstrate that there may be longer-run effects from attention blocking. In our experiments, participants who were pre-exposed to brand/quality and price/quality associations regarding one product paid less attention to other attribute/quality associations not only for that product, but for other related products as well. This implies that the attention blocking phenomenon may extend to multi-product quality judgements. Supporting this hypothesis, exit questionnaires indicate a strong relationship between pre-exposure to brand/quality and price/quality associations and a failure to discern other attribute/quality relationships.

These results may have implications for understanding consumer decision-making and the marketing strategies utilized by firms. Specifically, firms may seek to exploit attention blocking in new markets where consumers initially know little of a product's attribute/quality relationships.

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