The Affective Consequences of Alpha-Numeric Branding

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Numerical stimuli have affective consequences for marketing actions. Study 1 finds that people prefer numbers that are the sums of common addition problems (sum-numbers) and the products of common multiplication problems (product-numbers). Study 2 demonstrates that alpha-numeric brand names are liked better when they are appended with a product-number (e.g., Resorcinol 25) than when they are appended with a non-sum, non-product-number (e.g., Resorcinol 29) or no number at all (e.g., Resorcinol). Study 3 directly manipulates the accessibility number facts (e.g., 2 + 6 = 8, 3 x 4 = 12) to influence liking of sum-numbers (e.g., 8) or product-numbers (e.g., 12) in these facts. Study 4 shows that including operands in print advertisements can increase liking for alpha-numeric brands that contain the products of the operands.

Special Session Summary
Metacognitive Experiences in Number Processing
Keri Kettle, University of Alberta, Canada

SESSION OVERVIEW

Numbers are central in many decisions: consumers evaluate quantitative product attributes (Payne, Bettman, & Johnson, 1993), investors examine financial data (Slovic, 2001), and brands often include numeric values (Pavia & Costa, 1993). The objective of this symposium is to challenge the prevailing assumption that number processing is inherently cognitive. Metacognitive experiences are shown to influence people's evaluations of, and preference for, alpha-numeric brands (Paper 1) and risky gambles (Paper 2), and subjective confidence in the evaluation of precise numeric attributes (Paper 3).

Although research suggests that metacognitive experiences in information processing affect evaluations and preference in a wide range of domains (e.g., Janiszewski & Meyvis 2003; Schwarz 2004), it has been assumed that number processing is exclusively deliberative and not affected by metacognitions. The research covered in this symposium suggests that, in fact, some numbers are more fluent than others. The characteristics of particular numbers generate more or less favorable metacognitive experiences that, in turn, affect judgments and choices.

Janiszewski and King (Paper #1) show that people prefer numbers that are the sums of common addition problems (sum-numbers) and the products of common multiplication problems (product-numbers), and that this preference influences liking of alpha-numeric brand names (e.g., Resorcinol 25). The second paper, by Kettle and Häubl, demonstrates that people prefer numbers that are products of 25 and 10 (e.g., 50%, $125). People rate risky prospects comprised of those numbers as more attractive, and choose those prospects over similar prospects comprised of non-fluent numbers. Critically, each paper shows that consumers who indicate that they like a particular fluent number or gamble respond more quickly, which supports the hypothesis that processing fluency may drive this preference. The third paper, Manoj Thomas et al., suggests that precision or roundness of prices affect magnitude judgments because precise prices are less fluent than round prices. When asked to categorize products according to price, people were less confident in their response when the offer price had no zeroes (precise number) than when it had two zeroes (round number).

Aparna Labroo (University of Chicago), the discussant, will provide her own insights, and address directions for future research. Taken together, the research presented in this symposium provides additional insight into how consumers process information and form preferences, and offers the exciting potential for marketers to build more appealing numeric brand names and quantitative attributes. This research offers the exciting potential to enhance consumer decision-making in personal and business finances, budgeting and mental accounting, and product evaluation and choice.

EXTENDED ABSTRACTS

"The Affective Consequences of Alpha-Numeric Branding"
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The selection of a specific number (henceforth brand number) to be part of a brand name (henceforth alpha-numeric brand name) does not appear to be guided by a single strategy (Boyd 1985; Pavia and Costa 1993). Instead, it appears that brand numbers are selected for a variety of reasons (Boyd 1985; Pavia and Costa 1993; Robertson 1989). For example, a brand number may be phonetically consistent with other parts of the brand name (e.g., Core 2 Duo), semantically consistent with the desired brand image (e.g., 5th Avenue), semantically consistent with the product function (e.g., XBOX 360, 2000 Flushes), or highly associable (e.g., 0, 1, 7, 13, and 100) (Battig and Spera 1962; Boyd 1985; Cochran and Wickens 1963; Pavia and Costa 1993). We contend there may be an additional reason for managers to use certain brand numbers. People may like some numbers more than others (Heywood 1972; Schimmel 1993; Simon 1972). If marketers can take advantage of this fact, without violating guidelines that typically guide brand number selection, then they should be able to build more appealing alpha-numeric brand names.

We posit that one source of liking for a number is the fluency experienced when processing the number. In study 1, we have people view a randomly ordered presentation of the numbers 1 through 100 and indicate, as quickly as they can, whether they like, dislike, or are indifferent about each number. We find that people like the sum-numbers two through 20 (e.g., 1 + 1=2 through 10 + 10=20) and product-numbers (e.g., 2 x 2=4 through 10 x 10=100) more than the other numbers. In addition, when a person likes a number, the person responds to the number more quickly. This implies that fluent processing may be responsible for the number liking.

In study 2, we illustrate the importance of this finding. A choice-based-conjoint task is used to show that people prefer a brand named using a product number (e.g., Resorcinol 25) more than a brand named using a non-product number (e.g., Resorcinol 29) or no number at all (e.g., Resorcinol). Comparing the size of the brand name trade-off to the average size of a price tradeoff suggests the favorable product-number adds $ 0.43 of value to the brand name.

Study 3 is used to investigate the representation of numbers. Ashcraft (1982; 1987) proposes that declarative knowledge about arithmetic problems (e.g., 3 x 4=__) and correct responses to these problems (e.g., 12) are represented in a semantic network. The strength of association between these nodes increases with practice so that the response node (e.g., 12) is more active after encountering an arithmetic problem involving that response node (e.g., 6 + 6, 3 x 4). Campbell and Graham (1985) extend Ashcraft's ideas by arguing that the representation of arithmetic facts also includes associations from operands (e.g., 3, 4) to results (e.g., 12). The implication is that commonly practiced problems (e.g., 6 + 6=__, 3 X 4=__) are more likely to prime a product-number than uncommon problems (e.g., 67-55=__) or unrelated problems (e.g., 77 + 4). Study 3 illustrates this priming effect using addition and multiplication problems. Common problems made sum-numbers and product-numbers more accessible and more liked.

Study 4 illustrates how operand priming can operate in an advertising context. Ads are created for a product-number (e.g., 12) or a non-product number (e.g., 29). These ads include operands that can prime the product-number or not (e.g., 6, 2) (see below). Participants are asked to view one of the four ads and then report their attitude toward the ad, attitude toward the brand, and purchase intention. The ad liking, brand liking, and purchase intention measures were combined to create an affect toward the brand measure (Cronbach's ?=.85). The type of number by priming interaction was significant ($F(1, 181)=3.93$, $p<.05$). Operand priming led to more positive affect toward the brand when the product-number was in the brand name (MNo prime=5.70, MPrime=6.30; $F(1, 181)=6.15$, $p<.01$), but not when a non-product/non-sum number was in the brand name (MNo prime=5.19, MPrime=5.12; $F(1, 181)=.10$, $p>.05$). Two other ad replicates showed similar results.

"Numeric Fluency and Preference"

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Consumers often evaluate numbers in a decision context; they choose among products described by quantitative attributes (Payne et al., 1993), set budgets (Ülkümen et al., 2008), make investment decisions (Slovic, 2001), and decide how much to tip a waiter (Lynn et al., 1993). Although research has primarily examined the deliberate, cognitive evaluation of quantitative information (e.g., Dehaene, 1997), a growing body of literature suggests that people actually like some numbers more than others. For example, people spontaneously round off estimates of time and money (Kandel et al., 2001; Schindler & Kirby, 1997), and both stock prices and IPO offers disproportionately congregate at prices ending in "0.00", ".00", ".50" and ".25" (Huttenlocher et al., 1990; Sonneman, 2005). We propose that these numeric biases can be explained by the fluency experienced when processing the number.

Our key premise is that multiples of twenty-five and powers of ten (e.g., 10, 75, 125, 200), commonly referred to as "round numbers", are more fluent than sharp numbers of similar magnitude. According to the processing fluency model, exposure to a stimulus creates a feature- and/or meaning-based representation of that stimulus in memory that, in turn, enhances the ease with which one processes the stimulus in subsequent exposures (Lee & Labroo, 2004). Fluency is enhanced by incidental exposure and increases monotonically with repeated exposure (Janiszewski & Meyvis, 2001; Zajonc, 1968). Prior research has shown that round numbers are used in written and spoken language with greater frequency than sharp numbers (Dehaene & Mehler, 1992). We posit that the repeated use of, and exposure to, round numbers enhances their processing fluency (Lee & Labroo, 2004; Schwarz, 2004; Zajonc, 1968).

We examined numeric fluency in the context of choices between risky prospects (Kahneman & Tversky, 1979). Each prospect is described in terms of two numeric properties–a monetary payoff and the probability of attaining that payoff (as opposed to receiving nothing)–that jointly determine the expected value. Because round numbers are also easier to use in arithmetic, this context enables us to disentangle our processing fluency account from an alternative, cognitive account of the preference: effort minimization (Payne & Bettman, 2001). An effort minimization account suggests that, because people have limited cognitive capacity, they may strategically choose to exert the minimal amount of cognitive effort required to attain a satisfactory outcome. By this account, a preference for alternatives involving round numbers would reflect one's desire to avoid difficult calculations or comparisons.

To disentangle the metacognitive (fluency) and cognitive (effort minimization) explanations, we independently manipulated whether a prospect was comprised of round or sharp numbers, and the number of steps necessary to calculate the expected value. To illustrate, imagine the following choice between a prospect comprised of round numbers (Prospect A: 50% chance of $400) and a prospect comprised of sharp numbers (Prospect B: 53% chance of $378). In addition, we created prospects for which participants needed to make three additional calculations (two products and a sum) in order to estimate the expected value (e.g., Prospect B: 53% chance of 0.43 x $376 + 0.56 x $387). We refer to such prospects as being of high arithmetic complexity. The fluency and effort accounts predict contrasting effects of arithmetic complexity on preference and decision time (the time required to process the information, form a preference, and indicate that preference). First, an effort minimization account predicts that increasing the arithmetic complexity of a prospect should decrease preference for that prospect. Second, the effort account suggests that increasing the arithmetic complexity of a prospect should not lead to longer decision times (beyond an incremental increase to process the additional stimuli). That is, if the preference for round numbers reflects the desire to minimize cognitive effort, then people should not exert additional effort to estimate the expected value of a more complex prospect.

In study 1, each participant made 8 choices between pairs of prospects. Choice sets were designed such that the two prospects had nearly identical expected values, with any small discrepancies favoring the prospect comprised of sharp numbers. As predicted, participants chose the prospect comprised of round numbers 63% of the time. Participants took twice as much time to decide between two complex prospects (19.6 seconds) as they did to choose between two simple prospects (8.9 seconds), but increasing the arithmetic complexity of a prospect did not decrease preference for that prospect. Critically, decision times were significantly shorter when the fluent prospect was chosen irrespective of whether participants were choosing between two simple prospects, ($M_{roundChosen}$=8.0 seconds, $M_{sharpChosen}$=11.0 seconds), one simple and one complex prospect ($M_{roundChosen}$=14.7 seconds, $M_{sharpChosen}$=16.1 seconds), or two complex prospects ($M_{roundChosen}$=18.4 seconds, $M_{sharpChosen}$=21.9 seconds), which demonstrates that processing fluency drives the preference for round numbers. In study 2, we show that these results generalize to all sharp numbers by randomly generating the sharp numbers for each choice. The key results of study 1 were replicated. In study 3, prospects consisted either of all sharp numbers or of one sharp and one round number. The results demonstrate that the presence of even a single round number is sufficient to enhance preference by approximately 10 percentage points.

In study 4, participants were provided with the expected value of each prospect, in addition to its payoff and probability. They were first asked to choose between the same prospect pairs as in study 1. Then, they were presented with prospects one at a time, asked their willingness to pay for the prospect, and then asked to rate the attractiveness of the prospect. Numeric fluency did not affect willingness to pay. However, people rated round prospects as more attractive than sharp prospects, and they took less time to rate the sharp prospects, even though they were provided with the expected value of, and had already processed, each prospect. This pattern of results provides compelling evidence for our processing fluency account.

"The Precision Effect in Numbers: How Processing Fluency of Numbers Influence Response Confidence"

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Previous research has shown that precision or roundness of a price can influence magnitude judgments. For example, Janiszewski and Uy (2008) have shown that participants are willing to pay more when sellers ask for a precise list price (e.g., 799,800 or 800,200) instead of a round price (e.g., 800,000). Thomas, Kadiyali and

Simon (forthcoming) suggest that this precision effect occurs because precision or roundedness influences the magnitude perceptions of prices. They suggest that precise prices are judged to be smaller than round prices of comparable magnitudes.

This research further explores the mechanisms that underlie the precision effect. Specifically, we hypothesize that precision or roundness of prices affect magnitude judgments because precise prices are less fluent than round prices. The disfluency evoked by precise prices induces a feeling of uncertainty. This occurs because people consider the subjective experience as a metacognitive cue to assess the effectiveness of the mental processes. They try to reduce this feeling of uncertainty by heuristically attributing it to the most salient cause. The heuristic beliefs used for the attribution could be based on practices observed in the market place (e.g., sellers are more likely to round-up than to round-down prices) or the distribution of precise and round numbers in daily written and oral communication (e.g., large numbers such as the price of a car are rounded, while small numbers such as the price of gasoline are precise). The conceptual model is schematically summarized below:

Precision→Disfluency→Lower Confidence→Heuristic Attribution→Magnitude Judgment

Fundamental to this conceptualization is the premise that precision-induced processing fluency influences response confidence. Two studies that test this hypothesis are presented in this conference.

The first study shows that precision can reduce response confidence. The second study shows that direct manipulations of response confidence can moderate the effect of precision on magnitude judgments. In study 1, participants were asked to categorize various prices as high or low relative to an internal standard. They were shown a stapler and asked to guess the regular price of this stapler at a store. For each participant, the computer generated 12 offer prices, of which 6 were above the articulated internal standard and 6 were below the articulated internal standard. Participants' task was to categorize the offer prices as "HIGH" or "LOW" by clicking on one of the two response buttons. For each categorization response, we measured their confidence in the response. Participants were less confident in their response when the three digit offer price had no zeroes (78% confidence on a 50% to 100% scale), more confident when the prices had two zeroes (80% confidence), and most confident when the offer price had two zeroes (84% confidence, $p<.01$). Similar pattern manifested for response time. In study 2 we manipulated response-confidence and price-precision in a magnitude judgment task using between-subjects design. Participants were shown six prices of a house listed for sale. For each round price (e.g., 365000), we created a precise price that was comparable in magnitude (e.g., 365,583). It was observed that nominally larger precise prices were incorrectly judged to be smaller than round prices. However, precision affected magnitude judgments only when participants were uncertain about their ability to make magnitude judgments. Together, these results support the hypothesis that precision-induced processing fluency influences response confidence.

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