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ANNOUNCEMENT

1 Call for papers for a special issue in *Journal of Consumer Psychology*: "Emotion, self, and identity: Implications for and consequences of consumer behavior"
Durairaj (Mahesh) Maheswaran and Daphna Oyserman

RESEARCH REVIEW

2 Pleasure principles: A review of research on hedonic consumption
Joseph W. Alba and Elanor F. Williams

RESEARCH ARTICLES

19 When a product takes on characteristics of the person who created it: Sometimes it sounds sweeter
Valerie S. Folkes and Shashi Matta

36 Does brand spelling influence memory? The case of auditorily presented brand names
David Luna, Marina Carnevale and Dawn Lerman

49 Knowledge does not necessarily make the heart grow fonder: The moderating role of knowledge on accessibility experiences
Jayati Sinha and Dhananjay Nayankuppam

61 Self-regulatory strength amplification through selective information processing
Remi Trudel and Kylie B. Murray

74 Same destination, different paths: When and how does observing others' choices and reasoning alter confidence in our own choices?
Cait Poynor Lambertson, Rebecca Walker Naylor and Kelly L. Haws

90 The antecedents of anticipatory purchase: Reconciling the two routes to optimism
Elaine Chan, Jaldeep Sengupta and Anirban Mukhopadhyay

RESEARCH REPORTS

106 Sadness and consumption
Nitiika Garg and Jennifer S. Lerner

114 The effect of evolving resource synergy beliefs on the intentions-behavior discrepancy in ethical consumption
Reetika Gupta and Sankar Sen

122 Recycling gone bad: When the option to recycle increases resource consumption
Jesse R. Catlin and Yitong Wang

128 Positive fantasies dampen charitable giving when many resources are demanded
Heather Barry Kappes, Eesha Sharma and Gabriele Oettingen

RESEARCH DIALOGUE

136 Research dialogue introduction
Joseph R. Priester and Richard E. Petty

137 Comparison selection: An approach to the study of consumer judgment and choice
Itamar Simonson, James R. Bettman, Thomas Kramer and John W. Payne

150 Selective versus comparative processing
Frank R. Kardes

154 Choice theories: What are they good for?
Eric J. Johnson

158 The influence of context and fluency
Hal R. Arkes

161 Directions for judgment and decision making research based on comparison selection: Reply to Arkes, Johnson, and Kardes
Itamar Simonson, James R. Bettman, Thomas Kramer and John W. Payne


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Research Article

Does brand spelling influence memory? The case of auditorily presented brand names

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Abstract

We present a framework based on psycholinguistic theory to explain how individuals spell auditorily-presented information. We use the framework to predict and test how spelling-related characteristics of brand names and factors related to the context in which brand names are presented (e.g., spelling primes) will make the brands more or less memorable. Further, we reveal the process through which spelling-related linguistic variables influence brand recall: the dual-code (both written and auditory) that results from spelling a brand correctly leads to greater ability to later recall the brand. Our framework identifies two routes that interact when individuals have to transcribe a brand: the lexical (top-down) route and the sublexical (bottom-up) route.

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Introduction

The modern marketplace often requires that consumers use auditorily presented information in a visual manner. Consumers looking to buy a brand they heard advertised on the radio, for example, must convert the sound of the name into the name's visual representation in order to include it on their shopping list or to recognize the brand on the shelf. Consumers interested in searching online for a brand they learned about via word of mouth would have to do the same. Essentially, in both of these cases, consumers would have to discern how to spell the name based on the sounds that they previously heard. While this task is relatively easy for familiar brands, it can be more difficult for unfamiliar brands, especially if the sounds of the name can be plausibly represented by multiple spellings. The lack of a one-to-one relationship between sound and spelling is a feature of English and other so-called "deep languages"

(Cuetos, 1993). It is this feature that results in a single pronunciation of, for example, the English words "time" and "thyme".

Consumer researchers have devoted a great deal of energy to the study of the linguistic factors that drive a brand name's memorability and evaluations or preference (Lerman & Garbarino, 2002; Lowrey & Shrum, 2007; Meyers-Levy, 1989). However, the literature has not yet investigated the impact of brand name spelling on memory. We argue that understanding how consumers come to spell a brand name is important because proper spelling of the name is required for consumers to later find the brand online or in a store, particularly if they have never before seen the spelling. For instance, in an online context, consumers may guess at the spelling of a brand and type it in a search engine such as Google. If they do not guess correctly, they will be faced with the "Did you mean...?" search response. Then, they may have to choose the right spelling from among several options. In a traditional store context, consumers may have to remember the sound of a new brand they heard about, even if they do not remember its correct spelling, in order to ask a store clerk where to find the brand. This paper considers both scenarios by studying

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how spelling processes influence the delayed guessing of a brand name (as in the search engine example) and brand sound recall (as in the traditional store example).

We contribute to the psycholinguistic literature on spelling processes by showing how spelling a word (or nonword) as intended by a speaker can lead to greater memory for that word. To our knowledge, a theoretical account of this process does not yet exist in the psycholinguistic literature. We also uncover a previously unexplored variable that influences spelling accuracy, phonetic symbolism. Furthermore, we contribute to consumer psychology in various ways. We present an easy-to-apply framework to study how spelling affects the processing of new brand names. This framework describes two different routes in the spelling process and can be used to isolate linguistic and contextual variables that influence consumer responses to auditorily presented brands. We show that a brand's spelling influences its memorability, we identify the process through which this occurs, and we find theory-based moderators of that process. Additionally, our research is the first to show the effect of phonetic symbolism on brand memory (previous research had shown its effect on brand judgments and preference, but not memory; Lowrey, Shrum, & Dubitsky, 2003). The paper begins with a review of the processes involved in spelling a word, laying out our conceptual framework.

Auditory processing and spelling

Let us suppose that consumers hear about a brand from a friend and now would like to write it on a shopping list or in an internet browser. In that case, they would have to rely on their knowledge of how sounds and letters correspond to each other. Relationships between phonemes (the mental representations of sounds) and their corresponding graphemes (the letters or group of letters that visually represent phonemes) are governed by phoneme-to-grapheme, or sound-to-spelling, correspondence rules. Because the acquisition of the sound-to-spelling relationship is one of the fundamental steps when learning to write a language (Ziegler, Stone, & Jacobs, 1997), one might think that spelling should be a relatively easy task and indeed, it can be. So, for example, upon hearing an ad for the laundry detergent *Purex* a literate English speaker would know to spell it as *p-u-r-e-x*. A large part of the reason why English speakers would know how to spell *Purex* is that the letters *p-u-r-e-x* are the only letters that would produce such a sound in English, following the conventions for possible spellings in that language (Ziegler et al., 1997).

However, if the ad was for a different laundry detergent, *Gain*, the spelling task could become a little more complicated. In this case, the name could conceivably be spelled *g-a-i-n* or *g-a-n-e*, as both of these spellings correspond to the same sound. Although both are possible, the consumer might be more likely to spell the brand name *g-a-i-n* because this spelling matches that of a commonly used word. In other cases, a sound might correspond to more than two letter strings. In an even more challenging example, a brand could be named *Kaff*. In that case, the phoneme /_@f/ could correspond to the graphemes

aff, *alf*, *aph*, *augh*, as in *staff*, *half*, *graph* and *laugh*. Upon hearing such a brand, individuals would rely on their implicit linguistic knowledge in an attempt to spell the brand correctly. The resulting process may not be as straightforward as with *Purex*, or even *Gain*. The psycholinguistics literature has distinguished between consistent spelling patterns (as in *Purex*) and inconsistent patterns (as in *Gain* or *Kaff*). Such distinction is important because it affects the process of spelling a sound. The next section describes this distinction in detail.

Spelling consistency

The lack of a one-to-one relationship between phonemes and graphemes makes spelling in English particularly complex. The sound-to-spelling correspondence of a word determines that word's level of consistency. Specifically, if a phoneme can be mapped to one and only one grapheme, then that language is considered to have a consistent mapping; otherwise, it has an inconsistent mapping. Inconsistent mappings appear in 72% of all English monosyllabic words (Ziegler et al., 1997). Conversely, some phonemes (e.g., /_@g/ as in *tag*) are represented by only one grapheme (*ag*), so they have *consistent* mappings, which are used in different words (e.g., *tag*, *rag*). Consistency effects have been observed in faster and more accurate responses for consistent than for inconsistent words in a number of different tasks, such as reading and spelling performance (Coltheart & Leahy, 1992; Content, 1991; Ziegler et al., 1997) and writing to dictation (Bonin, Fayol, & Peereman, 1998; Bonin, Peereman, & Fayol, 2001).

The number of possible sound-to-spelling mappings determines the process by which sounds are more reliably spelled. There are two possible processes to spelling a sound. Consider, for example, the word "branch". Hearers may use one of two possible routes for transcribing the word's sound into graphemes. They could retrieve the written form in its entirety from their long-term memory (the *lexical* route) or they could translate the individual phonemes (i.e., /br@nC/) into their corresponding graphemes (i.e., /b/ to "b," /r/ to "r," /@/ to "a," /n/ to "n," and /C/ to "ch;" the *sublexical* route). In languages such as Italian, where consistent sound-to-spelling correspondences tend to be the norm, the sublexical route would most often lead to the correct output because the individual phonemes are almost always spelled in the same way. However, the nature of English, a language with abundant inconsistencies, would prevent this method from leading to the right spelling in most cases (Campbell, 1983; Folk, Rapp, & Goldrick, 2002; Houghton & Zorzi, 2003). We now describe the two routes.

A dual-route model to spelling

Lexical route

Through the lexical (or direct) route, a top-down process occurs as individuals access the spelling of a word by retrieving its lexical representation from long term memory (Ellis, 1982). That is, individuals access the spelling of the target word by referring to a representation in memory of that word

or another word that contains the same pronunciation pattern. These lexical representations may be accessed both phonetically (i.e., from the sound of a familiar word) and semantically (i.e., from its meaning; Barry, 1994; Houghton & Zorzi, 2003). This process seems to occur in an automatic fashion (Rapcsak, Henry, Teague, Carnahan, & Beeson, 2007). The lexical route typically applies to familiar words (Houghton & Zorzi, 2003).

Sublexical route

When a hearer encounters an unfamiliar word or a nonword, the lexical route will not reliably produce the intended spelling because, by definition, such stimuli lack an exact lexical mental representation. In these cases, the sublexical (or indirect) route is used; that is, each phoneme is individually transcribed into its corresponding grapheme, in accordance with a bottom-up process. It follows that, when the sublexical route is used, the consistency of the sound-to-spelling relationships will have a role in enhancing (or impeding) the conversion of phonemes to graphemes. The consistency of the sound-to-spelling mapping may facilitate the spelling task by decreasing the number of possible solutions.

The sublexical route works well for sound-to-spelling conversions of nonwords as well as novel words that strictly follow language spelling rules and sound-to-spelling regularities. In the case of novel words that are inconsistent, however, the sublexical route could systematically lead to misspelling the word. As a result, if the nonword contains an inconsistent spelling pattern, individuals may attempt to use the lexical route to guess at its spelling (Houghton & Zorzi, 2003), with varying degrees of success.

Spelling and branding

Facilitating brand spelling

Many brands are nonwords (they do not correspond to previously existing words; e.g., Bose). A considerable stream of research has shown that the spelling of a nonword may be enhanced by the spelling of a word heard immediately before that contains the same spelling pattern as the target nonword. For example, in lexical priming a real word that sounds and is spelled like the nonword is presented before the nonword (e.g., “rose” before Bose). Thus, individuals can relate the nonword (Bose) to one for which they already have a phonological representation (rose). In such cases, the lexical and sublexical routes interact to optimize the final choice (Campbell, 1983; Cuetos, 1993; Seymour & Dargie, 1990). That is, the potential competition among different graphemes activated at the sublexical level (Boze, Bose, Boes,...) is solved by the graphemes activated at the lexical level (“ose”), through the semantic/phonological representation of the priming word (rose).

In spelling, the lexical and sublexical routes routinely interact, as they iteratively communicate until one grapheme is selected to represent the target phoneme (Coltheart, Rastle, Perry, Langdon, & Ziegler, 2001; Houghton & Zorzi, 2003; Rapcsak et al., 2007; Rapp, Epstein, & Tainturier, 2002).

While both the lexical and the sublexical routes allow for the activation of different potential graphemes, the lexical route tends to prevail by narrowing the choice to those graphemes that make more sense at a lexical level (i.e., mimicking other words that contain them as in the Bose example).

In a consumer research context, when auditorily presenting a novel nonword brand name, slogans or jingles could be employed to phonologically prime, and thus facilitate, the correct spelling of the brand name via the lexical route. For instance, the slogan could include a known word that uses the same intended spelling as the novel brand name (e.g., a rhyme with identical spelling). This would help spelling when the sublexical route is hampered—for instance, when the brands include inconsistent sound-to-spelling mappings (Experiments 1–2) and/or those mappings are used infrequently in the real world (Experiment 2). When the sublexical route can be reliably used by consumers (e.g., when the brand name consists of consistent mappings), they are able to more easily spell the brand name as intended, so the phonological prime should not impact spelling.

H1. When the sublexical route is hampered, priming a brand’s intended spelling will lead to consumers’ guessing the intended spelling correctly.

Priming of nonword spellings can be implemented through prior presentation of rhyming words, which provides a clear suggestion of the pronunciation pattern to be followed (Barry & Seymour, 1988; Burden, 1989; Campbell, 1983). This finding has been shown to hold even under more indirect priming conditions, where the nonword is primed by a word that is only semantically associated with a potential prime (e.g., “doctor” priming “lurse” because of its similarity with “nurse”). Thus, another possible way to facilitate the correct spelling of the target brand could be the inclusion of a semantic cue in addition to a phonetic one (Dixon & Kaminska, 1994; Seymour & Dargie, 1990). In other words, the context in which the brand is embedded could carry semantic associations, instead of or in addition to the phonetic prime. We conceptualize semantic effects with the notion of semantic congruity between the target brand and its verbal context.

Semantic cues can activate the intended spelling of the brand via the lexical route, by narrowing down the plausible set of spellings for the brand’s sounds (Seymour & Dargie, 1990). Therefore, semantic cues will benefit brands with inconsistent spelling mappings, where the sublexical route to spelling is hampered. For consistent mappings, the spelling process can be resolved via the sublexical route unambiguously to begin with, so there will not be a need to use the lexical route.

H2. When the sublexical route is hampered, semantic context cues will lead to consumers’ guessing the intended spelling correctly.

Spelling and brand memory

Memorability is one of the most important characteristics of a brand name (Keller, 1993; Schmitt, Pan, & Tavassoli, 1994;

Sen, 1999). For example, the more memorable a brand name is, the higher are its chances of being included into consumers' consideration sets (Hauser & Wernerfelt, 1990; Noel, 2006). We hypothesize that, when exposure to the brand is exclusively auditory, correctly guessing the intended spelling of a brand will increase memory for the brand.

To our knowledge, the psycholinguistic literature on spelling has not yet investigated this process. Instead, that literature has tended to focus on the exclusive analysis of tasks performed during or immediately after presentation of verbal stimuli; for example, dictation tasks (to study sound-to-spelling processes; Seymour & Dargie, 1990) or word naming and lexical decision tasks (for spelling-to-sound processes; Baron & Strawson, 1976; Stone, Vanhoy, & Van Orden, 1997). As a result, limited research has been conducted on spelling effects on memory. One study, for instance, investigated the role of spelling consistency on short term memory (not long-term memory) via a serial recall task which was administered immediately after presentation of the target list of words (Collay, Fayol, & Bonin, 2004). Given this timing, the recall task is more akin to a dictation task (slightly delayed for the words in the beginning of the list) than a memory task.

A different stream of research, based on reading research and educational psychology, focuses on the factors that influence whether respondents, usually beginning readers, will remember new words' spellings (Burt & Blackwell, 2008). Respondents are typically trained on how to pronounce certain words, for example by showing their written form (Bosman, van Hell, & Verhoeven, 2006). Later, sometimes after a delay, they must write the words to dictation. Because the test involves the experimenter reading the stimuli aloud, this type of study only tests the previously learned spelling, using the auditorily presented word as a cue; it does not test for memory of the word itself, as in the present research. Further, such studies do not focus on auditorily presented words; rather, they present words graphically in the training phase.

Our research bridges the gap between the spelling and memory literatures. We examine how the successful spelling of a nonword, in our case a new brand name, leads to enhanced memory for that nonword, not just the ability to spell the word next time it is presented to the individual. To our knowledge, no other study has investigated this process empirically or theoretically. We propose an explanation for this effect: a dual-coding process, by which successful spelling generates a visual image of the spelling, which is encoded in conjunction with the sound of the brand, and facilitates later retrieval.

Hence, we theorize that recall of a brand name may be affected by the ability of consumers to correctly spell the name. If an individual encodes an auditorily presented brand in both its auditory and written representation, the resulting dual-code representation should lead to superior long-term memory (Martin, 1980; Penney, 1989). If individuals can guess the intended spelling of the brand, and are given feedback confirming their correct choice, they will be more likely to store the written representation of the brand in long term memory. This process should be manifested empirically in that correctly spelling a brand name should mediate the effect of linguistic

variables on memory. In practical terms, consumers may hear about a brand and immediately search for it on their smartphones. If they successfully spell the brand and find its website, the process itself would provide positive feedback, increasing the likelihood of brand storage in memory. Later, when asked to recall the brand, they could use either the visual or the sound memory traces to retrieve the name.

We are interested in studying two memory-based measures: brand sound recall, and delayed guessing of the spelling. Whether consumers recall the sound (pronunciation) of the brand is important because this variable simulates the knowledge necessary to ask a store clerk for information about a brand consumers have heard about. Our hypothesized process should also be evident in delayed "guessing" tasks in which respondents are presented with different possible spellings of an auditorily presented inconsistent brand name. This delayed guessing task would be akin to choosing one of the options in Google's "Did you mean...?" query after having misspelled a word in an initial search.

In conclusion, we hypothesize that when the sublexical route is hampered, as in inconsistent brands, spelling primes and semantic context will influence brand recall via the mediating effect of correctly guessing the intended spelling of the brands. The mediation effect is not expected for consistent brands, for which there is no spelling ambiguity and the sublexical route is reliable.

H3. When the sublexical route is hampered, priming a brand's intended spelling will enhance brand sound recall and delayed brand spelling.

H4. When the sublexical route is hampered, semantic context cues will enhance brand sound recall and delayed brand spelling.

H5. When the sublexical route is hampered, correct spelling of the brand name will mediate the effect of contextual and linguistic variables on brand sound recall and on delayed brand spelling.

Experiment 1

Experiment 1 begins to investigate the possible joint effect of the lexical and sublexical routes in spelling with respect to consumers' ability to spell and remember a brand. We conducted an experiment comparing fictitious nonword brand names that had consistent sound-to-spelling mappings to similar names that had inconsistent mappings. As described above, consistency of a brand name influences the reliability of the sublexical route. The helpfulness of the lexical route was manipulated by introducing (or not introducing) a spelling prime.

Method

The experiment had a 2 (spelling consistency: inconsistent vs. consistent) × 2 (spelling prime: prime vs. no prime) between-subjects design, implemented on an interactive software.

Procedure and measures

Eighty-eight undergraduate business students participated in the experiment for course credit. All respondents were highly

proficient English speakers at a northeastern university (scoring above four on a five-point self-administered language proficiency scale). The target stimuli were eight fictitious nonword brand names. After a short training session, each participant was exposed to eight audio clips, one for each brand name. After each audio clip, participants were offered three attempts (trials) to correctly spell the brand name using a computer keyboard. The sum of the number of trials left unused by each participant for all of the brand names was utilized to measure one of the dependent variables: guessing of the intended spelling of the brand. Thus, the scores for this measure could potentially range from zero (if respondents did not guess any of the intended spellings) to 16 (if respondents guessed the intended spelling of each of the brand names on their first try and had two unused trials for each of the eight brands).

Then, respondents completed an unrelated spelling task to assess their general spelling abilities. The task was a multiple-choice test including words like “embarrassment” and “millennium”. After that, respondents were asked to recall the brand names they had heard. Our measure of recall focused on whether respondents could remember the sound of the brand name, regardless of the spelling they used in their answers. Two independent judges blind to the hypotheses coded the accuracy of each response from zero to three, coding the variable as three if respondents remembered accurately the full sound of the brand name (e.g., “Paff” or “Paugh”), two if they remembered most of it (e.g., “Path”), one if they remembered some minor parts of it (e.g., “Pin”), or zero if they did not remember the sound of the brand name at all (e.g., “Bolt,” or blank responses). Inter-rater agreement rate was 94% and disagreements were resolved by discussion.

After the recall task, respondents in the inconsistent condition completed a delayed guessing task, in which they were presented with all the possible English spellings of the brand names and asked to guess which of the spellings was the intended one for each brand name. Although this is similar to a recognition measure, note that it is not fully equivalent: respondents had never been exposed to the visual representation of the brands, so unless they previously guessed the intended spelling correctly, in this task they are not tapping into a previously stored stimulus.

Materials

Each audio clip provided the following information: product/service featured in the ad, last words in the ad, and brand (website) name. We manipulated consistency of the brand names using the norms provided by Ziegler et al. (1997). For inconsistent brand names, we never chose the most frequent or least frequent spellings. For instance, for the brand name “Lum,” the most frequent spelling of the sound [}m] in English is “ome” (e.g., come), followed by “om,” “um,” and “umb” (Ziegler et al., 1997). The priming condition consisted of having the last word in the website ad prime or not prime the intended spelling for the nonword brand name. For example, in the consistent-priming condition, after the service featured in the website (i.e., name for a lawyer’s website), participants listened to the last words of the website ad, which would either

prime (i.e., ...remove the tag) or not prime (i.e., ...remove the paint) the brand name that immediately followed (i.e., Pag.-com). The following is a sample stimulus heard by respondents: “Name for a lawyer’s website. Remove the tag. Pag.com”. The study’s instructions explained the procedure and how the stimuli would be presented, describing what respondents were about to hear. Prior to the target stimuli, respondents went through a practice session, where they were exposed to the same experimental procedure with practice (non-experimental) brand names. This ensured that we would not encounter any problem (e.g., audio) during the main experiment.

The brand names used were all monosyllabic nonwords, to minimize potential extraneous effects from non-experimental syllables. In addition, the stimuli were non-morphemic. Morphemes are the smallest units of language with a meaning (e.g., the word “unbreakable” is made up of three morphemes, “un-”, which means negation, “break,” which means to separate into parts, and “-able”, which indicates ability). Our brand names avoid English morphemes to minimize the probability that non-experimental variables would influence the extent to which brand names are spellable and memorable. To ensure that respondents would not perceive any meaning relationship between the brands and their respective product categories, we only used brands that in a pretest were considered unrelated to their categories (scoring below the midpoint of 4 on a 1–7 scale relatedness scale, where higher scores meant higher relatedness). Lastly, although consistent and inconsistent brands are as similar as possible, the pairings involve slightly different brands because the same sound cannot be simultaneously consistent and inconsistent. This does not present a problem for testing our hypotheses because they focus on comparisons within consistency conditions. However, comparisons across consistency conditions must be made with caution.

We further examined potentially confounding differences in stimuli across consistency conditions. For this, we performed a pretest to check if the two conditions differed along the phonetic symbolism scale used by Lowrey and Shrum (2007). The results of a multivariate analysis showed that neither the full sets of names ($M_{\text{consistent}}=3.94$ vs. $M_{\text{inconsistent}}=3.77$; $F(1, 33)=1.95$; $p>.17$) nor individual brand names (interaction consistency \times brand name $F(7, 27)=1.51$; $p>.20$) differed in phonetic symbolism across conditions. A similar pretest was performed on the product categories utilized in the study, to check whether the categories were perceived differently across conditions. The results also indicated that neither the full set of categories nor any of the individual categories differed in symbolism across consistency conditions ($M_{\text{consistent}}=4.22$ vs. $M_{\text{inconsistent}}=4.40$; $F(1, 31)=2.34$; $p>.14$; interaction consistency \times product category $F(7, 25)=1.78$; $p>.14$). Table 1 includes the stimuli used in this experiment.

Results and discussion

Guessing of intended spelling

There were two significant main effects: consistent brands resulted in more accurate spelling ($M_{\text{consistent}}=13.08$ vs. $M_{\text{inconsistent}}=6.44$; $F(1, 84)=36.00$; $p<.001$), and

Table 1
Experiment 1 stimuli.

Inconsistent brands			Consistent brands		
Category	Ad sentence		Brand name	Brand name	
	No-priming condition	Priming condition		No-priming condition	Priming condition
Name for a music website.	... Thinking of the signs.	... Thinking of the staff.	Paff.com	Name for a house builder website.	Larve.com
Name for a jeans website.	... A first-class train.	... A first-class yacht.	Lacht.com	Name for a cleaner's website	Ludge.com
Name for a fruit store website.	... Stand there and smile.	... Stand there and wait.	Sait.com	Name for a turkey farm website.	Noof.com
Name for an employment agency website.	... Run out of water.	... Run out of fuel.	Nuel.com	Name for a church website.	Nube.com
Name for a winter vacations website.	... A cup of milk.	... A cup of juice.	Suice.com	Name for a lawyer's website.	Pag.com
Name for the subway's website.	... A yellow flag.	... A yellow root.	Noot.com	Name for a toothpaste website.	Saith.com
Name for a weight equipment website.	... The right name.	... The right style.	Syle.com	Name for an allergy medication website.	Suke.com
Name for a boat website.	... Beating the traffic.	... Beating the drum.	Lum.com	Name for a clothing website.	Tist.com

priming led to greater spelling accuracy ($M_{\text{prime}} = 11.02$ vs. $M_{\text{no prime}} = 7.92$; $F(1, 84) = 5.12$; $p < .05$). This suggests that both the sublexical route (manipulated by consistency) and the lexical route (manipulated by priming) were utilized in the spelling task. As expected, however, the main effects were qualified by an interaction of both routes that confirmed H1. That is, there was an interaction of consistency and priming ($F(1, 84) = 13.60$, $p < .001$). For consistent brands, scores were high regardless of priming condition ($M_{\text{no prime}} = 13.80$ vs. $M_{\text{prime}} = 12.32$; $F < 1$). However, for inconsistent brands, priming the intended spelling had a positive effect ($M_{\text{no prime}} = 3.71$ vs. $M_{\text{prime}} = 9.91$; $F(1, 84) = 20.05$; $p < .001$). This pattern of results suggests that consistent brands were relatively easy to spell, since they could only be spelled in one way. Therefore, further priming the spelling did not help respondents guess the intended spelling. Inconsistent brands, however, could be spelled in several ways, so priming the intended spelling via the ad phrase helped respondents guess correctly. It is worth noting that nine individuals had scores of 0 on this variable.

Brand sound recall

Priming had a positive main effect on recall ($M_{\text{no prime}} = 9.60$ vs. $M_{\text{prime}} = 13.30$; $F(1, 84) = 7.71$; $p < .01$). The main effect of consistency was not significant ($F < 1$). More importantly, we found a significant interaction of consistency and priming ($F(1, 84) = 5.55$, $p < .05$). The results show a similar pattern to the spelling measure, supporting H3. Thus, consistent brands displayed no effect of priming ($M_{\text{no prime}} = 10.85$ vs. $M_{\text{prime}} = 11.37$; $F < 1$). However, priming had a significant effect for inconsistent brands ($M_{\text{no prime}} = 8.71$ vs. $M_{\text{prime}} = 15.05$; $F(1, 84) = 14.69$; $p < .001$). Interestingly, within the priming condition, inconsistent brands resulted in higher memory scores than consistent brands ($M_{\text{inconsistent}} = 15.05$ vs. $M_{\text{consistent}} = 11.37$; $F(1, 84) = 4.12$; $p < .05$). This is likely a result of additional processing in the inconsistent condition. When an encoding cue is presented (the prime), the additional processing can result in enhanced recall.

Delayed guessing of intended spelling

After the recall task, respondents in the inconsistent condition performed a guessing task. For each target brand, they were presented with all the possible spellings that occur in English (Ziegler et al., 1997) and asked to click on the spelling they thought was intended in the experiment. The possible range for this variable was therefore zero to eight, since there were eight target brands. Only respondents in the inconsistent condition performed this task because, by definition, there is only one way to spell consistent brands. As expected, there was a main effect of priming ($M_{\text{no prime}} = 2.93$ vs. $M_{\text{prime}} = 4.18$; $F(1, 42) = 10.66$; $p < .01$), suggesting that our priming manipulation was successful in aiding the written encoding of the intended spelling. We also analyzed delayed guessing only for those brands that respondents initially spelled as intended. Therefore, this would be equivalent to a recognition measure. The results show the same main effect of priming as in the

full data set ($M_{\text{no prime}} = 1.14$ vs. $M_{\text{prime}} = 2.82$; $F(1, 42) = 19.60$; $p < .001$)

In the delayed guessing task, we also checked the number of times that respondents chose the most frequent spelling for each brand (Rapp et al., 2002); that is, the spelling that occurs most often in the English language for each particular sound. Note that our stimuli never used the most frequent English spelling. The results show that respondents were less likely to choose the most frequent spelling for the brand in the priming condition ($M_{\text{no prime}} = 2.36$ vs. $M_{\text{prime}} = 1.50$; $F(1, 42) = 6.40$; $p < .05$). This effect also shows that our priming manipulation worked as intended, leading respondents away from choosing the most natural answer for them.

Mediation analysis

We tested H5 by examining whether correctly guessing the intended spelling mediated the effect of a brand's linguistic characteristics on brand sound recall. Because guessing is only relevant for inconsistent brands (consistent brands do not curtail the sublexical route and therefore do not provide a substantial spelling challenge) and the delayed guessing variable is only available for inconsistent brands (it is by definition not applicable to consistent brands), we only included respondents in the inconsistent condition for this analysis. For those respondents, we conducted a simple mediation analysis of the effect of spelling prime on recall.

Following Zhao, Lynch, and Chen (2010) we performed a bootstrap test of mediation, which has been shown to perform better than the Sobel test (Preacher & Hayes, 2004, 2008; Zhao et al., 2010). In the analysis we used 5000 bootstrap resamples and a bias-corrected and accelerated 95% confidence interval as recommended (Preacher, Rucker, & Hayes, 2007). Results show that guessing of the intended spelling is a significant mediator of the spelling prime on both brand sound recall and delayed guessing, supporting H5.

We found that the mean indirect effect of spelling prime on brand sound recall from the bootstrap analysis is positive ($a \times b = 1.31$) and significant, with a 95% confidence interval excluding zero (.05 to 3.15). Hence, correct spelling mediates the effects of spelling priming on recall. To classify the type of mediation, we estimated the individual coefficients. Results show that in the indirect path, spelling prime (vs. non spelling prime) increases guessing of the intended spelling by $a = 6.19$; $b = 0.21$. Therefore, holding constant spelling prime, a unit increase in correct spelling enhances recall by 0.21. The direct effect c , instead, is not significant ($p > .10$). Hence, indirect-only mediation, or full mediation, is established. These results not only show that correct spelling mediates the effect of spelling prime on recall; they also indicate that an omitted alternative mediator of the process is unlikely (Zhao et al., 2010).

Similarly, we found that the mean indirect effect of spelling prime on delayed guessing of the intended spelling from the bootstrap analysis is positive ($a \times b = 0.6$) and significant, with a 95% confidence interval excluding zero (.07 to 1.21). Hence, correct spelling mediates the effects of spelling priming on delayed guessing, just as it does for brand name recall. To classify the type of mediation, we estimated the individual

coefficients. Results show that in the indirect path, spelling prime (vs. non spelling prime) increases guessing of the intended spelling by $a = 6.40$; $b = 0.09$. Therefore, holding constant spelling prime, a unit increase in correct spelling enhances delayed guessing of intended spelling by 0.09. The direct effect c , instead, is not significant ($p > .10$). Hence, indirect-only mediation, or full mediation, is established.

Finally, to test whether respondents' general spelling ability influenced our results, we included respondents' scores to a 15-item spelling test as a covariate in each of our dependent measures. Spelling ability did not interact with either of the experimental variables (F 's < 1).

The results of this experiment provide evidence that spelling processes matter when it comes to remembering the sound of brand names. The results suggest that lexical and sublexical processes interact when individuals attempt to spell new words and when they try to recall them after a delay. We also found support for the mediation of correct spelling in the effect of spelling primes on brand sound recall and on delayed guessing of the intended spelling.

Experiment 2 further examines those effects, utilizing semantic factors in addition to spelling primes to improve spelling performance and brand memory. The next experiment only utilizes brands with inconsistent spellings because they provide the most interesting case from a theoretical and practical perspective. Consistent spellings do not present a significant challenge for consumers or marketers, since there is only one way to spell the sounds.

Experiment 2

This experiment manipulates another variable that we theorize operates at the lexical level, semantic processing. The consumer research literature suggests that semantic factors are important when designing new brands because they can facilitate processing (Schmitt, Tavassoli, & Millard, 1993) and increase their likelihood of success in the market (Robertson, 1989). Our aim in this experiment is to examine brands with inconsistent spellings more closely, to see if semantic congruity can aid spelling accuracy above and beyond the effect of priming the intended spelling. One challenge in manipulating semantic congruity within non-morphemic brands like those used in our experiments is that, by definition, they lack meaning—at least in the conventional sense. Experiment 2 uses a well-established effect in psychology and consumer research, phonetic symbolism, to bypass that difficulty. We manipulate semantic congruity by varying the level of agreement between the meaning of the brands' sounds and their product category.

We also utilize a different manipulation of sublexical route reliability from the previous experiment. In this experiment all brands have inconsistent spellings because such spellings are more theoretically and practically interesting. Consequently, sublexical processes are manipulated via spelling pattern frequency. Some of our experimental brands include frequent spelling patterns and others infrequent spelling patterns. Frequent patterns should be more reliable for spelling than

infrequent patterns. We now describe in detail how phonetic symbolism and spelling pattern frequency can influence memory.

Phonetic symbolism and semantic processing

In this experiment we aim at enhancing the level of semantic processing and thus encourage the use of the lexical system to spell a word when the sublexical system is unreliable or curtailed (as it is with inconsistent words). To do this, we attempt to increase the degree of semantic fit (Vanden Bergh, Adler, & Oliver, 1987) between the brand name and the product category. Past research has shown that the fit between a product category and a brand name influences recall, preference, and inference (Lowrey et al., 2003; Meyers-Levy, Louie, & Curren, 1994; Pavia & Costa, 1993). We intend to operationalize the degree of fit through the sound symbolism of the brand names. Thus, a brand name could contain sounds that are congruent with its product category or not. Although some research has hinted at the potential influence of sound symbolism on memory (Klink, 2000; Vanden Bergh et al., 1987), past research has focused on the types of associations evoked by different sounds and on brand name preference as a dependent measure. Therefore, this is the first attempt at empirically investigating the influence of sound symbolism on brand name recall.

Sound symbolism has recently been the subject of study in consumer research (Klink, 2000; Lowrey & Shrum, 2007; Yorkston & Menon, 2004). The basic premise of sound symbolism is that some sounds have the capacity to evoke certain meanings. For instance, front vowels like the English sound “ee” are associated with small objects, and back vowels like the English sound “o” are associated with large objects. Thus, Klink (2000), for example, has shown that brand names containing front (back) vowels may elicit perceptions such as smallness (largeness), lightness (heaviness), fastness (slowness), coldness (warmth), and bitterness (sweetness). Yorkston and Menon (2004) and Lowrey and Shrum (2007) extend Klink’s finding by showing that the fit between the sounds used in a brand and its category influences consumers’ attitude towards the brand, as well as their purchase intentions. For instance, if smallness represents a desirable attribute for the product category (e.g., cell-phones), the brand name Detal should be preferred to Dutal as it contains a front vowel (rather than a back vowel).

We argue that the congruity between the meanings conveyed by the brand’s sound and the attributes typically associated with the product category should provide direct and specific input to the lexical route to spelling. When the intended spelling of a brand is primed, the congruity created by phonetic symbolism will provide a stronger link between the prime and the brand, helping to narrow down the graphemes that could represent a sound with an inconsistent spelling and enhancing brand name memory. Because the brand itself is involved in this manipulation, the link can be used by consumers to later retrieve the visual form of the brand.

Spelling frequency

Sounds with inconsistent spellings have several ways in which they are spelled in a language. Each of these possible spellings has a different frequency of occurrence in English. For example, the phoneme /āk/ can be transcribed into a variety of graphemes (e.g., ake, ache) that differ with respect to their frequency of occurrence; that is, how much more often one spelling of the sound occurs relative to other possible spellings. The word *fake* presents an inconsistent yet frequent spelling pattern since *ake* is the grapheme that most frequently represents the phoneme /āk/ within the English lexical system. The same phoneme, however, is represented by the grapheme *ache* with a very low frequency. Therefore, a word like *ache* is said to have an infrequent as well as an inconsistent spelling pattern. In conclusion, both consistency and frequency (the latter is only relevant to inconsistent phonemes) can make spelling easier.

Ziegler et al. (1997) tallied the frequencies for some inconsistent sounds in a large linguistic corpus. The corpus included a database of 2694 American English words containing virtually all monosyllabic, mono-morphemic words in Kucera and Francis (1967)’s corpus. For instance, Ziegler et al. found that, for the sound [ʃm] (as in “come”), the spelling “ome” had a summed frequency of 1630 occurrences, “om” occurred 1000 times, “um” 100 times, and “umb” 35 times. Thus, we can say that “ome” is a frequent way of spelling that sound, and “umb” an infrequent way. It is important to note that, even though there may be more ways to spell the sound, only those listed here are spellings that actually occur in the English language.

We theorize that spelling frequency, similarly to consistency, can serve as a variable to manipulate how reliable the sublexical system is to arrive at the correct spelling of a word. Thus, if individuals use the sublexical system to spell a new word (i.e., they transcribe the word sound by sound without reliance on semantic associations or similar words that they know), they will be more likely to spell it correctly if the word contains frequent, albeit inconsistent, sound-to-spelling mappings. In such cases the sublexical route will lead to reliable spelling results. With infrequent mappings, however, the sublexical route is hampered because it systematically leads to the most frequent version of the word’s spelling, which in this case would be incorrect. Hence, if the word contains an infrequent spelling pattern, individuals may have to resort to the lexical system to get the spelling right.

In this experiment, we also examine an alternative explanation for the effect of linguistic variables on recall: the affect generated by the stimuli or the guessing procedure. According to our theorizing, spelling-related variables influence memory via dual coding. However, the process of trying to spell a brand may also result in a different process, unrelated to dual coding, that could mediate the effect. The experimental procedure or the sounds of the brand name could elicit affect in respondents (Argo, Popa, & Smith, 2010), either negative because of the frustration experienced in the guessing task, or positive because of the enjoyment generated by guessing

correctly. Research in psychology has found that positive affect can lead to increased levels of dopamine, attention, and better performance in cognitive tasks like problem solving or memory (Ashby, Isen, & Turken, 1999). Therefore, it is possible that brand recall could be influenced by the motivational effect of positive (or negative) affect after the immediate spelling task. This experiment tests this alternative explanation.

In conclusion, we expect that the interaction between the lexical and sublexical route with respect to immediate spelling and memory will emerge when we semantically connect the brand to its product category. When consumers attempt to spell a brand but the sublexical route is hampered, as it is with inconsistent/infrequent spellings, they will make use of the semantic congruity between the brand's sounds and the product category.

Method

Design

The experiment is a 2 (semantic congruity: congruent vs. incongruent) \times 2 (spelling map frequency: frequent vs. infrequent) between-subjects experiment. Semantic congruity refers to the fit between the meanings conveyed by the brand's sound and the desirable trait for a given product category. Frequency refers instead to the relative frequency of occurrence of sound to spelling correspondences observed within a language.

Procedure and materials

A total of 91 English-proficient students at a northeastern university participated in the experiment in exchange for class credit. The procedure was similar to Experiment 1, but we used six different brands. Each of the six audio clips provided the following information: product/service featured in the ad, last words in the ad, and brand name. Six product categories were considered, including several from Lowrey and Shrum (2007): two-seat convertible cars, SUV, knives, hammer, pencils, and cell phones.

One difference between this experiment and Experiment 1 is that the ad phrase was simultaneously presented to respondents both visually and auditorily. Visual exposure was used to implement the manipulation of frequency—otherwise, respondents might not know if the sound was supposed to have a frequent or infrequent spelling. Auditory presentation of the ad phrase was used to ensure respondents encoded the prime phonologically, as in Experiment 1 (Coulter & Coulter, 2010; Vanhuele, Laurent, & Drèze, 2006). The brand name itself, though, was presented only auditorily. In addition, in order to make the frequency manipulation work, all respondents were in a “spelling prime” condition, in which the ad phrase indicated the intended spelling of the brand name. In this experiment, since there were six brands, the recall and spelling tasks could have a maximum score of 18. Recall measures were coded similarly to those in Experiment 1, and agreement between the two coders was 80%, with disagreements resolved by discussion. The delayed guessing measure could have a maximum score of six. Prior to the memory tests, we measured respondents' affect toward the stimuli and experimental procedure with a four-

item scale (1 = Definitely Not; 7 = Definitely Yes). Two of the items were averaged to measure negative affect (Did you feel upset when you had to guess the right spelling of the website names?; Did you have a feeling of frustration when you were typing the website names?), and two to measure positive affect (Did you enjoy the task of guessing how the website names were spelled?; Did you think that guessing the spelling of the brand names was fun?).

Following Lowrey and Shrum (2007), congruity was manipulated by varying front versus back vowel to convey meanings that applied (or not) to the product category in the congruent (or incongruent) condition. For example, consider the two-seat convertible car category, for which speed is a desirable attribute (Lowrey & Shrum, 2007). Therefore, in the congruent condition we used a front vowel (i.e., Leam) that would convey a meaning congruent with the positively valenced attribute. In the incongruent condition, instead, a back vowel was used (i.e., Lome) to convey the meaning of undesirable traits for the product category (e.g., slow). For the product category SUV, where heavy and large are desirable attributes, a back (front) vowel was used in the congruent (incongruent) condition (i.e., Lome vs. Leam). Hence, our manipulation involved only the vowels in the brand names. Consonants were kept constant for each brand name across conditions to minimize interference from potential symbolism stemming from consonants.

Four of our categories (i.e., two-seat convertible cars, knives, pencils, and cell phones) were fast, sharp, thin, small,... items, so congruity was operationalized by front vowels, and two of the categories (i.e., SUV, hammer) were large, heavy, dull,... items, where congruity was operationalized by back vowels. Product categories for this experiment were obtained from Lowrey and Shrum (2007), with the addition of the categories pencil and cell phone. We conducted two pretests to check (1) perceptions of our front versus back vowel brand manipulation, and (2) perceptions of the traits of our product categories, to ensure that for example a “sharp” brand name would be a good match for a kitchen knife. Thus, we tested whether, on average, the brand names using front vowels were perceived to be weaker, lighter, thinner, brighter, more oblong, softer, more toward the front, sharper, cooler, smaller, more open, more compact, narrower, and fuller than the brand names using back vowels. The results showed a significant difference between front and back vowels ($M_{\text{front}}=4.20$ vs. $M_{\text{back}}=3.87$; $t(66)=4.898$; $p<.001$). Regarding the product categories, we found that, on average, knives, convertibles, pencils, and cell phones were perceived to be faster, thinner, sharper, smaller, lighter, weaker, more elongated, more compact, and narrower than hammers and SUV cars ($M_{\text{knives/convertibles/pencils/cell phones}}=4.90$ vs. $M_{\text{hammers/SUV cars}}=2.76$; $t(55)=18.66$; $p<.001$).

In addition, we included a manipulation check in the main study, after all dependent measures had been collected. Respondents were asked to indicate on a seven point 4-item semantic differential scale the extent to which each brand name was perceived as light (vs. heavy), fast (vs. slow), small (vs. large), and sharp (vs. dull).

The frequency manipulation only changed the target spelling pattern, not the sound. In the above mentioned example, Leme

Table 2
Experiment 2 stimuli.

Infrequent condition		Frequent condition		Category
Congruent	Incongruent	Congruent	Incongruent	
Ad sentence/brand name	Ad sentence/brand name	Ad sentence/brand name	Ad sentence/brand name	
... And that is great/Neat	... What a route/Noute	... What a root/Noot	... And that is the date/Nate	Kitchen knives
... What a route/Noute	... And that is great/Neat	... And that is the date/Nate	... What a root/Noot	Hammer
... For a theme/Leme	... And there a comb/Lomb	... And there a home/Lome	... For a team/Leam	Two seat convertible car
... And there a comb/Lomb	... For a theme/Leme	... For a team/Leam	... And there a home/Lome	Sport utility vehicle (SUV)
... Hold on a fete/Sete	... Your route/Soute	... Your foot/Soot	... Hold on and wait/Sait	Pencil
... Just suite/Luite	... The watt/Latt	... The squat/Lat	... Just eat/Leat	Cell phone

and Lomb would be the infrequent spelling pattern for Leam, and Lome, respectively. Ziegler et al.'s (1997) norms were used to classify sound-to-spelling mappings according to their frequency of occurrence within the English language. All frequent sounds used were at least twice as likely to occur as infrequent sounds, according to Ziegler et al. (1997). Table 2 provides a complete list of the stimuli used, ordered by condition.

We also performed a pretest to ensure that the stimuli would be perceived as nonwords and that participants would not be familiar with any of them. To this end, 36 respondents indicated the extent to which each of 12 brands was “a real word” and whether they had “seen it before” (1 = Definitely Not, 7 = Definitely Yes). Responses to both items were averaged. Among the brands listed were the six nonword brands selected for this experiment, mixed with six monosyllabic real words (e.g., moat, chat, bite). We used the most frequent spellings of the experimental brands. The results of this pretest indicate that our nonword brands were perceived significantly less real/familiar than actual words ($M_{\text{Words}}=6.44$ vs. $M_{\text{NonWords}}=3.05$; $t(1, 35)=24.39$; $p<.001$). Two of our stimuli that could have been interpreted as abbreviations or proper names displayed similar results, “lat” ($M_{\text{Words}}=6.44$ vs. $M_{\text{Lat}}=2.19$; $t(1, 35)=16.60$; $p<.001$) and “nate” ($M_{\text{Words}}=6.44$ vs. $M_{\text{Nate}}=4.83$; $t(1, 35)=4.52$; $p<.001$).

Results and discussion

Our manipulation check on whether front vowel brands were perceived to be lighter, faster, smaller, and sharper than back vowel brands confirms that our phonetic symbolism manipulation was successful ($M_{\text{front}}=4.38$ vs. $M_{\text{back}}=3.91$; $t(1, 90)=4.441$, $p<.001$). For the main results, we expected a significant interaction of semantic congruity and spelling frequency with respect to immediate guessing of the intended spelling, brand sound recall, and delayed guessing.

Guessing of intended spelling

A main effect of frequency emerged such that frequent spelling mappings resulted in higher correct spelling scores ($M_{\text{frequent}}=11.96$ vs. $M_{\text{infrequent}}=7.00$; $F(1, 87)=20.86$; $p<.001$). Semantic congruity did not have a significant main effect ($M_{\text{congruent}}=10.40$ vs. $M_{\text{incongruent}}=8.71$; $F(1, 87)=1.96$; $p>.15$). More importantly, the results revealed a

significant interaction of congruity and frequency ($F(1, 87)=5.00$, $p<.05$). As expected, respondents were able to spell frequent mappings as intended ($M_{\text{congruent}}=11.52$ vs. $M_{\text{incongruent}}=12.39$; $F<1$). However, for infrequent mappings, for which the sublexical system becomes unreliable, respondents who could not use the lexical system to guess the spelling (i.e., those in the semantically incongruent condition), had lower spelling scores ($M_{\text{congruent}}=9.10$ vs. $M_{\text{incongruent}}=5.32$; $F(1, 87)=6.50$; $p<.01$). Eleven respondents had scores of 0 on this variable. These results are consistent with Experiment 1 and support H2 and our general theorizing; they provide further evidence for the interaction of the lexical and sublexical systems in spelling processes for new brands. Hence, spelling new, nonword brand names seems to be a two-step process: first, the sublexical route is attempted; if that fails, lexical, top-down factors like semantic associations are used to guess the right spelling.

Brand sound recall

There was a main effect of congruity on recall ($M_{\text{congruent}}=7.84$ vs. $M_{\text{incongruent}}=5.58$; $F(1, 87)=8.85$; $p<.01$). The main effect of frequency was not significant ($M_{\text{frequent}}=7.20$ vs. $M_{\text{infrequent}}=6.22$; $F(1, 87)=1.65$; $p>.20$). But more importantly, we observed a significant two-way interaction ($F(1, 87)=4.98$, $p<.05$). A closer inspection showed a similar pattern to guessing of the brand spelling, supporting H4. Thus, in the frequent condition, both congruent and incongruent brands resulted in equally high recall ($M_{\text{congruent}}=7.48$ vs. $M_{\text{incongruent}}=6.91$; $F<1$). In the infrequent condition, there was a significant effect of congruity, indicating that incongruent brands were not remembered as well as semantically congruent brands ($M_{\text{congruent}}=8.20$ vs. $M_{\text{incongruent}}=4.24$; $F(1, 87)=13.33$; $p<.001$). Therefore, our manipulation of semantic congruity through sound symbolism was able to provide specific input to the lexical route, creating a vivid visual trace of the written form of the brand. Because the manipulation involved the brand itself, the semantic cues were linked to the visual representation of the brand and were used for later retrieval, increasing recall for infrequent spellings of brands.

Delayed guessing of intended spelling

A main effect of frequency on delayed guessing emerged ($M_{\text{frequent}}=3.78$ vs. $M_{\text{infrequent}}=2.16$; $F(1, 87)=30.97$; $p<.001$), but congruity did not have a main effect ($M_{\text{congruent}}=3.12$ vs.

$M_{\text{incongruent}}=2.87$; $F<1$). However, as with our other dependent variables, a two-way interaction was observed ($F(1, 87)=6.25$, $p<.01$). Again, there was no effect of congruity in the frequent condition ($M_{\text{congruent}}=3.52$ vs. $M_{\text{incongruent}}=4.04$; $F(1, 87)=1.73$; $p<.20$), but there was a significant effect in the infrequent condition, such that semantically congruent brand names resulted in greater accuracy than incongruent brands ($M_{\text{congruent}}=2.65$ vs. $M_{\text{incongruent}}=1.75$; $F(1, 87)=4.88$; $p<.05$). This pattern confirms the effectiveness of the semantic congruity manipulation. As in Experiment 1, we also analyzed delayed guessing only for those brands that respondents initially spelled as intended. The results show a similar interaction to the full data set: a two-way interaction ($F(1, 87)=4.58$, $p<.05$). There was no effect of congruity in the frequent condition ($M_{\text{congruent}}=2.83$ vs. $M_{\text{incongruent}}=3.34$; $F(1, 87)=1.33$; $p>.20$), but there was a marginally significant effect in the infrequent condition, such that semantically congruent brand names resulted in greater accuracy than incongruent brands ($M_{\text{congruent}}=2.10$ vs. $M_{\text{incongruent}}=1.24$; $F(1, 87)=3.49$; $p=.06$).

When we analyzed the number of times respondents chose the most frequent spellings for the brands in this task, we found two main effects. The main effect of frequency suggests that our manipulation of frequency was effective: respondents chose the most frequent spelling more often in the frequency condition ($M_{\text{frequent}}=3.78$ vs. $M_{\text{infrequent}}=1.76$; $F(1, 87)=53.52$; $p<.001$). We also observed a main effect of congruity such that incongruent brands resulted in respondents choosing the more frequent spelling more often. This provides further support for the effectiveness of our congruity manipulation: respondents in the congruent condition built a stronger and more accurate memory trace so they were not led astray by the frequent spellings as often as respondents in the incongruent condition ($M_{\text{congruent}}=2.51$ vs. $M_{\text{incongruent}}=3.02$; $F(1, 87)=4.90$; $p<.05$).

Mediation analysis

To analyze the processes underlying the effects of frequency and congruity on recall we conducted a mediation analysis (Preacher & Hayes, 2004; Zhao et al., 2010). We tested for moderated mediation, also known as conditional indirect effects (Preacher & Hayes, 2008; Preacher et al., 2007), to accommodate the interactive effect of the two independent variables, congruity and frequency. Results show that guessing of the intended spelling is a significant mediator of frequency on brand sound recall and delayed guessing, both in the congruent and in the incongruent condition. This provides further support for H5.

For brand sound recall, in the incongruent condition, the mean indirect effect of frequency on brand name recall from the bootstrap analysis is significant, with a 95% confidence interval excluding zero (-1.34 ; CI: -2.75 to $-.31$). The direct effect c , instead, is not significant ($p>.10$). Similarly, in the congruent condition the mean indirect effect of spelling prime on recall is significant, with a 95% confidence interval excluding zero ($-.46$; CI: -1.41 to $-.001$) while the direct effect is not significant ($p>.10$). Hence, indirect-only mediation is established. In other words, guessing of intended spelling fully

mediates the effects of spelling prime on brand name recall, in both the congruent and the incongruent condition.

Guessing of the intended spelling is also a significant mediator of frequency on delayed guessing, both in the congruent and in the incongruent condition. In the congruent condition, the mean indirect effect of spelling prime on delayed guessing of the intended spelling from the bootstrap analysis is significant, with a 95% confidence interval excluding zero ($-.30$; CI: $-.74$ to $-.004$). Moreover, the direct effect is not significant ($p>.10$); hence, indirect-only mediation is established. In the incongruent condition, the mean indirect effect of frequency on delayed guessing of the intended spelling is also significant, with a 95% confidence interval excluding zero ($-.89$; CI: -1.47 to $-.43$). However, the direct effect is also significant (-1.27 ; $p<.05$). Since both the mediated effect and the direct effects are significant and their product is positive, complementary mediation, or partial mediation, is established (Zhao et al., 2010). This type of mediation suggests that, in the incongruent condition, there might be an omitted mediator that, in addition to guessing of the intended spelling, explains the effects of frequency on delayed guessing of the intended spelling. This does not present a problem for our hypotheses. Rather, it suggests that not all the variance in delayed guessing of incongruent brands can be explained through immediate guessing. There might be other variables (not examined in this study) that influence delayed guessing. In conclusion, just like for brand name recall, guessing of intended spelling mediates the effects of spelling prime on delayed guessing, in both the congruent and the incongruent condition.

Alternative explanation

We considered the possibility that our stimuli and experimental procedure might have caused either positive or negative affect in respondents, and that this affect might have influenced respondents' memory. To test this alternative explanation, we analyzed both the positive and the negative affect measures collected in the experiment, subjecting them to separate 2-way ANOVAs with semantic congruity and spelling frequency as independent factors. The results reveal neither main effects nor an interaction term for either affect measure (Positive Affect: $M_{\text{congruent/frequent}}=3.17$, $M_{\text{congruent/infrequent}}=3.23$, $M_{\text{incongruent/frequent}}=3.63$, $M_{\text{incongruent/infrequent}}=2.88$; Negative Affect: $M_{\text{congruent/frequent}}=4.00$, $M_{\text{congruent/infrequent}}=4.43$, $M_{\text{incongruent/frequent}}=3.85$, $M_{\text{incongruent/infrequent}}=4.30$; all p 's $>.30$). Therefore, neither semantic congruity nor frequency have main or interactive effects on affect, and we can reject the alternative explanation that affect mediates the influence of the independent variables on memory. The dual-coding explanation of the effect of linguistic variables on recall is more plausible.

As with the two previous studies, general spelling ability of respondents did not interact with either of the experimental variables with respect to our dependent measures (F 's <1).

General discussion

In this paper, we show how spelling processes are relevant for brand memory. Neither the psycholinguistics literature nor

consumer research had provided theory-based studies on the topic to date. Experiment 1 compares brands that can only be spelled in one way (consistent) to brands that can be spelled in multiple ways (inconsistent). Inconsistent brands curtail the sublexical route to spelling, so priming can help offset that handicap via the lexical route, leading to greater memory than if there is no prime. In Experiment 2 we manipulate semantic factors through phonetic symbolism and find that semantic-level factors can offset the recall handicap when the sublexical route to spelling is hampered. We theorize that the influence of spelling-related linguistic factors on brand recall can be explicated through a dual-coding explanation: when consumers encode the correct written representation of an auditorily presented brand (by spelling it as intended by the marketer), they store an auditory and a visual trace which can later be used for retrieval.

Several contributions emerge from our results. Our findings that (a) spelling a brand as intended by the speaker mediates the effect of linguistic variables on brand memory, and (b) semantic context operationalized via phonetic symbolism can aid spelling when the sublexical route is hampered, are significant contributions to the psycholinguistics literature. Additionally, although phonetic symbolism has received a lot of recent attention in the consumer research literature (Argo et al., 2010; Coulter & Coulter, 2010), our paper is the first to report phonetic symbolism effects on memory. We provide consumer researchers with a framework to study spelling influences on auditory processing of brand communications. This framework describes how two routes can be followed when attempting to spell words: the lexical and sublexical routes. Each route is used in different situations, and different variables can influence each of them separately. Armed with this knowledge, researchers can further study spelling processes in brand communications. For instance, to facilitate the lexical route, we use spelling primes; that is, words that sound and are spelled the same as the target brand names. Using the framework presented here, future researchers could include primes that sound but are not spelled the same as the target. Such primes might be easier to find and employ in advertising and they might facilitate brand sound recall. However, in such case the prime might not facilitate performance in the immediate or delayed guessing of the intended spelling. We also contribute to the consumer psychology literature by simulating the process that consumers follow in order to find a brand for which they do not know the spelling (a trial-and-error procedure). This process, when successfully resolved, leads to greater memory.

Research on phonetic symbolism has shown that the mere sound of a nonword, such as a novel brand name, may affect brand preferences through the meaning conveyed, for instance, about attribute dimensions of the product. However, even most phonetic symbolism research in marketing has used visual (written) stimuli. Very little research has been done studying auditorily-presented brand names as stimuli. This is surprising given that consumers are exposed to novel brand names on a regular basis, through word of mouth, radio ads, and *buzz* marketing. Building on psycholinguistic research, we explored the

way consumers may process and later use these sounds, providing some ideas for marketing practitioners and researchers.

Our studies point toward several specific, actionable recommendations for marketers who would like to create a new non-morphemic brand. The best combination of variables to ensure that the new brand is memorable seems to be the following: inconsistent sound-to-spelling mappings, but making sure that the ads that serve to present the brand to consumers include phonetic primes, or hints, as to how the brand name is spelled. In addition, the inconsistently spelled brand name should either include frequent sound-to-spelling mappings or possess a high degree of semantic congruity with the product category. In categories where novel spellings might be the norm (e.g., pharmaceuticals) or where distinctiveness is deemed important in order to stand out on the shelf (e.g., Haagen Dazs vs. Breyers, Dolly Madison, etc., at least at the time of its introduction), embedding the name with a semantic cue should aid memory.

With respect to the phonetic primes, in Experiment 1 we used auditorily-presented primes but in Experiment 2 we used primes that were presented both auditorily and visually. The latter approach was followed to ensure that respondents would be alerted as to whether the brand was intended to be spelled with a frequent or an infrequent spelling. Although this might be a condition difficult to replicate in the marketplace, our intent was to show that frequency has an influence on spelling and memory. Marketers can test their auditory primes prior to inclusion in advertising, to ensure that consumers understand that the prime has a frequent spelling. This would eliminate the need for a visual presentation of the prime prior to the auditory presentation of the brand.

We should also note that this paper examined the processes involved in transcribing sound to spelling. There is, however, a rich literature that investigates the reverse: spelling to sound relationships (Stone et al., 1997). How individuals pronounce written words depends on certain rules (Bauer & Stanovich, 1980) and other, individual-level variables (Baron & Strawson, 1976). The pronunciation process could bring a second-order effect to word-of-mouth campaigns. For instance, consumer A sees a new brand and tells consumer B about it. In a case where the brand had more than one possible pronunciation, if A chose one that was not intended by the marketers, then B could feasibly write down, when asked, a brand that has little to do with the original, especially if the pronunciation by A had itself more than one possible spelling (i.e., an inconsistent sound). Effects such as these should be investigated in future research.

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