

**DOES THE DELIVERY FORMAT IN WHICH A MESSAGE IS
COMMUNICATED MATTER?:
HOW CONSUMERS PROCESS ALTERNATIVE TYPES OF SENSORY DATA IN
WORKING MEMORY**

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DEDICATION

I dedicate this work to the only person whose life it has affected as much as mine: my daughter, Lucia. I often think about my education as something I have achieved not in spite of a child, but because of her. Luci was only two when I started my PhD. She has slept under seminar tables, watched movies on a laptop in the back of labs, waited patiently through talks, stayed with friends while I was at conferences, and helped me think about “how we could make your research more interesting”.

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ABSTRACT

Marketers often present the same information about a product in different media that employ alternative delivery formats (e.g., magazines often deliver information in a text format and radio in an audio format). However, little is known about how these different formats affect consumers' processing and assessments of the product information. Across two chapters containing four studies, I show that the format that will better accomplish one's objectives depends on whether the language employed in a message is image-evoking or primarily semantic. Due to limits of the resource pools that fuel two separate working memory pathways, information typically is better retained when messages draw on both, rather than only one, resource pool. Strategically selecting the format (text or audio) and language (image-evoking or semantic) of the message can accomplish this. Further, because information retention can mediate perceptions of the product, variation of these two factors can also influence both product perceptions and assessments. Finally, expanding working memory capacity provides additional insights into how working memory processes affect product assessments, producing outcomes that are the reverse of those observed in the first three studies.

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CHAPTER I

INTRODUCTION

Not only do marketers commonly relay their messages to consumers in a myriad of media (e.g., magazines, radio, or TV ads), but they frequently translate the same message into multiple media and deploy them all at once. For example, Geico insurance has used two popular slogans in both print and radio ads, “Geico: Saving money - so easy, a caveman could do it!” and “Geico: 15 minutes could save you 15% or more!” No doubt, Geico is not alone in the assumption that if a message works appropriately when delivered in one format (e.g., text), it should work similarly in another (e.g., audio). After all, the meanings of words are the same no matter how the words are delivered. Still, an important question arises: What effect, if any, does reading versus hearing a marketing message have on consumers?

The present research aims to show that because consumers process text and audio messages differently, using these alternative delivery formats can produce varying consequences depending on the language used in the message itself. By message language, I refer to whether the language that relays the message evokes either imagery (e.g., “chunks of brightly-hued vegetables”) or more basic semantic information (e.g., “pieces of multihued vegetables”). Returning to the initial example, note that both of Geico’s slogans communicate the ease with which customers can save money on car insurance. Yet, the first slogan does so by evoking a mental image (e.g., that of a lumbering caveman easily obtaining inexpensive car insurance), while the second slogan

relays this same idea by conveying mostly semantic information (e.g., it only takes 15 minutes to obtain money-saving auto insurance).

When deciding which format (text vs. audio) to employ for each type of language content (imagery-evoking vs. semantic), a reasonable assumption might be that individuals should ‘match’ the format and language, say by providing imagery-evoking language in a visual text format (i.e., both are visual in nature). Interestingly, my research finds that this type of matching can undermine ad effectiveness. Specifically, by drawing on a prominent model of working memory, I show that when a marketing message’s delivery format and language ‘match,’ this may require too much of a single type of resources (e.g., resources that accommodate the visual processing of a message delivered in *visual text* and containing language that evokes a *visual image*). As a result, memory for the message is likely to suffer, which can dampen consumers’ assessments of the product; for example, in Geico’s case, such assessments most likely would concern the ease of obtaining economical car insurance. Yet, this consequence is averted if the message’s delivery format and language draw more moderately on alternative pools of resources (e.g., separate pools that accommodate the processing of visual data and semantic meaning).

Contribution

The findings in this paper contribute to the literature in several ways. First, they show that retention of message content depends not only on whether the message is delivered in a text versus an audio format, but also on the very nature of the message

language itself—that is, whether the words employed evoke imagery or more pallid semantic meaning. Further, because retention of the message content can influence other important outcomes, such as assessments of key product traits, my research suggests that a marketer’s decision about whether to use a text (e.g., print) or an audio (e.g., radio) format to deliver a message should be contingent on whether the information content itself elicits imagery or semantic meaning.

A second contribution of this work concerns the finding that the format in which information is delivered (e.g., text or audio) does not always dictate the manner in which it will be processed. Rather, in keeping with the focal model of working memory that proposes there are two ways in which information is processed (visually or semantically), I show that how information is processed is somewhat malleable. Hence, presenting a message in, say, a visual text format need not mean that its content will be processed using strictly visual resources.

Third, the current work indicates that, counterintuitively, maintaining compatibility between or “matching” a message’s delivery format and language (e.g., using a *visually* imparted text format to present *image*-evoking information) will often be counterproductive. This insight contrasts with the dominant view in the literature, which suggests that matching delivery format and language (e.g., using visual options of both) should produce more desirable outcomes because such actions should invoke compatible types of processing and foster stronger representations (e.g., Childers and Houston 1984; Farah 1988; Pylyshyn 2002). Instead, in the domain that I examine, engaging in this sort of matching activity can undermine both information retention and product assessments.

Dissertation organization

The remainder of this dissertation is organized in the following manner. The current chapter (Chapter I) describes the literature related to work on modality processing and working memory. It also explains how my research aligns with and is supported by this literature.

Next, Chapter II reports three experiments which demonstrate that a message's delivery format (text or audio) interacts with its language (whether it evokes visual images or semantic meaning) to influence consumers' memory and assessments of the product. In experiment 1, I test this basic theorizing and illustrate how product information delivery format and language can jointly lead to differences in information retention and product assessments. Experiment 2 adds to my inquiry by generalizing the findings to different kinds of consumer products and, importantly, ruling out a plausible rival fluency explanation. Finally, experiment 3 expands our understanding in two pivotal ways. First, it illustrates that when a message's delivery format and language induce pathway use that elevates consumers' retention of the message, consumers' assessments of the product may be influenced either positively or negatively, depending on the implications of the retained data for the consumer in question. Second, experiment 3 offers crucial evidence that information retention mediates such outcomes.

Chapter III expands the investigation outlined above by showing that under certain conditions, working memory capacity in essence can be expanded, which can prompt a reversal of the aforementioned outcomes. The research reported in this chapter demonstrates that this occurs when individuals engage in relational processing (Einstein

and Hunt 1980). Such processing encourages people to form connections between pieces of information, enabling them to better retain incoming data while using fewer resources.

Finally, Chapter IV summarizes the findings, discusses some limitations of the research, and highlights important avenues for future investigation.

BACKGROUND

Existing research sheds light on some consequences that may occur when information is delivered in either a visual (text) or an auditory format. For example, messages relayed in a text versus an audio format are generally self-paced (save for exceptions when, say, text is delivered via banner ads). This allows message recipients to control the pace at which they process the textual data, which in turn can enhance both consumers' understanding of and the persuasiveness of the message (Chaiken and Eagly 1976). In contrast, messages presented in an audio format are typically externally-paced, which prompts sequential processing of the message content and possible order effects on memory of the message content (Unnava, Burnkrant and Erevelles 1994). Further, because audio (versus textual) messages may contain distinctive audio cues, message recipients may devote increased attention to the message source, which can impact persuasion if the message source is especially liked or disliked (Chaiken and Eagly 1983).

These and other studies that focus on the influence of processes that co-occur or are linked with message formats are informative about consequences that may ensue from the use of text versus audio delivered messages. Nevertheless, such research appears to

skirt a more basic and pivotal question: In what fundamental way are data that are presented in a visual versus an audio format different? Note that I shall focus on these two message delivery formats (i.e., the use of text versus a spoken audio format) because they are commonly employed in communicating marketing messages, and they can be used to present the same information content.

Basic logic and some theory imply that text versus audio presentation of marketing messages should produce *no* differences in consumers' perceptions or assessments. For example, models of semantic networks assume that written and spoken words do not differ in meaning (Miller and Fellbaum 1991; Johnson-Laird, Herrmann, and Chaffin 1984). After all, the definition of a word is the same regardless of the sensory modality that perceives it (i.e., whether one reads or hears the word). Further, consumers often differ in their preference for the written versus spoken word (Corbett and Smith 1984), casting doubt on whether marketer-imposed message delivery formats could differentially influence consumers' responses to messages beyond those produced by such personal preferences.

In contrast, I propose that not only do people process written versus spoken information in alternative ways, but the consequences of engaging in these types of processing can differ depending on the language used to convey the information content. My theorizing draws on an influential model of working memory (Baddeley and Hitch 1974; Baddeley 2000; Baddeley and Wilson 2002) that is well-suited for studying such issues, for it offers insight into how visual and audio information as well as image-evocative and semantic language are processed.

A Model of Working Memory

Baddeley and Hitch's (1974) model of working memory provides a useful template that explains how people process information that they intake through different senses or modalities (see Baddeley 2003 for a review). This model suggests that information can be processed in two different ways: (a) visually and in terms of images or (b) phonologically and in terms of meaning (i.e., semantics). Indeed, these two ways of processing data are claimed to account for any type of information or modality input.

The model posits that information initially enters working memory and is directed to the appropriate visiospatial sketchpad or phonological loop by the executive function. There, the information can be held briefly or rehearsed within either the visiospatial sketchpad (hereafter called the visual pathway) that attends to visual/spatial information, or the phonological loop (termed the phonological pathway) that extracts meaning-based information, such as sounds or semantic ideas. Importantly, each of these two pathways has an independent and finite resource pool for processing information. Finally, information can be manipulated (e.g., an object can be imagined in another color) or integrated with other data in working or long term memory in the "episodic buffer," which is the work desk for working memory (Baddeley 2000; 2001).

It is often assumed that the modality in which information is acquired determines the working memory pathway used to process it. For example, a picture that is perceived through the visual modality will most likely be processed in the visual pathway. Similarly, reading text is a visual process, which implies that textual information is likely to be processed in the visual pathway. Nevertheless, I qualify this assumption and

contend that in some instances, aspects of the perceived information can itself alter the pathway used to process that information. More specifically, I reason that this is so for the particular words or language used in either a text or an audio message. In some instances, the particular words used in a message may promote visual images that invite visual representations of the content, which should invoke the use of the visual pathway. Yet, at other times, the words presented may simply activate meanings, leading to the use of the phonological pathway for processing such content. I suggest that while the manner of information acquisition (i.e., through the visual process of reading text or the aural process of hearing an auditory message) can dictate the pathway that processes at least part of the information, whether the words in a message arouse either visual images or simple meanings also influences which of the pathways will partially process the given information. Thus, the preceding logic suggest that by varying message wording, it should be possible to alter the pathway(s) that will assume responsibility for processing a portion of the information; part of the information processing will be determined by the information delivery format, and part will be determined by the description language (i.e., its wording).

Message Retention and Product Assessments

The aforementioned model of working memory is informative, for it provides expectations about how data perceived by the visual and auditory modalities may be processed (i.e., represented) and affect both memory for and assessments of a focal product. Focusing first on implications for memory, the model suggests that given the

same amount of information, retention of such data may vary depending on whether one or both of the pathways (visual and phonological) processes the information. Such variation in retention should occur because each pathway possesses a finite resource pool (Baddeley and Hitch 1974). If excessive information is processed in a single pathway, say too much information is processed in the phonological pathway (e.g., data that are delivered in an audio format and employ meaning-based language), this excess will foster a deficit in the resources available for processing the data. The inadequate resources, then, limit memory for the information processed in that particular pathway. However, if the same amount of information were evenly distributed between and processed in *both* pathways (e.g., delivered in a visual text format and expressed using meaning-based language), the information is likely to be processed and remembered quite well because the resources that fuel each pathway must process only a portion of the data. Hence, although the overall amount of information that must be processed remains constant, when some aspects of it are processed in the visual pathway (e.g., visual text format) and others in the phonological pathway (e.g., meaning-based language), it should be better remembered than if it were processed entirely in a single pathway (e.g., visual text containing image-evoking language).

In a similar manner, important implications can be derived about how people should assess the focal product under the conditions just described. Prior research indicates that access to insufficient resources can not only lead to poor retention, but it also can undermine the persuasiveness of product messages, resulting in less favorable product assessments (e.g., Peracchio and Meyers-Levy 1997). This suggests that when

product information draws on a single (versus dual) pathway and resource pool(s), not only does memory for the message suffer, but message-derived inferences or assessments about the product are also undercut.

It may strike some readers as counterintuitive for me to suggest, for example, that a visual delivery format (e.g., text) should *not* be used for relaying visual content (e.g., imagery-evoking language) if the goal is to maximize data retention. This intuition is driven by the view espoused in much of the marketing literature, which posits that matching similar aspects of information (e.g., the goals that guide one's processing of information and the information content) aids information processing and perhaps data retention (Wang, Bristol, Mowen, and Chakraborty 2000; Lee and Aaker 2004). Yet notably, evidence exists which suggests that 'matching' delivery format and content can undermine consumer learning. For example, Unnava, Agarwal and Haugtvedt (1996) found that when participants received information visually (i.e., in visual text) and tried to visually represent its content (i.e., form a mental image of the content), these processes interfered with one another and caused participants to forget more of the information than they did when the processes produced no such interference (e.g., audio reception and visual imagery). Comparable outcomes occurred when participants received audio information (i.e., an audio delivered description) and tried to represent its content using audio imagery (e.g., imagine a bell ringing). The model that underlies my theorizing is conceptually concordant with this evidence insofar that it contends that people process data using discrete brain areas (or capacities) and each is fueled by a resource pool that is both independent and finite.

Importantly, my theory expands on the idea of modality interference (e.g., the notion that processing incoming data visually and engaging in visual imagery interfere with each other for they draw on the same pool of resources) and enables the generation of predictions about how various modality inputs will interact not only with their directly matching imagery, but with other types of language content. The support I offer for my theory, based on Baddeley and Hitch (1974), has important implications because it offers a broad framework for understanding the interaction of modality perception and language content, including, but not limited to, effects such as those reported by Unnava et.al 1996. This framework suggests that the interpretation of information (i.e., how working memory represents data) is more critical in retention and assessments than how the information is engineered (i.e., whether it was designed to elicit a certain type of imagery). Further, I show how resource constraints can affect not only retention for product information, but assessments of particular features or traits of a target product.

Given the dynamics of the two pathways and their limited available resources, matching the information delivery format and the language in which content is expressed is apt to cause forgetting or reduced retention of message information, particularly in instances where substantial information is presented. I build on the underlying model and its theory by showing that the resulting memory detriments can cause predictable and crucial effects on how people perceive and assess product messages.

CHAPTER II

The set of studies reported in this chapter examine the deductions derived and discussed in Chapter I. I reasoned that two aspects of a descriptive product message should affect whether people use either a single (i.e., visual or phonological) or dual pathways to process its content. One is the format in which the information is delivered. Text (i.e., recognition of letters and words) is primarily visual and is often processed in the visual pathway, while audio (e.g., spoken) information is generally processed in the phonological (meaning-based) pathway. As such, written versus spoken delivery of the same product description should induce people to process the information in their aforementioned respective pathways. A second aspect that also should influence which pathway(s) and resource pool(s) are used is whether the product information contains language that is fairly concrete and apt to evoke visual imagery (Paivio and Csapo 1969), or it consists of more pallid words that simply convey semantic meaning. For example, words such as “ladlefuls,” “sizzling,” “chunks” and “steaming” are likely elicit visual images, whereas conceptually similar words such as “servings,” “hot,” “pieces,” and “sweltering” should not. The expectation is that image-evoking language is likely to be processed in the visual pathway, while meaning-based language should be processed in the phonological pathway.

Because each of the pathways draws on a separate and limited pool of resources, presenting individuals with a sizable amount of data that is apt to be processed in a single (visual or phonological) pathway should produce a resource deficit that will compromise or foster spotty retention of the data. Consequently, if individuals were subsequently

asked to assess a central trait of the given product—a characteristic that was discussed in a message, such as how imaginative (i.e., gourmet) a described restaurant menu item seems—their product assessments are likely to be undermined (i.e., they would assess the product as less gourmet) due to their impoverished processing or appreciation of the product features that implied that trait. However, if comparable information was spread across both pathways, it should be processed more fully, producing enhanced assessments of the product on the trait in question.

At the same time, while I suggest that retention of product information (as influenced by the adequacy of available resources) can determine people's assessments of the product, this should occur only if the assessments concern product traits that can be inferred from the product information. I refer to such inferences as central traits. By way of an example, adult diners generally prefer restaurant dishes that are gourmet, meaning that they are imaginative and/or infused with many tasty ingredients. Thus, when such diners obtain descriptions of several restaurant dishes, they might draw inferences about the extent to which each dish delivers these characteristics. Therefore, each dish's perceived gourmet quality and the amount of detailed information provided about its taste are likely to be central traits that diners gauge. In the event that adults process the menu item descriptions using both rather than a single working memory pathway(s), they should be able to retain more information about the items. In turn, this should prompt them to assess that the menu items are more gourmet and the menu option descriptions are more informative about the items' gourmet quality.

EXPERIMENT 1

Design

Experiment 1 tested these hypotheses. The study employed a 2 (information delivery format: text vs. audio) by 2 (language: imagery-evoking vs. meaning-based) by 4 (menu item: pasta, soup, stir-fry, omelet) within subjects design, where participants received all four menu items, each presented in a different product information delivery format and language condition. Note that both the delivery format and language in which menu items were presented corresponded with how such items are often relayed in actual restaurants. Descriptive information about the foods, then, was delivered either in a text format that participants read and would be likely to process in the visual pathway, or it was described orally in an audio recording format that participants heard and processed in the phonological pathway. In addition, two versions of each product description were created that were comparable in meaning, but they were expressed in language that employed either imagery-inducing words (processed in the visual pathway) or meaning-based words (processed in the phonological pathway).

I expected that when the product description was delivered in a text format and used imagery-evoking language, it most likely would be processed by and overload the visual pathway. But when the description was delivered in an audio format and employed imagery-evoking language, I anticipated that processing of the data would be divided between the visual (for image-evoking words) and phonological (for audio information) pathways. Alternatively, audio delivery of a meaning-based description was likely to be processed by and overload the phonological pathway. Yet, text delivery of a meaning-

based product description would be processed partially in the visual (due to text delivery) and the phonological (due to meaning-based language) pathways. See table 1 for the hypothesized relationship between information delivery format and language on pathway and resource use.

Insert table 1 about here

Method

Participants consisted of 64 undergraduates who were paid \$5 each. They were told that the computer administered study would explore their assessments of restaurant menu options. These options would be described either in text, as on a menu, or orally as a waiter might do.

To manipulate the product information delivery format, participants either read the text or listened to an audio version (via headphones) of the item's description, which was accompanied by a degraded picture of the item (used to support the cover story of evaluating menu items). Exposure to the materials for each menu item was 20 seconds, which pretests found sufficient for reading or listening to each description. To manipulate language, half of the participants received the menu item description expressed in imagery-evoking language, while the others received it in meaning-based language (see appendix A for the imagery and meaning-based descriptions of each menu item).

Participants assessed all four food options, each presented in a different information delivery format and language combination that together represented the four critical treatment conditions. The latter two factors were counterbalanced across the food options

for each subject, thereby avoiding confounding any one condition with any single menu option.

I anticipated that when participants remembered more information (due to their use of both vs. a single processing pathway), they would perceive that they were more informed about that menu option's gourmet quality—its central trait featured in the description—and thus assess it as higher in gourmet quality. Therefore, after exposure to each menu item, participants completed several items that probed the gourmet quality of the food. Specifically, on 7 point scales (1=not at all, 7=very much), respondents assessed six items that gauged both the item's gourmet quality (how complex the dish was, how many steps it would take to create the dish, and the amount of time it would take a chef to create the dish) and the amount of information they received concerning the item's taste (whether the description provided a good idea of how the food would taste, how much information participants felt they received about the food, and how well they understood the description). Cronbach's alpha for the six items was .81, and for ease of exposition, I refer to this six item index as assessments of the dish's gourmet quality. Note that I also analyzed assessments of the menu item's gourmet quality and information about its taste as separate measures, treating the two as a repeated factor. The results remained unchanged and, henceforth in this paper, the gourmet quality index will be treated as a single measure.

Results

After excluding two participants who failed to follow instructions, a repeated measures ANOVA was conducted on participants' assessments of the gourmet quality of each menu item. This analysis revealed that the menu item factor exhibited no main or interaction effects. As anticipated, however, a significant interaction emerged between information delivery format (text versus audio) and language (imagery-evoking versus meaning-based wording) on participants' assessments of the menu items' gourmet quality ($F(1, 61) = 9.66, p < .01$). When both the information delivery format and language that described the food options prompted participants to process the product information in two separate (i.e., visual *and* phonological) pathways versus a single (i.e., visual *or* phonological) pathway, participants assessed the menu option as more gourmet. Specifically, contrasts revealed that when the product information was delivered in text format, participants viewed the menu options as higher in gourmet quality when the description language was meaning-based ($M = 4.66$) as opposed to image-evoking ($M = 4.33; F(1, 61) = 4.31, p < .05$). Alternatively, when the information was delivered in audio format, assessments of the menu options' gourmet quality were greater when the language evoked imagery ($M = 4.70$) than when it was meaning-based ($M = 4.30; F(1, 61) = 5.38, p < .05$). As figure 1 illustrates, when the product descriptions were processed primarily in one pathway (i.e., text format plus image-evoking language OR audio format plus meaning-based language), working memory apparently was overloaded such that participants assessed the menu options as less gourmet than when descriptions were

processed in both pathways (i.e., text format plus meaning-based language OR audio format plus image-evoking language).

Note that my theorizing and interpretation of the preceding findings rest on the assumption that participants' assessments of the menu options' gourmet quality were influenced by their retention of the menu item information. To examine this assumption, I ran a post-test on a separate sample of students. Participants received the same stimulus materials and measures for one of the menu items from experiment 1--the soup. In addition to administering the scaled items that assessed the gourmet qualities of the dish, I added a new measure that explored retention of the soup description. Note that I deliberately chose not to include any retention measures for the four menu item descriptions used in experiment 1 because doing so would have cued participants early on to try to remember the descriptive menu item information. Not only would this sabotage my effort to assess participants' naturally occurring retention of such data, but participants' focus on remembering the data could alter their assessments of the menu items.

Thus, in my post-test, 54 participants were presented with the soup description in either a text or an audio format, and the description language was either imagery-evoking or meaning-based. After receiving the description and spending about three minutes completing some demographic measures, participants assessed the gourmet quality of the soup and then were given 12 recognition probe words (six valid words and six foils). They were asked to identify which words had appeared in the soup description.

As in experiment 1, I replicated the interaction of delivery format and language on participants' assessments of the soup's gourmet quality ($F(1, 50) = 4.16, p < .05$). As expected, assessments of soup's gourmet quality were higher in the dual pathway conditions ($M = 4.14$) versus the single pathway conditions ($M = 3.60; F(1, 50) = 4.76, p < .05$). I also conducted an ANOVA to examine the effect of menu item delivery format and language on the number of words recognized correctly. A main effect of description language emerged ($F(1, 50) = 9.28, p < .01$). Consistent with extant literature that reveals superior retention for data that are more imagery-evoking (Paivio and Csapo 1969), participants correctly retained more words when the menu item description contained imagery-evoking rather than meaning-based language ($M = 3.55$ vs. $M = 2.50$). More importantly, however, and as my theory suggests, I also observed a significant interaction ($F(1, 50) = 8.93, p < .01$). It indicated that participants in the dual pathway conditions correctly retained more words from the description than did those in the single pathway conditions. Specifically, when participants received the description that contained imagery-evoking language, they correctly recognized more words when the description was delivered in an audio ($M = 4.02$) versus a text format ($M = 3.07; F(1, 50) = 3.99, p = .05$). But, when participants received the description with meaning-based language, they correctly recognized more words when the description was delivered in a text ($M = 3.06$) versus an audio format ($M = 1.94; F(1, 50) = 4.86, p < .05$). While the presence of the correctly recognized words in the ANOVA reduced the effect of the treatments on assessments of the soup's gourmet quality (F-values drop from 4.16 to 3.13 when retention was included in the model), retention failed to mediate the effect of the

treatments; perhaps this occurred because the sensitivity of my retention measure was impaired by probing a limited number of words from a single description.

Nonetheless, these findings are important as they support my contention that individuals who process data in dual versus a single pathway(s) are apt to better retain the data. I investigate this thesis and the meditational impact of retention in experiment 3 where I seek to increase the sensitivity of the retention measure by assessing recognition for two descriptions.

Discussion

The preceding findings support the main premises of my theory. They suggest that variation in both the delivery format and language in which product descriptions are presented can alter whether the information is processed in just one or both working memory pathways. Further, when the information is processed in a single pathway (as opposed to being distributed more evenly across both pathways), the resources that fuel the single pathway may prove inadequate for processing the product information, which will undermine retention. This reduced retention of the information then dampens assessments of the products' central trait (e.g., in my study, the menu options' gourmet quality) compared to instances where both pathways are employed and retention is not debased.

Experiment 1 also demonstrates another important point, namely that the pathway in which people process information is flexible. That is, even when product information is delivered in a particular format (e.g., visually, as in text), it can be partially processed

in the alternate (e.g., the phonological) working memory pathway if aspects of the information, such as its wording, render it amenable to being processed in that alternate pathway. This suggests that by strategically selecting the delivery format and the language used to present a message, it is possible to influence how communications will be processed in working memory (i.e., in one or both pathways) and thus the perceptions that individuals will form about products.

Despite the informativeness of these results, experiment 1 remains limited in at least two ways. First, it investigated assessments of the central trait of only a single type of product (i.e., the gourmet quality of menu options). However, my theory suggests that my findings should apply more broadly to the central trait of any type of product. Thus, experiment 2 explores whether my predictions will hold for very different central traits of alternative types of products, namely, the elegance of a dining table and the entertainment value of a new movie. Second, it is possible that a rival process could explain the outcomes that I observed in experiment 1 when descriptive data were processed using both rather than a single working memory pathway(s). Although I propose and found some evidence that my outcomes reflected people's superior retention of the product information when both pathways were employed, it could be that the use of both working memory pathways instead increased the ease or fluency of individuals' processing of the descriptive data. In line with other research (Whittlesea et al. 1990), this heightened fluency may have produced the observed outcomes (e.g., heightened assessments of the menu items' gourmet quality). Experiment 2 explores the viability of this alternative mechanism in two ways: by introducing a misattribution manipulation that should

eliminate any fluency-driven effects on the response measures, and by examining perceptions of product traits that should be sensitive to variation in processing fluency but not sensitive to differences in information retention.

EXPERIMENT 2

Design

Experiment 2 was guided by two main goals: a) to assess whether the effects of working memory pathway use that I observed in experiment 1 would replicate on other important central traits of different types of products, and b) to explore the possibility that processing fluency, not information retention, may be responsible for the outcomes observed on people's assessments of the central traits. Relevant to the latter issue, extant research has found that when a stimulus is processed fluently, people often misattribute the sensation of fluency to stimulus-related factors, such as the stimulus' familiarity (Whittlesea 1993), truthfulness (Reber and Schwarz 1999), or other plausible feature. In experiment 1, this could include the product's gourmet quality (Whittlesea et al. 1990; Jacoby et al. 1988). Thus, it is possible that the working memory pathway(s) used to process the product descriptions (as determined by the information delivery format and language factors) altered how fluently people processed the product descriptions. This fluency, in turn, could have been misattributed to the products' status on the central product trait (i.e., its gourmet quality), producing the observed outcomes. Stated otherwise, data processed in both versus only one pathway(s) may be processed more

fluently, and individuals may have falsely attributed this fluency to the product's presumed magnitude of its central trait.

One method that I used in experiment 2 to evaluate the viability of this rival processing fluency explanation was to provide some individuals with instructional material, which indicated that any processing fluency they might experience was due to an extraneous factor that was unrelated to the product itself (Appendix B). This procedure has been used successfully in previous research to eliminate people's attribution of any felt processing fluency to a target object (e.g., the product; Schwarz and Clore 1983). If my findings occurred because people misattributed processing fluency induced by the treatments to the target product, the effect of information delivery format and language on assessments of the product's central trait should emerge only in the absence of this material that offered an external explanation for any feeling of processing fluency that people may have experienced. On the other hand, if as I theorize, treatment differences are due not to variation in processing fluency but instead to differences in information retention, then treatment effects of the aforementioned factors should be observed on assessments of the product's central trait, regardless of whether or not people are supplied with an external reason for any feelings of processing fluency.

A second means I used to assess the viability of the processing fluency explanation was to present people with dependent measures that gauged their assessments of both the central trait of the product—a trait that was implicated by the product description—as well as other traits that the product could reasonably possess but were unrelated to the information relayed in the product description. The processing fluency

explanation suggests that treatment effects are likely to emerge on all viable product traits; the traits need only be perceived as plausible sources of experienced processing fluency. Therefore, if both the central trait and the description-unrelated traits reveal treatment effects, the processing fluency explanation would be supported. However, the information retention explanation that I favor predicts that treatment effects should only emerge on the product's central trait and not on traits that are not referenced in (and could not be retained from) the product description. If treatment effects emerge on only the central trait that was referenced in the product description but not on others, the information retention explanation offers a more plausible account for these outcomes as well as those observed in experiment 1.

Method

Experiment 2 employed a mixed design with five factors: 2 (information delivery format: text vs. audio) by 2 (language: imagery-evoking vs. meaning-based) by 2 (fluency attribution statement: present vs. absent) by 2 (trait type: description related vs. unrelated) by 2 (product type: a new movie vs. a dining table). As in experiment 1, all participants received each of the products with different combinations of format and language. The provision of a reason for attributing processing fluency to an unrelated source was counterbalanced across products and participants. Finally, all participants were presented with both the new movie and the dining table, and they assessed both the product descriptions' related and unrelated traits. The product descriptions employed in

this study were for inedible consumer products rather than foods, thereby broadening the applicability of the theorizing (the descriptions appear in Appendix C).

A total of 194 students completed the study in exchange for course credit.

Descriptions were developed for two consumer products: a new movie and a dining table. Each implied that the product possessed a particular central trait. Specifically, the movie description suggested that the film's central trait was its high entertainment value, while the dining table description implied that the table's central trait was its elegance. On 7 point scales (1=not at all, 7=very much), participants completed two items that assessed each product's central trait. For the movie, they were how entertaining and absorbing the film was, and for the table, they were the extent to which it was elegant and appropriate for special occasion use. In addition, two other items probed a different trait that each product plausibly possessed, but importantly, this trait was unrelated to (i.e., not discussed in) the product's description. For the movie, the description-unrelated trait concerned its stellar production qualities (how likely it was that the movie featured praise-worthy cinematography and had an excellent soundtrack). For the table, the description-unrelated trait concerned its adaptability (how likely the table size could be expanded by adding leaves and the likelihood that the table was available in a stain prevention finish).

Based on my theorizing, which proposes that information delivery format and language should produce effects on information retention--not on processing fluency, two critical outcomes should obtain. First, an interaction of information delivery format and language should emerge on assessments of the products' central traits that are implied by

the description, and this should occur irrespective of whether participants are provided an extraneous reason for why they might experience processing fluency. Second, this interaction should be observed only on assessments of the central traits implied by the product descriptions (i.e., the movie's entertainment value and the table's elegance), not on traits that are unrelated to the descriptions (i.e., the movie's stellar production qualities and the table's adaptability).

Results

As in experiment 1, product type (i.e., movie or dining table) exerted no main or interaction effects on any measures. However, assessments of the products' traits revealed the anticipated three-way interaction of information delivery format, language, and trait type ($F(1, 193) = 6.67, p < .05$). Further examination of this interaction revealed that, as expected, when participants assessed the central or description-related trait, the two-way interaction of information delivery format and language was significant ($F(1, 193) = 6.86, p < .01$; figure 2). But when the trait was unrelated, no treatment effects emerged ($F_s < 1$ for main effects and interactions; figure 3). Planned contrasts performed on assessments of the central or related trait upheld predictions. When the product information was delivered in a text format, participants assigned higher ratings to the description-related (central) traits when the descriptions employed meaning-based language ($M = 5.19$) as opposed to image-evoking language ($M = 4.78$; $F(1, 193) = 5.12, p < .05$). But when such information was delivered in an audio format, they assigned higher ratings to these related traits when the descriptions employed image-evoking

language ($M = 5.04$) as opposed to meaning-based language ($M = 4.68$; $F(1, 193) = 3.72$, $p < .05$).

Equally noteworthy was the observation that providing participants with an extraneous reason for why they may have experienced processing fluency produced no main or interactive effects on any dependent measure (all F s < 1). Thus, this observation as well as the finding that the crucial (i.e., information delivery and language) treatments affected assessments of only the products' description-related and not its unrelated traits suggest that variation in processing fluency is unlikely to have produced any of my observed outcomes.

Discussion

The findings of experiment 2 argue against the notion that treatment induced differences in processing fluency account for the findings in this study or experiment 1. In particular, providing people with an extraneous reason for why they may have experienced heightened processing fluency failed to eliminate treatment effects that arose and conceptually replicated those of experiment 1. Further, the treatments failed to exert an influence on traits that were unrelated to the product description, even though these traits concerned features that the product plausibly possessed and that could have been the target of any misattributed processing fluency that individuals experienced. A more plausible explanation for these and all other findings observed in this paper is that they were the result of differences in people's retention of the descriptive product information,

where such retention was shaped by how the treatments affected the working memory pathway(s) that processed the information.

In addition to casting doubt on this rival explanation for the findings, experiment 2 also established that the central trait of a product does not invariably concern any single product feature. Rather, it can reflect inferences about any key feature that individuals may draw from the product information. In experiment 1, the central trait was the perceived gourmet quality of the described menu items. This makes sense given that restaurant menu items are often evaluated on indicators of this trait (e.g., the perceived complexity of the food, and the care that characterizes its preparation), and this trait was implied in the menu item descriptions. The central traits of the products examined in experiment 2—a movie and a dining table—were the movie’s entertainment value and the table’s elegance. This too follows from the idea that not only are these characteristics frequently used by consumers to evaluate products of these types, but the product descriptions employed in this study highlighted these features.

Overall, the results of studies 1 and 2 support the thesis that overloading the resources of a single working memory pathway (due to the presentation of too much information of a single type that depletes the resources available for processing it) may negatively affect consumers’ assessments of the product’s central trait. I theorize that this can occur because people retain less of the presented information when it is processed in a single, as opposed to both pathway(s). Nevertheless, to this point my research has offered limited evidence that information retention not only was influenced by my

treatments, but it actually mediated people's assessments. One important goal of experiment 3 was to provide such evidence.

Experiment 3 also pursued a second goal. Note that the preceding studies demonstrated the apparent *positive* consequences that can occur when information is processed in dual pathways. That is, individuals' assessment of a focal product's critical trait (e.g., in experiment 1, the gourmet quality of the menu items) was found to be higher when the message was processed in both versus a single pathway(s). Yet, while positive consequences may occur in some instances, I reasoned that this will not always be observed. Although processing product information in both, versus a single pathway may lead individuals to retain more message information that supports a product's central trait, the value that consumers assign to that central trait should vary depending on whether the trait has positive or negative consequences in the specific situation in question.

Experiment 3 explored these issues in a context that involved assessing two menu items. One was a new menu item intended to further generalize my findings. Participants were asked to assess the appropriateness of each menu item for particular types of diners other than the self. If, as my theory suggests, participants view the foods' gourmet quality as higher when the menu item descriptions are processed in both (versus a single) pathway(s), then participants' assessments of the foods' appropriateness for particular types of diners should vary depending on the sophistication level of the diner's culinary palate. More specifically, a diner who possesses a sophisticated palate is likely to value gourmet quality food, which should prompt participants to assess menu options that are viewed as relatively gourmet (i.e., ones processed in both pathways) to be quite

appropriate choices for this type of diner. However, if the diner in question is a less experienced consumer of food, as, say, most children and picky eaters tend to be, participants who regard menu items as relatively gourmet (i.e., again, because they were processed in both pathways) should view the menu options as a relatively inappropriate choices for such less experienced diners. In this way, the appropriateness of the menu options should vary depending on the situation, namely, the particular nature of the diner. Support for these predictions would be of interest because they suggests that reliance on both versus a single working memory pathway(s) during message processing can produce either positive or negative outcomes.

EXPERIMENT 3

Design

Experiment 3 employed a 2 (information delivery format: text vs. audio) by 2 (language: imagery-evoking vs. meaning-based) by 2 (menu item: pizza vs. pasta) by 2 (diner type: sophisticated vs. unsophisticated) mixed design. Similar to experiment 2, participants were exposed to two of the four combinations of information delivery format and language, and they received different treatment combinations for two menu item descriptions. Participants assessed each item's gourmet quality as well as its appropriateness for both types of diners.

Descriptions were presented for the pasta dish used in experiment 1 and for a pizza entrée, for which a new description was created (see Appendix D). Both of these menu items could be appealing if viewed as either simple standard fare or gourmet

cuisine. As in the previous studies, each of the menu options was delivered in either a text or an audio format, and it was described using either imagery-evoking or meaning-based language. The same measures from experiment 1 were employed to assess the gourmet quality (i.e., central trait) of each menu option. In addition, participants assessed on 7 point scales two items that gauged how appropriate each menu option would be for two different types of diners (1=not at all a good choice, 7=an extremely good choice). The two types of diners were those with sophisticated palates, and those with relatively unsophisticated palates. Specifically, participants assessed how appropriate the menu items would be for gourmets and city dwellers, individuals who are relatively sophisticated and typically prefer more gourmet dishes, and how appropriate the menu items would be for children and picky eaters, people with relatively unsophisticated palates who, as a rule, tend to favor simple dishes. A final measure examined participants' memory for each of the menu item descriptions. As in the post-test of experiment 1, participants were asked to identify which of 12 words presented in a list they recognized from the menu item description they had just received. A word list consisting of six valid probes and six foils was presented after each of the two menu items.

Method

For course credit, 177 undergraduates completed experiment 3. The study procedure mimicked that of experiment 1 except that (a) participants assessed both the menu items' gourmet quality (i.e., the central trait) and the items' appropriateness for each of the two types of diners, and (b) memory was examined for words presented in

each menu item description (to assess retention as a mediator). The gourmet quality and appropriateness measures were ordered randomly and followed by the recognition task. I expected that participants' assessments of the menu items' gourmet quality would exhibit the same interaction of information delivery format and language observed in experiment 1. More specifically, the menu items should be assessed as more gourmet when their descriptions were processed in both rather than a single pathway. A similar interaction also should emerge on participants' retention (i.e., correct recognition) of particular words from the descriptions, indicating better memory for such words when the menu item descriptions were processed in both rather than one pathway.

A more complex pattern of outcomes was anticipated, however, on participants' assessments of both menu items' appropriateness for specific types of diners because responses on these measures should depend on the sophistication level of the diners in question and therefore the value such diners ascribe to the central trait (i.e., the menu item's gourmet quality). Conceptually, when the diners in question are relatively sophisticated in their culinary tastes, food perceived as more gourmet should be viewed as an asset, and this should elevate participants' assessments of the menu items' appropriateness for these diners. On the other hand, when the diners are relatively unsophisticated, food that is perceived as gourmet should be seen as a drawback, and participants should assess such menu items as relatively inappropriate choices for these unsophisticated diners. The preceding implies that when the menu item descriptions are processed in both (only one) working memory pathway(s), assessments of the food's gourmet quality should be higher (lower), and this, in turn, should prompt participants to

assess the food as an appropriate (inappropriate) choice when the intended diner is relatively sophisticated. Yet, this pattern of outcomes should reverse when the diner is low in culinary sophistication. This follows because processing a menu item description in a single (versus both) pathway(s) should produce incomplete or spotty retention of the descriptive data owing to the overloading of the pathway's available resources. Importantly, this should prompt the perception that the menu item is relatively *low* in gourmet quality. As such, participants should assess such menu items as relatively appropriate choices for a diner whose culinary sophistication is low.

Results

The data were analyzed using a mixed model that included information delivery format (text vs. audio), language (imagery-evoking vs. meaning-based), menu item (pizza vs. pasta) and diner type (sophisticated vs. unsophisticated). The latter two factors were repeated measures, but the diner type factor was employed only when analyzing the appropriateness of the menu items for particular types of diners. In all analyses, I controlled for the participants' general liking of each food type. Because the menu item factor produced no effect on any dependent variable (all $ps > .30$), it is not discussed any further.

Analysis performed on assessments of the menu items' central trait--their gourmet quality, revealed the expected interaction of information delivery format and language ($F(1, 176) = 11.07, p < .01$; see figure 4). Replicating my prior outcomes, when the product information was delivered in a text format, participants assessed the menu items

as more gourmet when the language was meaning-based ($M = 4.73$) as opposed to when it evoked imagery ($M = 4.49$; $F(1, 176) = 3.89, p < .05$). However, when the information was delivered in an audio format, they assessed the menu option as more gourmet when the language evoked visual imagery ($M = 4.70$) rather than when it conveyed meaning-based content ($M = 4.39$; $F(1, 176) = 7.65, p < .01$).

Participants' retention of the product description content revealed a similar interaction of information delivery format and language ($F(1, 176) = 3.16, p < .01$). When participants read the description (text format), they recognized more words in the menu items' descriptions when they were expressed in meaning-based ($M = 3.5$) versus image-evoking language ($M = 2.95$; $F(1, 176) = 10.07, p < .01$). Yet, participants who heard the description (audio format) directionally recognized more such words when they were in image-evoking ($M = 3.26$) versus meaning-based language ($M = 3.13$; $F < 1$). Although this latter contrast failed to attain significance, it is noteworthy that contrasts for the difference between text versus audio formats within both the meaning-based and the image-evoking language conditions were significant ($ps < .05$).

Next, I analyzed participants' assessments of how appropriate the menu items were for particular types of diners by adding the repeated diner type measure (sophisticated vs. unsophisticated) to the model. A three-way interaction of information delivery format, language, and diner type emerged on these assessments ($F(1, 176) = 12.89, p < .001$). When participants assessed the appropriateness of the menu options for sophisticated diners, a significant two-way interaction of the first two factors emerged ($F(1, 176) = 6.20, p < .05$). When the menu item description was delivered in a text

format, participants exhibited a directional albeit nonsignificant tendency to view the item as a more appropriate choice for sophisticated diners when it was described using meaning-based ($M = 5.26$) rather than imagery-evoking language ($M = 5.07$; $p < .18$). But when the menu item description was delivered in audio format, participants assessed the item as a more appropriate choice for sophisticated diners when it was described using imagery-evoking ($M = 5.21$) rather than meaning-based language ($M = 4.91$; $F(1, 176) = 3.84$, $p < .05$). Importantly, a significant two-way interaction of information delivery format and language also emerged on participants' assessments of the menu items' appropriateness for unsophisticated diners ($F(1, 176) = 7.01$, $p < .01$). As anticipated, the outcomes on this measure revealed the opposite pattern. Here, when the menu item description was delivered in text format, participants assessed the item as more appropriate for unsophisticated diners when the item was described using imagery-evoking ($M = 4.54$) rather than meaning-based language ($M = 4.26$; $F(1, 176) = 3.71$, $p < .05$). But when the description was delivered in audio format, participants assessed the item as more appropriate for such unsophisticated diners when it was described in meaning-based ($M = 4.55$) versus imagery-evoking language ($M = 4.17$; $F(1, 176) = 6.38$, $p < .05$). See figures 5 and 6.

The reversed outcomes observed when participants assessed the appropriateness of the menu items for unsophisticated versus sophisticated diners were predicted to occur because participants in the single versus dual pathway conditions remembered *less* information about the menu items' gourmet quality, which implied that the items were lower in gourmet quality. These seemingly less gourmet menu items then were viewed as

relatively *appropriate* choices for people with unsophisticated palates. On the other hand, in the dual pathways condition where retention of menu item information was higher, the menu items were perceived as more gourmet and therefore were viewed as inappropriate options for unsophisticated diners. To assess support for this explanation, Sobel tests (Baron and Kenny 1986) examined whether the number of correctly retained (recognized) words from the menu item descriptions mediated the relationship between the treatments and assessed appropriateness of menu item choice for each of the two diner types. Although a more preferable test of mediation would entail using the bootstrapping method (Preacher and Hayes 2004), to the best of my knowledge, there is no version of this test that is appropriate for a repeated measures mixed design such as the one employed in this experiment. Nevertheless, Sobel tests indicated that the number of correctly remembered words indeed mediated the effect of the treatments on assessments of the menu item appropriateness for sophisticated diners ($z = -2.04, p < .05$) and mediation approached significance for unsophisticated diners ($z = -1.63, p < .10$). Further, a Sobel test showed that the number of correctly remembered words from the menu item descriptions also mediated the effect of the working memory pathways on perceived gourmet quality of the menu items ($z = -1.99, p < .05$). See figure 7 for the double mediation pathway; regression coefficients are shown before and after including the mediators (coefficients in parentheses are those after including the mediators).

Discussion

The findings of experiment 3 support the contention that the memory pathways consumers use when processing a product description can affect their retention of the descriptive product information that they receive, their assessments of the product's central trait, and other key assessments that consumers may make, such as the appropriateness of the product for particular types of consumers. More specifically, this study indicated that variation in information delivery format and language used when presenting menu item descriptions influenced whether individuals processed the descriptive content in both working memory pathways, which enabled the information to be amply processed, appreciated, and retained, or the content was processed and retained incompletely owing to individuals' reliance on a single overloaded pathway during processing. Critically, more (less) complete retention of the menu item descriptions heightened (undermined) individuals' perceptions of the items' implied central trait, namely their gourmet quality. Hence, when individuals subsequently were asked to assess the appropriateness of the menu items for diners with relatively sophisticated palates, they assessed the items as more appropriate for these diners when they had processed the menu item descriptions in both working memory pathways rather than just one. On the other hand, when individuals were asked to assess the menu items' appropriateness for relatively unsophisticated diners whose tastes were simple, they assessed the items as more appropriate for such diners when they had processed the menu item descriptions in a single rather than both pathway(s).

Importantly, analysis revealed that individuals' recollection of menu item description content mediated both their perceptions of the item's gourmet quality and their assessments of the menu item's appropriateness for diners who possessed either relatively sophisticated or unsophisticated culinary tastes. As such, the findings of experiment 3 indicate that processing product data in both (versus one) memory pathway(s) and thereby retaining more (less) data that support the product's implied critical trait can result in either more or less favorable product assessments; the valence of such assessments depends on how the implications of the retained data correspond with situational issues, such as the particular preferences of the consumer in question.

GENERAL DISCUSSION

Although consumers commonly encounter product information in multiple formats (e.g., visual and audio data), existing research has offered little insight into how alternative formats differentially influence consumers' responses to the data and how the particular dynamics of working memory may affect consumers' retention and assessments of the information and product. The present research sheds light on these questions by drawing on a prominent model of working memory, which proposes that all information formats are processed using one or both of two pathways that operate on limited and separate pools of resources. One of these pathways accommodates visual-spatial data, while the other processes more meaning-based semantic information. Based on the idea that presenting too much information in one pathway can overload the resource pool fueling that pathway, I reasoned that consumers' retention of and the

favorableness of their responses to such information will often be heightened if aspects of the data (i.e., its format and manner of language) were processed using the resources of both rather than only one pathway(s). The three studies reported in this paper not only support this premise, but they also cast doubt on the viability of an alternative mechanism (i.e., processing fluency) that might explain such outcomes.

I examined these issues by focusing on important downstream outcomes that emerge when essentially the same product information is presented in alternative delivery formats (text or audio) and forms of language (imagery-evoking or meaning-based). The results of such inquiry enhance our theoretical understanding in three major ways. First, they elucidate the basic process by which product information is handled in working memory, and how the dynamics of this process can shape consumers' responses. More specifically, my research shows that variation in product information's delivery format (text versus audio) and language (imagery-evoking versus meaning-based) can determine whether one or both of the two working memory pathways (i.e., one for visual and/or spatial data and the other for meaning-based data) will process the information. This issue is important because the resources that fuel each of the pathways are limited and thus subject to overloading. Overloading-produced deficiencies in information encoding and, importantly, retention can be avoided if the product information's delivery format and language prompt individuals to spread the burden of processing the data between both pathways rather than channeling it into just one pathway. Further, because better retention of product information generally fosters a more detailed and informed representation of the product that heightens appreciation of its critical features or traits, the studies show

that consumers should respond more favorably to product information if it is processed in both versus only one working memory pathway. Note, though, that this is true unless, as in experiment 3, the central trait is not viewed positively by the consumer.

A second insight that the current research highlights is that, contrary to popular assumptions, the modality that perceives the information (as determined by the data delivery format) need not completely dictate how it is processed. Instead, such processing is malleable. Consider how people process text. Printed text can be processed visually based on its perceptual appearance, or it can be interpreted in terms of the meaning its content conveys. Similarly, minor alterations in the language employed by an audio message can alter whether consumers represent the content visually in terms of engendered images or semantically in terms of its basic meaning.

A third contribution of the present work derives from its lesson that, unlike the findings observed in most areas of inquiry that exhort the benefits of data alignment (e.g., the regulatory frame of a message should match the regulatory focus of the audience; Lee and Aaker 2004), it is not always advisable to present all data in an aligned manner. Indeed, the present research suggests that matching the language and delivery format of product information (e.g., presenting imagery-evoking information in a visual text format) may undermine data retention and product assessments. This concurs with Unnava, Agarwal and Haugtvedt's (1996) observation that visual imagery can interfere with visual perception, and, similarly, audio imagery can interfere with audio perception. Drawing on the working memory model that I employ, I build on these findings by showing that both information delivery formats and language that fosters image-evoking

or meaning-based representations can jointly produce resource overload. Such overload can prompt predictable differences not only on memory, but also on other important measures such as product assessments about the appropriateness of product choice.

A key premise of my theory is that people's assessments of a product's critical traits are based on the product information that is retained in working memory, and such retention is affected by variation in the information's delivery format and language. Given that this premise underscores the role played by such retained data, some readers might question whether my findings are limited to situations in which people render their assessments of the product's critical trait in a memory-based fashion (i.e., they are derived some period after product information has been processed in working memory), as opposed to generating assessments online at the time that product information is initially processed (Hastie and Park 1986). Such a limitation would seem to be quite severe, as according to Hastie and Park (1986), people are thought to form most of their assessments online rather than based on memory. Importantly, however, careful consideration of my theory makes it clear that no such limitation actually exists. The initial processing of product information in working memory—when data are directed to either one or both pathway(s)—determines the amount of data that is comprehended and that may be either used early on to form an online assessment or stored in long term memory where it may be used later to render a memory-based assessment. In other words, both online and memory-based assessments are derived from information that successfully passes through working memory. Thus, because my hypotheses reflect the

dynamics of working memory, they should hold for both types of (online and memory-based) assessments.

In addition to advancing our theoretical knowledge, the present research suggests some important applied implications. It appears that in most instances, consumers will respond in a more desirable manner (e.g., better retain product data, form stronger assessments of a product's implied central feature) when product information is processed in both rather than just one working memory pathway. This implies that by strategically selecting the delivery format (text vs. audio) and manner of language used in a product message (imagery-evoking vs. meaning-based), it should be possible to enhance consumer appreciation and acceptance of the product. Because information delivery formats and language that encourage dissimilar ways of processing should typically foster more desirable consequences (i.e., they should prompt consumers to process the information in both pathways rather than just one), it would seem advisable to present imagery-evoking product claims orally (using an audio format), while more pallid meaning-based claims should be presented in written text.

While the current research highlights the consequences of overloading working memory pathways, future research should seek to identify ways of overcoming the resource constraints of such pathways. For example, individuals who employ certain processing styles (e.g., relational vs. item-specific) might process data in working memory in a more resource efficient manner, leading to heightened retention. Identifying such methods of effectively expanding working memory not only could aid in the

practical application of working memory theory (i.e., help consumers to remember more information), but also expand our understanding of working memory dynamics.

Another important step in broadening our understanding of how working memory operates and affects consumers' responses would be to explore how it processes information from people's other modalities, such as taste, touch, and smell. It seems plausible that data acquired from these other senses could at times evoke visual imagery and be processed in the visual pathway, and at other times it might be construed in terms of semantic meaning and be processed in the phonological pathway. Research that identifies if and when each of these possibilities occurs and whether the findings that I observed will generalize under such circumstances promises to both enhance our theoretical understanding of how working memory processes all types of sensory information. It also can help marketers use these other types of sensory data more effectively in applied settings.

Finally, my research focused on how working memory processes relatively positive information. Indeed, note that even in experiment 3 where participants sometimes reported that the product was less appropriate for particular types of consumers, the product information was never negative from an absolute perspective. Yet, it seems possible that outrightly negative information, such as data often communicated in advertising disclaimers, rumors, or product liability cases, could have a greater impact on working memory dynamics than positive information. This is possible because negative information may be weighed more heavily (Fisk 1980) and thus require more resources to process than positive data, or negative information may require

different memory strategies. By examining the dynamics of various types of information processing within the working memory framework, I hope that future research will shed light on other unanswered communication questions.

Table 1

Experiment 1: The Consequences of Information Delivery Format and Language on the Pathway(s) Employed For Processing and Data Elaboration

<u>Language</u>	<u>Information Delivery Format</u>	
	Text	Audio
Imagery	Use of Single Visual Pathway (Inadequate resources and elaboration due to information overload)	Use of Dual Visual & Phonological Pathways (Resources are adequate and enable some elaboration)
Meaning	Use of Dual Visual & Phonological Pathways (Resources are adequate and enable some elaboration)	Use of Single Phonological Pathway (Inadequate resources and elaboration due to information overload)

Figure 1: Experiment 1 - The Effect of Information Delivery Format and Language on Assessments of Menu Item Gourmet Quality

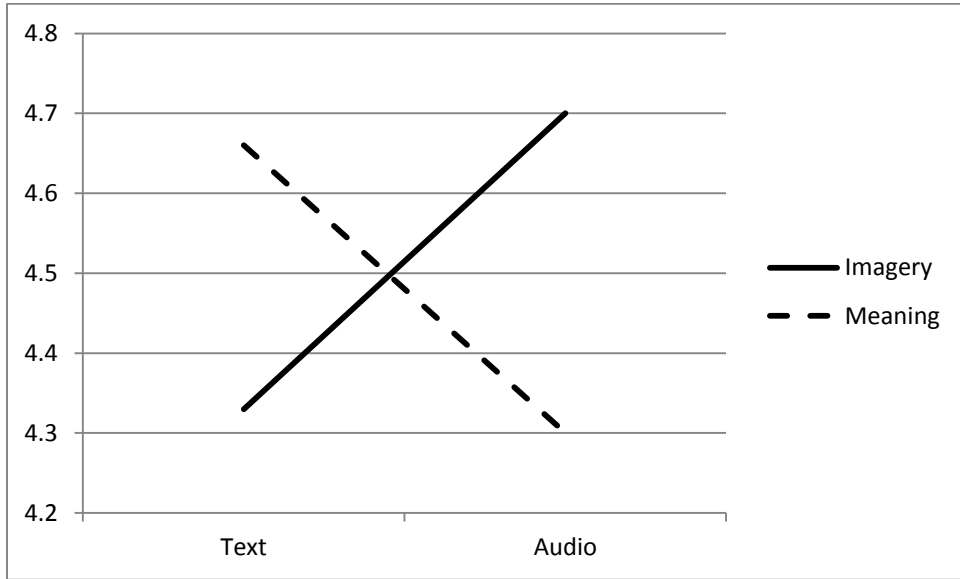


Figure 2: Experiment 2 - The Effect of Information Delivery Format and Language on Assessment of Related Traits for a Dining Table and Movie

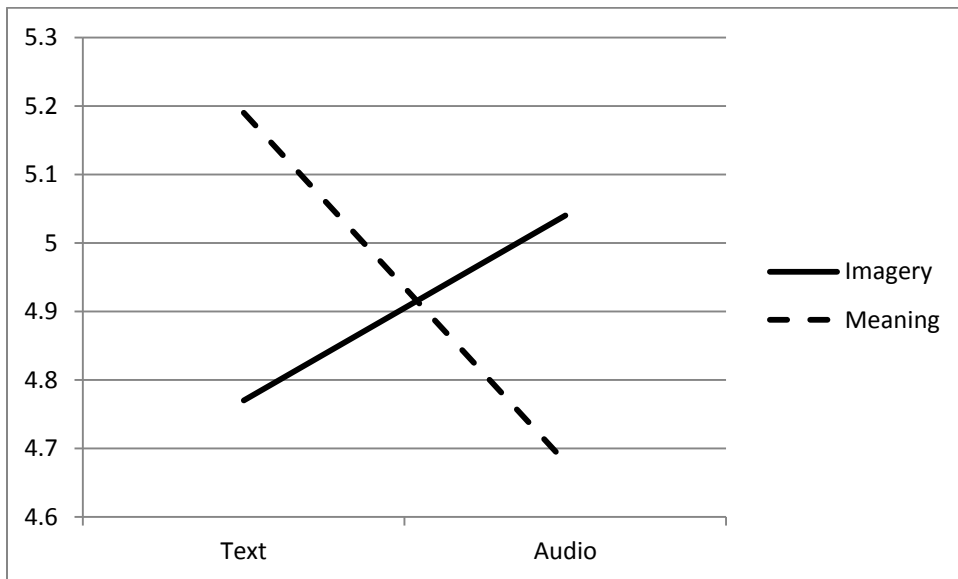


Figure 3: Experiment 2 - The Effect of Information Delivery Format and Language on Assessment of Unrelated Traits for a Dining Table and Movie

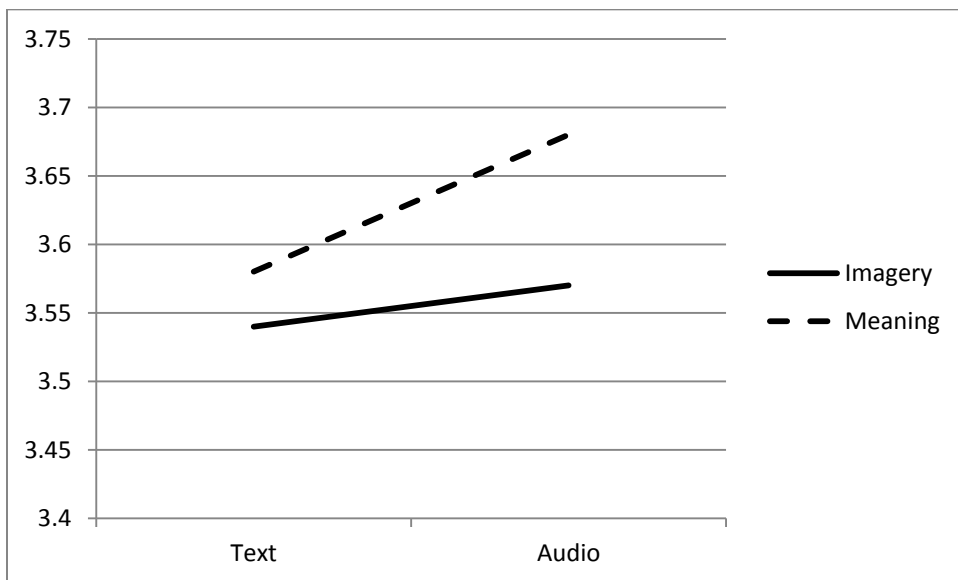


Figure 4: Experiment 3 - The Effect of Information Delivery Format and Language on Assessments of Menu Item Gourmet Quality

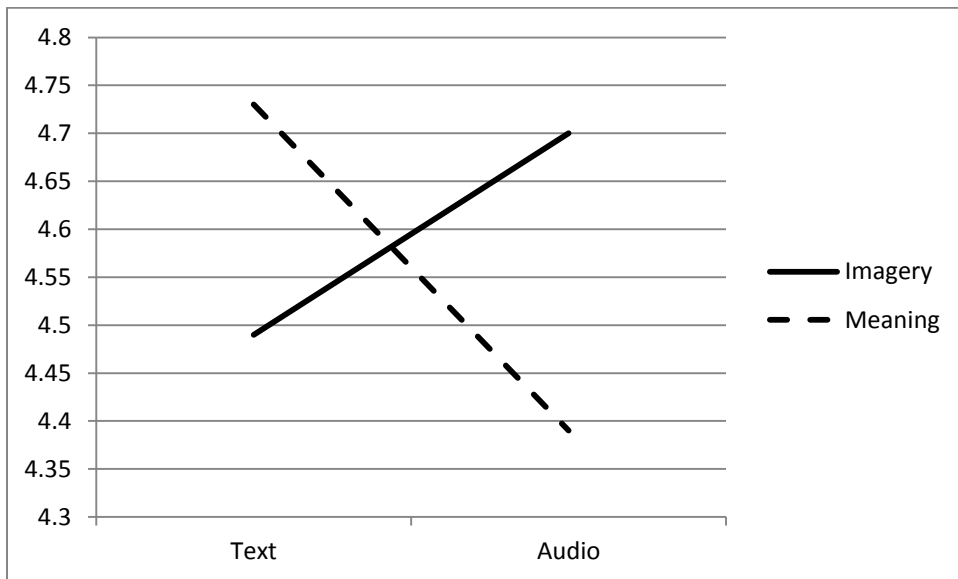


Figure 5: Experiment 3 - The Effect of Information Delivery Format and Language on Assessments of Menu Item Appropriateness for Sophisticated Diners

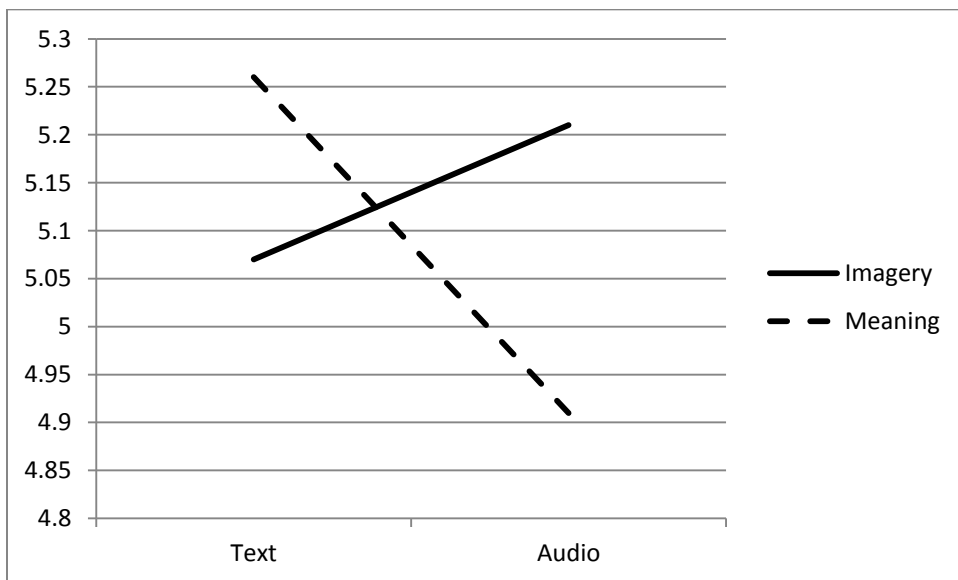


Figure 6: Experiment 3 - The Effect of Information Delivery Format and Language on Assessments of Menu Item Appropriateness for Unsophisticated Diners

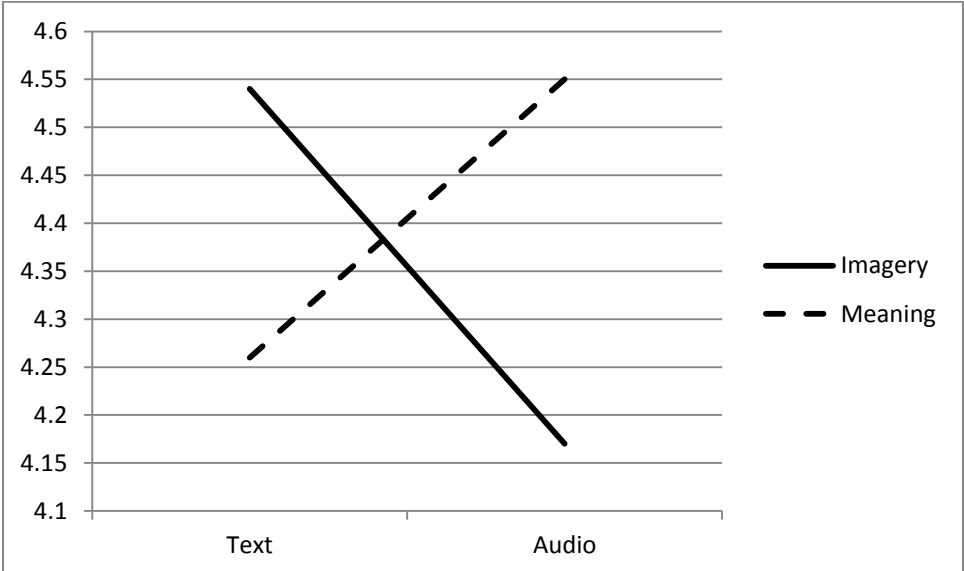
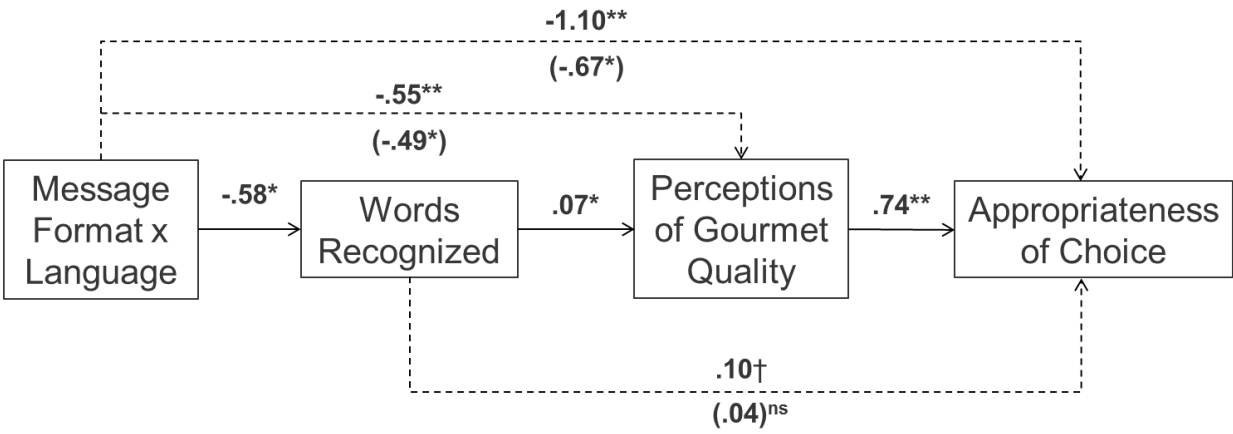


Figure 7: Experiment 3 – Mediation Path



CHAPTER III

The studies reported in Chapter II elucidate the consequences that can ensue when too much information of a particular type (i.e., either visual or meaning-based data) overloads the resources that fuel processing in a single working memory pathway. In Chapter III, I build on this and explore a related issue. Specifically, I examine whether expanding working memory capacity by inducing people to process data (i.e., use the resources of each pathway) more efficiently can eliminate information overload when data are processed in a single pathway. In addition, I examine an intriguing albeit counterintuitive possibility: can expanding capacity potentially reverse the entire pattern of outcomes that were observed in the prior studies? The research reported in this chapter attempts to effectively expand capacity or resource availability by priming people to employ a more integrative and hence efficient relational versus item-specific style of processing when they encode the target information.

To explain, research that distinguishes between people's use of relational versus item-specific processing suggests that relational processing may make more efficient use of individuals' resources. Consistent with this idea, whereas item-specific processing entails encoding each individual piece of data independently as its own unit, relational processing prompts people to attend to commonalities and interconnections that integrate and possibly unitize individual pieces of data (e.g., Hunt and Einstein 1981; Meyers-Levy 1991). The latter can foster more efficient processing because individual pieces of data are essentially chunked into integrated units or themes, which reduces the number of data units that must be processed. Thus, I expected that priming people to process product data

in a relational versus an item-specific manner would induce them to make more efficient use of the pool of resources available within each working memory pathway.

If employing relational processing causes people to process data and use resources more efficiently--effectively expanding resource availability in each pathway, this could affect outcomes in alternative ways. Perhaps the most obvious possibility is that when individuals adopt relational (but not item-specific) processing, information overload should be eliminated when people process product information in a single pathway. If so, individuals who employ relational processing should retain and use data equally effectively regardless of whether they process it in a single pathway or both pathways. In this event, while the previously observed treatment effects of information delivery format and language should emerge on people's responses when they engage in item-specific processing, these effects should be absent and result in null effects when individuals use more efficient relational processing.

A second possibility, however, is that the impact of the resource expansion caused by relational processing could have more far-reaching and complex consequences. In particular, it could enable important benefits to emerge that otherwise would neither occur nor be manifested when data are processed in a single pathway. These benefits are substantial and may not merely offset, but they actually may *outweigh* any positive effects that resource expansion also might exert when data are processed in both pathways. Baddeley and Hitch's model of working memory (1974; Baddeley 1996; 1998) sheds light on some of these potential benefits. One such advantage could transpire because when data are processed in a single rather than both pathways, resources are not

needed to switch between the two pathways—a process that is mandatory and can undermine processing when information is processed in both pathways. Supporting this thesis, Spinnler et al. (1988) found that data can be lost when the central executive must switch pathways and coordinate the processing of information in both pathways. Such switching and coordination consumes resources that otherwise could be devoted to both the encoding and elaboration of the presented data. A second previously precluded benefit that can emerge when resources are expanded and data are processed in a single (rather than both) pathway(s) involves enhanced understanding and elaboration of the data during the initial interpretation stage. This can occur because if certain data, say contextual information, can facilitate understanding of a given piece of information *and* both such pieces of data are processed in the same pathway, the contextual data can be more easily accessed and better used to aid interpretation. Hence, when the resources available to working memory pathways are expanded and data are processed in a single rather than both pathway(s), significant benefits are now likely to be manifested in terms of not only comprehension, but also encoding, elaboration, retention and thus use of the data. Further, although resource expansion may ease the burdens of performing certain tasks that are required when information is processed in both pathways (i.e., switching and coordinating pathways or integrating data), such consolations are apt to be dwarfed by the seemingly more substantial elaboration benefits that resource expansion enables when processing is streamlined and occurs in a single pathway.

The preceding discussion suggests that the treatment effects produced by variations in information delivery format and language are likely to differ in direction

when people are induced to process product information in either an item-specific or relational manner. In particular, the effects of information delivery format and language observed in the previous studies should be maintained when people engage in (less efficient) item-specific processing; yet, they may actually reverse and now manifest the previously occluded benefits of processing information in a single versus both pathways when people employ more efficient relational processing. Stated otherwise and casting the predictions in terms of product information, individuals who are primed to use relational processing may better perceive the product's central trait—in the case of food, its gourmet quality—when they process product descriptions using a single pathway rather than both pathways. Tables 2 and 3 outlines the processes that may transpire and produce these outcomes when item-specific (table 2) or relational (table 3) processing of the product information is induced.

Insert tables 2 and 3 about here

The experiment that I now report tests this theorizing and these outcomes. In this study, individuals are primed to use either relational or item-specific processing as they receive food descriptions that should be processed in either a single or dual pathway(s) due to variation in the information delivery format and language of the descriptions. Thus, as in the previous studies, the pathway(s) individuals use are altered by varying whether the product descriptions are delivered in a text or audio format and the language used in the descriptions is imagery-evoking or meaning-based.

Method

A total of 163 students completed the study for course credit. The design of the experiment was similar to the studies in Chapter II, with the following changes. First, descriptions of a different product, varieties of chocolate candies, were created (see appendix E for descriptions). Second, in addition to varying the format used for delivering information about the candies (text or audio) and the language employed (imagery- evoking or meaning-based), at the onset of the study participants were primed to employ either relational or item-specific processing as they encountered the candy descriptions. The particular primes, which were validated extensively in a pretest, appear in appendix F and appendix G. Finally, measures similar to those employed in experiment 1 of chapter 2 were used to assess participants' perception of the gourmet quality of the candies. With these changes, the study design was a 2 (type of processing primed: relational vs. item-specific) by 2 (information delivery format: text vs. audio) by 2 (language: imagery-evoking vs. meaning-based) by 3 (chocolate variety: white, dark, and raspberry) mixed factorial, where all but the last factor was varied between subjects.

Results

Because the chocolate variety factor produced no effect on the dependent measures, it was dropped, and the data were analyzed in a repeated measures mixed model. All analyses controlled for participants' self-reported fluency in English. An index similar to that used in experiment 1 of Chapter II was created to assess perceptions of the candies' central trait – their gourmet quality. As expected, a three-way interaction of type

of processing, information delivery format, and language emerged on the index of the candies' perceived gourmet quality ($F(1, 155) = 13.29, p < .001$). When participants employed item-specific processing, the two-way effect of information delivery format and language was significant ($F(1, 155) = 3.71, p < .05$; figure 8) and mimicked the outcomes observed in Chapter II. That is, when item-specific processing was primed, assessments of the gourmet quality of the candies were higher when the candy descriptions were delivered in text format and they relayed meaning-based ($M = 5.28$) rather than image-evoking language ($M = 4.97$; $F(1, 155) = 5.31, p < .05$). Further, when the candy descriptions were delivered in an audio format, the candies were perceived as more gourmet when they were communicated in image-evoking ($M = 4.90$) rather than meaning-based language ($M = 4.60$; $F(1, 155) = 4.86, p < .05$). Thus, assessments of the candies' gourmet quality were higher when the candy descriptions were processed in both rather than a single pathway.

Of greater interest, however, were the outcomes observed when participants employed relational processing. When relational processing was primed, the effect of information delivery format and language was significant ($F(1, 155) = 3.91, p < .05$; figure 9), yet it revealed the opposite pattern of outcomes. When the candy descriptions were processed in a relational manner and they were delivered in text format, participants perceived the candies' gourmet quality to be directionally albeit nonsignificantly higher when they were described in language that was imagery-evoking ($M = 5.12$) rather than meaning-based ($M = 5.06$; $F < 1$). But when the descriptions were delivered in audio format, the candies were perceived to be of higher gourmet quality when meaning-based

($M = 4.88$) rather than imagery-evoking language was used ($M = 4.55$; $F(1, 155) = 4.90$, $p < .05$). In other words, following a relational processing prime, participants perceived that the candies were higher in gourmet quality (i.e., higher on the critical product trait) when the candy descriptions were processed in a single rather than both working memory pathways.

Discussion

The results of this study reinforce the notion that working memory processes, such as resource use, encoding, and data elaboration, can affect consumers' assessments of products' central traits. In particular, this is true when information about products is delivered in either a text or audio format and communicated using image-evoking or meaning-based language. Regardless of how such data are processed (i.e., in a relational or item-specific manner), variation in the information's delivery format and language determines whether it is processed in only one or both working memory pathway(s). However, the unique insight gained in Chapter III is that the consequences of using one or both of these pathways can differ depending on whether people employ less efficient item-specific processing or more efficient relational processing, where the latter effectively expands the resources available in each pathway. When product information is processed in a less efficient item-specific fashion and this occurs while using the resources of a single (versus both) working memory pathway(s), overload of the pathway's resources is likely to occur, which not only impairs encoding, elaboration, and thus retention of the product data, but it also appears to disallow the manifestation of

significant benefits in these same processes that, barring resource overloading, occur when a single pathway is used for processing (i.e., benefits during the initial information comprehension stage and ones that transpire from the lack of need for pathway switching and coordination and data integration). As a result, under such (item-specific processing) conditions, treatment effects such as those observed in experiments 1 through 3 emerge, where perceptions of the product's central trait are higher when product information is processed in both, versus one, pathway(s).

Interestingly, these outcomes can reverse when people employ relational processing, which uses resources more efficiently and thus expands available resources in each working memory pathway. Not only does this expansion eliminate the problem of resource overloading when product information is processed in a single pathway, but it enables the earlier mentioned benefits of single pathway processing (e.g., heightened elaboration) to become evident. Indeed, these benefits can dwarf those that may ensue from such resource expansion when data are processed in both pathways. Under these relational processing conditions, the data show that important benefits of single pathway processing may be realized, such that assessments of a product's central trait will be higher when product information is processed in a single rather than both working memory pathway(s).

An important theoretical contribution of Chapter III centers on the intriguing demonstration that it is possible to effectively expand a pool of resources, and inducing people to employ relational processing can accomplish this by fostering resource use that is more efficient. Exploration of this issue is important for not only does it show that a

surprising reversal of outcomes can emerge from such resource expansion, but it also begins to shed light on the largely overlooked complexities of working memory's mechanisms (e.g., the process and consequences of switching between working memory pathways and coordinating the pathways' operation). Additional work will be needed that can pinpoint and more closely track these processes and their consequences. Likewise, the observation that people's use of a relational versus item-specific processing style can influence the operation of their working memory represents a fertile topic that merits more inquiry.

Table 2
The Consequences of Product Information Delivery Format and Language When Less Resource Efficient Item-Specific Processing is Employed

<u>Language</u>	Information Delivery Format	
	Text	Audio
Imagery	Use of Single Visual Pathway (Inadequate resources and elaboration due to information overload)	Use of Dual Visual & Phonological Pathways (Resources approach an adequate level and some elaboration)
Meaning	Use of Dual Visual & Phonological Pathways (Resources approach an adequate level and some elaboration)	Use of Single Phonological Pathway (Inadequate resources and elaboration due to information overload)

Table 3
The Consequences of Product Information Delivery Format and Language When More Resource Efficient Relational Processing is Employed

<u>Language</u>	Information Delivery Format	
	Text	Audio
Imagery	Use of Single Visual Pathway (Ample resources and extensive elaboration)	Use of Dual Visual & Phonological Pathways (Pathway switching costs and moderate elaboration)
Meaning	Use of Dual Visual & Phonological Pathways (Pathway switching costs and moderate elaboration)	Use of Single Phonological Pathway (Ample Resources and extensive elaboration)

Figure 8: The Effect of Information Delivery Format and Language on Perceived Product Gourmet Quality When Item-Specific Processing is Employed

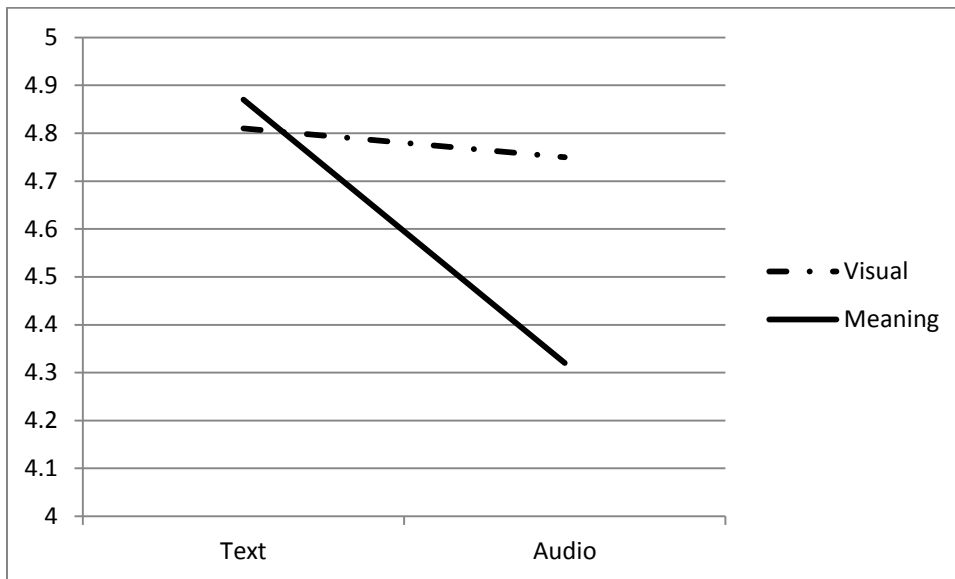
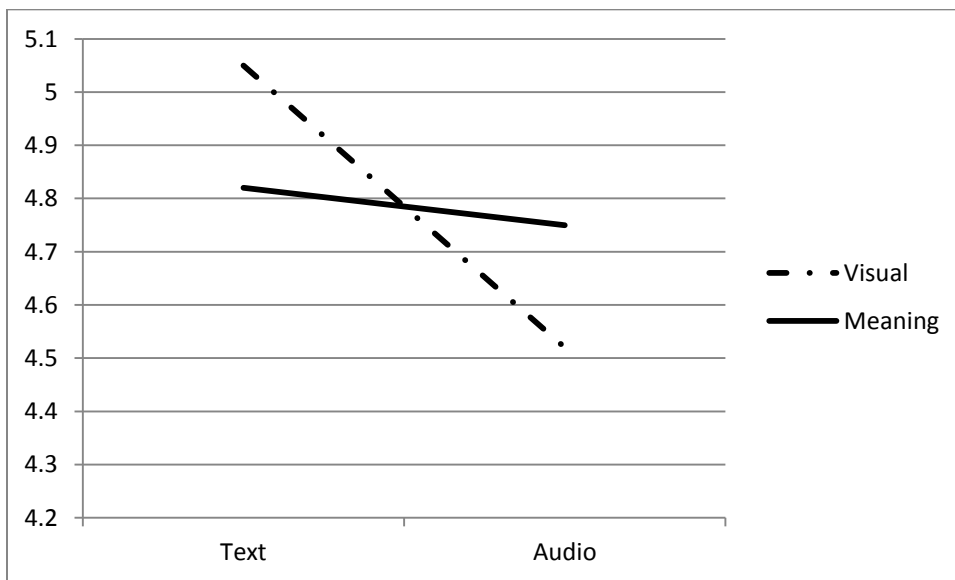


Figure 9: The Effect of Information Delivery Format and Language on Perceived Product Gourmet Quality When Relational Processing is Employed



CHAPTER IV

SUMMARY AND CONCLUSIONS

Summary

Although consumers commonly encounter product information in multiple modalities (e.g., visual and oral data), extant research has offered limited insight into how consumers actually process such data and how the particular dynamics of working memory may affect not only consumers' retention for product information but their perceptions and assessments of the information and product as well. The present research sheds some light on these issues by drawing on a prominent model of working memory, which proposes that all information modalities are processed in either or both of two pathways that operate on limited and separate pools of resources. One of these pathways accommodates visual-spatial data (e.g., images and often text), while the other processes more meaning-based semantic information. Based on the idea that presenting consumers with too much data of one of these types can overload their resource pool that fuels a given pathway, I reasoned that consumers' retention of and responses to such data typically will be enhanced if aspects of the data (i.e., its delivery format and the language it uses) could be processed across both pathways. The four studies reported in this dissertation not only support this premise, they also cast doubt on the viability of alternative theories (i.e., resource matching) or mechanisms (i.e., processing fluency) that might explain the findings. Further, and provocatively, my research also suggests a means of enhancing pathway resource efficiency, which potentially can reverse consumers' responses that otherwise obtain.

Chapter III reported three studies which showed that when both a message's delivery format and content (i.e., language) draw on the same resource pool that powers a working memory pathway, processing and retention of such data are poorer than when the delivery format and message content are processed partially in both pathways. The resulting inferior retention typically lowers assessments of the target product's central trait (experiments 1 and 2), but it can lead people to assess that the product is a suitable (i.e., better) choice for individuals who do not value the product's suggested central trait (experiment 3; e.g., individuals who value simple rather than more sophisticated gourmet food). Evidence also suggests that processing fluency cannot explain the observed effects. Instead, it appears that retention of the data mediates the effects of single or dual pathway processing on product assessments.

Chapter III extended such inquiry by investigating a related issue. It explored whether expanding working memory capacity either simply eliminates or actually can reverse the retention-driven outcomes observed in Chapter II. Notably, the study reported in this chapter found that effectively expanding working memory capacity by introducing a relational processing style prime produced a reversal of the effects obtained in Chapter II. Presumably this occurred because when the capacity of a single pathway is expanded and thus allows full processing and retention of incoming data, processing data using a single pathway offers important advantages, for it enables enhanced message elaboration without incurring pathway switching costs that disrupt processing. In contrast, when individuals engage in dual pathway processing, they must expend resources that would otherwise be used for elaborating on the data because dual (but not single) pathway

processing necessitates that individuals switch their processing between two different pathways. This switching process is disruptive and can interrupt message elaboration. Therefore, when participants were primed to use relational processing, which effectively expanded working memory capacity, assessments of a target product's central trait were actually higher when individuals processed the product message using the resources of a single rather than both pathways. On the other hand, participants who were primed to use less resource efficient item-specific processing revealed outcomes that replicated those observed in the studies of Chapter II; that is, their assessments of the product's central trait were higher when individuals used both (not just one) pathways to process the message information.

Overall the findings reported in this dissertation suggest that the representation of message content is flexible with respect to how it will be processed. Words can be represented and processed as visual data, or as meaning-based semantic data. This flexibility supports the contention that information communicated in product messages will not necessarily be processed in a manner that corresponds with how the data were delivered and perceived (e.g., via visual or audio perception).

The findings also question the popular notion that 'matching' always leads to positive outcomes due to the benefits of processing fluency or congruity. When a message's content and delivery format match (e.g., imagery-evoking language is delivered in text), the resources used to process the information may be insufficient and impair message retention, which then produces lower assessments of central product traits. It seems that at least in the case where there is potential for resource-overload,

‘matching’ modality (i.e., delivery format) with message content representation is not advisable for marketers.

Limitations and Future Research

While the current work provides insight into how message delivery format and content can interact and affect consumers’ responses, certain limitations of the research are worth highlighting. First, the formats investigated in this dissertation involved only two modalities: vision and hearing. Yet, Baddeley and his colleagues (Baddeley and Hitch 1974; Baddeley 2000) contend that their working memory model can account for processing of all modality input. Hence, investigating the use of olfactory, gustatory or tactile information in product messages would be useful not only to allow for further testing of the model, but it also could provide informative insight about how content presented in these modalities may be represented in working memory.

In line with the observations uncovered in Chapter III, it would be beneficial to examine other methods of constricting or expanding working memory capacity and to study how such changes in capacity differentially affect retention and assessments of product information. For example, in Chapter III, I showed that varying the capacity of working memory pathways had consequences for elaboration of data and, thus, assessments of products. However, the capacity available for processing may also have other consequences on the manner in which working memory processes the information it receives. Although restricted resource capacity can undermine the retention of data content (as in Chapter II), it may also direct attention to more pertinent or diagnostic information. Similarly, restricted resource capacity may lead to better retention of

information that is chunked as opposed to individual pieces of data that are not or cannot be interconnected into integrative units.

Another worthwhile avenue for future research would be to investigate how marketers may be able to prime processing in one of the two working memory pathways. Baddeley (2002) has established a link between the phonological pathway and the left hemisphere, and the visual pathway and the right hemisphere. Hence, by introducing external cues that prime a brain hemisphere, say different types of music that can prime either the right or left hemisphere, it may be possible to influence memory for various types of information and alter consumers' assessments of products.

A final aspect of working memory that is interesting but was not addressed in this dissertation concerns the issue of attention. While the working memory pathways are prone to process different types of information (e.g., audio or visual), the way in which attention is directed to pertinent or intervening information could vary depending on context. Baddeley's model of working memory includes a separate component, the central executive, which is devoted to directing attention to information that it deems pertinent. It would be useful to explore the interaction between how the central executive guides attention and how the two pathways process the information perceived via this guided attention.

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APPENDIX A. Chapter II – Experiment 1: Menu Item Descriptions

PASTA

Imagery-evoking language: Dive into this succulent bowl of chicken tossed lightly with tender strands of fettuccini. Garden-plucked herbs are sprinkled atop the scrumptious heap, with a crispy slice of garlic bread on the side. Velvety alfredo sauce binds the bouquet of flavors together.

Non-imagery-evoking meaning-based language: Enjoy this luscious dish of chicken mixed nimbly with gentle pieces of fettuccini. Flavorful herbs top the delicious combination, with a toasted piece of garlic bread on the side. Smooth alfredo sauce brings the collection of flavors together.

SOUP

Imagery-evoking language: You'll gobble up with gusto ladlefuls of this festive sizzling soup. Overflowing with chunks of brightly-hued vegetables, it fuses home comfort with city sophistication. Served steaming hot, the delicate broth contrasts with the thick but tender vegetables. A saucer of crumbled cheese allows you to crown the soup yourself.

Non-imagery-evoking meaning-based language: You'll finish off with complete fulfillment the generous serving of this energizing hot soup. Filled with pieces of multihued vegetables, it combines family times with urban elegance. Served sweltering hot, the dainty soup base contrasts with the substantial but soft vegetables. An accompaniment of ground cheese allows you to complete the soup yourself.

STIR FRY

Imagery-evoking language: Visual: A breakout flavor, chestnut brown sauce smothers juicy beef tips blended with a smorgasbord of exotic vegetables. Crunch into the bold flavors topped with grated citrus peel. The hand-picked diversity of flavors will fire up your taste buds.

Non-imagery-evoking meaning-based language: A full-flavor, ruddy brown sauce covers moist beef pieces mixed with a variety of extraordinary vegetables. Bite into the strong flavors finished with ground citrus covering. The specially selected assortment of tastes will rouse your senses.

OMELET

Imagery-evoking language: You've never had your taste buds tickled with an artist's omelet masterpiece like this one. A folded blanket of eggs hugs a treasure chest of gooey cheeses, baby green onions, and off-the-vine cherry tomatoes. Then flecks of just-plucked herbs are sprinkled across the top. A mound of golden roasted potatoes completes the mouth-watering package.

Non-imagery-evoking meaning-based language: You've never had your palate delighted with a sous chef's omelet creation like this one. An overlaying cover of eggs surrounds a treasury of fine melted cheeses, select verdant onions, and just picked mini-tomatoes. Then a scattering of newly grown herbs are laid atop. A pile of toasty broiled potatoes finishes the appetite whetting treat.

APPENDIX B. Chapter II – Experiment 2: Attribution Messages**MOVIE****Attribution:**

“The product description that follows concerns a new movie. Last year, the average American watched movies more than they engaged in any other form of out-of-home entertainment. Their apparent passion for movies may explain why studies have found that people’s bodies often release hormones (e.g., endorphins) that create a sense of alertness upon exposure to any materials concerning movies, say movie ads or trailers.

Neutral:

“Now, we’d like to give you some information about a movie that will be released in theaters next year.”

TABLE**Attribution:**

“On the next slide you will receive some material from a furniture company that makes dining tables. As suggested by the headlines about our country's obesity problem, people love to sit down and eat, whether at home or in restaurants. In fact, our love of food has become so powerful that experts now find that simply seeing something associated with eating, such as a dining table or dishes, can make us feel more aroused or on our toes.”

Neutral:

“Now please consider the following information about a dining table.”

APPENDIX C. Chapter II – Experiment 2: Product Descriptions**MOVIE**

Imagery-evoking language: Strap yourself in for a story line that will take you flying through dizzying twists in the lives of a handful of oddball neighbors in a crumbling apartment building. The movie, *Pet Peeves*, brings you face to face with a herd of offbeat characters unlike any other that has trotted across the silver screen. Gerri and Rick are a couple living in a small coal mining town. They live next door to a foxy cradle-robbing bombshell who provokes a head-on collision when she pounces on the couple's tenderfoot 16 year old son. It's not long until volcanic eruptions rock everyone. This leads the group on a road trip where paths cross with a balding stoned rock star, a former bullfighter turned body-builder, and a Nobel Prize winning chemist who may be a slippery con man. Your jaws will clench and sweat will bead on your brow as the patched-together gang side-steps land mines that could have bloody consequences. All eyes will be glued to the screen as you await the next jaw dropper on this roller coaster ride.

Non-imagery-evoking meaning-based language: Prepare yourself for a plot that will have you speeding through the many unexpected adventures in the lives of a group of unusual acquaintances living in an old residential building. The movie, *Pet Peeves*, will introduce you to an array of distinctive characters unlike any that has graced your local cinema. Gerri and Rick are a twosome residing in a small ore prospecting town. They live next door to a captivating temptress of young lads who creates a stir when she makes advances on the couple's naïve adolescent son. It's not long until signs of significant events threaten everyone. This leads the group to take to the interstate where they interact with an aging drug dependent music performer, an animal trainer turned fitness enthusiast, and a prestigious prize winning scientist who may be a deceitful crook. Your body will tense and perspiration will dampen your brow as the unlikely group attempts to avoid mishaps that could have dire consequences. All attention will be focused on the plot as you await the next unexpected event in this unpredictable journey.

TABLE

Imagery-evoking language: The burly wood of this richly chocolate-colored dining table hails from the lush leafy forests of Sweden. Designed by skilled craftsmen with an eagle eye for detail, the clean lines and hypnotizing silky curves of the table create a gripping drama that will play out in your home. The tabletop's glistening veneer gently caresses and echoes the colors of the room as the streaming sunlight or flickering candlelight dances seductively on the surface. Variation in the table's natural wood grain makes each creation a one of a kind work of art. Towering chairs with a fluid character are also available to complement, never steal the spotlight from the table. Choose from oval or ladder-back chairs carved from the same handsome wood, and select either sleekly sculpted wood seats or soothingly cushioned upholstered ones. Finally, an artist's palette of finishes allows you to creatively harmonize or subtly contrast the chairs with the table.

Non-imagery-evoking meaning-based language: The solid wood of this deep auburn-hued dining table comes from the bountiful verdant woods of northern Europe. Constructed by experienced masters who have a fine appreciation of aesthetics, the meticulous lines and exquisitely contoured curvature of the table create a spectacular sight and deliver it directly to your residence. The tabletop's polished sheen majestically alters and reflects the colors of the surroundings as the natural ambient light or bright candlelight creates alluring shadows on the surface. Variation in the wood's untouched grain pattern makes each piece different and distinctive from all others. Tall chairs with a mellow character are also available to compatibly accompany, never overtake the table. Choose from circular-back or mission-style chairs made from the same attractive wood, and decide between either fluently molded wood seats or comfortably upholstered stuffed ones. Finally, an assortment of finishes allows you to tastefully coordinate or slightly differentiate the chairs from the table.

APPENDIX D. Chapter II – Experiment 3: Menu Item Description**PIZZA**

Imagery-evoking language: Each taste bud tickling individualized pizza is handmade from gently massaged, air-tossed dough that is baked to a lustrous gold in our cavernous stone ovens. Then the airy crust is smothered with our old world sauce made from fire-engine red plump juicy tomatoes and fragrant garden herbs. Last, you can customize your masterpiece with a blanket of five snappy cheeses, sun-ripened vegetables grilled on an open pit, and/or thick slabs of meat.

Non-imagery-evoking meaning-based language: Each appetite evoking pizza-for-one is caringly made from nimbly kneaded, air-spun dough that is cooked to a pleasant tan in our big masonry ovens. Then the light crust is covered with our flavor-filled sauce made from rosy red large mellow tomatoes and aromatic Italian herbs. Last, you choose your toppings from a covering of five delightful cheeses, select tasty vegetables seared in a broiling oven, and/or generous pieces of meat.

APPENDIX E. Chapter III: Candy Descriptions

WHITE CHOCOLATE

Imagery-evoking language: Pearly white chocolate veils an airy cloud of hazelnut mousse. As your teeth crack the brittle shell, the luscious bonze-colored whipped treasure will simply melt in your mouth. Each of these ivory white chocolate buds is crafted from gourmet cocoa butter churned exclusively in Hawaii. One taste of these satiny goddesses and you'll be transported.

Non-imagery-evoking meaning-based language: Lustrous white chocolate covers a puffy core of hazelnut delight. As you pierce the fragile outer layer, the tasty tan puree in the center will seduce your taste buds. Each of these sandy white chocolate beauties is created from world class cocoa butter made only in Hawaii. One bite of these glossy morsels of goodness and you're in paradise.

DARK CHOCOLATE

Imagery-evoking language: Each of these velvety dark chocolate babies hides a pillow of dewy butter cream with hints of pistachio. The masterpieces are then crowned with a dusting of cocoa powder. This marriage of bold chocolate flavor together with a creamy inside cushion is simply heaven on earth. A crown jewel of texture and flavor.

Non-imagery-evoking meaning-based language: Each of these smooth dark chocolate pieces surrounds a mound of soft butter cream with pistachio flavoring. The creations are then finished with a veneer of cocoa powder. This combination of robust chocolate flavor together with a mellow inner center is simply perfection. A wondrous creation of substance and spirit.

RASPBERRY CHOCOLATE

Imagery-evoking language: Gauzy thin layers of semi-sweet dark chocolate are sandwiched between delicate blankets of raspberry glaze. A single oversized toasty almond sliver rests artfully on each square. These works of art offer a dazzling feast for both the eyes and the mouth.

Non-imagery-evoking meaning-based language: Wispy thin sheets of semi-sweet dark chocolate are interspersed between fragile expanses of raspberry gel. A large roasted almond slice sits handsomely on each square. These attractive creations offer a captivating treat for both one's sight and taste.

APPENDIX F. Chapter III: Priming Task Used to Elicit Item-Specific Processing

Product Task

Consumers are often aware of the names of many brands that offer goods in a particular product category. For example, when thinking about bread, several brands might come to mind, including Wonderbread, Pillsbury bread, Healthy Choice bread, etc. In this task we are interested in the brand names that come to mind first or most readily when you think of certain product categories. For example, using the sample product “bread,” the brand name Wonderbread may come to mind more readily or before the brand name Healthy Choice. Below is a list of several product categories. For each category, identify the single brand name of a product in that category that comes to mind *first or most readily*.

List *one* brand name for each category. Don't spend more than 3 minutes on this task.

soup _____

coffee _____

suit _____

toothpaste _____

cold remedy _____

refrigerator _____

hospital _____

bottled water _____

candy bar _____

paint _____

credit card _____

crackers _____

fast food _____

shampoo _____

newspaper _____

florists _____

moving company _____

bank _____

athletic shoes _____

facial tissues _____

breath mint _____

frozen dinner _____

hardware store _____

realtor _____

ice cream _____

church _____

hotel _____

rental car company _____

hair salon _____

cigarettes _____

APPENDIX G. Chapter III: Priming Task Used to Elicit Relational Processing

Product Task

Many of the products that consumers use can be thought of as complementary. That is, they tend to be associated with each other because they are often used together or sequentially during a consumption episode (e.g. bread and a toaster), are substitutes for one another (e.g., cup and mug), or one product is acquired from the other (e.g. medicine and a drug store). On the left below are some of these kinds of products. For each product listed on the left, please identify a product in the column on the right that can be thought of as its complement. Then write down the letter of the complementary product in the blank next to the product on the left. **Please try to pair each complementary item from the column on the right with *only one* product in the column on the left.**

Please do not spend more than 3 minutes on this task.

<u>Product</u>	<u>complementary item</u>
_____ soup	a. coffee
_____ suit	b. toothpaste
_____ cold remedy	c. refrigerator
_____ hospital	d. bottled water
_____ candy bar	e. paint
_____ credit card	f. crackers
_____ fast food	g. shampoo
_____ newspaper	h. florists
_____ moving company	i. bank
_____ athletic shoes	j. facial tissues
_____ breath mint	k. frozen dinner
_____ hardware store	l. realtor
_____ ice cream	m. church