Consumer Behavior in Complex Contexts: Effects of Indirect Marketing on Memory

by

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A dissertation accepted and approved in partial fulfillment of the

requirements for the degree of

Doctor of Philosophy

in Marketing

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Spring 2026

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DISSERTATION ABSTRACT

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Doctor of Philosophy in Marketing

Title: Consumer Behavior in Complex Contexts: Effects of Indirect Marketing on Memory

In their everyday lives, consumers are exposed to a proliferation of memory associations through exposure to advertising, influencer marketing, sponsorship, and general activities such as sports engagement. For example, the number of brand and event pairings in sport sponsorship continues to grow, with brands sponsoring at multiple levels ranging from athletes and large sporting events to individual races and stadiums, creating a complex sponsorship ecosystem. Additionally, brand associations exist in multiple sensory modalities, such as visual branding, auditory branding through sonic logos, and even scent branding. In the current dissertation, we examine how consumers encode and retrieve memories formed in such increasingly complex, real-world contexts. In marketing, much of the memory literature is centered on a spreading activation process related to associative memory theory. Throughout the dissertation, we focus on introducing novel theorizing that is more apt to today's complex environment compared to those theories favored in the past. Building on our conceptual work, we use experiments, field studies, and eye-tracking to demonstrate how modern accounts of memory are fundamental to understanding consumer behavior across contexts.

Essay 1 ("PRISMA Review of Consumer Memory") presents a PRISMA literature review of consumer memory research. In the review, we create a framework for consumer memory and identify key contexts (e.g., advertising, experiential marketing), provide consideration as to how the different types of memory (i.e., sensory, short-term, long-term) are of consequence to consumers, and identify the constructive memory account and the accessibility-diagnosticity framework as key theoretical frameworks driving consumer memory. The review identifies the

structure of consumer memory networks and auditory branding as key areas to address in the future, providing the basis for Essay 2 and Essay 3, respectively.

Essay 2 ("Brand Memory in Marketing Ecosystems: Evidence from Sponsorship") introduces theorizing on the consequences of accessing a well-structured semantic memory network and moves beyond the traditional heuristic-based explanation of consumer memory biases in sponsorship. We draw on novel methodologies in network science and cognitive psychology to quantitatively measure consumer memory networks for sport sponsorship and demonstrate that memory network characteristics can drive consumer behavior related to sponsorship.

Essay 3 ("Auditory Imagery: A Sensory Processing Account of Branding") is centered on the construct of auditory imagery. Sponsorship of sports, arts, and music as a platform for marketing communications blends logo placement and auditory brand mentions with the experiential context that is sponsored. This combination offers a rich context for sensory-based memory, but past research has not explicitly considered the role of auditory imagery. Building on the sport sponsorship literature, we examine how the processing modality of sponsorship information influences memory and brand outcomes. We demonstrate that auditory imagery not only predicts recall but also determines both brand choice and visual attention.

In sum, presented is a theoretically grounded, multi-method approach to address how memory drives consumer behavior in different contexts. The work utilizes new theory and new methods. While each essay is freestanding as a contribution, they are integrated in studying memory as a vital aspect of consumer behavior.

ACKNOWLEDGEMENTS

I am sincerely grateful for my dissertation chair, T. Bettina Cornwell, for her guidance, support, and belief in me throughout the PhD program. I am also grateful to my committee members Jiao Zhang, Ravi Pappu, and Ben Hutchinson for valuable feedback on the manuscript. I thank Zen Seliokas, Camilla Seliokas, Bill Knox, and Anne Knox for their support throughout my life culminating in the PhD journey. I also thank Gus Dilley for his help recording stimuli and endless love. Finally, I am grateful to Cristel Russell and Wendy Boland for introducing me to marketing and their support early in my academic journey.

DEDICATION

This dissertation is dedicated to my grandfather, Simas Mankus. Thank you for always believing in me and in this dream.

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INTRODUCTION CHAPTER

"Taken together – differences in individuals and differences in content – an endless number of differences come to light. One individual overflows with poetical reminiscence, another directs symphonies from memory, while numbers and formulae, which come to a third without effort, slip away from the other two as from a polished stone... If by any chance a way to a deeper penetration into this matter should present itself surely, considering the significance of memory for all mental phenomena, it should be our wish to enter that path at once." (Ebbinghaus, 1885, pp. 3–6).

Marketing is a field rich with context; from brands embedded in television shows (Russell, 2002) to sponsorship (Cornwell et al., 2005) consumers are consistently exposed to a plethora of brands throughout their daily lives. Such a proliferation of brand associations highlights the need for updated theorizing on consumer memory. Consumer memory research has been in decline within the marketing discipline since 2000 (Camilleri et al., 2024). Yet, memory is fundamental in driving consumer behavior, especially in an increasingly complex world where the number of brand associations consumers are exposed to continues to grow. The aim of this dissertation is to provide an updated account of consumer memory (Essay 1) and provide two applications of modern theorizing in relation to consumer memory (network structure and sponsorship in Essay 2 and auditory imagery in Essay 3).

Though memory research has acknowledged the endless possible combinations of individual differences and environmental contexts since its inception (Ebbinghaus, 1885), a framework of consumer memory has yet to emerge. Theories of memory in tightly controlled experimental settings abound, however, there has been little consideration of an integrative framework that explains how consumers use their memory in an applied context. In marketing,

memory research began in 1925 (Burtt & Dobell, 1925) and has long been considered a crucial element in building brand equity (Keller, 2003; Cornwell et al., 2023) and for understanding consumer behavior more broadly (Hoyer et al., 2017; Kotler & Keller, 2006). In consumer memory theory, there has been a strong orientation towards spreading activation theory (Anderson, 1983; Collins & Loftus, 1975) and the context of advertising (e.g., Kumar & Krishnan, 2004; Law, 2002). We present alternative theoretical perspectives on consumer memory and address contexts such as sponsorship and auditory branding by taking conceptual, experimental, and neuroscientific approaches.

This dissertation includes three chapters to address consumer memory in marketing. When Ebbinghaus conducted the first investigations of memory in 1885 for his doctoral dissertation, he was limited in empirical methods, but his passion for the field was evident, as demonstrated in the opening quote. We are now in a scientific age with unparalleled access to Ebbinghaus's hope of studying "memory for all mental phenomena." Where better to study the ubiquity and manifestations of memory than in the modern consumer? First, we will the discuss the memory as a process view and then describe the proposed dissertation.

Memory as a Process

Broadly, memory as a process consists of three stages: encoding, storage, and retrieval (Melton, 1963) and each stage is associated with different aspects of consumer behavior. We will briefly discuss each of the three stages.

For encoding, the levels of processing framework (Craik & Lockhart, 1972) emphasizes the need for deep processing of information during encoding for memory to be successful, as encoding is the process of bringing information into memory (Tulving & Thomson, 1973). This framework is utilized extensively in marketing as introduced by Houston et al. (1987) and

MacInnis and Jaworski (1989), both in an advertising context. Other popular models demonstrating the importance of encoding in marketing include the elaboration likelihood model (Petty & Cacioppo, 1986) and the adaptation of encoding variability (Melton, 1970) to marketing (e.g., Janiszewski et al., 2003; Unnava & Burnkrant, 1991). The levels of processing framework, elaboration likelihood model, and encoding variability have been utilized extensively to explain not only memory, but broader consumer behavior such as persuasion and responses to advertising. As an example, vividness has a positive effect on memory because it increases elaborative processing (Childers, 1986; Kisielius & Sternthal, 1984). In contrast, distinctiveness during encoding improves memory by limiting interference from related information (Childers, 1986; Lynch & Srull, 1982). From a consumer neuroscience perspective, Venkatraman et al. (2021) provide evidence that print advertisements show a memory advantage over digital advertisements due to greater encoding throughout advertisement exposure. While the current dissertation is predominantly focused on memory retrieval processes, theories and applications of encoding are discussed in the review of memory research found in Essay 1.

Compared to encoding and retrieval, storage has been largely under-explored in marketing. While literature discusses how memories can change and be reconstructed (e.g., Braun, 1999; Lakshmanan & Krishnan, 2009), the reconstruction occurs through retrieval rather than occurring directly in storage. From neuroscience, reconsolidation theory provides an account of how stored memory traces are modified (Nader et al., 2000), but this framework has yet to be applied to marketing. While this dissertation does not address storage mechanisms, it remains an important area to bring into the marketing literature.

With memory retrieval defined as, “the recovery of stored information” (Lockhart, 2001), retrieval processes have long been acknowledged as a strong determinant of consumer memory

performance (Burke & Srull, 1988; Keller, 1987; Keller et al., 1998; Kent & Allen, 1994). In marketing ease-of-retrieval, as the subjective experience of difficulty in retrieving information is detrimental to brand evaluations has been important (Aaker, 2000; Menon & Raghubir, 2003; Sinha & Naykankuppam, 2012). Additionally, the way that information is structured in memory also influences memory retrieval for brands (Cowley & Mitchell, 2003; Nedungadi et al., 2001). For example, when consumers are given product category structure, not only is brand memory improved, but so is brand choice behavior (Nedungadi et al., 2001). In a sponsorship context, memory retrieval is thought to function through heuristics based on prominence and congruence (Johar & Pham, 1999). In Essay 2 we address both memory structure and retrieval mechanisms for sponsor identification by providing updated theorizing and a new method for quantitatively measuring consumer memory networks.

Taken together, memory performance is influenced by all stages of the memory process: encoding, storage, and retrieval (Melton, 1963). While each step of the process is presented separately, encoding and retrieval often function in tandem to predict memory performance. In Essay 3 we take this combined approach and demonstrate how auditory imagery drives visual attention (encoding) memory retrieval, and brand choice.

The Current Dissertation

Figure 3.1 is a visual summary (Venn diagram) of the dissertation. While the three essays have overlap and similarities between them, each essay is distinct and intended to stand on its own, with the goal of being submitted to an academic journal. In Figure 3.1, each oval is representative of one essay, while the overlapping portions represent similarities between the essays.

The research questions addressed across the essays are:

Essay 1) What are the foundations of consumer memory? Where has the literature been and where should the literature go?

Essay 2) How do consumers remember the true sponsor of an event? Does measured memory network structure for sponsorship predict sponsor recall?

Essay 3) How does auditory imagery impact brand recall, choice, and visual attention? Does auditory imagery function differently if elicited by sonic logos versus spoken brand names?

Essay 1 consists of a PRISMA literature review of all consumer memory research published in top academic marketing journals since the year 2000. Throughout the review we highlight prominent contexts in consumer memory such as advertising, pricing, experiential marketing, and memory-based decision making. As well, we present findings related to long-term memory, short-term memory, and sensory memory factors paired with the presentation of two theories central to consumer memory: constructive memory and the accessibility-diagnosticity framework.

Building on the theoretical work of Essay 1, Essay 2 uses experiments and computational memory network modeling to address how consumers are impacted by the dense ecosystem of sponsorship associations. We present new theorizing needed to address the ecosystems-based view of sponsor identification that extends beyond the traditional spreading activation approach in favor of global activation models. Across five studies, we demonstrate that when consumers have a flexible memory network structure, increased experiential engagement improves memory for sponsors; however, for consumers who lack such a structure, increased experiential engagement provides less memory support. We contribute to the marketing literature by introducing the ecosystems-based view of memory in a field of marketing and the first

quantitative analysis of consumer memory networks. We contribute to the psychology literature by directly testing memory network characteristics as explanatory variables for behavioral findings, such as the relationship between experiential engagement and memory performance.

Essay 3 also considers the proliferation of brand associations, but in the context of auditory branding. In a cluttered branding environment, brands are complimenting their visual branding strategy with auditory branding; however, while the importance of visual imagery is well-studied in marketing (A few cites), auditory imagery has not been addressed empirically. We take a multi-method approach, using experiments, a field study, and eye-tracking to demonstrate the importance of auditory imagery in relation to both sonic logos and spoken brand names. Across five studies, we provide evidence that auditory imagery is a predictor of brand memory, brand choice, and visual attention. Studying both sonic logos and spoken brands names is an important contribution as there are many situations where the use of a sonic logo is not permitted. Our research demonstrates that auditory imagery supports recall and brand choice in relation to spoken brand names, but only sonic logos increase visual orientation and exploration of a brand's corresponding visual logo. In sum, whether considering sonic logos or spoken brand names, auditory imagery is a consistent predictor of consumer behavior.

Having discussed each of the three essays, we now turn to considering their similarities, as emphasized in 3.1. Essay 1 provides the foundation on which Essays 2 and 3 are built. Two gaps in the consumer memory literature as identified in Essay 1 are: the prevalence of memory network structure as an explanatory mechanism, without quantitatively measuring network structure; and a large literature on imagery, predominately examined in the visual and olfactory modalities, but not the auditory modality. We address these gaps in Essay 2 and Essay 3, respectively. Connecting Essay 2 and Essay 3 is the real-world observation that consumers are

exposed to a multitude of brand associations on a daily basis, and we address this proliferation of brands exposures in two separate approaches, with both essays drawing on the context of sponsorship. Lastly, at the center for Figure 3.1, we can see the unifying theme of all three essays: gaining a deeper understanding of how consumers use their memory in complex, real-world contexts.

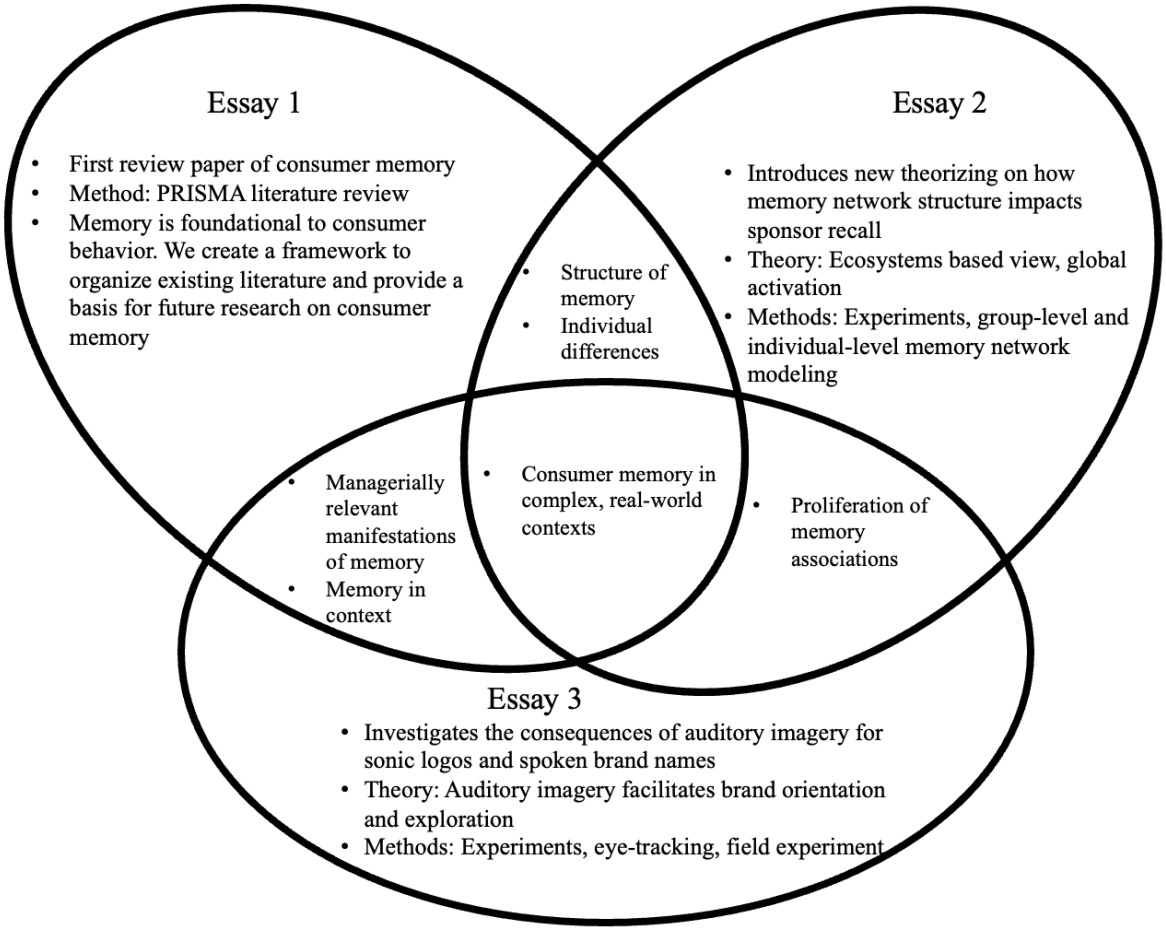


Figure 3.1. A Venn diagram representation of uniqueness and similarities across the dissertation essays.

Contributions

In sum, this dissertation uses a multi-method approach to understand consumer behavior in relation to memory. As discussed, Essay 1 is conceptual and provides the first comprehensive review of consumer memory research published in top marketing journals. Essay 2 introduces novel theorizing on sponsor identification and demonstrates how computational memory network modeling can be applied to marketing. Essay 3 explores a new area to marketing, auditory imagery, and is comprised of experiments, a field study, and eye-tracking. As such, the current dissertation makes not only substantive theoretical contributions to marketing but also highlights the importance of using varied research methodologies.

This dissertation provides theoretical, methodological, and managerial contributions to the marketing literature. Regarding theory, in Essay 1 we highlight changes in theoretical orientation throughout consumer memory research, as well as drawing on psychology and neuroscience for theoretical insights. In Essay 2, as mentioned, we introduce the ecosystems-based view on sponsor identification to move beyond the traditional heuristic-based explanations of sponsor identification. Essay 3 presents existing literature in psychology on auditory imagery that has yet to be addressed in marketing, as well as using eye-tracking to advance theory. Methodologically, in Essay 2 we introduce computational memory network modeling to marketing, as well as extend its application from measuring memory networks for concrete topics (e.g., fruits, animals) to a more subjective and associative context of sport sponsorship. Essay 3 emphasizes the importance of a multi-method approach, blending experiments, a field study, and eye-tracking. Managerially, from Essay 2 we identify an individual difference that can either support or hinder memory rates for sponsors, allowing marketing managers to consider how they engage in sponsor partnerships across specific groups of individuals. Last, in Essay 3

we demonstrate that in situations where the use of a sonic logo is not appropriate, having spoken brand names in the environment also induces auditory imagery and its subsequent positive outcomes.

Throughout this dissertation, we aim to contribute to the marketing literature and honor Ebbinghaus's desire to study memory for all mental phenomena. Marketing is a field rich with context and real-world applications of human behavior, which to some degree, will always rely on memory. By investigating consumer memory, with its pitfalls and strengths, we can better understand one of the cornerstones of human behavior. It is my hope that through this dissertation, the reader can appreciate the diversity of consumer memory research, and as Ebbinghaus did, *wish to enter that path at once.*

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ESSAY 1
PRISMA REVIEW OF CONSUMER MEMORY

Memory is foundational to consumer behavior. When considering the consumer journey with a brand (e.g., awareness, consideration, decision, retention, advocacy, Lemon & Verhoef, 2016), every stage has been associated with memory in previous marketing literature. When considering the "Four Ps" of marketing (product, price, place, promotion, Goi, 2009; Singh, 2012) all four rely on memory in driving consumer responses. Memory research in marketing has a long history, beginning with consideration of the forgetting curve for advertising material (Burtt & Dobell, 1925). Early advertising research in marketing from the 1950s also provides evidence for the importance of consumer memory (Zielske, 1959). However, to date, there is no research review that provides a framework for understanding memory research in marketing. While Bettman (1979) reviews memory theory and provides considerations of how it can apply to consumer behavior, it is not a review of memory research *in marketing*. To that end, we conduct a systematic literature review to create a framework of memory research in top marketing journals and provide considerations for future research.

This research has three primary contributions to the literature. First, we present a theoretical framework of consumer memory with a focus on memory contexts, types of memory, memory theories, as well as moderating and individual difference factors impacting memory outcomes such as recall, revising memories, false memory, and forgetting. In doing so, we provide a theoretical base that can serve as a starting point for future memory research in marketing. Second, research in marketing on consumer memory has been declining since 2000 (Camilleri et al., 2024). By providing a comprehensive review of the consumer memory literature, we demonstrate the ubiquity of memory throughout multiple touchpoints in consumers' everyday lives, highlighting the importance of continued research on consumer

memory. Our third contribution to the literature consists of identifying gaps that remain and future research direction for consumer memory research.

Systematic Literature Review

Methods

To understand consumer memory, we utilize a PRISMA literature review (Moher et al., 2009). The three steps of the PRISMA literature review process are: 1) identification, 2) screening, and 3) inclusion. The review was limited to top marketing journals as defined by several sources, such as the A* journals from the ABDC list, the FT50 list, and the UT Dallas list. Only the following journals were included in the review: *International Journal of Research in Marketing, Journal of the Academy of Marketing Science, Marketing Science, Journal of Consumer Psychology, Journal of Consumer Research, Journal of Marketing Research,* and the *Journal of Marketing*. The *International Journal of Research in Marketing* was selected to include a top journal outside of the United States. We used Web of Science to access articles from each journal.

To begin the review, we created a protocol for accepting or rejecting papers for the review. All articles from the identified journals were written in English and oriented towards consumers. The current research is focused explicitly on consumer memory; therefore, we do not consider research on memory outside of marketing as part of the review protocol. However, psychology studies are cited throughout to provide context for the consumer memory research findings. When considering what constitutes a consumer memory paper, we focus on whether memory as a process (encoding, storage, retrieval; Melton, 1963), or any additional memory theory (e.g., associative memory theory, constructive memory), is used in the paper's theoretical framework. Formally, we discuss such papers as having a "memory-based theoretical

framework." In other words, we only include papers that use memory theory or memory processes in their conceptual development. Papers that were lighter on memory theory, but utilized encoding, storage, or retrieval as independent or dependent variables were also included. Papers only mentioning memory are not included in the review. Our criteria also included the prerequisite of memory being addressed at an individual level, since we are assessing consumer memory. Data collected from the articles include author names and year of publication, topic, theory and type of memory, independent and dependent variables, and findings. Article screening was based on title, abstract, and keyword review, followed by a full-text review. If an article was ambiguous based on the title, keywords, and abstract, it was advanced to full-text review for further consideration.

Search terms included the stem of *consumer* paired with *memory, memory search, short-term memory, long-term memory, episodic memory,* and *semantic memory.* For example, different search strings included, 1) "consumer" AND "memory", 2) "consumer" AND "memory search", 3) "consumer" AND "episodic memory." Articles were extracted on February 3, 2026 and the specified start date was the year 2000. The year 2000 was chosen as the initiation date for the review based on the finding that memory research in marketing has been on the decline since 2000 (Camilleri et al., 2024). Choosing the year 2000 strikes a balance between understanding both the evolution of consumer memory research, as well as the trajectory underlying the declining interest in memory as a topic in marketing. Ultimately, one goal of Essay 1 is to demonstrate that despite a decline in research, consumer memory is still relevant to consumer behavior broadly and is being studied in impactful and intriguing contexts. We hope to provide a modern, theoretical account of consumer memory to fuel future research. Consumer memory

papers before the year 2000 are cited for context but are not included in the PRISMA review process.

Article Selection Process

Figure 4.1 visualizes our article selection process. In the identification phase (Step 1) we identified 550 records from our keyword searches. Of these 141 were duplicate records and therefore removed, resulting in 409 articles to review using title-abstract-keyword screening. In this stage, articles that did not meet our criteria as a consumer memory paper were excluded from the analysis based on being irrelevant to the topic (n = 273). This resulted in 136 articles that were advanced to full-text review. Next, we describe the reasons for excluding articles during the full-text review process.

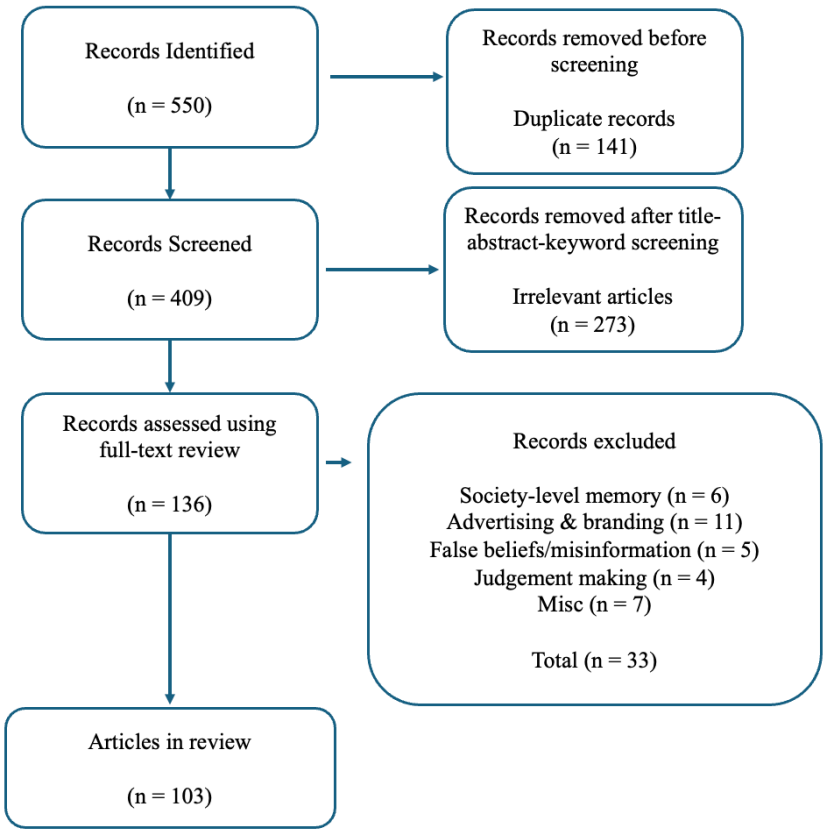


Figure 4.1 Systematic Review Process

The single largest category of excluded articles belonged to the advertising and branding area (n = 11). In these papers, memory is mentioned; however, the focus of the theoretical frameworks for topics such as goals (Pieters & Wedel, 2007), visual and auditory features of brands (e.g., Wedel & Pieters, 2015; Yorkston & Menon, 2004; Zhao et al., 2014), and product placement (Russell, 2002) do not rely on memory as a process. Articles that focused on society-level memory (n = 6) were excluded from the final review. We focus on memory at the individual level; thus, any record that considers societal or historical memory was not included in this review. For example, Brunk et al. (2018) consider how societies remember socialism and its impact on marketization.

Further, papers that mention false beliefs, but do not consider memory processes were also excluded (n = 5). In our review, we do identify articles that discuss false beliefs from a memory framework and those are included, however, articles on false beliefs that do not consider memory as a central part of their explanatory framework were not included. For example, the continual influence of misinformation (Hamby et al., 2020) does not utilize a memory-based theoretical framework and was excluded. A related area to misinformation is judgment-making; we excluded papers (n = 4) from this area that do not use memory as a central construct in their framework. For example, papers that discuss the influence of product warranty on product quality judgments (Purohit & Srivastava, 2001) do not focus on memory and are excluded.

Lastly, we removed seven articles that upon full-text review, were deemed irrelevant to the research area. For example, studies considering how children acquire brand names (Ellis et al., 2010) and mentally represent brand names (Chaplin & Lowrey, 2010) were excluded. Further, papers considering how consumers evaluate the meanings of brands/products do not focus on memory, resulting in exclusion (e.g., Barnett & Cerf, 2017; Dimofte & Yalch, 2007). In

total, after full-text review, we exclude 33 papers, leaving 103 papers. Papers included in the review are summarized in Table 4.1.

Table 4.1. Articles Included in Review

Authors	Journal	Year	Topic	Type of Memory Examined
LaTour, LaTour, & Zinkhan	JM	2007	Brand meaning through early memories	Autobiographical memory
Roehm	JCP	2016	Flashbulb memory	Autobiographical memory
Punj & Brooks	IJRM	2002	Information search and consideration set	Declarative vs procedural
Srivastava & Raghubir	JCP	2002	Memory-based credit card expenses	Episodic
Montgomery & Unnava	JCR	2009	How do consumers evaluate experiences retrospectively	Episodic
Spears & Yazdanparast	JCP	2014	Consumer imagination	Episodic
Dimofte & Yalch	JCP	2010	Self-referent encoding	Episodic vs semantic memory
Sokolova, Seenivasan, & Thomas	JMR	2020	Left-digit bias in memory-based evaluations	Episodic vs semantic memory
Kronrod, Gordeliy, & Lee	JCR	2023	Language of reviews	Episodic vs semantic memory
Law	JMR	2002	Repeated brand claims	False memory
Lakshmanan & Krishnan	JCP	2009	Imagery, false memory	False memory
Rajagopal & Montgomery	JCR	2011	False experience effect	False memory-autobiographical
Lee	JMR	2002	Advertising and brand choice	Implicit
Samu & Krishnan	JAMS	2010	Brand name characteristics	Implicit

Authors	Journal	Year	Topic	Type of Memory Examined
Kyung, Thomas, & Krishna	JCR	2017	Numerical judgments, interference	Implicit
Dalton & Huang	JCR	2013	Motivated forgetting	Implicit vs explicit
Aaker	JCR	2000	Processing ease	LTM
Desai & Hoyer	JCR	2000	Memory consideration set	LTM
Kumar	JCP	2000	Memory interference	LTM
Wedel & Pieters	MS	2000	Eye fixations and brand memory	LTM
Van Osselaer & Janiszewski	JCR	2001	Learning brand associations	LTM
Luna & Peracchio	JCR	2001	Bilingual advertising	LTM
Nedungadi, Chattopadhyay, & Muthukrishnan	IJRM	2001	Memory category structure	LTM
Childers & Jass	JCP	2002	Typeface and semantic associations	LTM
Shapiro & Spence	JCR	2002	Encoding and retrieval in memory-based choice	LTM
Cowley & Mitchell	JCR	2003	Does product category knowledge organization influence memory and retrieval for brands	LTM
Janiszewski et al.	JCR	2003	Spacing effects in advertising	LTM
Jewell & Unnava	JCR	2003	Branding, memory interference	LTM
Krishnan & Chakravarti	JCP	2003	Humor ads	LTM
Morrin & Ratneshwar	JMR	2003	Ambient scent	LTM
Grewal, Cline, & Davies	JCP	2003	Memory-based task	LTM

Authors	Journal	Year	Topic	Type of Memory Examined
Gurhan-Canli	JCR	2003	Memory-based information processing forming brand impressions	LTM
Menon & Raghubir	JCR	2003	Ease-of-retrieval for judgments	LTM
Kang, Herr, & Page	JCR	2003	Time vs distance knowledge and judgments	LTM
Cowley & Janus	JCR	2004	Advertising misinformation effect: post-experience information influences memory for brand evaluations	LTM
Garretson & Burton	JM	2005	Spoke-characters as cues in IMC	LTM
Appleton-Knapp, Bjork, & Wickens	JCR	2005	Recalling print advertisements	LTM
Skurnik et al.	JCR	2005	False claims become recommendations	LTM
Warlop, Ratneshwar, & Van Osselaer	IJRM	2005	Product consumption experiences	LTM
Cornwell et al.	JCR	2006	Memory for sponsorship	LTM
John et al.	JMR	2006	Brand concept maps	LTM
Noel	JCR	2006	Advertising repetition	LTM
Schlosser	JCR	2006	Virtual products and false memory	LTM
Cowley	JCR	2007	Do post-experience affective reactions influence ability to recall actual evaluative information	LTM
Aaker, Drolet, & Griffin	JCR	2008	Recall of mixed emotional experiences	LTM
Zauberman, Ratner, & Kim	JCR	2009	Strategic memory protection	LTM

Authors	Journal	Year	Topic	Type of Memory Examined
Ahn, Liu, & Soman	JCP	2009	Memory for experience, perception of time	LTM
Kim, Park, & Wyer	JCR	2009	Temporal Distance	LTM
Freeman, Shapiro, & Brucks	JCP	2009	Social marketing	LTM
Hornik & Miniero	IJRM	2009	Circadian rhythm	LTM
Krishna, Lwin, & Morrin	JCR	2009	Smell and memory	LTM
Ng & Houston	JMR	2009	Field dependency (people who pay greater attention to contextual information)	LTM
Cronley, Mantel, & Kardes	JCP	2010	Memory-based attitudes	LTM
LaTour & LaTour	JCR	2010	Aficionados	LTM
Lwin, Morrin, & Krishna	JCP	2010	Scent and ads	LTM
Pocheptsova & Novemsky	JCR	2010	Incidental mood effects, memory-based judgments	LTM
Mehta, Hoegg, & Chakravarti	JCR	2011	Product comparisons from memory	LTM
Mercurio & Forehand	JCR	2011	Identity-dependent learning	LTM
Morrin, Krishna, & Lwin	JCP	2011	Scent and retroactive interference	LTM
Dimofte & Yalch	JCP	2011	Mere association effect	LTM
Luna, Carnevale, & Lerman	JCP	2013	Spelling brand names	LTM
Puligadda, Ross, & Grewal	JMR	2012	Brand schematicity scale	LTM

Authors	Journal	Year	Topic	Type of Memory Examined
Schnittka, Sattler, & Zenker	IJRM	2012	Brand concept maps and favorability	LTM
Sinha & Naykankuppam	JCP	2013	Knowledge and experience accessibility	LTM
Krishna, Morrin, & Sayin	JCR	2013	Olfactory imagery	LTM
May & Irmak	JCR	2014	Indulgence and memory distortion	LTM
Fernandes et al.	JCP	2016	Forgetting	LTM
Chun, Diehl, & MacInnis	JM	2017	Savoring consumption experiences	LTM
Marcoux	JCR	2017	Forgetting through souvenirs	LTM
Reczek et al.	JCR	2018	Ethical attributes	LTM
Miniard et al.	JAMS	2018	Extension brand association with parent brand ("reinstatement effect")	LTM
Hansen, Kupfer, & Hennig-Thurau	IJRM	2018	Social media firestorms	LTM
Cowley & Anthony	JCR	2019	Remembering lies	LTM
Walters & Hershfield	JCR	2020	Inferences about forgotten attributes of a product	LTM
Babin et al.	IJRM	2021	Brand placement	LTM
Venkatraman et al.	JMR	2021	Print vs Digital Ad memory	LTM
Yang, Koo, & Hwang	JCP	2022	Gifting	LTM
Jung, Ryu, Han, & Cho	JM	2023	Timing of leaving reviews	LTM
Mirny & Spiller	JCR	2025	Source memory for opinions vs facts	LTM

Authors	Journal	Year	Topic	Type of Memory Examined
Wood & Neal	JCP	2009	Habitual consumer	LTM, WM
Toure-Tillery & Kouchaki	JCR	2021	Virtuous behavior	Memory efficacy
Winterich, Reczek, & Irwin	JM	2017	Identity loss	Memory Preservation (LTM)
Kyung & Thomas	JMR	2016	Memory-based price comparison	Metacognition, LTM, implicit
Lindsey & Krishnan	JCR	2007	Brand cues in collaborative settings	Recall in groups
Tavassoli & Han	JCR	2001	Processing language	Relational memory (STM, WM)
Vanhuele & Dreze	JM	2002	Pricing	STM
Chen, Iyer, & Pazgal	MS	2010	Price competition	STM
Davis & Herr	JCR	2014	Can reading homophones semantically prime consumer behavior	STM
Laurent & Vanhuele	JCR	2023	Price encoding, ET	STM
Vanhuele, Laurent, & Dreze	JCR	2006	Memory for prices	STM/WMC
Biswas, Biswas, & Chatterjee	JCP	2009	Cue-strength order effects	STM/WMC
Coulter, Choi, & Monroe	JCP	2012	Pricing	STM/WMC
Rottenstreich, Sood, & Brenner	JCR	2007	Memory-based choice	WM
Luna & Kim	JCP	2009	Basket price estimation	WM
Viswanathan et al.	JCP	2009	Literacy	WM
Coulter & Coulter	JCR	2010	Pricing	WM

Authors	Journal	Year	Topic	Type of Memory Examined
Noseworthy, Cotte, & Lee	JCR	2011	Ad context and gender	WM
Jiang et al.	JCR	2016	Brand logos and imagery	WM
Kang & Lakshmanan	JCP	2017	Consumer learning	WM
Nelson & Redden	JCR	2017	Satiation	WM
Bagozzi	JCP	2008	Visual vs auditory processing	Review
Wyer, Hung, & Jiang	JCP	2008	Visual vs verbal processing	Review
Johar, Maheswaran, & Peracchio	JCR	2006	Information processing	Review paper, all

Figure 4.2 overviews the frequency of consumer memory journal articles over time in the current review. The frequency of consumer memory articles declining over the years is also discussed by Camilleri et al. (2024). These authors put forward that while memory research was popular in the early 2000s, the area has faced diminished prevalence in more recent years. This decline is especially notable given that other areas of consumer psychology have continued to increase in popularity (e.g., decision making, self-regulation, giving behavior; Camilleri et al., 2024).

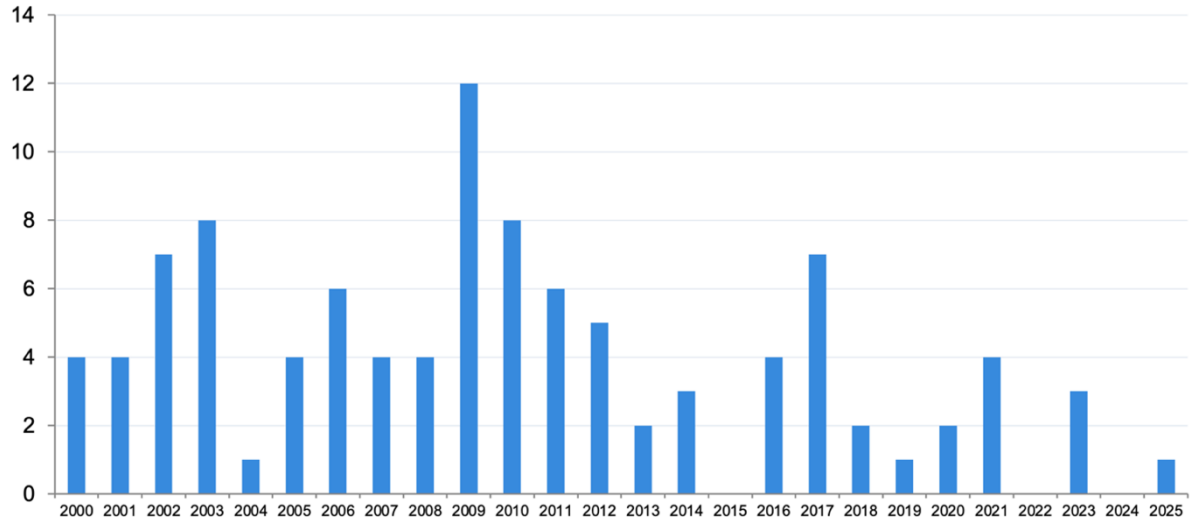


Figure 4.2 Consumer Memory Research Published from 2000 to 2025

Key Themes

We used thematic analysis to extract themes from the PRISMA literature review. Articles were initially reviewed to generate codes for contexts utilized, theoretical memory approaches, types of memory systems, and moderating variables (Braun & Clarke, 2006; Snyder, 2019). After categorization, we created formal themes that are described in detail in this review. Major context themes that appear in marketing include advertising, pricing, experiential consumption, and consumer behavior more broadly. The contexts of advertising, pricing, and experiential consumption appear repeatedly throughout the consumer memory literature, which is in keeping with a review of manuscripts published in the *Journal of Marketing Research*, where 13.5% of all papers represented advertising, while pricing comprised 9.7% of the literature (Grewal et al., 2020). Holbrook and Hirschman (1982) proposed that experiential consumption is integral to marketing and in memory research, their view is reflected in subsequent publications. Our general category of consumer behavior includes works that do not belong to a single definitive context (e.g., memory preservation techniques).

In addition to contexts, we consider themes related to the multiple memory systems view, which is comprised of sensory, short-term, and long-term memory (Tulving, 1985). The multiple memory systems view (Nadel, 1992; Tulving, 1987) puts forward that different memory systems have adapted to handle specialized functions, with each system representing its own guiding principles on the relationship between memory encoding, storage, and retrieval (Sherry & Schacter, 1987). Beyond the multiple memory systems view, we also consider unique theoretical accounts of how consumer memory functions. We identify three theories that appear repeatedly in the consumer memory literature: associative memory, constructive memory, and the accessibility-diagnosticity framework. While these three theories are described in detail, additional theories such as source monitoring and working memory models are discussed throughout the essay.

Lastly, we highlight the role of moderating variables and individual differences present in the literature. In particular, we frequently find the moderators of familiarity and individual differences of product knowledge, expertise, age, and cultural background. Throughout each theme we highlight different consumer memory outcomes (e.g., false memory, forgetting, revising memory) that are driven by context, memory types, theoretical accounts, moderating and individual difference variables.

Contexts

Advertising. Advertising is a prominent context in the consumer memory literature. We begin by discussing two theoretical accounts of how memory for advertising functions (encoding variability versus constructive memory). Beyond the theoretical logic, research in this area can be categorized into two foci: executional characteristics (e.g., repetition and spacing, message characteristics) and individual factors driving advertising responses. We review both foci and

address which theoretical account is supported by the findings. Additionally, we incorporate consumer memory research that influences advertising decision making.

The relationship between executional characteristics of ads and memory has historically been attributed to encoding variability (Burnkrant & Unnava, 1987; Garretson & Burton, 2005; Singh et al., 1994). Encoding variability refers to the observed phenomenon in which memory is boosted when the to-be-remembered information is presented in multiple contexts thus increasing retrieval cues available for the ad (Melton, 1970). Theory on encoding variability extends beyond acquiring new retrieval cues. In neuroscience, when a stimulus is repeated, the brain reduces neural activation in response to the stimulus (i.e., neural repetition suppression, Summerfield et al., 2008). Following this thinking, advertisement spacing with variation would be advantageous in preventing repetition-based suppression (Wagner et al., 2001; Xue et al., 2011) and thereby improve memory performance for the ad.

In contrast, the constructive memory process proposes that similarity between spaced ads improves consumer memory (Appleton-Knapp et al., 2005). Based on constructive memory theory, later exposures to an advertisement cause the retrieval of older presentations and this retrieval boosts memory performance. As noted, encoding variability suggests that changing executional characteristics of an ad improves memory by providing additional context associated with the ad. Countering this account, Appleton-Knapp et al. (2005) put forward that changing executional characteristics of ads reduces the ability of consumers to recall previous ad presentations and ultimately reduces memory performance. These two theories are consequential because they both address a fundamental question in marketing with competing predictions: Should marketing managers aim to promote similarity between their advertisements or change executional characteristics from ad to ad?

Noel (2006) directly compares the encoding variability explanation to the constructive memory hypothesis. Formally, constructive memory theory suggests that recall depends on a consumer's ability to reconstruct the first exposure when the second presentation occurs (in-line with Appleton-Knapp et al., 2005). Findings from Noel (2006) support the constructive memory process rather than encoding variability: if consumers are unable to reconstruct their first experience with a brand, memory is reduced. Specifically, when advertisements are similar, spaced repetition forces greater elaboration on the second presentation ultimately improving memory (Noel, 2006). Beyond spacing effects, the constructive memory theory is directly supported by findings that memory for advertisements is improved when ad components are linked and highly consistent compared to advertisements with lower consistency levels (Childers & Jass, 2002). For more on spacing effects in marketing, see Janiszewski et al. (2003).

From a different perspective, memory for advertising can be explained by a model of attention and memory processes (Wedel & Pieters, 2000). For instance, the number of eye-fixations a consumer has on an advertisement is related to the amount of information a consumer extracts from the advertisement (Wedel & Pieters, 2000). We propose that variability in eye-fixations for repeated ads may help elucidate whether encoding variability or constructive memory theory are the supported explanation for spacing effects. For example, do consumers extract more information (i.e., have more fixations) on spaced advertisements that change an executional characteristic versus advertisements that maintain similarity between the ads?

Within advertising, we now turn to advertising decision making and consumer memory. Using neuromarketing techniques, Venkatraman et al. (2021) find that print ads are advantageous for content memory and context accuracy through increased engagement. Relating to the two competing theories, increased engagement is indicative of greater elaboration on print

advertisements and constructive memory theory highlights the need for elaboration on a stimulus to improve memory performance (Noel, 2006). Beyond decision-making on using print versus digital advertisements, another common technique is to use humor in advertisements. When considering humor in ads, high strength humor reduces elaboration by taking attention away from the ad message, while moderate humor improves elaboration and consequently memory (Krishnan & Chakravarti, 2003). Similarly, humorous information can reduce elaboration on non-humorous content presented in an ad (Warren et al., 2018).

Considering interference effects in advertising, Jewell and Unnava (2003) find that a competitor ad can help promote memory for new ad claims from a target brand. In this research, when a brand introduces a new attribute, memory for the new attribute is reduced due to interference from the old attribute. However, when consumers are exposed to a competitor's ad that also shares the target brand's old attribute, memory for the target brand's new attribute is improved. This counter-intuitive finding occurs because the association between a competitor and the old attribute reduces activation for the relationship between the target brand and old attribute, allowing the new attribute to be remembered (Jewell & Unnava, 2003).

The relationships between advertising characteristics and memory are moderated by individual differences such as identity and familiarity. In consumer memory, identity and familiarity draw on state-dependent memory, part of the encoding specificity principle (Tulving & Thomson, 1973). State-dependent memory proposes that memory is improved when cues at retrieval match cues from the encoding memory phase. In a seminal study from psychology, Godden and Baddeley (1975) had individuals study lists of words either on land or underwater. Memory was improved for the land condition when the test (retrieval phase) was on land, while for the underwater group, memory was increased when tested underwater. In marketing,

Mercurio and Forehand (2011) put forward an identity-based state-dependent memory paradigm, in which identity is utilized as the "state." In other words, when a consumer's identity is activated during both encoding and retrieval, memory for identity-linked brands is improved.

Another individual difference, familiarity, is often used as an explanation for memory in consumer behavior broadly (Soderlund, 2002) and advertising (e.g., Cowley & Janus, 2004). In advertising, consumers are often subject to misinformation, which impacts brand evaluations due to constructive memory (Cowley & Janus, 2004). From a constructive memory viewpoint, consumers who are familiar with an advertising context are more likely to integrate misinformation into their existing beliefs through the memory reconstruction process (Cowley & Janus, 2004). Further, having higher versus lower familiarity differentially impacts memory intrusions from self-referent advertising with consequences for brand evaluations (Dimofte & Yalch, 2010), such that highly familiar consumers experience schema-based intrusions, while less familiar consumers experience imagination intrusions.

In sum, advertising is an area rich in consumer memory research, stemming back to the earliest days of consumer research (Burtt & Dobell, 1925). There is continuing debate on whether encoding variability or constructive memory theory drives the impact of advertising factors on memory; however, the constructive account receives the weight of more recent support (Cowley & Janus, 2004; Appleton-Knapp et al., 2005; Noel, 2006). Constructive memory does not function alone; factors such as identity and familiarity are also important considerations. Methodologically, advertising research has utilized consumer neuroscience methods such as eye-tracking (Wedel & Pieters, 2000) and fMRI (Venkatraman et al., 2015), marking theoretical and methodological advancements in consumer memory's oldest context.

Pricing and Phonological Processing. Another prominent area in consumer memory is pricing. We again begin by reviewing the primary theoretical account of the consumer memory literature for pricing (triple-code model), followed by a presentation of major findings. The pricing literature relating to consumer memory is largely centered on phonological processing of prices, relating to working memory.

When consumers encode a price, they rely on Dehaene's (1992) triple-code model. Per the triple-code model consumers encode prices in three distinct codes: a visual code, an auditory/verbal code, and the magnitude of a price (Vanhuele & Dreze, 2002). The triple-code model relies on the phonological processing component of the Baddeley working memory model (Baddeley, 2006; Baddeley & Hitch, 2019; Luna & Kim, 2009). The core interpretation of the phonological loop is that it temporarily holds verbal information (for a few seconds), which fades from memory unless the information is refreshed using articulatory rehearsal (Baddeley & Hitch, 2019). Additionally, the phonological loop has a limited capacity and is subject to interference, especially from processing in the same modality (Baddeley & Hitch, 2019).

Evidence supports the argument that working memory interference disrupts memory for prices in consumer behavior. Tavassoli and Han (2001) found that language processing is disrupted by phonological processes, while logographic words are disrupted by visual distractors. In other words, processing two streams of information in the same modality reduces memory performance (Tavassoli & Han, 2001). Similarly, Davis and Herr (2014) find that when verbal homophone interference is induced, willingness to pay for a brand is reduced. Further, when prices consist of long numbers, they tax working memory leading to more biased basket price estimations (Luna & Kim, 2009). In a similar finding, Vanhuele et al. (2006) find that recall for prices decreases as syllable length increases, with people who speak faster demonstrating slower

recall decline. This finding supports the psychology memory literature, in which memory recall is partly determined by language speed (Hulme et al., 1984; Smyth & Scholey, 1996). This literature provides evidence for the claim that memory for prices is related to an internal verbalization of the number, which impacts consumer perceptions of the price.

There is also a relationship between the phonological loop and the storage of numbers as magnitude. For example, phonetic symbolism suggests that the way numbers sound is impactful for perceptions of numerical magnitude for prices. Specifically, phonological interference can either reinforce or interfere with magnitude encoding (Coulter & Coulter, 2010). In the verbal code, the presentation style of prices (number of digits, commas, periods) provide variability in how consumers internally verbalize the number, such that longer processing time leads to perceptions of greater magnitude (Coulter et al., 2012). Beyond sound symbolism, the processing time of prices also influences how price magnitude is encoded (Coulter et al., 2012). The relationship between phonological processes and magnitude are important because consumers store long-term price information as a sense of magnitude (Vanhuele & Dreze, 2002). Further, Chen et al. (2010) propose that consumers should be motivated to encode (low) price information to ultimately put pressure on firms to reduce prices.

Taken together, memory for prices is driven through not only visual processes, but also in phonological and magnitude codes, which have unique and important implications for consumer behavior. While the pricing consumer memory literature is predominantly focused on working memory, future research can consider how phonological processes influence consumers' ability to reconstruct prices from long-term memory. For example, the presence of decimal points and cents (e.g., $10.75 versus $11) increase processing time leading to greater perceptions of price magnitude (Coulter et al., 2012). However, it is unclear whether prices retrieved from memory

are still represented with the decimal and cents or if memory defaults to a whole number. Further, when prices are retrieved from long-term memory, the retrieved internal verbalization could interfere with the initial visual, verbal, or magnitude encoding. Continuing with the example, if memory does default to a whole number by removing the decimal and cents, will this change the encoded price magnitude?

Consumer Experiences. To understand how meaningful experiences drive consumer memory, we draw on experiential marketing and its application to autobiographical memory. Experiential marketing highlights consumers as emotional individuals who aim to achieve pleasant experiences (Schmitt, 1999). Research has applied this broad construct to consumers by considering autobiographical memory. Autobiographical memory consists of personal experiences that shape someone's life narrative (Fivush, 2011). These memories often include recent events in a consumer's life and extraordinary experiences but also extend backwards into childhood. When consumers have early life experiences with brands, these prove to be foundational experiential memories that can define a consumer's relationship to the brand for a lifetime (LaTour et al., 2007).

In addition to early life experiences, the marketing literature also considers extraordinary experiences in consumers' lives through the study of flashbulb memories. Flashbulb memories are vivid, highly detailed memories for a major life event, such as 9/11 or the explosion of the Challenger (McCloskey et al., 1988). Relating to experiential marketing, flashbulb memories occur from extraordinary events that differ from everyday life, and that these memories consistently present brand information (Roehm, 2016). Flashbulb memories are of importance to consumers because consumable goods may be embedded in such experiential contexts (Roehm, 2016). For example, marriage days and proposal are typical flashbulb memories where

consumers can remember detailed information such as brands and products that were involved in the experience.

Outside of extraordinary events, consumers often buy souvenirs to help remember experiences, however, Marcoux (2017) demonstrates that buying a souvenir to commemorate an experiential event, such as 9/11, makes consumers forget more about the event through compartmentalization. In a similar counter-intuitive finding, Roehm (2016) finds that the accurate maintenance of flashbulb memories depends on oral rehearsal, however, when consumers write about the event instead, memory accuracy decreases. This is consequential for marketing because consumers often engage in commemorative souvenir buying or writing about events to preserve experience memories, but these behaviors may be detrimental to the brands embedded in the to-be forgotten memories.

Memory research in experiential marketing is largely focused on autobiographical memory, with findings highlighting the importance of early life brand experiences, as well as the counter-intuitive findings in which subsequent consumer behaviors can decrease memory rather than improving it. Findings point towards a mechanism through which consumers "off-load" their memory. In this process explicit memories are no longer rehearsed by consumers because they have an external reminder of the event. In essence, writing about brands in an autobiographical memory and buying souvenirs may serve as a psychological external hard drive of consumer memory. However, this off-loading mechanism has yet to be explored in the consumer memory literature. Experiential marketing represents a broad literature in general marketing, yet more research on consumer memory in relation to experiential marketing is needed.

Memory-Based Decisions. This set of papers focuses on how consumers make judgments when recalling information from memory versus when the information is presented to them. While not all the papers focus on memory itself, memory processes are involved in the judgment task. The memory-based decision-making literature spans a wide variety of categories, from long-term memory and working memory to metacognition and implicit memory.

Making memory-based judgments can influence how consumers perceive a brand. For example, the mere accessibility hypothesis suggests that consumers use ease of retrieval as a heuristic when making product judgments (Menon & Raghubir, 2003), with easier retrieval leading to more positive brand evaluations. The accessibility of memory-based cues influences not only brand evaluations but extends to estimates of past and future credit card expenses (Srivastava & Raghubir, 2002). Related to heuristic processing, memory-based judgments require a greater number of cognitive resources compared to stimulus-based judgments. As such, consumers are more likely to engage in affective, automatic processing (e.g., relying on heuristics) when engaged in memory-based judgment making (Rottenstreich et al., 2007). Additionally, when consumers are encoding brand information, incidental moods will also bias memory-based judgments (Pocheptsova & Novemsky, 2010).

From a different perspective, Kyung and Thomas (2016) find that metacognitive experiences can block memory during a memory-based task. The authors argue that when consumers try to explicitly recall a price from memory and fail, this induces a "feeling of not knowing," which further blocks the consumer's ability to implicitly recall the price (Kyung & Thomas, 2016). Further relating to implicit recall, Lee (2002) demonstrates that using implicit memory to evaluate advertising effectiveness may be more useful than using measures of explicit

memory. Further research is needed to understand how memory-based decision making is influenced by implicit versus explicit memory processes.

Stimulus versus memory-based decision making also impacts the formation of attitudes (Cronley et al., 2010) and changes how word-of-mouth influences memory retrieval (Grewal et al., 2003). This is important because individuals can differ in their (implicit) preference for using memory-based versus stimulus-based decision making (Gurhan-Canli, 2003). Overall, the literature on memory-based versus stimulus-based decision-making spans a wide variety of memory types and marketing contexts. While Rottenstreich et al. (2007) contrast memory-based and stimulus-based decisions, research has paid less attention to integrating the two. Consumers can make stimulus-based decisions while also incorporating memory-based information. This combined processing may be important for contexts such as goal maintenance, in which consumers make decisions while directly exposed to stimuli (e.g., choosing between a healthy versus indulgent choice), but also use memory-based information to make their decision (e.g., remembering the goal or considering how consistent one has been with healthy eating). Future research can work to explore such combined processing contexts.

Consumer Behavior. We consider consumer behavior broadly in papers that do not neatly fit into any one context category of consumer memory. In this section we address how consumers act to preserve memories, the relationship between memory and writing brand reviews (i.e., post-experience evaluations), and factors that address how post-experience evaluations can impact memory for an original event.

Consumers take a variety of routes to preserve memory. For example, when individuals feel that a special memory will be hard to recall later, they engage in memory protection by avoiding situations that dampen their ability to recall a special memory (Zauberman et al., 2009).

Alternatively, consumers may savor their experiences, which increases elaboration by integrating more information from the ongoing experience (Chun et al., 2017). Savoring not only improves memory through elaboration but also improves evaluations of brands related to the experience context (Chun et al., 2017).

From a unique perspective, memory also provides insights for consumer gift-giving. Yang, Koo, and Hwang (2022) find that even though individuals prefer to receive experiential gifts, gift-givers provide material gifts because they serve as a strong cue for the gift-receiver to remember the gift-giver. In other words, material gift-giving is driven in part due to the giver's hope to preserve the receiver's memory of the giver. Further, gifts and goods related to memories often hold sentimental value, defined by an emotional connection to the good through memory (Winterich et al., 2017). Such an emotional connection can reduce a consumer's intention to donate the sentimental good; however, by engaging in memory preservation consumers can reduce their fear of identity loss and increase intentions to donate the good (Winterich et al., 2017).

We now consider how post-experience factors influence consumer memory and brand outcomes. In psychology, peak-end theory is identified as a driver of how experiences are evaluated (Kahneman, 2000). Individuals do not evaluate experiences in their entirety; rather, experiences are often evaluated based on the peak emotional response, as well as the affect present at the end of the experience (Fredrickson, 2000). Montgomery and Unnava (2009) examine how consumers evaluate experiences retrospectively and find support for peak-end theory in a consumer context. Specifically, a timing delay in evaluating an experience impacts experience judgments because of a reduced ability for consumers to recall the final instance of an experience (Montgomery & Unnava, 2009). This finding is consequential in the context of

brands that improve their performance over time, in which a time delay reduces purchase intentions due to an inability to recall the most recent, positive experiences.

Consumers use post-experience information to reconstruct their consumption experiences (Cowley & Janus, 2004). Building on this research, Cowley (2007) finds that emotions after viewing an advertisement can interfere with recall of the original experience-based evaluation. Additionally, memory reconstruction not only influences brand evaluations, but also consumer perceptions of time, such that rich experiences pass by quickly in the moment, yet feel longer when later recalled (Ahn et al., 2009).

Another post-experience evaluation behavior is writing reviews. Based on review timing, Jung et al. (2023) find that reminders to leave reviews immediately after a product experience can trigger psychological reactance, outweighing the benefits of product recall compared to delayed reminders. While consumers typically write truthful reviews, brands sometimes suffer from fabricated reviews (Kronrod et al., 2023). Understanding the different types of consumer memory can help elucidate whether a review is truthful or not. In the multiple memory systems view, episodic memory consists of an individual's ability to remember past experiences from their life, often embedded in a "who, what, where, when" context (Tulving, 1993). Kronrod et al. (2023) demonstrate that truthful reviews contain episodic language, while fabricated reviews do not.

Relating to fabricated reviews, Cowley and Anthony (2019) provide a framework as to how consumers remember their lies (i.e., deception memory). Broadly, individuals experience increased arousal when engaging in untruthful communications (Caso et al., 2005; Cowley & Anthony, 2019). Arousal narrows attention to promote processing of the arousal-eliciting information, while decreasing memory for the contextual, peripheral details (Easterbrook, 1959).

Based on this logic, while highly consequential lies may be riskier if forgotten, consequential lies increase arousal during encoding and are therefore less likely to be forgotten (Cowley & Anthony, 2019). As such, consumer memory for lies is driven by encoding processes rather than arousal during memory retrieval (Cowley & Anthony, 2019).

Sensory Factors in Consumer Memory

In considering sensory factors that drive consumer memory, the literature repeatedly highlights visual and olfactory processes, as well as contrasting visual and auditory processing. In addition to considering consumer memory in relation to different sensory modalities, we also discuss the role of individual differences in driving sensory factors for consumer memory.

In marketing, vision has been the predominant sense examined as a predictor of consumer behavior (Peck & Childers, 2008), while the other senses (touch, taste, hearing, and smell) are seldom examined. However, the consumer memory literature repeatedly demonstrates that the power of scent drives behavior not only during immediate exposure, but also after delays of up to two weeks (Krishna et al., 2009; Morrin et al., 2011). Morrin and Ratneshwar (2003) test mechanisms through which scent improves memory, ruling out congruence, arousal, and mood. Rather, scent improves memory and brand outcomes through attention mechanisms (Morrin & Ratneshwar, 2003). Specifically, ambient scent in an environment can increase approach behavior by encouraging consumers to spend more time with a stimulus, which in turn has a positive impact on brand memory (Morrin & Ratneshwar, 2003). Additionally, scent can improve memory performance by reducing interference during memory retrieval for scented compared to unscented products (Morrin et al., 2011). Of particular interest, one does not need to physically experience smell for positive brand outcomes to occur; imagining scent can also improve recall and consumption behavior (Krishna et al., 2014).

The contrast between auditory and visual processing is also prominent in the consumer memory literature. In one stream of research, auditory processing is beneficial for memory performance largely attributed to sound symbolism. Sound symbolism is not only important as identified earlier for pricing memory, but for brands in general. Research in marketing demonstrates that the sounds comprising a brand name can elicit consistent perceptions of meaning, such as size, heaviness, sweetness, and warmth (Luna et al., 2013; Lowe & Haws, 2017). In turn, the sound symbolism elicited brand perceptions support not only brand memory, but also brand evaluations and judgments (Yorkston & Menon, 2004).

Although auditory processing is important for brands, individual differences in auditory versus visual processing are not well understood (Bagozzi, 2008). Further, visual and auditory processing do not always function in tandem. For example, consumers evaluate brands less favorably when they struggle to create a visual image based on solely a verbal brand description (Wyer et al., 2008). Dimofte and Yalch (2011) also find that auditory processing can result in negative brand perceptions, based on phonetic mere association effects. In the phonetic mere association effect, unrelated objects can be activated based on brand-sound associations. While these associations are irrelevant, consumers are unable to ignore them, which through a transfer process can drive negative brand outcomes (Dimofte & Yalch, 2011).

It is important to recognize that auditory processing can have positive or negative effects on brand outcomes. However, the long-term influences of auditory processing, individual differences in auditory processing, and responses to auditory branding are underexplored in consumer memory, and marketing more broadly. As such, Essay 3 of the dissertation is focused on auditory branding. Beyond the sense of hearing, studies on touch and taste are also underdeveloped components of sensory influences for consumer memory.

In the preceding sections on themes for marketing contexts, findings come from both long-term and short-term memory. In the following section, we go beyond contextual themes and focus on long-term memory, short-term memory, and memory theories. We extend across contexts to provide a foundational review of relevant topics in both memory systems, followed by a review of memory theories.

Long-Term Memory

We now turn to long-term memory and follow with a presentation of the short-term memory literature. When focused specifically on long-term memory, we present literature on the structure of long-term memory, forgetting processes, and false memories (i.e., memory distortion). The structure of memory is a long-standing consideration not only in psychology (Federmeier & Kutas, 1999; Kolodner, 1983; Luchini et al., 2024), but also across marketing research (e.g., Cowley & Mitchell, 2003; Nedungadi et al., 2001). Of relevance to marketing managers, brand memory failure is an important consideration, with forgetting and distortion identified in psychology as two major memory failure mechanisms (Schacter, 1999).

Memory Network Structure. First, we address the structure of long-term memory. Memory network structure is important for brands, in part, because organized information related to a brand in an associative memory network supports recall and recognition. When consumers have structured brand knowledge in their long-term memory, incoming brand-related information is processed more easily, improving brand outcomes (Cowley & Mitchell, 2003). Further, when consumers are provided with an organizational structure for brand categories, recall inhibition is reduced (Nedungadi et al., 2001). This view is in-line with older work in marketing, which suggests that consumers with a high level of expertise with a brand are better at organizing new information (Alba & Hutchinson, 1987). As an applied example, Punj & Brooks (2002) find that

the decision to buy a car hinges on organized product knowledge in long-term memory, supported by brand recall.

Memory network structure is, however, not always beneficial for memory performance. Specific factors of memory network structure can cause a reduction in memory performance. For example, when consumers have frequent experiences with a product category, highly detailed advertisements induce memory intrusions based on pre-existing knowledge stored in long-term memory schemas (Dimofte & Yalch, 2010). Similar to memory intrusions, interference can cause consumers to confuse brand consumption experiences when they share a similar cue (Warlop et al., 2005). When brands do not have a distinctive cue to differentiate themselves from other similar brands (e.g., cue sharing), it becomes difficult to differentiate one brand experience from another. Additionally, this competition between brands is varied on an individual differences level. Ng and Houston (2009) propose that certain individuals are field-independent, meaning they ignore contextual information and create abstract, global memory structures. Alternatively, field-dependents are more likely to rely on episodic experiences and connect brand beliefs to multiple products. As such, not only do brand-features contribute to memory network structures that inhibit memory for brands, but memory network structure is also determined on an individual basis.

Although the structure of consumer memory has been highlighted in the literature, a quantitative methodology for measuring said structure in marketing has yet to be identified. Though techniques such as brand concept maps (John et al., 2006; Schnittka et al., 2012) have been utilized previously, they do not allow for the measurement of specific memory network structure characteristics to be examined quantitatively. In contrast, network science methodologies (e.g., Benedek et al., 2017; Kenett, 2018; Ovando-Tellez et al., 2022) allow for

such quantitative analysis. This gap in the consumer memory literature is addressed in Essay 2 of the current dissertation.

Long-Term Memory Forgetting. The first form of memory failure we consider is forgetting. We begin by addressing why forgetting from long-term memory occurs, followed by two unique applied areas of interest: ethical behavior and social media firestorms.

While forgetting can occur through encoding processes (e.g., diminished attention to commercials during high-intensity moments of the Super Bowl reduces commercial memory, Beasley et al., 1998), forgetting in consumer memory is also driven by memory retrieval mechanisms. For example, in motivated forgetting information is not lost in memory, rather, the information is not retrieved as a defense mechanism to a threat (Dalton & Huang, 2013). Specifically, Dalton and Huang (2013) demonstrate that social identity threat-driven motivated forgetting does not occur due to attention or elaboration mechanisms during encoding, but rather during memory retrieval. Forgetting can also occur due to mixed emotional experiences. While unipolar emotions tend to become more intense over time, mixed emotional experiences provide conflicting information towards a single source, which dampens memory over time (Aaker et al., 2008). It is apparent that one mechanism of forgetting in consumer memory is conflict: whether one feels conflicted by identity threat or experiences conflicting emotions, forgetting occurs.

The conflict account of consumer memory forgetting also applies to memory for brand attributes. Consumers view forgetting as a morally acceptable way to cope with conflicting feelings on how they want to behave and how they should behave (Reczek et al., 2018). For example, when consumers are exposed to unethical brand attributes, forgetting the unethical information is viewed as more appropriate than knowing the information and ignoring it (Reczek et al., 2018). Similarly, when a brand attribute is perceived as forgotten (versus unknown)

consumers are more likely to retrieve information that is positively in-line with overall brand beliefs, rather than objective evidence (which could indicate either positive or negative information; Walters & Hershfield, 2020).

Forgetting has a multitude of consequences for consumers and brands. For consumers, believing that one has a low memory efficacy (i.e., forgets frequently) can reduce their willingness to engage in virtuous behaviors such as donating (Toure-Tillery & Kouchaki, 2021). When consumers believe they have a poor (vs good) memory, they see their overall behaviors as less self-diagnostic and subsequently not donating to a cause does not impact their self-image (Toure-Tillery & Kouchaki, 2021). In other words, when consumers believe they have a good memory, their behavior is tightly tied to their self-concept, which drives donation behavior; however, once behavior is no longer self-diagnostic, donation behavior decreases.

Another unique area of forgetting is associated with social media firestorms. A social media firestorm occurs when there is sudden flooding of social media with commentary on a specific person/company/brand. Hansen et al. (2018) examine how consumers remember such social media firestorms. Two years after a firestorm occurs 23.7% of consumers remember it and 10.2% remember the reason for the firestorm. Also from this work, in the short run, firestorms result in 58% of brands experiencing impoverished brand perceptions, and for 40% of these brands, this translated into long-term negative brand perceptions (Hansen et al., 2018). Although only a subset of consumers remembered the brand's social media firestorm, the brand still suffered perceptual damage, which highlights implicit memory processes. Even though consumers cannot explicitly remember the firestorm event, their perceptions remain impacted by the occurrence of the firestorm; there is no explicit memory for the event, and yet implicitly, it still influences brand perceptions.

False Memory. For our second category of memory failures, we address false memories, also known as memory distortions. In marketing, three broad categories emerge: problems from source memory, the role of expertise in creating memory distortions, and the influence of imagery on false beliefs. Each category presents a different mechanism for memory distortions in marketing, which we outline in detail.

In marketing, source monitoring theory puts forward that false memories can occur when consumers fail to differentiate between information learned during a consumption episode and information exposure post-consumption (Cowley & Janus, 2004; Lakshmanan & Krishnan, 2009). During exposure to post-consumption information, consumers reconstruct their original memory, merging the post-consumption and true consumption information, which can lead to false memory (Lakshmanan & Krishnan, 2009).

One factor increasing the importance of considering source memory for consumers is based on findings that consumers are less able to recall the source of a fact compared to an opinion, and subsequently, consumers rely on opinions more when forming inferences (Mirny & Spiller, 2025). Source monitoring is especially important for older consumers. As consumers age, their ability to recall source context is reduced, which leads to a strengthening of the relationship between repetition of misinformation and misremembering misinformation as true (Skurnik et al., 2005). While not focused on age, Law (2002) finds that repetition of similar competitor claims can cause confusion between brands, further highlighting the importance of source memory for brands. Further, source memory can influence consumer attitudes when they are impacted by a brand-related false memory and a brand-related true memory (Rajagopal & Montgomery, 2011). Additionally, source memories can also be reconstructed to match the present motivations of a consumer. When consumers are motivated to engage in anti-goal

behaviors, such as buying fast food while maintaining a goal to lose weight, they misrepresent their previous memories (false memory) by fudging how much progress they've made towards the goal (May & Irmak, 2014).

Beyond source memory, expertise is also identified as a driver of false memories for consumers. Expert consumers are hypothesized to have well-developed knowledge structures related to brands (Alba & Hutchinson, 1987); however, these knowledge structures are not always beneficial for brands. When consumers are comparing products from memory, experts are susceptible to mis-aligning product attributes (Mehta et al., 2011). For example, when Brand A contains four known attributes, but Brand B only contains two known attributes, experts will use their expertise to "fill-in" the missing knowledge, thereby falsely remembering the missing attributes for Brand B (Mehta et al., 2011).

Additionally, consumers can have extensive exposure to a brand category without gaining full expertise. In these scenarios, consumers are exposed to extensive brand category knowledge but have not gained the expertise to use it effectively, which drives susceptibility to false memories (LaTour & LaTour, 2010). In addition to susceptibility to false memories, expertise can also reduce brand liking. For example, when experts have to recall a small set of brand instances, they must inhibit the extra information in their memory structures, which makes the task more difficult and reduces brand liking (Sinha & Naykankuppam, 2013).

Imagery is our third mechanism driving false beliefs in consumers. Research consistently finds that false beliefs about an event are driven by imagery (Drivdahl & Zaragoza, 2001). This research is further supported by Rajagopal and Montgomery (2011), who find that when consumers are exposed to an imagery-evoking advertisement, they are more likely to have false beliefs of having interacted with the brand previously. Further, false beliefs of product

interaction and actually interacting with a product produce similar evaluations towards the product (Rajagopal & Montgomery, 2011). Also considering product interactions, when consumers virtually experience products with high visual imagery in an interactive environment, memory for the product is improved compared to a static picture; however, the high visual imagery also contributes to false memories regarding the product (Schlosser, 2006). This process occurs, in part, due to consumers using vivid imagery to "fill in the blanks" for missing product features (Schlosser, 2006), similar to the findings on experts (Mehta et al., 2011).

Considered together, the consumer memory research related to long-term memory supports a common theme addressed earlier: constructive memory is central to understanding consumer behavior. From a theory standpoint, constructive memory, interference from expertise, and mental imagery are identified as key explanations for false memories. While the relationship between imagery and memory has been examined in a visual context, as well as a scent context (Lwin et al., 2010), the literature on imagery and memory in other sensory modalities is limited. In the broader marketing literature, imagery for haptic information is examined (Peck et al., 2013), however not in the context of memory. In this literature, research regarding auditory imagery is missing, which will be the focus of Essay 3.

Short-Term and Working Memory

When evaluating short-term consumer memory, much of the research also highlights working memory. While marketing often uses short-term and working memory interchangeably or in conjunction (e.g., “short-term working memory” in Biswas et al., 2009), there are distinct differences between the two in the psychology literature (Cowan, 2008; Unsworth & Engle, 2007). Short-term memory is marked by information being forgotten through temporal decay and capacity limits for chunks of information; in contrast, working memory is conceived of as a

system with multiple functional components that are involved in holding and manipulating information, and using attention to guide short-term memory (Cowan, 2008) and goal directed behavior (Hu et al., 2016). The difference between short-term and working memory is also highlighted on methodological grounds; working-memory tasks are correlated with measures of higher-order cognitive function (e.g., fluid intelligence, Kane et al., 2005), while short-term memory tasks largely are not (Cowan, 2008).

One similarity between the two memory systems is that short-term and working memory both have a capacity limit (Cowan, 2001). Capacity limits are often studied through individual differences focused on multiple theoretical accounts on the composition of working memory capacity (Baddeley, 1983; Cowan, 2012; Oberauer et al., 2016; Unsworth & Engle, 2007). In marketing, individual differences in working memory capacity are identified as driving consumer distraction (Kang & Lakshmanan, 2017) and satiation rates (Nelson & Redden, 2017). For example, individuals with a lower working memory capacity are identified as being more easily distracted by music (Kang & Lakshmanan, 2017). Regarding satiation, Nelson and Redden (2017) demonstrate that individuals with a higher working memory capacity satiate faster because they encode and process stimuli at a deeper level compared to individuals with a lower working memory capacity.

Beyond individual differences in capacity, consumer research finds that individuals differ in their default sensory processing modality, contrasting visual and auditory processes (Vanhuele et al., 2006). Similarly, Viswanathan et al. (2009) find that consumers show individual differences in working memory to process information verbally or pictorially. Specifically, individuals who rely on visual processing tend to have a concrete understanding of the world and

struggle with symbolic abstraction. For these individuals having pictorial representations of brand names improves recognition for the brand (Viswanathan et al., 2009).

In the pricing literature discussed earlier, the phonological component of Baddeley's working memory capacity model (Baddeley, 1983; 2020) is central to consumer memory for prices. Additionally, research in marketing highlights the role of the visuospatial sketchpad in generating mental images (Baddeley & Andrade, 2000), such that overloading the visuospatial sketchpad prevents the imagery that drives how logo shapes influence attribute judgments for a product (Jiang et al., 2016). However, two components of the Baddeley (2000) working memory model have not been addressed in marketing research: the episodic buffer and the central executive. The episodic buffer component of working memory is important for language processing, binding visual and auditory information, and integrating information with long-term memory (Baddeley, 2000). The central executive is implicated in controlled processing and the ability to maintain attention on a focal task without being distracted (Baddeley, 2020). Both of these processes are underexplored in marketing and provide fertile ground for further consumer memory research.

In addition to considering all components of the Baddeley working memory model, the consequences of alternative theoretical accounts of working memory have yet to be examined in marketing research. Further, in comparison to long-term memory research, both short-term memory and working memory are understudied in marketing. Future research should work to elucidate the driving features that differentiate short-term from working memory, along with their unique influence on marketing outcomes.

Theories

The last component of our review on consumer memory research is centered on the different theories that underscore much of the literature. When considering the theories that drive consumer memory three appear consistently: associative memory theory, constructive memory, and the accessibility-diagnosticity framework. Associative memory theory is the backbone of the consumer memory literature, however, in recent years constructive memory and the accessibility-diagnosticity framework have become more prominent. Constructive memory is used to explain consumer memory in a wide variety of contexts, such as advertising, imagery, and experiences, while the accessibility-diagnosticity framework is often used with memory-based decision-making, as well as studies related to processing ease. Associative memory and constructive memory stem from the broader memory literature in psychology, while the accessibility-diagnosticity framework largely originates from the marketing literature. In this section, we outline all three theories and their mechanisms.

Associative Memory. In associative memory theory, information is stored in memory as a set of nodes connected through associative links that vary in strength (Anderson, 1983; Collins & Loftus, 1975). Memory retrieval is based on spreading activation, in which activation from one node travels to other related nodes, with strength decreasing the further the activation spreads. The strength of an associative link is determined by semantic similarity, as well as co-occurrences in the real world (Collins & Loftus, 1975).

For example, if a consumer learns that AT&T sponsors the NBA Finals, then an associative link between the nodes for AT&T and the NBA Finals would form in the consumer's memory. In the example, if the consumer later encounters AT&T the node will result in activation spreading to all of its associated nodes, including the NBA Finals. In turn, activation spreads from the NBA Finals to all of its associated links, and so on, with the strength of activation

weakening the further it spreads (Collins & Loftus, 1975). Stemming from the spreading activation mechanism, the fan effect puts forward that as activation spreads to a large quantity of nodes, the ability to recall any one specific association is reduced (Anderson & Reder, 1999). Research in marketing demonstrates that the more brands compete in a product category, it becomes easier to confuse them due to overlapping memory associations triggered through spreading activation (Keller et al., 1998).

Per the associative memory model, information is thought to be organized hierarchically in the memory network, which consists of product category as the highest node, leading to brands and then attributes of the brands (Hutchinson et al., 1994; Nedungadi, 1990). In contrast, Cowley and Mitchell (2003) suggest that only high knowledge consumers use hierarchical organization, while lower knowledge consumers associate all brands to a single node. This is important because spreading activation will be more concentrated for high knowledge consumers (i.e., activating only relevant brands) versus lower knowledge consumers (i.e., activating everything), thus, impacting memory performance (Cowley & Mitchell, 2003).

Though associative memory theory is the traditional explanation of consumer memory, the more recent literature focuses on constructive memory and the accessibility-diagnosticity framework. Numerous findings in marketing provide evidence counter to the predictions made by associative memory theory and specifically spreading activation. In early work, Ratcliff and McKoon (1981) conducted a priming study and found results that were inconsistent with the spreading activation theory's prediction. In addition, other theories propose that associative links are strengthened through synchronous activity rather than a spread of activation (Nelson et al., 2003). In a finding not supported by the spreading activation mechanism, Dimofte and Yalch (2011) demonstrate that consumers struggle to ignore phonetically activated irrelevant

associations in memory, which can result in unfavorable brand attitudes. Further Van Osselaer and Janiszewski (2001) find that associative memory alone does not explain consumer brand association learning, as the process depends on cue integration, which is not a component of associative memory. In sum, spreading activation has played a historical role in the consumer memory literature, however, updated theorizing is needed to better understand mechanisms relevant to consumer memory.

Constructive Memory. While associative memory theory and spreading activation are older theoretical accounts that have largely fallen out of date, constructive memory has origins in early psychology work and is still actively utilized in various disciplines. Originating from Bartlett (1932), the constructive memory account puts forth that memories are not stored in their entirety, but rather as incomplete memory traces; that memory retrieval is a constructive process through which blanks are filled in using inferences, schemas, and current information in the environment; and lastly, that reconstruction occurs through a narrative process. More recently, Schacter and Addis (2007) put forward a cognitive neuroscience perspective of constructive memory that highlights similarities between the neural processes underlying both memory for the past, as well as imagining the future. This past-future connection is important considering consumer memory research has yet to evaluate prospective memory empirically (see Minton et al., 2017 for a conceptual review).

While a constructive memory system is beneficial in that it reduces the taxing of limited cognitive resources (i.e., remembering every verbatim memory as a tape-recorder does), there is a trade-off such that constructive memory is fallible (Schacter, 1999). However, although constructive memory is fallible, its function is adaptive and heavily implicated in the ability to simulate future events (Schacter, 2012). Research in psychology demonstrates that experts in an

area experience false memories through reconstruction (Brainerd et al., 2010), which has also been replicated in the consumer literature (e.g., Mehta et al., 2011). The marketing literature further reiterates the findings from the psychology literature. For example, state-dependent memory is a mechanism of constructive memory and is identified in marketing as an important predictor of memory performance in consumers (Appleton-Knapp et al., 2005; Chun et al., 2017; Luna et al., 2013; Mercurio & Forehand, 2011; Noel, 2006). Marketing research also demonstrates the tendency for constructive memory to induce false memories at multiple levels of expertise (Cowley & Janus, 2004; Lakshmanan & Krishnan, 2009; Rajagopal & Montgomery, 2011; Skurnik et al., 2005).

One of the key features of constructive memory theory is episodic reconsolidation, a process that is time-dependent (i.e., it does not happen immediately) and supports the integration of new information into existing episodic memories (Hupbach et al., 2007). However, episodic reconsolidation has yet to be addressed systematically in the marketing literature. Overall, more work is needed in marketing to understand how constructive memory facilitates both true memories and false memories. Additionally, understanding how constructive memory functions in relation to future-thinking behavior can help marketing move towards studying prospective memory, an understudied area.

Accessibility-Diagnosticity. The accessibility-diagnosticity framework is based on the principles of accessibility, diagnosticity, and their interaction. While the principles of memory accessibility and diagnosticity have their origins in psychology, the specific accessibility-diagnosticity framework originates from the marketing literature (Feldman & Lynch, 1988; Schwarz, 1995; Menon et al., 1995; Lynch, 2006). Given that associative memory theory and the

constructive memory framework originate from psychology, the marketing origin of the accessibility-diagnosticity framework is an important differentiator.

Accessibility refers to the ease (or difficulty) an individual's experiences when attempting to retrieve a memory (Aaker, 2000). Accessibility has long been identified as important in a consumer context, with Kisielius and Sternthal (1984) demonstrating that vivid information results in cognitive elaboration and imagery, which improves accessibility to the information during brand evaluations. Further, when consumers make unconscious judgments, ease of retrieval is used to inform the evaluation (Menon & Raghubir, 2003).

Diagnosticity refers to a consumer's judgment as to how informative a piece of information is to their current situation (Herr et al., 1991). It is important to note that diagnosticity depends on context; information can be diagnostic for one judgment, but not another (Herr et al., 1991). Recent research in the area has considered the role of self-diagnosticity in consumer behavior. Toure-Tillery and Kouchaki (2021) find that when consumers experience moments of forgetting (i.e., poor memory efficacy), they view their behavior as less self-diagnostic, which allows them to behave less virtuously at a later time. Diagnosticity is contextual, with the context of behavior determining whether memory efficacy has an impact on virtuous behavior (Herr, 1991; Toure-Tillery & Kouchaki, 2021). Further in-line with diagnosticity being context-dependent, Aaker (2000) demonstrates that the effectiveness of advertising appeals is different across cultures, because the appeals are more (or less) diagnostic based on consumer culture.

Central to the accessibility-diagnosticity theory is that neither process occurs in isolation, rather both elements are used when consumers make judgments (Lynch & Srull, 1982). Lynch and Srull (1982) propose that any consumer judgment depends on how accessible information is

in memory and that diagnosticity informs whether the accessible information is needed. When accessible information is not diagnostic, it is excluded from consideration (Schwarz & Bless, 1992). Additionally, when information is both accessible and diagnostic, consumers ignore information in the environment, further highlighting the importance of memory-based judgments discussed earlier (Menon et al., 1995).

The accessibility-diagnosticity framework has been used to explain phenomenona such as advertisement expenditures not always impacting perceived brand quality (Rajavi et al., 2022), how brand scandals impact consumer attitudes for the scandal brand (Liu et al., 2025), and even box office sales for movie sequels (Belvaux & Mecarelli, 2021). These findings suggest that the accessibility-diagnosticity framework is useful in consumer memory research. Future research can work towards understanding how the accessibility-diagnosticity framework interacts with the principles of constructive memory in driving consumer behavior.

Conclusion

Consumer memory research spans a multitude of topics in marketing. Our review identifies marketing contexts such as advertising, pricing, experiential consumption, memory-based decision making, and consumer behavior broadly as core areas of the consumer memory literature. We also find research related to specific types of memory, such as sensory processing, long-term memory, as well as short-term and working memory. Across the review we highlight theories that drive prominent consumer memory findings and review three overarching theoretical frameworks that drive consumer memory research. In this theoretical consideration, we address the historical importance of associative memory theory but identify constructive memory and the accessibility-diagnosticity framework for future research. Additionally,

throughout the paper, we highlight areas of importance that would be ideal for future research to bring under investigation.

Two major areas for future research include measuring consumer memory network structure and the relationship between auditory imagery and memory performance. Memory network structure is identified as a causal variable across many consumer memory papers (e.g., Ng & Houston, 2009; Nedungadi et al., 2001); however, there has yet to be a method in marketing that can quantitatively evaluate consumer memory network structure. As such, Essay 2 brings forward a new methodology from network science and psychology to demonstrate the consequences of a well-structured versus poorly structured consumer memory network. Regarding auditory imagery, imagery broadly has been identified as driving both positive and negative memory performance in consumers (Bagozzi, 2008; Lwin et al., 2010; Rajagopal & Montgomery, 2011). However, imagery research has generally remained in the visual and olfactory modalities; while in psychology, auditory imagery is considered more frequently. Together, we consider the unique influence of imagery in consumers along with the psychology findings on auditory imagery to bring the construct into marketing through Essay 3.

To conclude, Ebbinghaus in 1885 hoped that eventually, science would be able to consider "the significance of memory for all mental phenomena" (Ebbinghaus, 1885, pp. 3-6). It is my hope that through Essay 1, we can appreciate the modern state of consumer memory as a prime example of how to study memory for all real-world mental phenomena and to be inspired to continue probing a fruitful area that will always be of consequence to marketing. As the world changes, we can be certain that memory will always be an important driver of consumer behavior.

Essay 1 References

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ESSAY 2

BRAND MEMORY IN MARKETING ECOSYSTEMS: EVIDENCE FROM SPONSORSHIP

Consumer memory structure is frequently identified as a driver of consumer behavior across a multitude of contexts, such as brand choice (Nedungadi et al., 2001), product consumption (Warlop et al., 2005), product knowledge learning (Cowley & Mitchell, 2003), and brand extensions (Puligadda et al., 2012). Yet, given the absence of methodology to quantitatively test memory structure as a predictor of consumer behavior, measures of memory network structure have been predominantly qualitative. In the current research, we use the context of sport sponsorship to present a methodology for quantitatively modeling memory network structure and demonstrate that network structure does indeed impact brand outcomes.

In popular communication strategies such as sponsorship and brand placement, the nature of brand knowledge—gained primarily through product, brand, or logo exposure embedded in sports, arts, and entertainment—is different from that in traditional marketing (Cornwell & Kwon, 2020). Past theoretical frameworks do not apply neatly to evolved marketing communication strategies and do not adequately explain brand memory outcomes in these contexts. Beyond methodological contributions, we argue that an ecosystems perspective capturing the importance of extensively layered past brand exposures paired with an increasing number of current exposures, is needed to explain the development of memory structures which drive counterintuitive marketing communication outcomes.

While our theorizing is generalizable to any communication ecosystem, we focus on sport sponsorship given that current spending is over 100 billion annually and expected to reach 189 billion worldwide in 2030 (Statista, 2024). Consider the marketing relevance of the following example. Working with an industry collaborator, Wakefield (2020) surveyed consumers across auto, insurance, credit card, technology, and telecommunications categories to

see if they could correctly identify official league sponsors in Major League Baseball (MLB), National Football League (NFL), and National Basketball Association (NBA). The findings published in *Forbes Magazine* note that memory for league sponsors is largely at the same level as chance (33%). Importantly, those watching professional sports "often" or "all I can" generally did not have better memory for sponsors as compared to those indicating "don't watch" or "don't watch often." The extreme case was the NFL where individuals answering "watch all I can" had the lowest recall accuracy (30%) of all categories of viewership. Wakefield questioned: do league sponsors get lost in the "brand name shuffle?" The current work seeks to explain how sponsors, while not lost, may be inaccessible in the complex partnering ecosystem.

Unlike in traditional advertising, in sponsoring and product placement, brands make a concerted effort to relate to the sponsored content or to weave brand name placement into the plot or theme (Davtyan et al., 2021). The communications landscapes employing these brand integration strategies have become multi-layered and complex. For example, in sport sponsoring, any event is sponsored at many levels, including leagues, teams, individuals, venues, equipment, and moments of activity (e.g., replays). Further, brands may sponsor multiple events and activities, and many brands have a history of sponsoring dating back decades. Because of the cluttered layering of sponsors in the environment, brands face an ecosystem of accumulated sponsor-related exposures in the minds of viewers and attendees.

We make three research contributions. Our first contribution is the introduction of the semantic fluency task technique (Luchini et al., 2024; Siew & Guru, 2023) to marketing. To our knowledge, the semantic fluency task has not been tested in an applied setting such as marketing. In this task, participants are cued with a prompt and asked to list as many appropriate responses as possible within a set time. Subsequently, semantic memory estimation methods are used to

model a representation of the memory network structure. These estimation methods provide semantic memory network characteristics that can be quantitatively compared between groups. Additionally, we present two distinct estimation methods, correlation-based group-level analysis and the U-INVITE individual-level analysis. In sum, we present new testing for consumer memory network structure consistent with demonstrated findings from the ecosystems-based view of sponsor identification.

Introducing the ecosystems-based view of sponsor identification constitutes our second contribution. Our ecosystems-based view differs from heuristic-based accounts of sponsor recall based on relatedness and prominence (Johar & Pham, 1999; Pham & Johar, 2001) in two primary ways. First, we move away from spreading activation (Collins & Loftus, 1975) as the supporting theory in favor of global activation theory (Hintzman, 1988). Second, updating the underlying theory allows for counterintuitive theorizing. For example, though previous research identifies experience-related variables such as fan identification (Mazodier et al., 2018) and psychological involvement (Lardinoit & Derbaix, 2001) as supportive of memory, the ecosystems-based view suggests that a consumer's experiential engagement (Mankute et al., 2025) could have a negative effect on memory due to cluttered messages in the context.

Our third contribution comes from managerially useful insights on how recall works in sponsoring and other marketing communication approaches that naturally develop ecosystems of exposure. For certain groups of consumers, memory network structure can be indistinguishable from random, creating noise when retrieving brand names. In contrast, other groups demonstrate a flexible memory network structure, providing a boost to memory performance.

Across five studies, we demonstrate a consistent relationship between experiential sports engagement, memory network structure, and memory performance for sponsoring brands. Study

1 introduces the novel methodology of quantitatively measuring consumer memory networks in two samples and demonstrates that groups such as students and MTurkers have sponsorship memory networks that differ from each other. Having established differences between a well-structured and a poorly structured sponsorship memory network, Study 2A demonstrates that when a memory network is poorly structured, increased experiential engagement decreases memory for sponsoring brands; while in contrast, Study 2B provides evidence that for well-structured networks, experiential engagement improves memory for sponsors. In Study 3A and Study 3B we extend our findings by measuring memory network structure on an individual level and connecting network characteristics to both engagement and memory recall.

Conceptual Development

Ecosystems-Based View

Early work on sponsor identification proposed that a consumer's ability to correctly recall the true sponsor of an event is a constructive process based on prominence and congruence heuristics (Johar & Pham, 1999). Under this theorizing, a large athletic shoe brand such as Adidas would be easily remembered as the sponsor of a marathon, while an incongruent sponsor such as Burger King would be remembered less frequently. Congruence and prominence effects are still prevalent in sport sponsorship; however, they do not address the complex, layered sponsorship ecosystem. The ecosystems-based view of sponsor identification is needed to understand modern-day consumer responses to sponsors embedded within a densely connected sponsorship ecosystem.

Ecosystems are a cornerstone concept in addressing our new complex interconnected world. Definitions of ecosystems are discussed across disciplines, but in sponsoring, a social ecosystem has been identified as most representative of the interplay between business and non-

business entities (Cornwell & Kwon, 2020). Taking a brand perspective, Maslowska, Malthouse, and Collinger (2016) describe the customer engagement ecosystem as including customer brand experience, brand dialogue behaviors, brand consumption, and shopping behaviors, as well as the brand itself, media, and other consumers as participants in the ecosystem. Our conceptualization of the ecosystems-based view builds on the sponsoring and the branding literature by considering the mechanisms and outcomes of repeated exposure to a contextual ecosystem.

In conceptualizing a sponsorship ecosystem, one can consider the different levels of competition present in sport; for example, international, national, regional, and local competitions each have their own structure and extent of sponsorship. Brands in the international ecosystem include events such as the Olympics partnered with global companies like Procter & Gamble, whereas local events have local sponsors. Likewise, ecosystems can be seen in particular sports (e.g., esports, Scholz et al., 2021) or sport-related systems (e.g., mountain sports tourism, Bouhaouala, 2022). The sponsorship ecosystem extends over time as well, creating a layered ecosystem of sponsors past and present. This layering can be seen in the examples of sport event name changes, in which the new sponsor's name is remembered well in the short-term, but over time, individuals increasingly recall the old sponsor's name for the event (McAlister et al., 2012).

In sum, an ecosystem such as that found in sport sponsoring is a contextually bounded system that contains multiple levels and extensive layering over time for various sport systems. Consumers are exposed to the sport sponsorship ecosystem through different touchpoints in their daily lives. Exposure can come from sponsored athlete promotions on social media, sports participation, fantasy sports play, collegiate and professional sports viewing and attending, and increasingly, betting and prediction markets. Through such omnipresent exposure, consumers

develop and update a mental representation of the sport sponsorship ecosystem that includes brands, events, athletes, and related sports knowledge, with associative links connecting individual pieces of information. Such a mental representation is viewed as a memory network in which individual pieces of information (e.g., athletes, sponsors, events) are "nodes" and the associative links connecting the nodes are called "edges" (Anderson, 1983). An alternative view argues that exposure to events leads to a "rich catalogue" of these nodes and edges not as units but as part of structured event representations (Wahlheim & Zacks, 2025). The ecosystems-based view proposes that varying levels and types (e.g., TV or live) of exposure result in structural differences in memory network representation, which has important consequences for consumers' ability to recall a true sponsor. Following, we present theory on how memory network structure develops, followed by how the structure of semantic memory network influences memory performance.

Developing a Sponsorship Memory Network

In marketing, there is an emphasis on consumer exposure to brand information being critical for the development of memory network structures (Alba & Hutchinson, 1987; Keller, 1993; Jacoby et al., 1986). Broadly, consumer memory research demonstrates that repeated exposure to brand information can strengthen the associations between nodes in a network by increasing accessibility; however, it is important to distinguish between strengthening existing associations and the creation of new associations (Campbell & Keller, 2003). Just because a memory network has strong linkages, does not mean it will always be beneficial for learning new information. To form new associative links, direct experiences with a brand can create stronger associations as compared to indirect experiences (Marks & Olson, 1981).

However, exposure is not always beneficial for integrating new product information into a memory network. While fully established expertise creates better organized and more abstract networks (Alba & Hutchinson, 1987), having exposure without the development of expertise can reduce memory performance (LaTour & LaTour, 2010). For example, high exposure (i.e., familiarity) without an expert-level structured memory network results in all brand information being linked to a single node, eliciting high levels of memory interference (Cowley & Mitchell, 2003). In contrast, expert consumers use hierarchical information organized into categories (Cowley & Mitchell, 2003). In the current research, we refer to those hypothesized to have an expert-level structured memory network as "systematic individuals," reflecting their network structure, but not their overall knowledge. In contrast, those who have experience with the sponsorship ecosystem, but are missing the necessary memory network structure are referred to as "familiar individuals." As argued further below, familiar individuals can be exposed to the same information as systematic individuals, but without developing the necessary network structure, increased familiarity is detrimental to memory performance.

In the current research, we propose that with consistent, direct exposure to the sport sponsorship ecosystem, a well-structured sponsorship memory network can develop. However, if consumers gain familiarity without developing systematic knowledge structures, any activation of the memory network will result in all sponsorship information activating, reducing memory; in contrast, for systematic individuals, because information is organized hierarchically, only a subset of information will be activated, increasing memory performance. In the current research, we examine overall exposure with experiential sports engagement and quantitatively measure memory network structure, connecting both to memory performance for sport sponsorship. To

better understand differences in memory network activation, we turn to the psychology literature on global activation models.

Global Activation and Matching Memory Models

In contrast to the popular *spreading-activation model* of memory (Anderson, 1983; Collins & Loftus, 1975), many global activation theories (and global matching models, Osth & Dennis, 2015) posit that activation levels are compared for all items simultaneously in the neighborhood (here ecosystem). One key difference is that spreading activation suggests the more associations that connect to a node, the more memory is improved due to the flow of activation (Collins & Loftus, 1975); in contrast, Nelson et al. (2003) suggests that fewer connections boost memory, but when nodes are densely interconnected, memory is further improved regardless of node set-size. This process is distinct from the spreading activation-based logic in marketing, which suggests building as many associations as possible supports memory performance (Keller, 1993; Krishnan, 1996). Global activation suggests that it is the interconnectivity of nodes that bolsters memory (Nelson et al., 1992, 2003), not simply increasing the number of associations to any one brand. As such, increased associations without the proper network structure (e.g., interconnectivity) will be detrimental to memory for sponsorship information.

From a distinct, but related, perspective on memory retrieval, Raaijmakers and Shiffrin (1981) propose that episodic memory traces are created during information exposure, and that a retrieval cue is simultaneously compared to all memory traces stored. In this model, making a brand distinguishable supports memory performance (Shiffrin & Steyvers, 1997) and if too many brands are present, activation for any one individual brand decreases (Raaijmakers & Shiffrin, 1981). Specifically, when consumers are exposed to a cue, multiple overlapping traces connected

to the cue decrease the probability of recalling the target brand, which is supported by the marketing literature (Burke & Srull, 1988; Kent & Allen, 1994). As discussed, consumers with brand familiarity, but without systematic knowledge structures, connect all relevant information to a single cue (i.e., node, Cowley & Mitchell, 2003). As such, memory performance would be decreased due to the extensiveness of overlapping traces connected to a single cue.

To summarize, marketing literature to-date highlights the importance of creating as many associations to a brand as possible (Keller, 1993), driven theoretically by spreading activation. Nelson et al. (2003) demonstrate that it is not the number of associations that is most crucial, but their interconnectivity. In other words, consumers have a memory network and the structure of that network drives memory performance. While trace models do not inherently highlight memory network structure, they do demonstrate the importance of being able to distinguish a target brand from the competitors also activated in memory. Global activation theory as proposed by Nelson et al. (2003) has yet to be tested in marketing, while the trace model has some empirical support. However, these models have not been tested in combination with each other, and we believe that in-tandem, they can explain counterintuitive findings for the influence of experiential engagement on memory for sponsorship information.

Ecosystems and Experiential Engagement

We put forth that variability in ecosystem exposure and subsequent changes in memory network structure are captured in large part by variance in experiential engagement. Experiential engagement is a "product of cumulative and ongoing behavioral and emotional exposure, involvement, and interaction that an individual has with a definite observable context (broadly or narrowly defined, e.g., music or jazz, sport or golf)" (Mankute et al., 2025, p. 5). Experiential engagement goes beyond sport involvement or sport fan identification to be able to predict

context-relevant knowledge development, as well as furthered ecosystem behavior such as sports betting (Mankute et al., 2025). It is a multi-faceted scale capturing consumers' behavioral involvement, intimacy, and influence related to a context, such as sport. In the current research, this suggests a close relationship between experiential engagement for sports and memory network structures for sport sponsorship. Indeed, experiential engagement captures a consumer's lived sports experience and degree of exposure to the sports sponsorship ecosystem, which impacts sponsorship memory network structure.

As individuals accumulate experiences by engaging with the sponsorship ecosystem, sponsorship relevant memory networks will continue to develop (Nelson et al., 2013). Viewing memory networks as developing through experiential engagement supports the notion that memory network structures are continuously formed at an individual level based on lived experiences (Lee & Chen, 2022). Additionally, simple exposure to the sponsorship ecosystem is not enough to create well organized memory network structures for sport sponsorship. Differences in types of exposure and lived experience will determine if consumers go beyond accumulating nodes or create meaningful connections between information. If consumers simply acquire nodes without interconnectivity between them, increased experiential engagement will reduce memory performance; however, if consumers have a well-organized sponsorship memory network, experiential engagement should improve memory for sponsorship information.

Hypotheses

Experiential Engagement without Memory Network Structure

As discussed, experiential engagement's impact on memory for sponsorship depends on the structure of the consumer's sponsorship memory network. The typical consumer will develop a memory network consisting of sponsorship associations stored as memories of lived

experiences. When exposure to sports is indirect (Marks & Olson, 1981), such as watching through TV, or individuals are highly familiar with sports, but have not developed systematic networks (Cowley & Mitchell, 2003), we propose experiential engagement will be detrimental to memory for sponsorship information. Specifically, without systemic-level organization to their sponsorship memory network, consumers connect most sponsorship information to a single cue (Cowley & Mitchell, 2003). As such, as experiential engagement increases, so should the number of concepts simultaneously co-activated by a single cue in the sponsorship memory network, which produces interference effects and hinders memory performance (Nelson et al., 2003; Raaijmakers & Shiffrin, 1981). In psychology, Bormann (2011) finds that when organizational structure is not present in a memory network greater interference effects emerge. Taken together, experiential engagement increases the number of sponsors and events consumers are exposed to, but without a way to organize all the information, memory performance for those sponsors is reduced. Stated formally:

H1: When consumers do not have a well-structured sponsorship memory network, higher experiential engagement will reduce memory for the true sponsor of an event.

Additional Evidence in Evaluating Hypothesis 1

The structure of a memory network has consequences for not only memory performance but also reaction time (Locker et al., 2003; Mirman & Magnuson, 2008). Psychology literature finds that response times increase when individuals experience greater interference from distractors in a network (Bormann, 2011; Tamminen et al., 2013). As such, memory networks that are poorly organized and produce greater interference should result in slower reaction time for consumers. Consideration of response time provides additional insights on network structure.

Experiential Engagement with Memory Network Structure

While sport sponsorship memory networks are formed through lived experiences with a context and are, in theory, accessible to all consumers, some individuals develop an organizational structure, while others do not. When considering the consequences of a well-structured semantic memory, we differentiate between the activation of both semantic (factual knowledge) and episodic (experiential) information. A memory network that is well-structured allows for the use of semantic retrieval cues that aid memory beyond solely episodic retrieval mechanisms (Greenberg & Verfaellie, 2010; Herz & Brunk, 2017). From global activation theory, the concurrent activation of both episodic information and semantic information is expected to bolster memory performance (Arndt 2010; Clark & Gronlund, 1996). Additional research demonstrates that experts in an area, such as people who accumulate direct experiences with the sponsorship ecosystem, can easily integrate sponsorship information into their existing memory network (Alba & Hutchinson, 1987). In sum, organized information about a context supports consumers' use of personal experiences and factual knowledge to aid in memory retrieval. Formally:

> H2: When consumers exhibit a well-structured memory network, experiential engagement will improve memory for the true sponsor of an event.

What Exactly is Network Structure?

In the memory literature, analysis of semantic memory has been improved largely due to advances in network science methodologies (Siew et al., 2019) and new tools in the quantitative modeling of memory networks (Luchini et al., 2024). Memory network characteristics are important because well-structured networks aid in the retrieval of information (Kenett, 2025).

Meaningful differences in network characteristics have been identified between higher- and lower-knowledge students (Luchini et al., 2024; Siew & Guru, 2023), individuals with greater or lesser openness to experience (Christensen et al., 2018), and greater or lesser creativity (Kenett & Faust, 2019). The contexts of previous research have been academic subjects (e.g., psychology, biology), fruits, and animals. However, no study to date has attempted to measure memory network characteristics for complex, applied topics, such as sponsors, events associated with sponsorship, and general sports.

Our primary hypotheses (H1 and H2) are driven by the assumption that different groups of individuals exhibit variation in their sponsorship memory structure. We introduce recent methodological advances in the memory literature that provide an approach for the quantitative analysis of semantic memory network structures (Christensen & Kenett, 2023; Luchini et al., 2024) upon which our third hypothesis rests. This methodology is especially relevant to marketing given that methods such as brand-concept maps (John et al., 2006) are qualitative network measures. While brand-concept maps can provide the number of association pairs, semantic fluency tasks also allow for quantitative analysis of specific network structure characteristics, such as the Average Path Length (APL), Clustering Coefficient (CC), and Modularity (Q) to be discussed.

This is also distinct from the network analysis presented in Teichert and Schontag (2010), in which factor analysis is used to test for characteristics such as number of word mentions and network density, but not statistical significance between the presented networks. In other work, Stephen, Zubcsek, and Goldenberg (2016) find that higher connectivity in a network structure has a negative influence on innovativeness of ideas; however, the authors assign participants to pre-determined networks and do not measure pre-existing network characteristics. In addition to

testing for structural characteristics not presented in previous marketing literature, the semantic fluency task technique allows for testing statistical significance in network structure characteristics in two (or more) groups. Further, the semantic fluency task technique includes a step in which the empirical semantic networks for each group are tested against a simulated null network model (Christensen & Kenett, 2023). To our knowledge, no memory network analysis technique used in marketing has tested empirical networks versus matched, randomly generated network models.

To understand memory network structure and its impacts on consumer behavior, we combine theory on global activation (Nelson et al., 2003) with the cognitive network paradigm as specified above. Previous research identifies three characteristics of memory networks that drive behavior. Specifically, networks with high flexibility (i.e., advantageous for memory) are identified as having higher clustering coefficient, lower average path length, and a lower modularity score (Kenett & Faust, 2019). We propose that the presence of this flexible network structure is what differentiates systematic consumers from familiar consumers when considering the role of exposure in memory networks (Alba & Hutchinson, 1987).

Another frequently identified network structure is known as a "small world network," which has a more extensive history of research compared to the "flexible network." Small world networks are identified based on a high clustering coefficient and a low average path length (i.e., a subset of the "flexible network" identified above; Steyvers & Tenenbaum, 2005) and have been shown to support memory performance for related information.

Beyond supporting memory, small world network development depends on exposure and can change over time. For example, small world networks shift throughout learning, such that memory networks of high-knowledge individuals become increasingly restructured to fit a small

world organization (Luchini et al., 2024). Further, Denervaud et al. (2021) demonstrate that alterations to learning approaches can produce varied memory network structure. As such, different groups of individuals may experience the same event, but the format of exposure may impact the development of memory network characteristics. In other words, it is possible that individuals with more direct sports experiences (such as college students at a Division 1 school) develop distinct memory network structures from those who encounter the sport sponsorship ecosystem indirectly (e.g., through TV) or at a more local level (e.g., regional sponsorship of children's sports). This argument is also supported by Christensen et al. (2018) who demonstrate that individuals can know the same words but organize them differently in their memory network. In other words, the same content presented in different contexts changes the organization of memory networks. This is important when considering why groups of individuals differ in their network organization; assuming everyone is exposed to the same sporting events, the context of those exposures has a crucial role in developing small world networks specifically.

In the current research, we consider the influence of experiential engagement on memory performance, as well as the direct impact of experiential engagement on the development of sponsorship memory network structure. We do not, however, test for other drivers of a well-structured memory network. As such, we do not make inferences as to why some individuals develop a well-structured sponsorship memory network, but rather in Study 1 we quantitatively examine two samples that show divergent results in sponsorship memory network structure.

We test for statistical significance in the global network characteristics of clustering coefficient, average path length, and modularity between systematic individuals and familiar individuals on three semantic fluency tasks (sponsors, events associated with sponsorship, and general sports). In our sponsorship memory network analysis, we consider three levels of

network structure: macroscopic, mesoscopic, and microscopic (Siew et al., 2019). Clustering coefficient is a microscopic measure that assesses the relationships between nodes and edges (Siew et al., 2019). Additionally, clustering coefficient is the metric that is most readily informed by global activation models of memory. The average path length is a macroscopic measure that represents a network's overall organization. Lastly, modularity serves as a mesoscopic measure, which focuses on assessing the network's community structure. We next describe the three memory network characteristics in detail.

Clustering Coefficient. The clustering coefficient represents the average likelihood for two associates of a node to be connected as associates themselves (Christensen & Kenett, 2023). An analogy would be measuring the extent to which "your friends [are] also friends of each other" (Siew et al., 2019, p. 4). Thus, clustering coefficient measures the degree of local clustering (Siew & Guru, 2023), with a higher clustering coefficient suggesting that neighbors co-occur and thus provide for a more organized semantic memory. Consequently, memory networks with a high degree of interconnectivity have a higher clustering coefficient (Cosgrove et al., 2021), which is a predictor of language recognition, learning new words, and memory recall (Siew et al., 2019). Given that the clustering coefficient is a measure of interconnectivity and its benefits for memory performance, it maps on well to the Nelson et al. (2003) argument that networks with greater interconnectivity will support memory. If the clustering coefficient of a memory network does improve memory performance, we would expect systematic individuals to have a larger clustering coefficient compared to familiar participants.

Average Path Length. As discussed, memory networks are constructed of nodes (responses) and edges (strength of association between two nodes; Christensen & Kenett, 2023). The average path length represents the average number of edges required to move between nodes

(Christensen et al., 2018), with lower values indicating a greater ability to switch between sub-groups within the network. Having a lower APL allows for an increased chance of reaching more associations (Christensen et al., 2018; Christensen & Kenett, 2023). In line with this, Kenett and Faust (2019) argue that the lower APL found amongst individuals with greater creative ability allows them to find more distant associations. In other words, a lower APL is related to more accessible remote associates, which should improve memory, while a higher APL may be related to a decreased ability to reach all associates in a semantic network, hindering memory. However, Kenett and Faust (2019) do not assess the relationship between these structural differences and memory performance. Overall, we would expect systematic individuals to show a lower APL compared to familiar participants.

To note, there is no direct mapping between average path length and the predictions made of global activation models. However, Nelson, Bennett, and Leibert (1997) find that indirect associations separated by two steps facilitate memory, while three-step indirect associations do not. Conceptually, this is in-line with the prediction that a lower average path length is beneficial for memory performance. Caution in this interpretation is warranted however, given that global activation functions at a local level, while average path length is a global measure of network structure.

Modularity. Modularity represents the extent to which a semantic network can be classified into subnetworks (Christensen et al., 2018). Specifically, modularity measures whether a semantic network has extensive connections within a subnetwork and few edges connecting nodes between subnetworks (Christensen & Kenett, 2023; Fortunato, 2010). In a marketing context, subnetworks can represent product categories; for example, higher modularity for a brand network would represent dense connections within both the sneaker and the insurance

product categories, but few connections between brands in the sneaker product category and brands in the insurance product category. Previous research demonstrates that modularity is a consequential predictor of rigid processing (Christensen et al., 2018; Kenett et al., 2016), which hinders memory performance; thus, lower values of modularity are associated with a more flexible (i.e., easier to search) semantic network (Christensen & Kenett, 2023). If the structure of semantic networks is consequential in determining memory performance, we would expect systematic individuals to show a lower score on Q as compared to familiar participants.

Taken together, the literature provides evidence that memory network structures comprised of higher density (greater clustering coefficient), shorter paths between all nodes (lower path length), and fewer defined sub-networks (lower modularity; Cosgrove et al., 2021; Kenett et al., 2016) support memory performance. Excluding clustering coefficient, these network characteristics are from a different paradigm than the global activation models referenced earlier. However, extending the logic from both frameworks, these same network characteristics that support memory performance, may do so because they allow for greater coherence and strength of simultaneous activation as defined by global activation models (Nelson et al., 2003). In other words, flexible memory network structure may provide the basis for a more impactful (i.e., potent) global activation in comparison to networks with less flexible structure, which do not co-activate as consistently or easily.

We put forth:

H3: Systematic individuals will demonstrate a more flexible memory network (higher clustering coefficient, lower path length, and lower modularity) than familiar participants.

Individual-Level Mediation. To consider proposed mediation, we need to make a distinction between the previous group-level analysis and individual-level network analysis. Group-level versus individual-level memory network modeling are distinct processes with their own operationalizations of how an edge is determined; as such, measurements of the same characteristics with different estimators are not comparable; estimates should always be compared within method (Siew & Guru, 2023; Zemla & Austerweil, 2018). On the group-level we use a correlation-based estimator, which creates a single network for the entire group based on the statistical co-occurrence of words (Christensen & Kenett, 2023). The correlation-based estimator represents network structure, with the flexible network pattern (low average path length, low modularity, high clustering coefficient) being a key insight.

In contrast, the individual-level network modeling is based on the hierarchical U-INVITE algorithm method (Zemla et al., 2020), which uses a Bayesian estimation for a censored random walk retrieval process. In censored random walk, the sponsorship memory network is a map with nodes (sponsors) and edges connecting related nodes (Zemla & Austerweil, 2018), and during retrieval, one walks a path from sponsor to sponsor to provide responses to the fluency task. The observed responses to the fluency task represent the first time you visit each sponsor; however, in reality, the path you take is longer, going through sponsors that were already visited (Zemla & Austerweil, 2018). The Bayesian estimation component assesses the likelihood of the observed network compared to all other possible networks that exist (Zemla, 2022). The process is iterative such that edges are added and removed based on how they impact the likelihood until the algorithm converges on the best explanation for the data (Zemla & Austerweil, 2018). U-INVITE is unique such that it can infer edges that were never listed consecutively in the observed data (Zemla & Austerweil, 2018).

The flexible network versus the output of U-INVITE are inherently not comparable as they represent distinct constructs. While the correlation-based estimator only models structure, U-INVITE is a process model which captures elements of both structure and retrieval mechanisms (Zemla & Austerweil, 2018). Given the incompatible comparison between characteristics on the group versus individual level, we differentiate between variables that are estimated using the correlation-based estimator (e.g., average path length-CB) and variables estimated with U-INVITE (e.g., average path length-UI). One advantage of U-INVITE is that it provides us with an ability to directly assess how network characteristics represent memory retrieval for sponsorship information beyond the inferences of the correlation-based analysis. Further, if U-INVITE reflects memory network retrieval, network characteristics may mediate the relationship between experiential engagement and memory performance.

Importantly, previous literature in the area does not directly consider the relationship between memory network structure and memory recall. The U-INVITE method has only been used in relation to patients with Alzheimer's disease (Zemla & Austerweil, 2019) and to compare older versus younger individuals (Zemla, Gooding & Austerweil, 2023); in both cases, memory performance is not considered. Even considering the correlation-based estimator, outcomes that have been considered are creativity measures (Benedek et al., 2017), intelligence (Kenett et al., 2016), personality (Christensen et al., 2018), language production (Cosgrove et al., 2023), and knowledge assessment (Luchini et al., 2024; Siew et al., 2019). None of these outcomes are similar to memory performance as measured by free recall. As such, it is unclear how individual-level memory network characteristics will predict memory performance.

Conceptually, memory network characteristics should mediate the relationship between experiential engagement and memory performance; however, the directionality of that

relationship is unclear. While lower average path length-CB, lower modularity-CB, and higher clustering coefficient-CB are associated with a more flexible memory network, as discussed, correlation-based estimation measurements are not comparable to those estimated with U-INVITE.

Formally, we hypothesize:

H4: Memory network characteristics, as estimated by U-INVITE, will mediate the relationship between experiential engagement and sponsor identification.

The use of semantic fluency tasks for sponsors, events associated with sponsorship, and general sports allows us to model the memory retrieval process in an applied setting of consumer behavior. While semantic models can contain much information (e.g., semantic relationships, phonetic relationships, associations between brands, associations between brands and attributes), at their core, they are composed of two components: a memory representation and a retrieval process (Siew et al., 2019). In the present research, responses to the semantic fluency tasks are modeled to create the memory representation, and we provide a theoretical account for the retrieval process. Overall, we present an updated view of the consumer memory process, which is supported not only with behavioral, experimental data but also with the usage of a new methodology to provide a quantitative analysis of differences in consumers' memory network structures.

Study 1: Measuring Memory Network Structure

The primary underlying assumption of our argument regarding the varied influence of experiential engagement on memory is that MTurk and student participants differ in the structure of their semantic memory. Study 1 tests for quantitative differences in the memory network

structure for sports sponsorship between MTurk and student participants, using three semantic fluency tasks (Luchini et al., 2024). As noted, previous semantic fluency tasks target networks for animals, fruits, psychology terms, etc. In contrast, we use semantic fluency tasks to estimate semantic memory networks specifically for sponsors, events associated with sponsorship, and general sports.

Methods

We recruited 274 student participants *(*54% Female*,* M_{Age} = 20.81, *SD* = 1.41) and 293 MTurk participants (28% Female, M_{Age} = 37.37, *SD* = 11.04) for a total of 567 participants in Study 1. Students were compensated with course credit and MTurk participants earned $1.75 for 15 minutes of participation in the study. The study consisted of three semantic fluency tasks (i.e., sponsors, events associated with sponsorship, and general sports), followed by self-report measures, and demographics.

Fluency Tasks

Following Siew and Guru (2023), the general sports fluency task was presented first, and the order of the remaining tasks was randomized. In each task, participants were instructed on the computer, "You have 1 minute to list as many words related to the prompt as possible. Please avoid repeating the same word within a list. Please separate each response with a comma," for all three tasks. The instructions then stated, for each task respectively, "Please list words you associate with sports; Please list brands you associate with sports sponsorship; Please list events that you associate with sports sponsorship."

Semantic Memory Network Estimation

Semantic fluency task data cleaning and analysis were conducted using a group of R packages compiled and developed specifically for semantic network analysis (SemNA;

Christensen & Kenett, 2023; Christensen et al., 2018; Luchini et al., 2024; Siew & Guru, 2023). The data pipeline for preprocessing, estimating, and analyzing semantic fluency data is composed of the following packages (and versions used): *SemNetDictionaries* (Version 0.2.0), *SemNetCleaner* (Version 1.3.6), and *SemNet* (Version 1.4.4).

Data preprocessing was conducted separately, but identically, for each of the three semantic fluency tasks. First, we created custom dictionaries containing all appropriate responses given by participants for each semantic fluency task, respectively. These dictionaries were then used to spell-check and autocorrect the data, in which responses given more than once (i.e., perseverations) and inappropriate responses are logged and dropped. In the final step of preprocessing, monikers were converted into standardized responses (e.g., NBA finals and NBA championships were entered as "NBA finals") using both automatic and manual processing (Siew & Guru, 2023).

The second step in the semantic fluency task technique is to create a binary response matrix from the cleaned data, in which columns represent each unique response provided by participants and rows represent individual participants (Christensen & Kenett, 2023). Values take the form of 1 (response given) or 0 (response not given). To control for the varied number of nodes and edges between MTurk and student semantic networks, we only accepted unique responses provided by at least two participants (following Christensen & Kenett, 2023; Luchini et al., 2024). Additionally, following Van Wijk, Stam, and Daffertshofer (2010), we equated the two groups, such that we only accepted unique responses provided by participants in both groups (Luchini et al., 2024; Christensen & Kenett, 2023). Thus, our estimated semantic memory networks are only comprised of responses that occur for both MTurk and student participants.

The third step in the semantic fluency task technique is network estimation. We use a correlation-based network estimator, which necessitates responses to be provided by at least two participants and equated across samples as described above (Christensen & Kenett, 2023; Siew & Guru, 2023). Using the binary response matrix, cosine similarity was computed using the SemNeT package, which estimates "the co-occurrence probability of two words by calculating the angle between two-word vectors" (Luchini et al., 2024, p. 5), which has previously been applied in text corpora semantic analysis (Landauer & Dumais, 1997) and semantic distance analysis (Beaty & Johnson, 2021; Luchini et al., 2024). Values range from 0 to 1, in which 1 represents two words that always co-occur, and 0 represents words that never co-occur (Luchini et al., 2024). Then, the Triangulated Maximally Filtered Graph (TMFG) method (Christensen & Kenett, 2023; Luchini et al., 2024; Massara et al., 2016) was used to capture the most reliable relationships from the cosine-similarity networks. The TMFG method helps prevent spurious associations from being included in the final network (Christensen & Kenett, 2023; Luchini et al., 2024). With the network estimated, we test three global network measures: clustering coefficient, average path length, and modularity.

Semantic Network Analysis

There are two primary components in quantitatively analyzing differences in the global network measures: comparison to random networks and comparison between groups. A random network is estimated for each group using Viger and Latapy's (2016) Markov chain Monte Carlo (MCMC) algorithm (Christensen & Kenett, 2023). In this process, the random networks are assigned an identical quantity of nodes and edges as in the original group's network; subsequently, MCMC is used to randomize the edges, which creates a null model to assess

whether each group's network structure is significantly different from random. Specifically, the process works as follows (Christensen & Kenett, 2023, p. 13):

> (a) for each group's network, generate X number of random networks;
>
> (b) compute global network measures for each group's random network, resulting in a sampling distribution for these measures; and
>
> (c) compute a p-value for the original group's network measures based on the sampling distribution of the random network's measures, with the value of X being number of iterations (generally, 1,000 per group).

Once the semantic networks are tested against a null model, we examine differences in the three global network measures between both groups using a case-wise bootstrapping approach, in which *N* participants are sampled with replacement for each group typically for 1,000 iterations (Christensen & Kenett, 2023). In this method, sampling distributions are computed using the empirical data exclusively. Following, a t-test can be used to compare the sampling distributions for each global network measure. We test for group-level differences between MTurk and student samples on clustering coefficient, average path length, and modularity.

Results

Random Network Analysis

We tested whether the semantic network characteristics of clustering coefficient, average path length, and modularity were significantly different from random for both the students' semantic network and MTurk participants' semantic network on the three fluency tasks. Random-network models were estimated based on the methods described above. To test for significant differences between the participant models and the random-network models, we used

the *SemNET* package in R to conduct a series of t-tests. For each of the three fluency tasks, three t-tests were conducted, with one t-test for each of the three network characteristics. As demonstrated in Table 5.1, students' network structure characteristics were consistently significantly different from random models containing the same number of nodes and edges (*p*s < .04). In contrast, for MTurk participants, the only task in which all three characteristics were significantly different from random was the general sports task. For the sponsor fluency task, average path length and modularity were not significantly different from the randomly generated model, and on the event fluency task, average path length was not significantly different from random.

Table 5.1 Results for testing the response network structure from random

	Sponsor Fluency Task				Events Fluency Task				General Sports Task			
Metric	M_{ob}	M_{rand}	SD_{rand}	*p*	M_{ob}	M_{rand}	SD_{rand}	*p*	M_{ob}	M_{rand}	SD_{rand}	*p*
Student vs Random Model					Student vs Random				Student vs Random Model			
Ave Path Length-CB	2.55	3.61	.46	.02	2.56	3.57	.48	.04	3.26	4.60	.32	< .001
Clustering-CB	.72	.03	.02	< .001	.71	.03	.02	< .001	.75	.01	.01	< .001
Modularity-CB	.50	.58	.03	< .01	.50	.57	.03	.01	.68	.64	.02	.01
MTurk vs Random Model					MTurk vs Random				MTurk vs Random Model			
Ave Path Length-CB	2.94	3.55	.42	**.15**	3.41	3.44	.36	**.93**	4.84	4.30	.20	.01
Clustering-CB	.69	.03	.02	< .001	.67	.04	.02	< .001	.69	.01	.01	< .001
Modularity-CB	.55	.56	.03	**.52**	.60	.54	.03	.01	.73	.58	.01	< .001

Note: *ob* = observed, *rand* = random; *z*-test used to compare means; *p*-values that are not significant are bolded and represent that the group network is not significantly different from random on the provided measure.

Group Differences

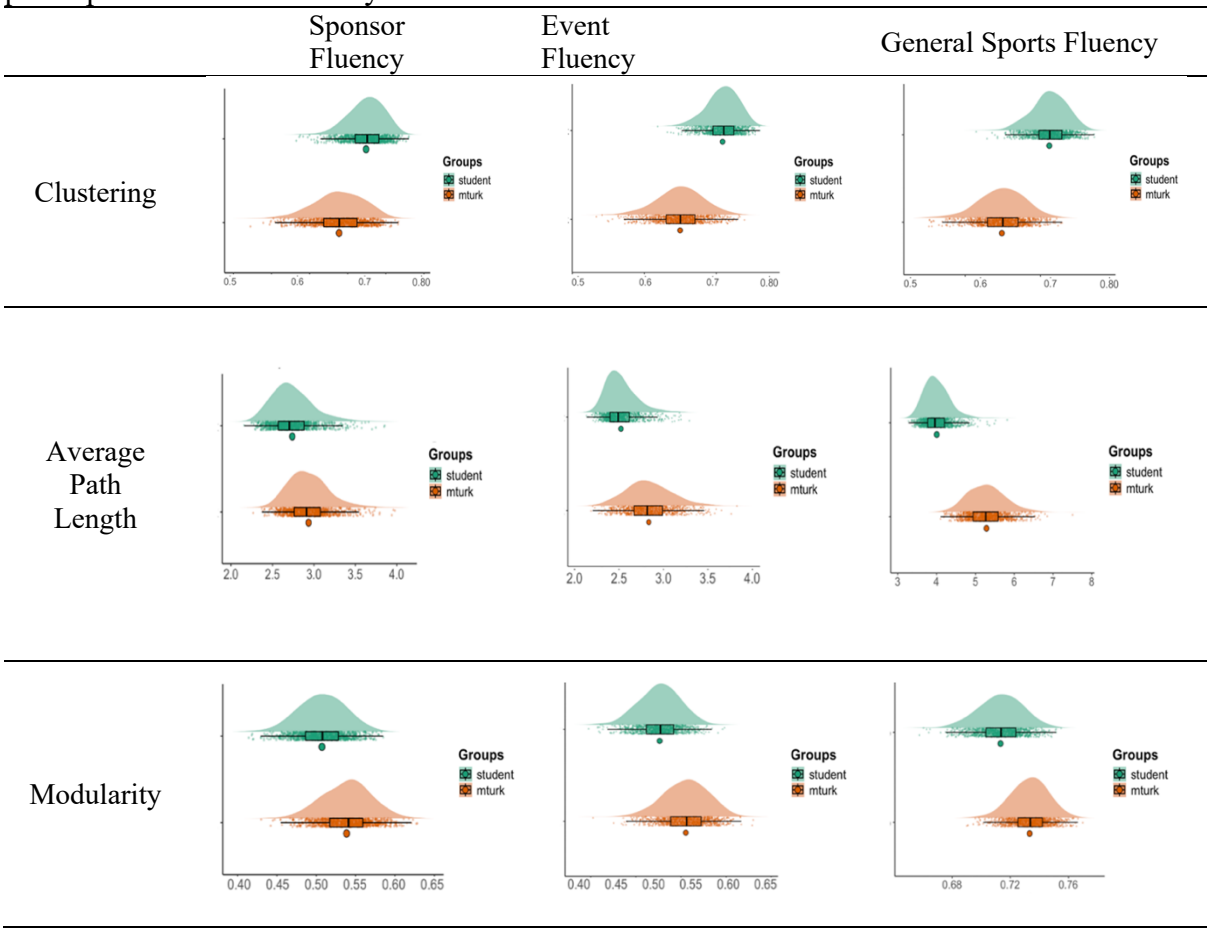
To assess differences in memory network structure between groups, we compared student versus MTurk participants on each of the three dependent variables (clustering coefficient-CB, average path length-CB, modularity-CB) for each of the three fluency tasks, again using the *SemNET* package in R to conduct a series of t-tests. As demonstrated in Table 5.2, MTurk and student participants were significantly different from each other on each of the three network characteristics for each of the three semantic fluency tasks (*p*s <.001). Furthermore, we replicated the comparisons across all three tasks, such that students consistently demonstrated a larger clustering coefficient, lower average path length, and lower modularity compared to MTurk participants. These differences are visualized in Figure 5.1.

Table 5.2 Group comparisons for clustering coefficient, average path length, and modularity measures between students and MTurk for three semantic fluency tasks.

	Sponsor Fluency			Event Fluency			General Sports Fluency		
Group	*M*	*SD*	*t*	*M*	*SD*	*t*	*M*	*SD*	*t*
				ASPL-CB					
Student	2.74	.25	-17.63*	2.73	.18	-32.07*	4.00	.33	-70.25*
MTurk	2.94	.25		3.05	.27		5.29	.47	
				Q-CB					
Student	.51	.03	-23.07*	.53	.02	-27.38*	.71	.02	-31.89*
MTurk	.54	.03		.56	.03		.73	.01	
				CC-CB					
Student	.72	.02	28.41*	.71	.02	48.00*	.71	.01	52.11*
MTurk	.69	.03		.65	.03		.67	.02	

Note: * represents t-values significant at the p < .001 level. This analysis uses bootstrapping that tests out of 1000 samples, how many times the results are directionally consistent (e.g., Students having a smaller APL-CB than MTurk).

Figure 5.1 Visualization of network sampling distributions comparing MTurk and student participants on three memory network structure characteristics



Discussion

Our results find that students have a higher clustering coefficient, lower average path length, and lower modularity compared to MTurk participants across three tasks related to sports sponsorship, which supports H3. Previous research has demonstrated that high openness-to-experience individuals (vs. low openness-to-experience individuals) have a global network structure pattern of higher clustering coefficient-CB, lower average path length-CB, and lower modularity-CB, which is interpreted as having a "more flexible and interconnected semantic network" (Christensen & Kenett, 2023, p. 13), aiding memory performance. These differences in memory structure support our theoretical argument that a well-structured memory network aids

in memory for sponsorship in students, while a less well-defined memory network in MTurk participants reduces memory performance.

Study 2A: Engagement Reduces Memory

Study 2A tests H1 and seeks to test the influence of experiential engagement on memory for sponsorship in an MTurk sample. We provide further evidence for our theory by collecting both free recall and *dprime* recognition. Collecting recognition responses allows for the computation of reaction time to help shed light on the underlying process and provide insight into our understanding of the findings.

Methods

Participants in the study were 600 MTurk workers (38% Female; M_{Age} = 35.24, *SD* = 11.25) who completed the study in exchange for $.85 for 10 minutes of participation. Study 2A used a 2 (true sponsor: congruent, incongruent) x 2 (competitor sponsor: congruent, incongruent) x experiential engagement mixed design, with the first two factors manipulated between-subjects and the last factor measured. In Study 2A and all subsequent studies, we manipulate true sponsor and competitor congruence to account for the role of congruence in existing sponsor identification theory; however, we use these as control variables to isolate our main effects of experiential engagement on memory and recognition reaction time.

Each participant read three press releases, each involving a different sporting event. The three events used were the 2024 Tour de France, the 2024 X Games, and the 2024 Rugby Currie Cup. We chose the events and brands based on pretesting (see Appendix A). While previous studies have operationalized congruence based on product category match to event (e.g., Johar &

Pham, 1999, Experiment 2), we use pretests to measure perceptions of congruence between specific brand-event pairings. All brands were rated similarly on brand-name recognition and brand familiarity. Additionally, we conducted full counterbalancing, such that there were eight conditions, and we collapsed across these counter-balanced conditions to use event-true sponsor congruence and event-competitor congruence as control variables in the statistical models.

After reading the press releases and completing a distractor task (reading a short children's story), participants answered the free recall question. Free recall was coded as follows: For each event, if participants listed the correct event and only the correct sponsor, true recall was coded as 1; for all other responses, true recall was coded as 0. We added the true recall across the three events to create a total true recall and used it as the dependent measure; thus, total true recall can take the values ranging from zero to three.

Then participants answered six yes/no questions (i.e., *dprime* memory task) in randomized order. For each of the three events, we asked two recognition questions: One for the true sponsor and one for the competitor (e.g., "Was [brand] announced as the true sponsor of the 2024 Tour de France?"). For these questions, the page advanced as soon as the participant selected a response. Thus, reaction time for the recognition question was measured as the time from question presentation to first clicking to advance. At the end of the study, we administered the six-item experiential engagement scale ($\alpha = .90$, Mankute et al., 2025).

Results

Free Recall

We test H1 by running a regression analysis using total true recall as the dependent variable. The independent variable was experiential engagement. True sponsor congruence and competitor congruence (both dummy coded) were included as control

variables. Consistent with H1, the regression analysis found a significant, negative effect of sports engagement on total true recall (B = -.24, t = -5.21, p < .001). No significant result was found for true sponsor congruence (B = .10, t = .97, p = .33) or competitor congruence (B = -.04, t = -.39, p = .70).

Recognition

A similar regression analysis using the *dprime* score as the dependent variable revealed a similar pattern. There was a significant, negative effect of experiential engagement on *dprime* (B = -.29, t = -7.77, p < .001). There was also a significant, positive effect of true sponsor congruence (B = .37, t = 4.35, p < .001) and no significant effect of competitor congruence (B = -.04, t = -.51, p = .61).

Reaction Time

The regression model used above was utilized again with reaction time as the dependent variable. For free recall reaction time, a significant, positive effect of experiential engagement was found (B = 25.70, t = 3.25, p = .001); no significant effect of true sponsor congruence (B = 11.42, t = .63, p = .53) or competitor congruence was found (B = 13.77, t = .76, p = .45). For average recognition reaction time, there was a positive, significant effect of experiential engagement (B = 1.93, t = 2.84, p = .005). No significant effect of true sponsor congruence (B = 1.69, t = 1.08, p = .28) or competitor congruence was found (B = .32, t = .21, p = .84). Results are presented in Table 5.3.

Table 5.3 Recall and Recognition Reaction Time Results for Study 2A and 2B

	Study 2A			Study 2B		
	B (SE)	*t*	*P*	*B (SE)*	*t*	*p*
Recall Reaction Time						

Experiential Engagement	25.70 (7.91)	3.25	.001	.37 (.69)	.54	.59
True Sponsor Congruence	11.42 (18.24)	.63	.53	3.35 (2.70)	1.24	.22
Competitor Congruence	13.77 (18.22)	.76	.45	2.20 (2.70)	.82	.42
Recognition Reaction Time						
Experiential Engagement	1.93 (.68)	2.84	.005	-.01 (.02)	-.52	.61
True Sponsor Congruence	1.69 (1.57)	1.08	.28	-.01 (.09)	-.08	.94
Competitor Congruence	.32 (1.56)	.21	.84	.11 (.09)	1.19	.24

Discussion

Results of Study 2A provide additional support for H1 and replicate our finding in Study 1. Furthermore, the significant, negative effect of experiential engagement on true sponsor recognition was found when recognition was measured with *dprime* scores. The results of Study 2A shed light on the underlying mechanism. We found that for MTurk participants, as experiential engagement increases, reaction time becomes slower in both free recall and recognition memory. Given that a slower reaction time is indicative of greater levels of interference, our findings are consistent with the argument that when consumers do not have a flexible sponsorship memory network, a cluttered ecosystem reduces memory performance and increases interference from all the competitors activated in the memory network.

Study 2B: Engagement Improves Memory

Study 2B uses the same design and stimuli as those used in Study 2A but involves participants from the same student population as that in Study 1. We aim to test H2.

Methods

Participants in the study were 425 students (50% Female; M_{Age} = 21.14, *SD* = 2.53) from a large university, who completed the study in exchange for course credit. As in Study 2A, participants completed a 2 (true sponsor: congruent, incongruent) x 2 (competitor sponsor: congruent, incongruent) x experiential engagement mixed design, with the first two factors manipulated between-subjects and the last factor measured (α = .95). All methods and stimuli were identical to those in Study 2A.

Results

Free Recall

Regression analysis as that used in Study 2A found a significant, positive effect of experiential engagement (*B* = .06, *t* = 2.04, *p* = .04). This finding is consistent with H2. No significant result was found for true sponsor congruence (*B* = .10, *t* = .91, *p* = .37) or competitor congruence (*B* = -.03, *t* = -.30, *p* = .77).

Recognition

A similar regression analysis using the *dprime* score as the dependent variable found no significant effect of experiential engagement (*B* = -.02, *t* = -.72, *p* = .47) or true sponsor congruence (*B* = .11, *t* = 1.29, *p* = .20). The main effect of competitor congruence failed to reach significance at the p = .05 level (*B* = .15, *t* = 1.78, *p* = .08).

Reaction Time

We ran similar regression analyses on reaction times. For the free recall reaction time, the analysis did not find any significant effect of experiential engagement (*B* = .37, *t* = .54, *p* = .59), true sponsor congruence (*B* = 3.35, *t* = 1.24, *p* = .22), or competitor congruence (*B* = 2.20, *t* = .82, *p* = .42). For the average recognition reaction time, the analysis did not find any significant effect of experiential engagement (*B* = -.01, *t* = -.52, *p*

= .61), true sponsor congruence (B = -.01, t = -.08, p = .94), or competitor congruence (B = .11, t = 1.19, p = .24).

Discussion

We held stimuli and design constant between Study 2A and Study 2B. These results suggest that differences in population (individuals with or without a well-structured semantic memory) are driving the positive versus negative effect of experiential engagement. These findings are consistent with our theorizing that memory is supported when a semantic network is well-structured. In Study 2B, experiential engagement is significant on recall memory but not on recognition memory, suggesting a well-structured memory network may be consequential for recall but not recognition paradigms. Additionally, there were no significant findings in terms of reaction time. The results suggest that when networks are poorly structured (Study 2A), interference reduces reaction time; however, when networks have a flexible structure (Study 2B), there is no impact of interference on reaction time, supported by the non-significant findings.

Study 3A: Individual-Level Networks with Prolific

The current study aims to test whether individual differences in memory network structure predict memory performance for sponsorship information. In other words, our focus is on understanding whether individual-level network characteristics predict recall, since this question is unaddressed in the existing literature. This process is complementary to the group-level analysis but cannot be used to explain why MTurkers and students in the previous studies showed diverging effects of experiential engagement on recall. As mentioned, path length-CB and clustering-CB are computed differently from and are not comparable to path length-UI and clustering-UI. Previously, we indirectly found that at a group level memory network characteristics can support or hinder memory performance. Using the same experimental

methodology as Studies 2A and 2B, we test whether memory network structure influences sponsor identification at an individual level.

In Study 1, we test for differences in memory network characteristics free from any bias of exposure to experimental materials. However, in order to understand how memory characteristics influence recall directly, we use the experimental procedure from Study 2A and 2B paired with the semantic fluency task and estimate memory network characteristics on an individual level. Given the inherent difference of measuring memory networks after stimulus presentation (this study) and measuring networks free of stimuli (Study 1), we do not report group-level differences to prevent incompatible comparisons across studies.

Methods

We recruited 230 participants (50% Female, M_{Age} = 44.18, SD = 12.11) on Prolific, who were compensated for participation in the study. The study consisted of a 2 (event-true sponsor congruency: congruent, incongruent) x 2 (event-competitor brand congruency: congruent, incongruent) x experiential engagement mixed design. Participants in each condition were asked to read three press releases, involving different sporting events. The study used the same design and materials as Study 2A and Study 2B, with the addition of three semantic fluency tasks at the end of the study. The semantic fluency task questions were the same as in Study 1.

Fluency Tasks and Model Estimation

Following Siew and Guru (2023), the general sports fluency task was presented first, and the order of the remaining tasks was randomized. In each task, participants were instructed on the computer, "You have 1 minute to list as many words related to the prompt as possible. Please avoid repeating the same word within a list. Please separate each response with a comma," for all three tasks. The instructions then stated, for each task respectively, "Please list words you

associate with sports; Please list brands you associate with sports sponsorship; Please list events that you associate with sports sponsorship."

Data preprocessing was conducted separately, but identically, for each of the three semantic fluency tasks. First, we created custom dictionaries containing all appropriate responses given by participants for each semantic fluency task, respectively. These dictionaries were then used to spell-check and autocorrect the data, in which the number of responses given more than once (i.e., perseverations), and inappropriate responses are logged and dropped. In the final step of preprocessing, monikers were converted into standardized responses (e.g., NBA finals and NBA championships were entered as "NBA finals") using both automatic and manual processing (Siew & Guru, 2023).

We consider two network characteristics that define small world networks: clustering coefficient and average path length. Subsequently, we utilize structural equation modeling, testing clustering coefficient and average path length as mediators of the relationship between experiential engagement and recall. While Ovando-Tellez et al. (2022) use memory network structure as a mediator between fMRI activity and creativity behavior, network characteristics have not been used previously as mediators in a behavioral paradigm.

For each semantic fluency task, we constructed individual semantic networks using the SNAFU toolbox (Zemla et al., 2020) in python (Hierarchical U-INVITE algorithm). Each participant's unique responses served as nodes, and undirected edges were added between items that appeared close together in the response sequence, using a sliding window of three responses. Repeated co-occurrences of the same pair increased the edge weight, resulting in weighted graphs that reflected how strongly items were associated in each person's responses. From these graphs, we calculated clustering coefficient-UI and average path length-UI for each participant

and task. In Study 1 we utilize all three tasks to demonstrate replicability of the group differences. In contrast, when considering how experiential engagement impacts network characteristics directly, the memory network for sponsors is most likely to reflect differences from exposure to the sport sponsorship ecosystem (compared to sporting events and general sports terms). As such, we present findings from the sponsor network task in-text, however, results from the event network and the general sports network are presented in Appendix B. The findings replicate for the event network, but not the general sports network.

After modeling the memory networks and retrieving individual scores for each characteristic, we use structural equation modeling to test the relationship between engagement, memory network structure, and sponsor recall. In the SEM model experiential engagement is the predictor, modeled as a latent variable with six item loadings. Clustering coefficient-UI and path length-UI were mediators and the DV was summed recall. In the structural model, experiential engagement is the independent variable and the outcome is recall.

Results

We tested the conceptual model as shown in Figure 5.2, using structural equation modeling in R with the lavaan package. For model estimation, we used maximum likelihood, with 5,000 bootstrap samples. When using maximum likelihood estimation, it is suggested to aim for a minimum of five (Anderson & Gerbing, 1988; Tanaka, 1987) to ten (Bentler & Chou, 1987) observations per observed variable. Our model (Figure 5.2) contains 9 observed variables, thus suggesting that a sample size of 230 meets the requirement for SEM.

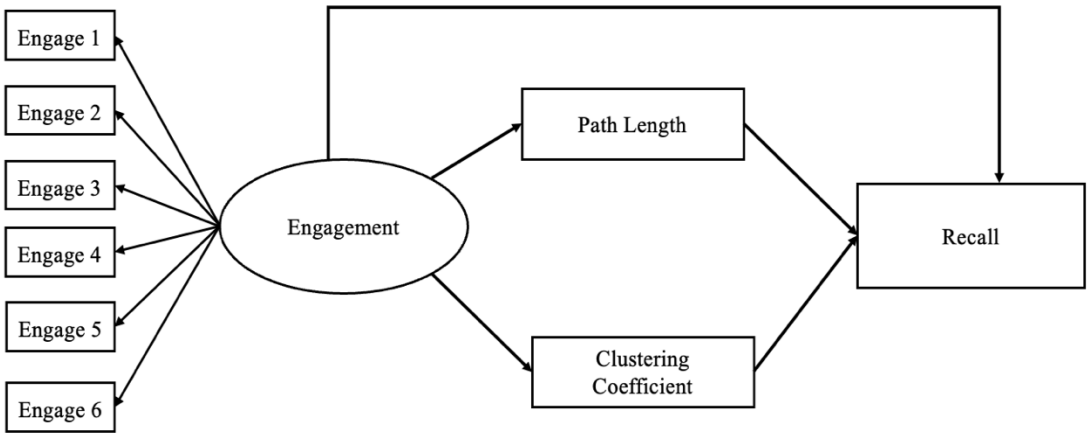


Figure 5.2 Structural Model for Prolific and Students

Prolific Engagement CFA

We conducted confirmatory factor analysis (CFA) to examine the unidimensionality of the experiential engagement (six items) construct. Two items (Engage2 and Engage4) were allowed to covary based on theoretical considerations. The single-factor, six-item CFA model exhibited excellent fit to the data ($\chi^2_8 = 19.04$, $p = .015$, RMSEA = .077, 95% CI = [.020, .131], CFI = .991, TLI = .984, SRMR = .014), as indicated by a range of model fit indices (SRMR < .08, CFI and TLI > .95, RMSEA < .08) (Hu & Bentler, 1999; Kline, 2023). The standardized factor loadings were sizable ($\beta > .75$) and statistically significant ($p < .001$). The composite reliability (CR) was .94 which exceeded the suggested cut-off value of 0.80 and the average variance extracted (AVE) was .73 which exceeded the suggested cut-off value of 0.50 (Fornell & Larcker, 1981).

Prolific Dual Mediation

We test the conceptual model in Figure 5.2 using structural equation modeling and bootstrapping for all estimates. The model exhibited excellent fit (Browne et al., 1993) to the

data (χ^2_{23} = 34.60, p = .057, RMSEA = .048, 95% CI [.000, .084], CFI = .991, TLI = .986, SRMR = .022). The SRMR value (< .08), and the incremental fit indices indicated good fit (CFI and TLI > .95 Hu & Bentler, 1999; Kline, 2023). An RMSEA value below .08 is considered acceptable (Browne et al., 1993).

Experiential engagement did not reach the p = .05 threshold for statistical significance in predicting recall (B = .10, SE = .05, p = .059). It did not predict either path length-UI (B = .03, SE = .02, p = .194) or cluster coefficient-UI (B = -.02, SE = .01, p = .133) significantly. Neither path length (B = .28, SE = .19, p = .142) nor cluster coefficient-UI (B = .31, SE = .34, p = .37) predicted recall significantly.

The total indirect effect of experiential engagement on recall via path length-UI and cluster coefficient-UI (IE = .002, p = .81; 95% CI [-.015, .025]) was not significant. Neither clustering coefficient-UI (IE = -.01, SE = .01, p = .51, 95% CI [-.35, .01]) nor average path length-UI (IE = .01, SE = .01, p = .38, [-.003, .039]) mediated the impact of experiential engagement significantly.

Taken together, there was not a reliable association between experiential engagement, clustering coefficient-UI, average path length-UI, and recall for the Prolific sample.

Discussion

In Study 3A, the results demonstrate that memory network structure does not explain the relationship between experiential engagement and recall. While we observe a positive relationship between experiential engagement and recall, memory network structure is not the key mechanism explaining the finding. Next, we test this same model in a student sample.

Study 3B: Individual-Level Networks with Students

The purpose of Study 3B is to examine individual level memory network characteristics in students. We utilize the same methods and materials as in Study 3A. This study also affords comparison to Study 3A.

Methods

We recruited 223 participants (31% Female, M_{Age} = 21.00, SD = 1.32) undergraduate students, who were compensated for participation in the study with course credit. We retain the same experimental design and methods, testing a 2 (event-true sponsor congruency: congruent, incongruent) x 2 (event-competitor brand congruency: congruent, incongruent) x experiential engagement mixed design. Participants in each condition were asked to read three press releases, involving different sporting events.

Results

Students Engagement CFA

We conducted the same CFA model, but with the student data. Two items (Engage2 and Engage4) were allowed to covary based on theoretical considerations. The single-factor, six-item CFA model exhibited excellent fit to the data (χ^2_8 = 16.42, p = .037, RMSEA = .069, 95% CI [.000, .124], CFI = .993, TLI = .987, SRMR = .013). The standardized factor loadings were sizable (β > .75) and statistically significant (p < .001). The composite reliability (CR) was .95 which exceeded the suggested cut-off value of 0.80 and the average variance extracted (AVE) was .74 which exceeded the suggested cut-off value of 0.50 (Fornell & Larcker, 1981).

Student Dual Mediation

We test the same conceptual model as Study 3A using structural equation modeling and bootstrapping for all estimates. The model exhibited excellent fit (Browne et al., 1993) to the

data (χ^2_{23} = 27.93, p = .218, RMSEA = .031, 95% CI [.000, .073], CFI = .996, TLI = .994, SRMR = .018).

Experiential engagement was not significant in predicting recall (B = .08, SE = .05, p = .137). However, experiential engagement was a significant predictor of average path length-UI (B = .09, SE = .03, p = .004), but not cluster coefficient-UI (B = -.01, SE = .01, p = .458). Path length-UI had a significant, positive effect on recall (B = .29, SE = .12, p = .017); while cluster coefficient-UI did not (B = -.12, SE = .40, p = .755).

The total indirect effect of experiential engagement on recall via path length-UI and cluster coefficient-UI (IE = .028, p = .079; 95% CI [.004, .069]) was significant based on bootstrapped confidence intervals excluding zero. The total indirect effect is driven by path length-UI (IE = .027, SE = .02, p = .087, 95% CI [.004, .068]), but not clustering coefficient-UI (IE = .001, SE = .01, p = .856, 95% CI [-.005, .021]).

Overall, the results indicate that the relationship between experiential engagement and recall in students is mediated through a small world network, driven by average path length-UI. We do not find a significant effect of experiential engagement on recall, which provides support for full mediation. To confirm that mediation is driven by path length-UI and not clustering coefficient-UI, we test two structural equation models, in which model one tests path length-UI as a mediator and model two tests clustering coefficient-UI as a mediator.

Average Path Length

We also tested an alternative model in which path length-UI is the only mediator between experiential engagement and recall. The model exhibited excellent fit to the data (χ^2_{18} = 26.33, p = .092, RMSEA = .046, 95% CI [.000, .088], CFI = .993, TLI = .989, SRMR = .02). Experiential engagement (β = .08, SE = .05, p = .141) was not a significant predictor of recall. It predicted

path length-UI (β = .09, SE = .03, p = .004) significantly. Path length-UI (β = .31, SE = .11, p = .005) predicted recall significantly. The indirect effect via path length-UI (IE = .029, SE = .016 p = .061, 95% CI [.006, .070]) was significant since the 95% CI excludes the value of zero. Additionally, the total effect of engagement on recall was significant (Total = .11, SE = .05 p = .037, 95% CI [.006, .206]).

Clustering Coefficient

We then tested a second alternative model in which clustering coefficient-UI is the only mediator between experiential engagement and recall. The model exhibited excellent fit to the data (χ^2_{18} = 22.790, p = .199, RMSEA = .035, 95% CI [.000, .080], CFI = .996, TLI = .994, SRMR = .016). Experiential engagement (B = .10, SE = .05, p = .043) was a significant predictor of recall. It did not predict cluster coefficient-UI (B = -.01, SE = .01, p = .458) significantly. Cluster coefficient-UI (B = -.60, SE = .36, p = .096) did not predict recall significantly. The indirect effect via path length-UI (IE = .005, SE = .01, p = .55, 95% CI [-.005, .031]) was not significant as the 95% CI includes the value of zero. The total effect was once again significant (Total = .11, SE = .05 p = .037, 95% CI [.005, .206]).

Discussion

In Study 3B we demonstrate that experiential engagement influences recall performance through changes to the average path length-UI component of small world networks. Of interest, experiential engagement predicts increased average path length-UI, and in turn, increased average path length-UI improves recall memory. This finding is counter to the broader literature demonstrating that a lower average path length is advantageous. Another consideration is that memory networks in the literature have previously been modeled with the correlation-based estimator, which cannot meaningfully be compared to the U-INVITE estimates. Memory

network structures that are broadly beneficial across groups may function differently from individual-level memory network structure predicting recall in individuals. One can imagine that memory networks with more distance (higher path-length-UI) between concepts helps to reduce interference from competitor sponsors also activated in the network.

General Discussion

In the current research, we introduce an ecosystems-based view for understanding sponsor identification through the lens of changes to consumer memory structures, which impacts memory performance related to the ecosystem context. This theorizing departs from the heuristics-based view by considering how repeated exposure to a system can reduce memory performance for the typical consumer. The current work presents a novel theoretical orientation for understanding memory for sponsor identification in the modern, complex sponsorship ecosystem.

We argue that memory network structure is an important predictor of memory performance. In Study 1 we demonstrate that students and MTurkers differ in memory network structure, such that students show a flexible memory network, while for MTurk participants, their networks are often indistinguishable from a random network. This network structure has a direct impact on the relationship between experiential engagement and recall. When a flexible network structure is apparent, experiential engagement improves memory performance, while a poorly structured network results in increased experiential engagement decreasing memory performance.

One limitation of the first three studies is that, due to modeling constraints, we estimate group-level memory networks without connection to an experimental paradigm. As such, we infer that our group-level network differences drive the differential impact of experiential

engagement on recall, but do not provide a direct test. Study 3A and Study 3B directly address this limitation by using an experimental paradigm combined with memory network modeling on an individual level. The results demonstrate that the average path length component of small world networks is a significant mediator for the relationship between experiential engagement and recall. It is important to note that memory network modeling on a group-level and the individual-level use different algorithms and are conducted with different software (R versus Python). As such, any direct comparison between group-level and individual-level memory networks requires caution.

The findings of the current research also bring forward the long-standing question: "Do student responses accurately reflect the behavioral patterns of other consumers?" (Enis et al., 1972, p. 72). The findings also reflect the repeated advice based on meta-analytic findings that "…emphasize the importance of replicating research based on college student subjects with nonstudent subjects before attempting any generalizations" (Peterson, 2001, p. 450). It is not that students are not appropriate and valuable samples for marketing research, but that any research should be cognizant of the ways in which they may differ from the general population.

Limitations and Future Research

One limitation of the current study is that we are not able to analyze specifically what variables drive differences in memory network structure. It is the case that university students have a unique exposure pattern to sports compared to the general population, especially at a Division 1 school where sports are a prominent component of the culture. Further, NCAA.org (2023) reports that, on college campuses, 63% of students were exposed to a betting advertisement, and this rate of sports betting exposure is higher than that of both the general population and those attending virtual or community college (NCAA.org, 2023). Marketing

research demonstrates that forming new relationships between concepts in memory occurs more efficiently from direct experiences rather than indirect experiences (Marks & Olson, 1981). It remains feasible that students at a Division 1 school have more direct experiences with sports than participants from MTurk and Prolific. It might also be related to the particulars of their education and the semantic structure afforded in their learning. Additional research is needed to understand the development of semantic networks as related to marketing contexts where ecosystems form.

Further, while the ecosystems-based theorizing applies to any system of communications platforms, we test only on sponsorship. For example, in product placement, various brands are brought together and related through programming content, while actors have individual brand deals formed external to the content. These relationships constitute an ecosystem with which individuals have differing levels of exposure. Future research could examine the extent to which regular exposure to programming in a serial format differs from movie exposure in terms of creating an ecosystem that will influence memory.

Contributions

The current work makes three primary theoretical contributions. First, we find support for the ecosystems-based view of sponsor identification. Indeed, we unite previous streams of research by taking into consideration how different patterns of exposure to the sports ecosystem result in consistent recall patterns for event sponsors. For example, though consumer characteristics (i.e., fan identification, psychological involvement) tend to improve memory, drawing on global activation theory (Hintzman, 1988) allows us to make counterintuitive predictions, such as greater experiential engagement reducing memory performance for sponsorship in MTurk participants. Indeed, when individuals lack a well-structured semantic

network, the simultaneous activation of an increasing number of sponsoring brands reduces memory performance.

Our second contribution consists of the introduction of the semantic fluency task technique in marketing. The semantic fluency task technique is new to the memory literature and has never been tested in an applied setting. While previous research measures semantic fluency for general knowledge categories such as animals (Christensen et al., 2018; Luchini et al., 2024) and fruits (Siew & Guru, 2023), our research is the first to utilize the semantic fluency task technique in a complex applied setting. Additionally, our study is one of the first to test the relationship between memory network characteristics on an individual level and memory performance. Across three different sports-related semantic fluency tasks, students show a more flexible and interconnected memory structure (lower average path length, lower modularity, and higher clustering coefficient) compared to MTurk participants. However, on an individual level our findings support that a higher average path length boosts memory performance. Considerations from this seemingly contradictory finding are provided above. Across all of our studies, we motivate the development of these differences in memory structure stemming from our ecosystems-based view.

Last, in addition to using memory network modeling in a context with higher ecological validity, our research highlights the importance of testing multiple samples (i.e., students, MTurk, Prolific). For example, the memory network structure characteristics for MTurk participants were not always significantly different from random, while the student networks were consistently significantly different from random. Our findings suggest that studies using only one of the two samples may not be capturing the full construct effect.

Conclusion

Consumers are generally not successful at remembering the true sponsor of an event. The current research addresses this real-world problem by examining the construct of experiential engagement, with theorizing rooted in our ecosystems-based view of sponsor identification. We find that, counterintuitively, for the general population, individuals with higher experiential engagement have worse memory for the true sponsor of an event, while students demonstrate that higher experiential engagement results in improved memory for the true sponsor. We identify differences between the two groups in their underlying memory structures related to sports sponsorship that may drive the differing effects between the two samples.

Essay 2 Appendix A

We conducted a pretest of events and brands to help choose the events and brands for Study 2A and 2B; the pretest involved 649 (missing demographics due to programming error) MTurk workers who completed the study in exchange for $1. Before conducting the pretest, we first searched the previous literature and popular press articles (e.g., Baker, 2023) for well-known sporting events and identified 21 events that were relatively well-known. Then we identified 13 product categories that regularly engage in sponsorship (e.g., retail, insurance; IEG, 2017). Finally, we searched the previous literature (Johar & Pham, 1999; Weeks et al., 2018) and popular press articles on top sponsors (zipsprout.com) to identify, for each product category, eight brands that varied in prominence, resulting in 104 brands. These 21 events and 104 brands were used in the pretest.

During the pretest, participants were randomly assigned to evaluate four brands and three events. For each of the four brands, participants answered whether they had heard of the brand before and how familiar they were with the brand (Kent & Allen, 1994). These responses were used to select brands for each event that did not differ in brand prominence (brand name recognition or familiarity), given that brand prominence is identified as a primary driver of memory for sponsorship information in the sponsorship literature (e.g., Johar & Pham, 1999). For each of the three events, participants rated the likelihood of the event being sponsored by 10 brands; the 10 brands were randomly selected from the 104 brands for each participant. These responses allowed us to rank brands in terms of their ecosystems-based congruence with an event.

Lastly, participants rated the likelihood of the event being sponsored by 10 product categories (randomly selected from the 13 product categories for each participant). These

responses allowed us to manipulate brand-event congruency while controlling for product category-event congruency.

Based on the pretest of 104 brands from 13 product categories and 21 events we selected stimuli for Study 2A and 2B. The stimuli across studies consisted of event-specific press-releases that announce both a true sponsor and a competing sponsor for an event. Importantly, at this stage, we excluded any brand-event pairings that currently exist in the sponsorship ecosystem. Three events with an adequate number of congruent and incongruent sponsors (Tour de France, X Games, Rugby Currie Cup) were selected. Specifically, we operationalized congruence in each event by choosing four brands from two product categories, with one brand from each product category being chosen from the top 30 congruent brands and one from the least 30 congruent brands. For each event, all brands were rated similarly on familiarity (Kent & Allen, 1994; Machleit et al., 1993) and brand name recognition.

The results of an independent samples *t*-test showed that for each of the three events used in Study 2A and 2B, there was no significant difference in congruence between the two product categories (Tour de France: $M_{general\ retail}$ = 5.01, *SD* = 1.42 vs. M_{Shoes}= 5.26, *SD* = 1.43, *t*(144) = -1.06, *p* = .29; X Games: $M_{consumer\ electronics}$ = 5.20, *SD* = 1.48 vs. $M_{Insurance}$ = 4.86, *SD* = 1.73, *t*(137) = 1.26, *p* = .21; the Rugby Currie Cup: M_{banks} = 5.13, *SD* = 1.64 vs. $M_{sports\ drinks}$ = 5.11, *SD* = 1.63, *t*(142) = .05, *p* = .96).

As before, we used analysis of variance to examine whether the selected brands for each event differed in brand familiarity. For Tour de France, no significant results were found (*p*s > .16). For the X Games, differences in familiarity were not significant at the p = .05 level (*F*(3, 97) = 2.57, p =.06); additionally, post hoc pairwise comparisons (Bonferroni adjusted) revealed

no significant differences (*p*s > .09). For the Rugby Currie Cup, no significant effect of brand was found on familiarity (*p*s > .23).

For brand name recognition, the chi-square tests failed to reach significance at the p = .05 level (Tour de France: $X^2(3, N = 101) = 1.65$, p = .65; X Games: $X^2(3, N = 101) = 7.43$, p = .06; Rugby Currie Cup: $X^2(3, N = 93) = 5.09$, p = .17). For the X Games, the Canon brand was recognized by 100% of participants randomly assigned to that brand (*n* = 24), while the New York Life Insurance brand was recognized by 77% of participants randomly assigned to that brand (*n* = 26).

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Essay 2Appendix B

Table 5.4 Events Network Dual Mediation

Student Model Fit: (χ^2_{23} = 31.81, p = .104, RMSEA = .045, 95% CI [.000, .086], CFI = .992, TLI = .987, SRMR = .024)

Prolific Model Fit: (χ^2_{23} = 32.91, p = .083, RMSEA = .043, 95% CI [.000, .080], CFI = .992, TLI = .988, SRMR = .023)

	Students			Prolific		
	B (SE)	*z*	*p*	*B (SE)*	*z*	*p*
			Main Effects			
Engage → Path Length	.04 (.02)	2.95	**.003**	.01 (.01)	.45	.65
Engage → Clustering	-.01 (.02)	-.48	.63	.01 (.01)	.88	.38
Engage → Recall	.06 (.06)	1.07	.28	.11 (.05)	2.31	**.02**
Path Length → Recall	.52 (.29)	1.79	*.07*	.68 (.25)	2.73	**.006**
Clustering → Recall	-.05 (.27)	-.20	.84	-.17 (.26)	-.68	.50
			Indirect Effects (with 95% CI)			
Via Path Length	.02 (.01)	1.55	.12 **[.002, .061]**	.004 (.009)	.42	.68 [-.011, .027]
Via Clustering	.00 (.01)	.08	.94 [-.01, .02]	-.002 (.005)	-.39	.70 [-.022, .003]
Total Indirect	.02 (.02)	1.52	.129 **[.001, .062]**	.002 (.01)	.16	.88 [-.021, .025]

Table 5.5 Events Path Length Mediation

Student Model Fit: ($\chi^2_{18} = 26.41$, $p = .091$, RMSEA = .050, 95% CI [.000, .094], CFI = .992, TLI = .988, SRMR = .022)

Prolific Model Fit: ($\chi^2_{18} = 26.89$, $p = .081$, RMSEA = .046, 95% CI [.000, .086], CFI = .993, TLI = .989, SRMR = .021)

	Students			Prolific		
	B (SE)	*z*	*p*	*B (SE)*	*z*	*p*
			Main Effects			
Engage → Path Length	.04 (.02)	2.95	**.003**	.01 (.01)	.45	.65
Engage → Recall	.06 (.06)	1.08	.28	.11 (.05)	2.28	**.02**
Path Length → Recall	.53 (.27)	1.92	*.06*	.73 (.24)	3.08	**.002**
			Indirect Effects (with 95% CI)			
Via Path Length	.02 (.01)	1.61	.11 **[.003, .062]**	.004 (.01)	.43	.67 [-.012, .028]

Table 5.6 Events Clustering Mediation

Student Model Fit: (χ^2_{18} = 29.22, p = .046, RMSEA = .058, 95% CI [.000, .101], CFI = .989, TLI = .983, SRMR = .024)

Prolific Model Fit: (χ^2_{18} = 31.52, p = .025, RMSEA = .057, 95% CI [.000, .095], CFI = .989, TLI = .984, SRMR = .024)

	Students			Prolific		
	B (SE)	*z*	*p*	*B (SE)*	*z*	*p*
Main Effects						
Engage → Clustering	-.01 (.02)	-.48	.63	.01 (.01)	.88	.38
Engage → Recall	.08 (.06)	1.48	.14	.12 (.05)	2.41	**.02**
Clustering → Recall	-.18 (.26)	-.69	.49	-.38 (.25)	-1.53	.13
Indirect Effects (with 95% CI)						
Via Clustering	.001 (.01)	.25	.81	-.004 (.01)	-.65	.52
			[-.004, .024]			[-.027, .004]

Table 5.7 General Network Dual Mediation

Student Model Fit: (χ^2_{23} = 28.86, p = .185, RMSEA = .034, 95% CI [.000, .074], CFI = .995, TLI = .992, SRMR = .018)

Prolific Model Fit: (χ^2_{23} = 37.63, p = .028, RMSEA = .053, 95% CI [.000, .087], CFI = .989, TLI = .982, SRMR = .025)

	Students			Prolific		
	B (SE)	*z*	*p*	*B (SE)*	*z*	*p*
Main Effects						
Engage → Path Length	.02 (.06)	.37	.71	.02 (.06)	.24	.81
Engage → Clustering	-.001 (.01)	-.18	.86	.00 (.01)	.12	.91
Engage → Recall	.11 (.05)	2.24	**.03**	.12 (.05)	2.28	**.02**
Path Length → Recall	.03 (.06)	.41	.68	.06 (.05)	1.24	.22
Clustering → Recall	-.17 (.58)	-.30	.77	-.67 (.57)	-1.17	.24
Indirect Effects (with 95% CI)						
Via Path Length	.001 (.005)	.13	.90 [-.006, .016]	.00 (.01)	.19	.85 [-.006, .016]
Via Clustering	.00 (.00)	.05	.96 [-.007, .012]	-.00 (.01)	-.09	.93 [-.018, .010]
Total Indirect	.00 (.01)	.14	.89 [-.010, .016]	.00 (.01)	.05	.96 [-.018, .018]

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ESSAY 3

AUDITORY IMAGERY: A SENSORY PROCESSING ACCOUNT OF BRANDING

*"So, when we drag our feet and paws in the door after a long day, I just need things to be simple, that's where **Get Real** by **Chewy** comes in."*

- Littlebearlumi (Influencer with declared paid partnership with Chewy)

*"Favorite Food…You have to pick one to eat...Like, I'm about to die right? Last meal, okay. I'm starting it off with some beef **Maruchan Ramen Noodles** with some **Frank's Red-Hot Sauce** in it."*

– CaseOh (Streamer, with 2.4 million views on YouTube)

*"In Lane 5, she's been in the top 4 of the USA championships in the 100m each of the past 3 years. Representing **Adidas**, Tamari Davis."*

– Announcer at 2025 USATF National Track and Field Championships.

Reading the opening quotes, can you hear the brand names in your mind, maybe even in the voice of an influencer, gaming streamer, or announcer? We propose that auditory imagery – i.e., the ability to hear information in your mind – has important unexamined consequences for consumer behavior, such as brand recall, brand choice, and even visual attention. Marketing research emphasizes visual aspects of communication over auditory features, despite calls for research on sensory marketing (Krishna, 2012) and auditory imagery (Elder & Krishna, 2022). Past research has focused on sonic logos (for reviews see Gustafsson, 2015; Spence & Keller, 2024) but has not considered the extent to which simple auditory mentions of a brand in a context influence brand outcomes. The purpose of the current research is to examine the role auditory imagery plays in brand recall and consumer brand response. While the topic is widely applicable, the work is conducted in the context of sponsorship.

Sponsoring is an exemplary context for the study of auditory imagery due to extensive brand name mentions during events and activities and due to the significant investments by

brands. For example, one of the most valuable assets that brands purchase is venue naming rights, with the renewal for Levi's Stadium, home of the San Francisco 49ers, valued at $170 million for a ten-year extension, and the new Sports Illustrated Stadium, home of the New York Red Bulls at $100 million for 13 years (*Sports Business Journal*, 2024). While the values of naming rights are multifaceted, they offer multi-sensory brand activation. The sponsoring brand's name appears not only on the stadium but is part of all communications; in short, to say the name of the venue is to say the name of the sponsoring brand. Similarly, event title sponsorship also includes regular repeated auditory mentions and visual exposures. For example, Truist Bank sponsored the Professional Golf Association (PGA) with the named event "Truist Championship" for seven years at $200 million (Carpenter, 2025). Significant investments that would include auditory mentions can also be seen at the top five professional US sports leagues (NFL, MLB, NHL, NBA, MLS) reaching $50 million in the 2024-2025 season (Sponsor United, 2025).

The current research makes two conceptual contributions. First, our work brings forward the importance of auditory imagery as a predictor of brand outcomes such as recall, brand choice, and visual attention. The way a consumer auditorily represents a brand in their mind for both sonic logos and auditory brand mentions predicts behavior in diverse marketing communications landscapes. In sponsorship, the role of brand visual imagery has been studied extensively (e.g., Boronczyk & Breuer, 2021; Chien et al., 2011; Close et al., 2015; Gwinner & Eaton, 1999); however, auditory imagery remains largely unexamined. We not only introduce the value of sensory elements in communication contexts, but we also provide the first empirical evidence that auditory imagery plays a role in memory and brand choice for sponsors in these contexts. Second, in introducing our conceptual framework of a multisensory view of

sponsorship architecture, we demonstrate the importance of not only sonic logos, but also auditory brand name mentions. While previous research on sonic logos in marketing is an increasingly researched area, the consideration of auditory brand names remains understudied. As such, throughout our research we include manipulations to test auditory imagery for both sonic logos and auditory brand name mentions.

Managerially, by understanding auditory imagery, brand managers can make a more informed decision on where to spend resources. With a crowded and expensive communications marketplace, pursuing auditory brand naming rights at various levels may be an effective method for reaching consumers. We find that auditory imagery supports recall and favorable brand outcomes, whether elicited by a sonic logo or simply the spoken brand name.

Conceptual Background for the Context of Study

While traditionally sponsorship has been conceptualized in a visual modality, we highlight a sponsorship architecture (Cornwell et al., 2024) that extends across sensory modalities. Specifically, we identify auditory imagery as a key predictor of memory for sponsorship information, as well as sponsor outcomes. Building brand awareness continues as a central objective in sponsoring (Jahn & Cornwell, 2025) and can be accomplished through auditory mentions, but reminding consumers of a well-known brand or its characteristics is also a worthwhile goal, although under-researched (for exceptions see Bhargave et al., 2016; He & Klein, 2023).

Auditory Imagery

Although research on auditory imagery is limited (Elder & Krishna, 2022), auditory features are being studied. For example, when considering the effect of auditory features such as pitch, Lowe and Haws (2017) find that lower pitch leads to larger product size perceptions

through visual imagery. Beyond pitch, other auditory features examined include intensity and pace of sonic logos (Mas et al., 2021), timbre (Melzner & Raghubir, 2023; Techawachirakul et al., 2023), as well as the frequency of sonic logos (Techawachirakul et al., 2025). While potentially interesting in brand decisions, specific auditory features or sonic logos have been examined in controlled presentation contexts (e.g., advertising) and do not connect readily with current uses, such as brand announcements that vary on many dimensions in productions.

Formally, auditory imagery is defined as, "the introspective persistence of an auditory experience, including one constructed from components drawn from long-term memory, in the absence of direct sensory instigation of that experience" (Intons-Peterson, 2014, p. 46). In early work focusing on auditory imagery, Unnava et al. (1996) find that imagining and perceiving information reduce memory performance because both processes draw on the same mental resources. Elder et al. (2017) conceptualize the sensory modality proximity construct and propose that senses such as taste and touch are proximal because they require physical proximity to be utilized; while hearing and sight are more distal in proximity because they can be used for stimuli further away. According to the authors, imagining in these sensory modalities maps on to the effects of psychological distance on product perception and persuasion (Elder et al., 2017). From a consumer neuroscience perspective, regions of the brain associated with auditory imagery connect associations between visual and sonic logos (Sung et al., 2011), suggesting that auditory imagery may play a role in integrating visual logos and sonic logos. Together these works suggest an unexamined role of auditory imagery in influencing brand memory and consequential brand outcomes.

We propose that auditory imagery can be developed through varied and repeated auditory exposures to branding elements such as sonic logos and auditorily presented brand names. This

process occurs through not only long-term memory associations, but also through evoked meaning from the patterns in the sound (Meyer, 1957). Research has shown that sonic logos serve as sensory cues that impact brand attribute perceptions, such as brand personality (Melzner & Raghubir, 2023). Direct linkages between sound and meaning create sound symbolism (Hinton et al., 1994). Yorkston and Menon (2004) argue that brand names induce sound symbolism, in which meaning is conveyed through brand name phonetic effects. When consumers are making brand evaluations, they infer product attributes from the phonemes in the spoken brand name; further, these inferences are automatic and occur outside of the consumer's awareness (Yorkston & Menon, 2004). As such, we expect auditory imagery to function similarly when using both sonic logos and the spoken brand name.

Drawing on the psychology literature, auditory imagery is a strong predictor of memory (Hubbard, 2010). Further, we can orient our research based on Hubbard's (2010) five-part typology of auditory imagery research in psychology: 1) imagery of auditory features; 2) nonverbal stimuli imagery; 3) verbal imagery; 4) the relationship between auditory imagery and outcomes, such as memory and perception; and 5) individual differences in auditory imagery. As discussed, significant work has been devoted to auditory features, and while not reviewed there is research on nonverbal stimuli imagery and on verbal imagery. Just as in marketing, however, much of the research on auditory imagery in psychology is related to features of sound (e.g., pitch; Berti et al., 2006; Keller et al., 1995; Sullivan et al., 1996). In contrast, we consider how auditory imagery itself influences brand outcomes, such as recall, brand choice, and visual attention. From Hubbard's typology, we emphasize the fourth category, understanding the impacts of auditory imagery in brand relevant outcomes. As a contrast of the current research to that in Hubbard's typology, past research has frequently worked with tightly controlled lab

procedures, such as judging tones (e.g., Sullivan et al., 1996). Applying auditory imagery to brand outcomes in natural settings represents new potential for the auditory imagery literature and brand marketing.

Hypotheses

Research is inconsistent regarding the superiority of visual stimuli over auditory activations on memory. In early work utilizing verbal labels, auditory recordings, and visual pictures of stimuli, recall rates were similar for both the auditory recordings and visual pictures (Sharps & Price, 1992). In comparing pictures, corresponding sounds, or combined audiovisual stimuli, Thompson and Paivio (1994) find that recall is best for the combination of audio and visual. Considering imagery specifically, previous research suggests that there is a positive relationship between visual imagery and memory recall; however, for auditory imagery, the relationship is curvilinear, with highly inaudible and highly audible objects being recalled better than those with an average audibility (Tracy & Barker, 1993). While further research has shown recognition memory is better for pictures than for sounds, any superiority in fidelity and memory disappears with a delay of two days (Gloede & Gregg, 2019). These studies were conducted in controlled laboratory settings with emphasis on a specific stimulus leading to a specific memory outcome. There is good reason for memory studies of visual and auditory stimuli to be lab-based; marketing stimuli such as real brand names have a rich history of associations and study in the field comes with a cacophony of exposures. Therefore, it is unclear to what extent auditory imagery outside the lab supports memory performance, especially in comparison to visual imagery.

Mental imagery impacts memory due, in part, to the activation of sensory neural mechanisms that correspond to perceiving the object (Zvyagintsev et al., 2013). Further, while

visual and auditory imagery employ overlapping brain regions (related to memory, attention, semantic processing, multisensory integration), sensory information is processed in modality-specific networks (Zvyagintsev et al., 2013). Modality specific brain networks are implicated in supporting not only imagery, but also in memory retrieval mechanisms (Huijbers et al., 2011). From a behavioral perspective, auditory imagery has improved recall rates compared to verbal elaboration and is shown to not depend on the articulatory loop component of working memory (Tinti & Cornoldi, 1997). Thus, we expect there to be a positive relationship between auditory imagery and memory recall, even in natural settings such as sponsorship.

Hypothesis 1: Auditory imagery will have a positive, significant effect on brand recall.

In considering brand outcomes beyond memory, we draw on research from the use of music in advertising, sonic logos, as well as spoken brand names. Music generally has a positive effect on brand outcomes (Anglada-Tort et al., 2022; Scott et al., 2022; Spangenberg et al., 2005); however, when music is aversive there is a negative impact on brand perceptions (Anglada-Tort et al., 2022). Looking at imagery specifically, octomodal mental imagery (visual, auditory, taste, touch, smell) has a positive effect on brand experience perceptions, and in turn brand authenticity (Li & Chung, 2025). In this view, auditory imagery is beneficial for brand outcomes due to the positive influence of music (Scott et al., 2022; Spangenberg et al., 2005). In the context of sonic logos, which induce auditory imagery, there is a beneficial impact on positive emotions and brand engagement (Kemp et al., 2024). Lastly, in considering spoken brand names, sound symbolism elicits positive brand perceptions (Spence, 2012). Taken together, whether considering a sonic logo or a spoken brand name, we hypothesize:

Hypothesis 2: Auditory imagery is positively related to brand attitudes and brand choice.

In addition to behavioral outcomes, we also hypothesize that auditory imagery has a role in guiding visual attention to brand logos, especially when sonic logos are utilized by the brand. While throughout the essay we have highlighted the role of both sonic logos and auditory brand names, literature on brand names and eye-tracking is scarce. As such, we focus H3a and H3b on sonic logos.

Having a meaningful sonic logo increases physiological orienting responses (Mas et al., 2021) and how quickly individuals orient to a brand visually (e.g., decreased hit time; Knoeferle et al., 2016). Our goal was to build on these existing findings by considering different visual attention processes as indexed by eye-tracking measures. Specifically, we focus on attention capture and brand orientation (hit time and time to first fixation), brand exploration behavior (gaze dwell time, dwells with saccades, and saccade count), as well as effortful processing (fixation count and average fixation duration). We propose that sonic logos improve brand orientation, as well as promote active brand exploration, while effortful point-by-point processing is not impacted by sonic logos. In other words, sonic logos provide ease of processing for brand-related visual information rather than taxing cognitive resources through effortful processing.

In the first stage of processing, brand orientation is important as faster orientating times have been shown to impact brand recall (Wedel & Pieters, 2000) and brand choice (Atalay et al., 2012). Brand orienting is a relatively automatic, bottom-up driven response reflecting sensory activation rather than controlled attention (Posner, 1980). As such, we would expect auditory sensory modality (sonic logo, spoken brand name, no sound) to influence orienting metrics.

For the second stage, exploration, we draw on measures such as gaze dwell time and saccade-based metrics, as they have been demonstrated to represent full scale engagement, reflecting visual search rather than effortful processing (Holmqvist et al., 2011; Wedel & Pieters, 2008). In contrast, fixation count reflects effortful processing, such that more fixations are associated with greater information extracted (Wedel & Pieters, 2000), but less efficient search (Goldberg & Kotval, 1999). Longer fixation durations have been explicitly linked to greater cognitive effort or processing difficulty (Goldberg & Kotval, 1999; Rayner, 2009). As such, we expect sonic logos to improve exploratory search behavior through general brand engagement but not lead to more effortful processing as reflected by fixation metrics. The consequences of such findings are impactful in relation to processing fluency: sonic logos provide efficient visual exploration, without increasing cognitive effort. Given that greater fluency leads to more positive brand responses (Reber et al., 1998), we expect sonic logos to be beneficial for brands.

H3a: Sonic logos will lead to a faster orienting response (a. lower hit time, b. lower time to first fixation).

H3b: Sonic logos will increase exploratory behavior (a. greater dwell time, b. greater dwells with saccades, and c. greater saccade count).

Further, we expect that the reason sonic logos elicit an orienting and exploration response is due to auditory imagery. If sonic logos do indeed improve processing fluency, the persistence of the sonic logo in the consumer's mind (auditory imagery) beyond exposure should facilitate such exploratory behavior. Similarly, if sound symbolism occurs through auditory imagery (as discussed previously), the conveyed brand meaning should also facilitate orienting and exploration behavior. From another perspective, sonic logos elicit approach motivation (Mas et

al., 2021); auditory imagery is again needed for approach motivation to function once exposure to the sonic logo has ended. In contrast, when no sonic logo is provided, sound symbolism and approach motivation do not occur, dampening the effect of auditory imagery on orienting and exploration responses.

H3c: Auditory imagery will mediate the relationship between sensory modality (sonic logo, spoken brand name, control) and eye-tracking outcomes.

Overview of Empirical Work

We take a multi-method approach to assess the relationship between auditory imagery, brand recall, brand choice, and visual attention. We present five studies, including experimental work (Study 1, Study 3), a field study (Study 2), an incentive-compatible design experiment (Study 4), and an eye-tracking study (Study 5). In total, we present auditory imagery as an important predictor of consumer behavior. Study 1 uses a simple experimental design to assess whether auditory imagery elicited by sonic logos impacts brand recall and brand favorability across six different brands (H1, H2). Study 2 builds on the experimental findings by testing whether auditory imagery improves brand recall in a real-world scenario (i.e., sponsors at a track meet, H1). In Study 3 we again use an experimental method to address whether auditory imagery of sonic logos functions similarly to auditory imagery of spoken brand names (H1, H2). Study 4 further extends our findings by presenting an incentive-compatible design: auditory imagery predicts brand choice (H1). Lastly, Study 5 demonstrates that sonic logos improve recall, as well as orientation to and exploration of visual brand logos, without increasing effortful processing and that this process is mediated by auditory imagery (H3a, H3b), providing initial evidence

towards processing fluency being a mechanism through which auditory imagery functions. Across these studies, our results find that auditory imagery is an important predictor of brand recall and favorable brand responses. All studies received institutional review board approval.

Study 1: Auditory Imagery in Cued Memory

Since auditory imagery has not been examined in marketing, we turned to psychomusicology to find an approach to elicit auditory imagery. Reymore and Huron (2020) utilized an auditory imagery task to map the dimensions of musical instrument timbre sense perceptions. Their approach asked participants to imagine and describe the sounds of target instruments. It proved effective with approximately 240 sounds (e.g., twinkling, brooding) imagined across 20 instruments and clear evidence that individuals were able to hear these sounds in their mind. With this background our auditory imagery task orients to participant ability to "hear a brand in their mind."

As noted, sonic logos are the most researched of marketing-related auditory stimuli and nearly all brands have a visual logo; therefore, as a first study to elicit auditory imagery we utilized available sonic and visual logos as stimuli. Study 1 assesses whether auditory imagery has a beneficial influence on brand recall when utilized with and without visual cues. As well, brand favorability is tested as an outcome variable.

Methods

Participants were 271 students (35% Female, M_{age} = 21.24, SD_{age} = 2.08) from a large US university, who completed the three-cell between-subjects design (Modality: Visual, Auditory, Auditory-Visual) in exchange for course credit. We reviewed 54 brands to identify well-known brands with sonic logos. We chose six brands from three product categories relevant to the

participant population and with varied brand histories (shorter and longer respectively) (computers: Apple, IBM; streaming services: Hulu, Netflix; and game consoles: Xbox, PlayStation). Participants were exposed to and completed a single trial for all six brands. The study took approximately 10 minutes to complete.

Participants in the visual condition were shown the visual brand logo for six seconds; similarly in the auditory condition, the sonic logo was played with no brand name provided; and, in the auditory-visual condition, participants saw both the brand's visual logo and heard the sonic logo. Stimuli were presented individually to participants in a randomized order. Each brand had its own trial which consisted of the stimulus, a math problem distractor, brand recall, and auditory imagery rating. After the distractor math problem, participants were asked to recall the brand they were just exposed to in the trial; if participants listed the correct brand, recall was scored as 1 and other responses were coded as 0. On the next page for all conditions, participants rated auditory imagery (1 = *not at all*, 7 = *very well*; "How well can you hear the sonic logo in your mind?"). The study concluded with demographics.

Results

To test H1 (i.e., the relationship between auditory imagery and recall) we ran a mixed effects model in which we assess the relationship between auditory imagery and recall. We also test whether the influence of auditory imagery on recall depends on the modality of brand presentation. Given that the moderator is a three-group categorical variable, we create two dummy-coded terms, with the auditory modality as the reference variable. Additionally, we use the same model to test H2 by including brand favorability ratings as the dependent variable. Given the repeated-measures design of the study, we include a random-effect for participant. The results are visualized in Figure 6.1.

Recall

There was a significant main effect of auditory imagery ($B = 1.24$, $SE = .13$, $Z = 9.57$, $p < .001$) on recall. The visual condition ($B = 10.06$, $SE = .86$, $Z = 11.63$, $p < .001$) and the auditory-visual condition ($B = 9.52$, $SE = .91$, $Z = 10.45$, $p < .001$) had significantly better recall rates than the auditory condition. The unstandardized beta coefficients are large, reflecting the low rates of recall in the auditory condition (auditory correct recall: 118, visual correct recall: 483, auditory-visual correct recall: 511). The main effects were qualified by two significant interactions. Interaction effects were such that the relationship between auditory imagery and recall is steeper for the auditory sonic logo condition compared to both the visual condition ($B = -1.23$, $SE = .14$, $Z = -8.50$, $p < .001$) and the auditory-visual condition ($B = -1.02$, $SE = .15$, $Z = -6.61$, $p < .001$).

Simple slopes analysis reveals a significant effect of auditory imagery on recall for the auditory condition ($B = 1.24$, $SE = .13$, $Z = 9.56$, $p < .001$) and the auditory-visual condition ($B = .22$, $SE = .09$, $Z = 2.56$, $p = .01$), while in the visual condition there was no effect of auditory imagery on recall ($B = .01$, $SE = .07$, $Z = .13$, $p = .89$).

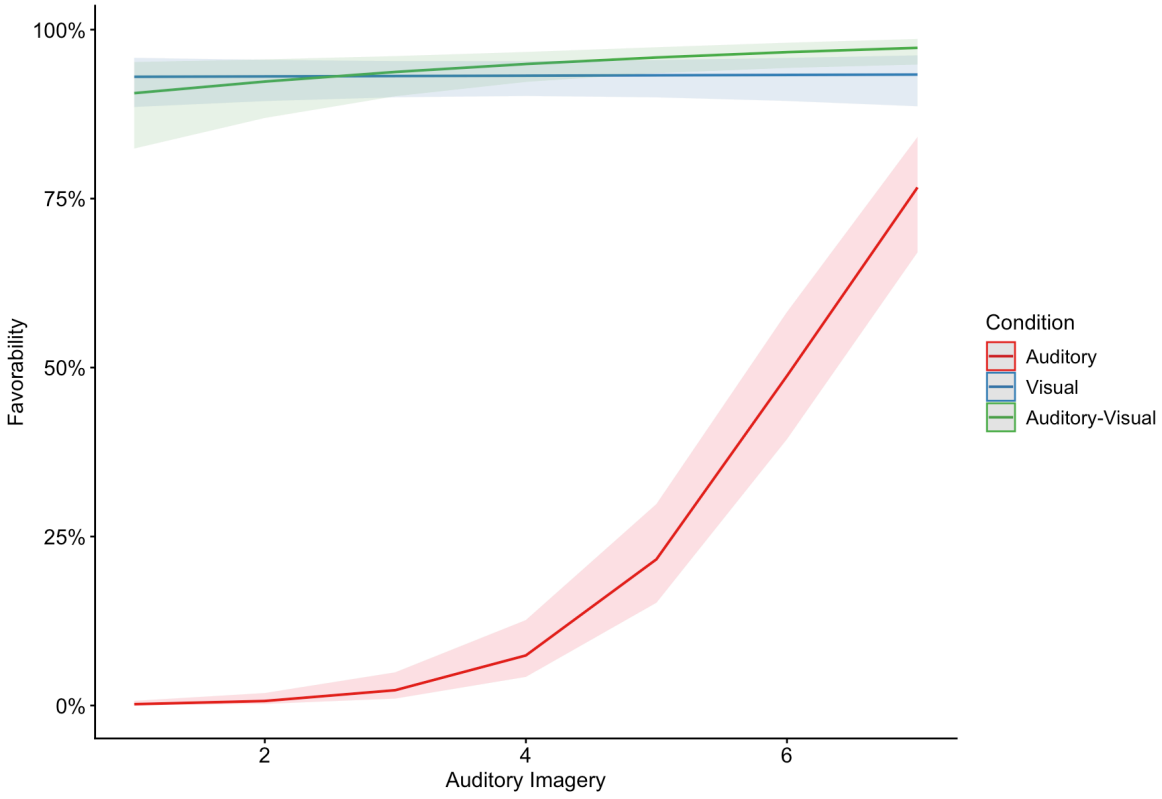


Figure 6.1 Study 1 Interaction Between Modality and Auditory Imagery on Sponsor Recall

Brand Favorability

There was a positive significant main effect of auditory imagery (B = .55, SE = .03, t = 20.65, p < .001) on brand favorability. In comparing the modality main effects, the auditory condition exhibits a lower favorability rating than the visual condition (B = .65, SE = .17, t = 3.78, p < .001); while the auditory-visual condition and the auditory condition are not significantly different in favorability ratings (B = -.09, SE = .20, t = -.44, p = .66). For interaction effects, the relationship between auditory imagery and favorability in the auditory condition is stronger than the visual condition (B = -.10, SE = .04, t = -2.79, p = .005); while there is no significant difference when compared to the auditory-visual group (B = -.01, SE = .04, t = -.34, p = .74).

Simple slopes analysis reveals a significant effect of auditory imagery on favorability for the auditory condition (B = .55, SE = .03, t = 20.65, p < .001), the combined condition (B = .54, SE = .03, t= 18.02, p < .001), and the visual condition (B = .45, SE = .03, t = 17.57, p < .001). The results are visualized in Figure 6.2.

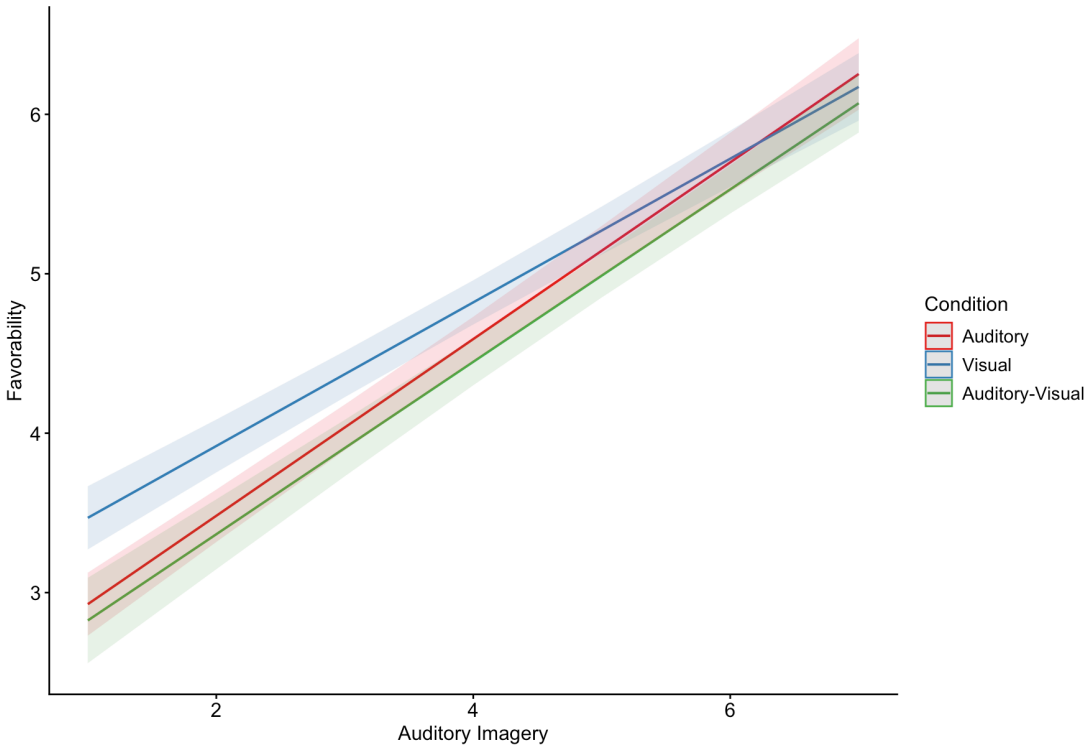


Figure 6.2 Study 1 Interaction Between Modality and Auditory Imagery on Sponsor Brand Favorability

Discussion

Supporting both H1 and H2, the results demonstrate that when auditory stimuli are present (auditory condition and auditory-visual condition), there is a significant effect of auditory imagery on recall. These findings suggest that when participants are not exposed to auditory branding (visual condition), auditory imagery has no influence on recall rates; however, adding a visual element to the auditory branding (auditory-visual condition) still resulted in a significant relationship between auditory imagery and recall. The study builds on previous literature by

utilizing sonic logos and links to past research by showing how auditory imagery supports brand favorability regardless of exposure modality. With confidence in the elicitation approach, we seek in Study 2 to examine auditory imagery with spoken brand names in a natural context.

Study 2: Auditory Imagery in a Field Study

In Study 2 we again test H1. Additionally, we assess an interaction between auditory imagery and recall modality (auditory cue versus visual cue) in a real-world sponsorship context. In other words, we assess whether the influence of auditory imagery on recall depends on whether memory retrieval is cued auditorily versus visually. We expect that auditory imagery should have a stronger effect on recall when an auditory cue is utilized. Additionally, we measure visual imagery to create a comparison with auditory imagery. To this end, in Study 2 we examine the research question in a track and field context.

Methods

Participants were 221 event attendees of a track championship (56% Female, 58% between ages 35 and 74). Collection began on the second day and continued through the four-day event. Trained researchers recruited participants in an area outside the competition venue in an outdoor setting. Participants either approached the booth where the researcher was stationed or were approached by the researcher in the nearby area. All participants were informed that the study was about track and field. The study took approximately three to five minutes to complete, and participants received a small toy figure as thanks for participating in the survey.

After obtaining written consent, participants completed the pen-and-paper survey packet, which included two recall questions of interest and two imagery questions. One recall question asked, “What sponsors do you remember hearing throughout the [event]? This could be spoken

brand names or sonic logos/jingles." The other recall question asked, "What sponsors do you remember visually seeing throughout the [event]? This could be printed brand names or visual logos." The order of these two questions was counter-balanced across the surveys. Subsequently, participants completed two questions about auditory and visual imagery (1 = *strongly disagree* 7 = *strongly agree*; "I can hear the sponsor names I've encountered during the event in my mind" and "I can see the sponsor names I've encountered during the event in my mind"). Participants finished the survey with demographic questions.

Analytic Strategy

The within-subjects measure of recall modality was coded dichotomously (1 = visual, 0 = auditory). The dependent variable was total recall and the moderators were auditory imagery and visual imagery. We coded recall for each event sponsor individually with 1 if the sponsor was listed and 0 if the sponsor was not listed. If a brand was listed by more than 5% of participants, then it was included in the total recall DV. The total recall DV was a sum of the dichotomous recall variables for Nike (athletic apparel), Toyota (automobiles), Kettle & Fire (bone broth), and Prevagen (health supplement). We use the sum these four brands as the total recall dependent variable. The event sponsors that did not reach the 5% recall rate were Xfinity (telecommunications), KT Tape (kinesiology product), PrimeTime Timing (technology), and Hershey's chocolate (candy). Given the within-subjects nature of the study design, we used a linear mixed effects model, in which total recall was regressed on the within-subjects manipulation, auditory imagery, visual imagery, the resultant two-way interactions (auditory x visual imagery; auditory imagery x recall modality; and, visual imagery x recall modality), and the 3-way interaction between auditory imagery, visual imagery, and recall modality.

Results

Main Effects

There was a significant, positive effect of auditory imagery on total recall (B = .24, SE = .07, t = 3.22, p = .001). There was no significant main effect for visual imagery (B = .07, SE = .05, t = 1.35, p = .18) nor the recall modality manipulation (B = -.17, SE = .28, t = -.62, p = .54).

Two-way Interactions

The interaction between auditory imagery and visual imagery was significant at the p = .10 level (B = -.02, SE = .01, t = -1.88, p = .06). Simple slopes analysis demonstrates that the relationship between auditory imagery and recall is strongest when visual imagery is one standard deviation below the mean (B = .16, SE = .04, t = 4.36, p < .001) and the relationship weakens when visual imagery is one standard deviation above the mean (B = .07, SE = .03, t = 2.50, p = .01). The interaction is visualized in Figure 6.3.

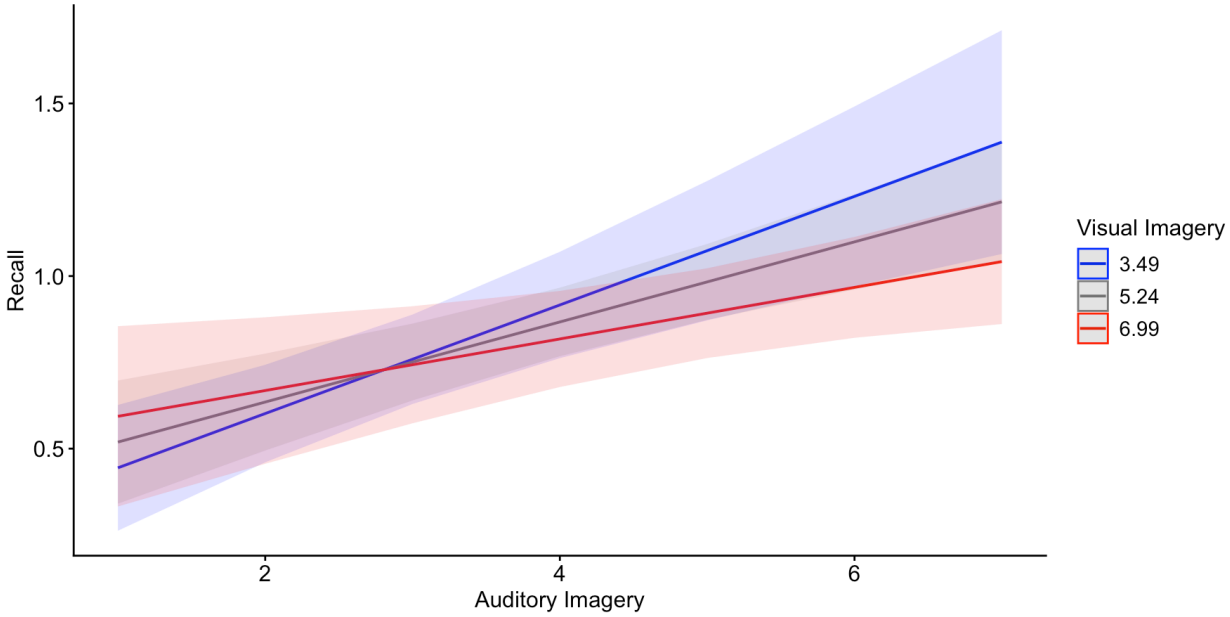


Figure 6.3 Study 2 Interaction Between Auditory Imagery and Visual Imagery on Recall Rates

There was also a significant interaction between visual imagery and recall modality (B = .14, SE = .05, t = 2.63, p = .009); however, simple slopes demonstrate that in both the auditory recall modality and the visual recall modality, there is no significant relationship between visual imagery and recall (B = -.03, SE = .03, t = -1.01, p = .31; B = .03, SE = .03, t = 1.08, p = .28, respectively). The interaction is visualized in Figure 6.4.

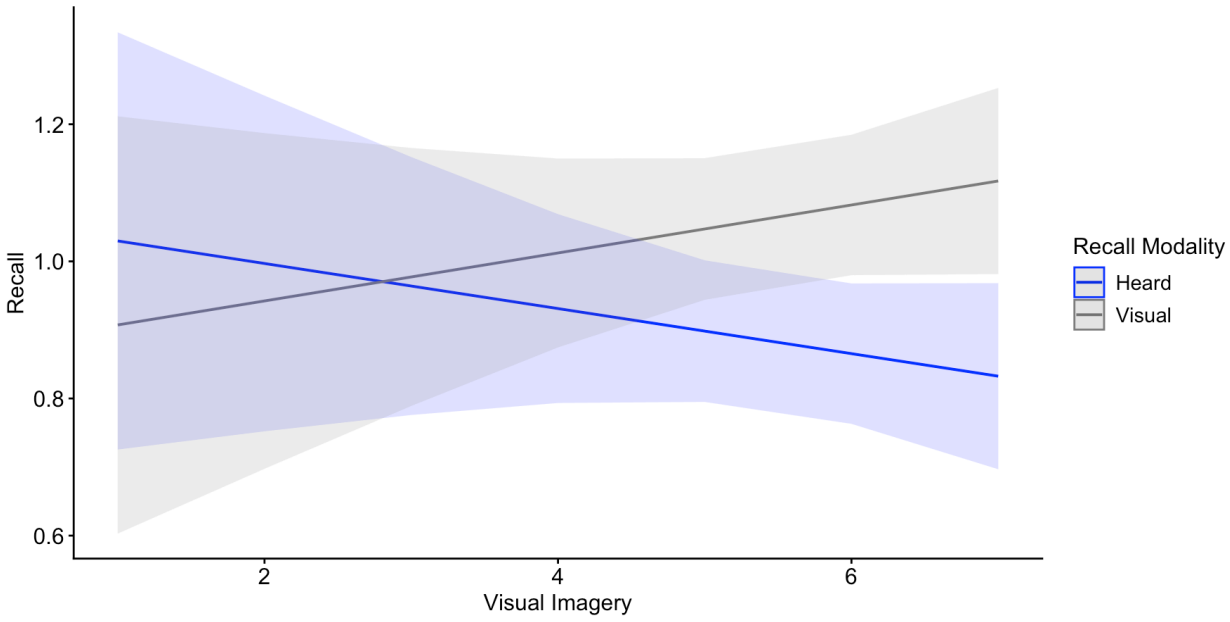


Figure 6.4 Study 2 Interaction Between Visual Imagery and Recall Modality on Recall Rates

There was no significant interaction between auditory imagery and recall modality (B = -.00, SE = .08, t = -.05, p = .96). However, simple slopes analysis demonstrates that in the auditory modality, there is a significant positive relationship between auditory imagery and recall (B = .12, SE = .02, t = 4.66, p < .001); while in the visual recall modality condition, there is no effect of auditory imagery on recall (B = .02, SE = .02, t = .64, p = .53). The interaction is visualized in Figure 6.5.

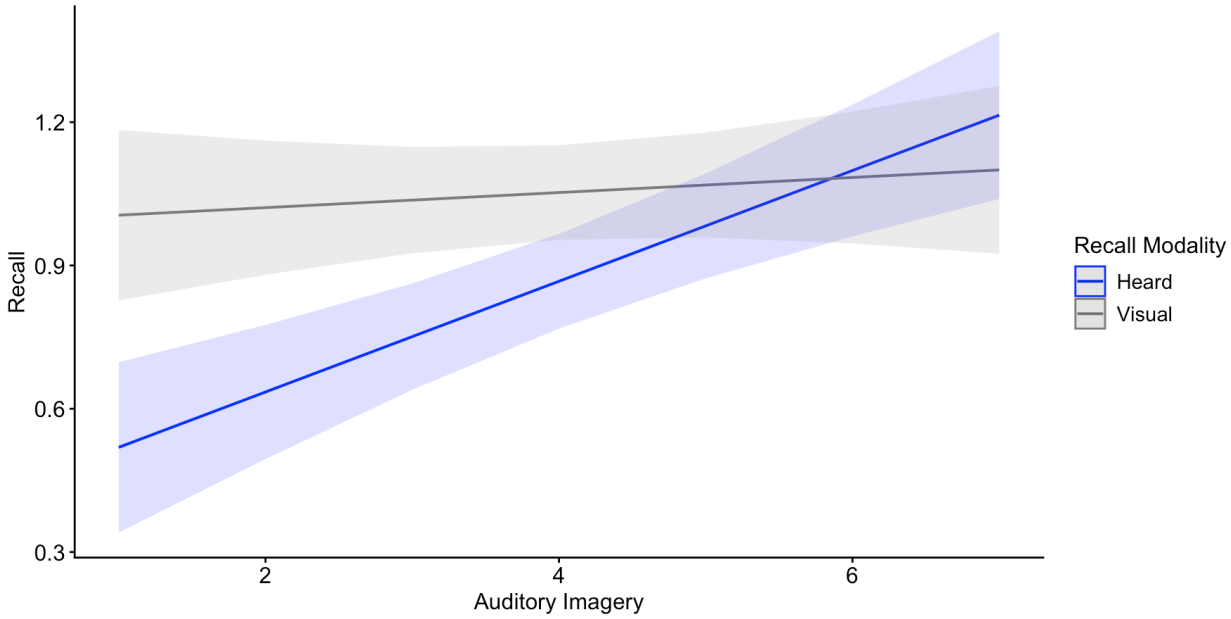


Figure 6.5 Study 2 Interaction between Auditory Imagery and Recall Modality on Recall Rates.

Three-way Interaction

The three-way interaction did not reach significance (B = -.02, SE = .01, t = -1.31, p = .19).

Discussion

Supporting H1, the results demonstrate that in a natural setting, auditory imagery provides benefits for brand recall. Of interest, some sponsoring brands of the event did not meet the 5% threshold to be included in the analysis; however, exposure to the spoken brand names during the event, may hold brand consequences beyond recall. In considering the consequences of low recall rates, Herrmann et al. (2011) find that consumers include sponsors in their consideration sets, even without explicit memory of the sponsor. Similarly, Cornwell and Humphreys (2013) argue that explicit recall is a high hurdle that is not necessary for many brand responses, such as the development of favorable attitudes or recognizing a brand in a retail environment.

Additionally, Study 2 highlights the comparison between auditory and visual imagery. We find that auditory imagery has a significant, positive influence on brand recall, while we fail to find the same effect with visual imagery. The results suggest that auditory imagery can be utilized by brands to improve recall rates, while visual imagery might be less advantageous. Study 2 tests auditory imagery for spoken brand names in the natural environment of a track and field event. In Study 3, we use a similar methodology to Study 1, but testing spoken brand names rather than sonic logos.

Study 3: Brand Name Auditory Imagery

Study 3 tests H1 by considering whether auditory imagery for spoken brand names increases recall rates for auditorily cued recall. We aim to replicate our basic finding that auditory imagery improves brand recall using experimental methodology presented in Study 1. While Study 1 utilizes sonic logos, the field study highlights spoken brand names. As such, we bridge our previous studies by using spoken brand names as the auditory stimuli in Study 3. In testing H2, we also extend the findings to additional dependent variables, such as brand favorability (replication from Study 1) and product quality perceptions.

Methods

Participants were 281 students (55% Female, M_{age} = 21.16, SD_{age} = 2.23) from a large US university, who completed the three-cell between-subjects design (Modality: Visual, Auditory, Auditory-Visual) in exchange for course credit. We chose brands from Study 1 (Apple, IBM, Netflix, Hulu, Xbox, and PlayStation) and Study 2 (Prevagen, Kettle & Fire, Toyota, and Nike). Participants were randomized into one of the three conditions and then further randomized to evaluate five of the ten brands. Participants in the visual condition were shown the visual brand

logo; in the auditory condition, the brand's spoken name was played (these were each recorded for this study by a male announcer); and, in the auditory-visual condition, participants saw both the brand's visual logo and heard the brand's name. Minimum exposure duration was 6 seconds, such that the next button did not appear until 6 seconds had passed. Stimuli were presented individually to participants in a randomized order.

As in Study 1, each brand had its own trial which consisted of the stimulus, a math problem distractor, brand recall, and auditory imagery rating. After the distractor math problem, participants were asked to recall the brand they were just exposed to in the trial; if participants listed the correct brand, recall was scored as 1 and other responses were coded as 0. On the next page, participants rated auditory imagery (1 = *not at all*, 7 = *very well*; "how well can you hear the Kettle & Fire brand name in your mind?"). Participants also rated their favorability towards the brand (1 = *not at all*, 7 = *very well*; "how favorably do you feel towards the Kettle & Fire brand?") and product quality perceptions (1 = *very poor,* 7 = *very good*; "please rate the product quality for the Kettle & Fire brand"). Work on multisensory branding, regarding touch, demonstrates that attributes of a product in one modality can pull individual estimates of attributes into alignment and thus, modulate overall product experience (Spence & Gallace, 2011).

Results

In analysis we ran mixed effects models, in which the manipulated modality variable, auditory imagery, and their interaction were entered as predictors of the dependent variables. Due to the three-group nature of our moderating variable, we create two interaction terms: auditory imagery with auditory-visual, and auditory imagery with the visual condition; as such,

the auditory condition is the reference group. Additionally, given the repeated measures nature of the data, we include a random effect for participant.

Recall

There was a significant positive effect of auditory imagery (B = .68, SE = .10, Z = 6.84, p < .001) on recall. Compared to the auditory condition, the visual condition (B = 2.51, SE = .66, Z = 3.77, p < .001) and the auditory-visual condition (B = 3.95, SE = 1.12, Z = 3.53, p < .001) both had higher overall recall rates; however, these were qualified by two significant interactions. Findings show that auditory imagery has a stronger impact on recall rates in the auditory condition, as compared to the visual condition (B = -.38, SE = .13, Z = -2.97, p = .003) and the auditory-visual condition (B = -.58, SE = .19, Z = -3.01, p = .003).

Simple slopes analysis reveals a significant effect of auditory imagery on recall for the auditory condition (B = .68, SE = .10, Z = 6.84, p < .001) and the visual condition (B = .30, SE = .09, Z = 3.42, p < .001), while in the auditory-visual condition there was no effect of auditory imagery on recall (B = .11, SE = .17, Z = .63, p = .53). The results are visualized in Figure 6.6.

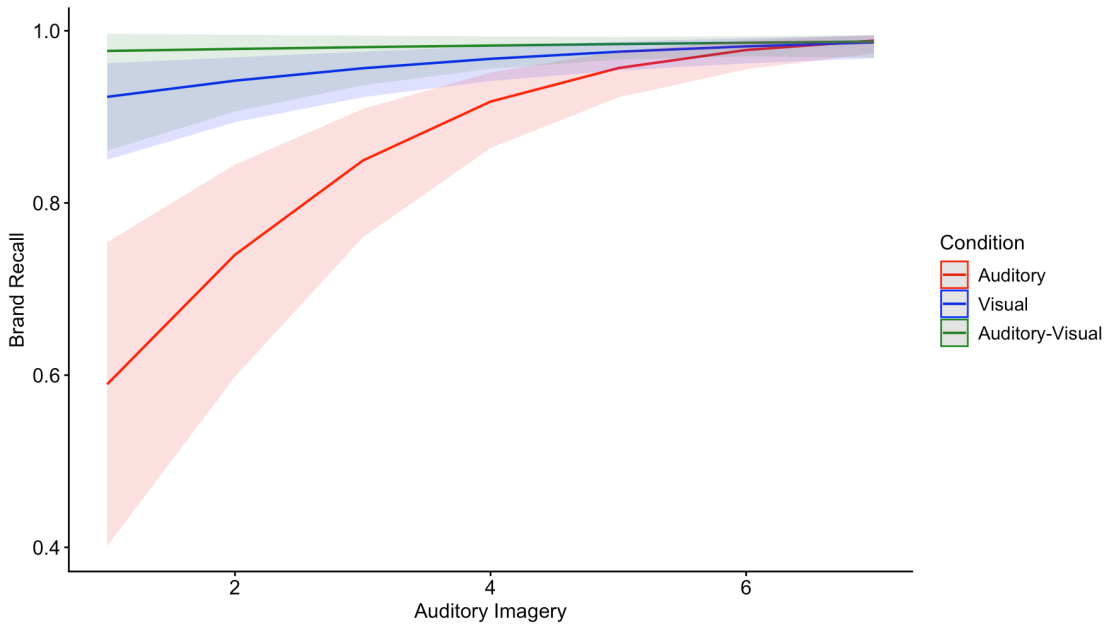


Figure 6.6 Study 3 Interaction Between Modality and Auditory Imagery on Sponsor Brand Recall

Brand Outcomes

To address brand outcomes beyond recall, we measure self-report ratings of brand favorability and product quality. Across both outcomes, there is a significant main effect of auditory imagery in predicting brand outcomes (*p*s < .001). Interaction terms are significant, such that the relationship between auditory imagery and the outcomes is strongest for the auditory condition. Results are presented in Table 6.1

Table 6.1 Favorability and Product Quality Outcomes

Outcome	Predictor	*B*	*SE*	*Z*	*p*	95% CI
Brand Favorability	*Main effects*					
	Auditory Imagery	.70	.03	20.47	< .001	[.63, .76]
	Visual vs. Auditory	1.30	.26	5.06	< .001	[.80, 1.80]
	Auditory-Visual vs. Auditory	.79	.34	2.30	.020	[.12, 1.46]
	Interactions					
	Auditory Imagery × Visual	-.16	.04	–3.55	< .001	[-.25, -.07]
	Auditory Imagery × Auditory-Visual	-.15	.06	–2.58	.010	[-.25, -.03]
	Simple slopes					
	Auditory condition	.70	.03	20.47	< .001	[.63, .76]
	Visual condition	.54	.03	18.81	< .001	[.48, .60]
	Auditory-Visual condition	.56	.05	12.21	< .001	[.47, .65]
Product Quality	*Main effects*					
	Auditory imagery	.56	.03	18.77	< .001	[.50, .62]
	Visual vs. Auditory	1.06	.23	4.70	< .001	[.62, 1.50]
	Auditory-Visual vs. Auditory	.71	.30	2.36	.020	[.12, 1.30]
	Interactions					
	Auditory Imagery × Visual	-.13	.04	–3.22	.001	[-.21, -.05]
	Auditory Imagery × Auditory-Visual	-.13	.05	–2.64	.008	[-.23, -.03]
	Simple slopes					
	Auditory condition	.56	.03	18.77	< .001	[.50, .62]

Visual condition	.43	.03	17.27	< .001	[.38, .48]
Auditory-Visual condition	.43	.04	10.76	< .001	[.35, .51]

Note. The reference condition is "auditory."

Discussion

Study 3 supports both H1 and H2, finding that auditory imagery increases not only brand recall, but also brand favorability and product quality perceptions. We replicate findings from Study 1, where auditory imagery is a significant predictor of brand favorability and extend our understanding of the value of auditory imagery for brands. The results demonstrate that auditory imagery supports brand outcomes in combination with visual imagery and is a profound contributor to brand outcomes in instances where only auditory brand mentions are possible.

Study 4: Streaming Context

In the preceding studies, we use the context of sport sponsoring and emphasized the role of sonic logos to understand how auditory imagery functions. In Study 4, we generalize the findings by considering spoken brand name mentions in a streaming context. Brands are frequent sponsors for streamers (people that publicize their game play on online video platforms such as YouTube) and may or may not be identified as sponsored. In addition to expanding context, we also demonstrate the importance of auditory imagery in predicting consumer brand choice by using an incentive-compatible design.

Methods

Participants were 335 students (42% Female, M_{age} = 21.27, SD_{age} = 2.04) from a large US university, who completed a 3-cell design (Modality: Audio-only, Reading, Streaming video) in exchange for course credit. In the streaming video, participants watched a clip of Stardew Valley, a farm life simulation video game, being played with narration from a male voice. The

context was selected as appropriate for a diverse audience. The video consisted of the game itself, and the narration mentioned two brand names from the same product category three times each. The auditory-only condition consisted of the voiceover from the video condition, while the reading condition was the transcript of the voice over.

Participants were randomly assigned to one of two product categories: Chocolate Candy (Targets: Twix, KitKat; Foil: Hershey) or Juice (Targets: Minute Maid, Welch's; Foil: Dole). The two product categories were chosen for generalizability, and we collapse across product category for data analysis. Brands with more than 95% "fame" (defined as the percentage of people who know the brand name) from YouGov's most popular food and drink brands for Q4 2025 were chosen for pretesting (YouGov.com, 2025). Based on pretesting with students from the same university as the primary sample (N = 45, 43% Female, M_{age} = 21.14, SD_{age} = 1.15), we selected three brands from the two product categories that were not significantly different from each other on familiarity or auditory imagery. Participants were exposed to two brand names during the stimuli presentation and a third was included as a foil for memory and product choice.

In the study procedure, after consent was obtained, participants were randomized into one of the three modality conditions. After exposure in the condition, participants completed a distractor task to clear working memory; they then completed a free-recall memory task probing for the three brands in the product category to which they were exposed. Participants were told initially and reminded after the memory tasks, that they would get to take the brand of their choice home. They then selected one of the three brands from their product category. Subsequently, participants rated auditory imagery (1 = *strongly disagree*, 7 = *strongly agree*; e.g., "I can hear the Welch's brand name in my mind"). Auditory imagery was collected after the dependent variables to avoid contaminating the recall and choice questions. The study concluded

with demographic questions and product choice. The data was structured such that each participant evaluated three brands, with each brand having a value for choice (0 = no choice, 1 = choice), recall (0 = did not recall, 1 = successful recall), and auditory imagery.

Results

In the analysis, our goal was to expand on H1 and H2 by testing whether auditory imagery functions as a mediator for the relationship between exposure (in one of the three modalities) and brand outcomes of recall and brand choice. We test whether a modality manipulation creates changes in auditory imagery, which subsequently predicts both brand recall and brand choice. Assessing the relationship between auditory imagery and brand choice further extends our brand outcome findings.

Including a random effect for participant in the models created a singularity issue, suggesting there is little variance across subject repeated measures. As such, we include a random effect for brand instead. We take a bootstrapping approach to mediation rather than the traditional Baron and Kenny (1986) method. Because bootstrapping provides a method for inference of the indirect effect using confidence intervals (Zhao et al., 2010).

Recall

We tested for mediation using the lme4 package in R with bootstrapping (1,000) and 95% confidence intervals. First, we evaluate whether our manipulation created a difference in levels of auditory imagery. There was a significant difference between the Listen and Watch conditions on auditory imagery (B = -.37, SE = .15, p = .01, 95% CI[-.662, -.079]). Listening to the transcript led to higher auditory imagery ratings than watching the video with the same auditory transcript. However, there was no significant difference between the Listen and Read conditions on auditory imagery (B = -.08, SE = .148, p = .58, 95% CI[-.374, .208]). Listening to the

transcript and reading the transcript led to similar levels of auditory imagery. Importantly, auditory imagery has a positive effect on brand recall (B = .16, SE = .04, z = 3.93, p < .001, 95% CI[.077, .249]).

For the direct effect of our manipulation on brand recall, the Listen versus Watch comparison did not reach significance at the p = .05 level (B = -.37, SE = .20, p = .061, 95% CI[-.75, .017]). The comparison between the Listen and Read conditions also was not statistically significant (B = .28, SE = .20, p = .167, 95% CI[-.112, .680]).

The indirect effect through auditory imagery is significant for the Listen versus Watch comparison (ab = -.061, SE = .024, 95% CI[-.106, -.011]), with the indirect effect accounting for 13.79% of the total effect (P_m = .1379). However, for the Listen versus Read comparison, there was not a significant indirect effect (ab = -.014, SE = .023, 95% CI[-.061, .033]). The two mediation models are visualized in Figure 6.7.

Lastly, the total effect (combination of both direct and indirect effects) for Listen versus Watch on recall reached significance (B = -.44, SE = .19, p = .02, 95% CI[-.818, -.059]); however, there was no significant difference between the Listen and the Read conditions (B = .24, SE = .20, p = .24, 95% CI[-.156, .632]).

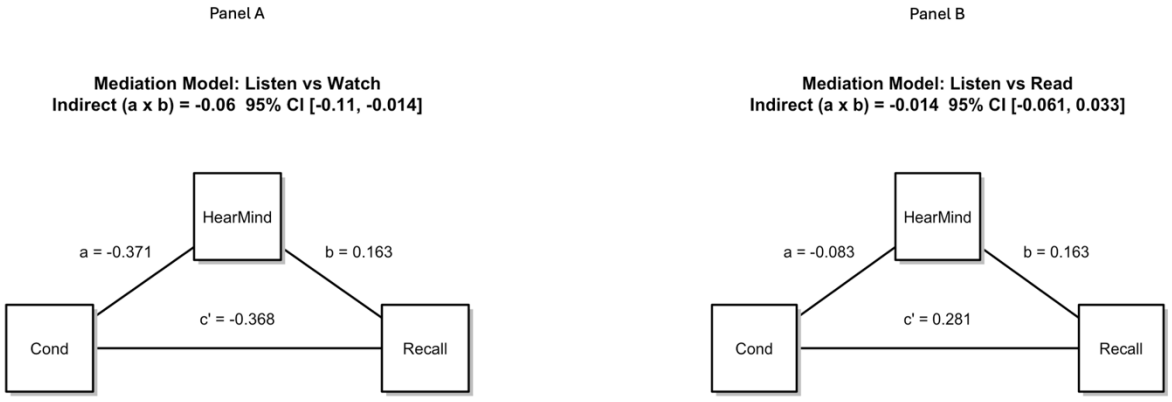


Figure 6.7 Study 4 Mediation Models for Recall

Brand Choice

We use the same analytic procedure to examine brand choice. Given that our a-path is the same as the preceding model, we do not present those results. For the b-path, the effect of auditory imagery on brand choice is significant (B = .12, SE = .04, p = .001, 95% CI[.049, .201]). Neither of the direct effects (c') were significant (Listen vs Watch: B = .05, SE = .17, p = .77, 95% CI[-.290, .394]; Listen vs Read: B = .02, SE = .17, p = .911, 95% CI[-.321, .360]). Additionally, there was no total effect of either condition comparison (Listen vs Watch: B = .00, SE = .17, p = .99, 95% CI[-.339, .339]; Listen vs Read: B = .00, SE = .17, p = .99, 95% CI[-.339, .339]). These estimates reflect the three-alternative choice task design, where brand choice levels are the same across the three conditions (33% target selection). The indirect effect through auditory imagery is significant for Listen vs Watch (ab = -.046, SE = .019, 95% CI[-.084, -.009]), but not for Listen vs Read (ab = -.010, SE = .018, 95% CI[-.043, .027]). We do not report proportion mediated because the total effect is near zero. This occurs because the indirect and direct effects are in opposing directions, creating a suppression effect (MacKinnon et al., 2000). In other words, the total effect combines the direct and indirect effects of the manipulation. Since our indirect effect is negative, and the direct effect is directionally positive, the total effect is near zero as a statistical artifact. The results are visualized in Figure 6.8.



Figure 6.8 Study 4 Mediation Models for Brand Choice

Discussion

The results of Study 4 replicate our previous finding that auditory imagery is an important predictor of brand recall. Additionally, we extend our findings by demonstrating that auditory imagery impacts not only memory and brand perception, but also product choice behavior of participants. We find that listening to a streaming audio and reading the transcript both increase auditory imagery, which in turn has positive effects on recall and brand choice, while watching the stream reduced auditory imagery and subsequent brand outcomes.

Additionally, the results demonstrate that listening to the transcript and reading the transcript provide similar effects on both recall and choice. This is interesting given the triple code theory from the pricing literature, which suggests numerical information is encoded as a visual code, an auditory code, and a sense of magnitude (Dehaene, 1992). Research demonstrates that the auditory code functions through phonetic symbolism, with phonetic symbolism influencing recall behavior (Coulter & Coulter, 2010). We propose that when reading information, not just numbers, individuals use an auditory code in addition to the visual information from reading. Imagining and perceiving information in the real-world activate

similar brain regions (Ganis et al., 2004), which suggests that auditory imagery functions similarly when information is heard in the real world or in one's mind. Support for this is found in the role of subvocalization in auditory imagery (Smith et al., 1995).

Study 5: Eye-Tracking Comparing Sonic Logos to Spoken Brand Names

The goal of Study 5 is to once again replicate the recall results, using auditory imagery for both sonic logos and spoken brand names compared to a control condition with no audio. Additionally, we extend our findings to demonstrate how auditory imagery drives attention behavior using eye-tracking.

Methods

Participants were 130 students (33% Female, M_{age} = 21.32, SD_{age} = 1.93) from a large US university, who completed a 3 (Auditory Modality: Brand Name, Sonic Logo, Control without Audio) x 2 (Competitor: Present, Absent) between-subjects design in exchange for course credit. We use a repeated measures design, in which each participant saw three stimuli. In all conditions we presented pictures from three sports games from the "Big Four" sports: Hockey, Basketball, and Baseball. These images had visual brand logos embedded within them. In the competitor absent condition, the target brand visual logo was presented with no other brand logos, while in the competitor present condition participants saw both the target brand logo and a competitor brand logo. We counterbalanced which brands were used as targets versus foils. Brands were chosen from three product categories (cell phone service, streaming service, and computers), with two brands from each product category that did not differ on pretested (N = 227, 34% Female, M_{age} = 20.89, SD_{age} = 1.18) ratings of auditory imagery. The pretest was conducted from the same sample pool as the primary sample. For the brand name modality, participants heard the

target brand's name during the sport picture onset (recorded with the same female voice for all conditions). In the sonic logo modality, participants heard the target brand's sonic logo. Lastly, in the control condition, there was no audio presented.

Participants were exposed to stimuli after obtaining consent and subsequently completed a distractor task to clear working memory. Participants then completed a free recall task asking, "You saw images from three sports scenes. Please list the sport and the brand(s) you saw in each scene." After recall, participants rated their auditory imagery for all six brands in the study, regardless of condition (auditory imagery: 1 = *strongly disagree*, 7 = *strongly agree*; "I can hear the Apple brand name [sonic logo, brand name/sonic logo] in my mind").

Analytic Strategy

We use moderated mediation structural equation modeling with the lavaan package in R to analyze the results. The independent variables were the modality manipulation and the competitor manipulation. Auditory imagery was the mediator between the two independent variables and our outcomes of recall and visual attention. Additionally, we included the two independent variables as moderators of the relationship between auditory imagery and our outcomes (b-path). In other words, we expect that our manipulations will influence the baseline strength of auditory imagery and, holding auditory imagery constant, the auditory modality of branding and presence of a competitor impact how auditory imagery influences recall and visual attention. For example, sonic logos (versus control) should not only provide increased auditory imagery, but also, when considering equivalent levels of auditory imagery, auditory imagery is more effective for recall and visual attention when activated by a sonic logo (versus control). Our moderated mediation model is consistent with Preacher et al. (2007) who propose that independent variables can moderate the mediator-to-outcome path, as well as the moderation-of-

process logic, in which experimental manipulations can change the strength of mediating mechanisms (Spencer et al., 2005). The model is visualized in Figure 6.9.

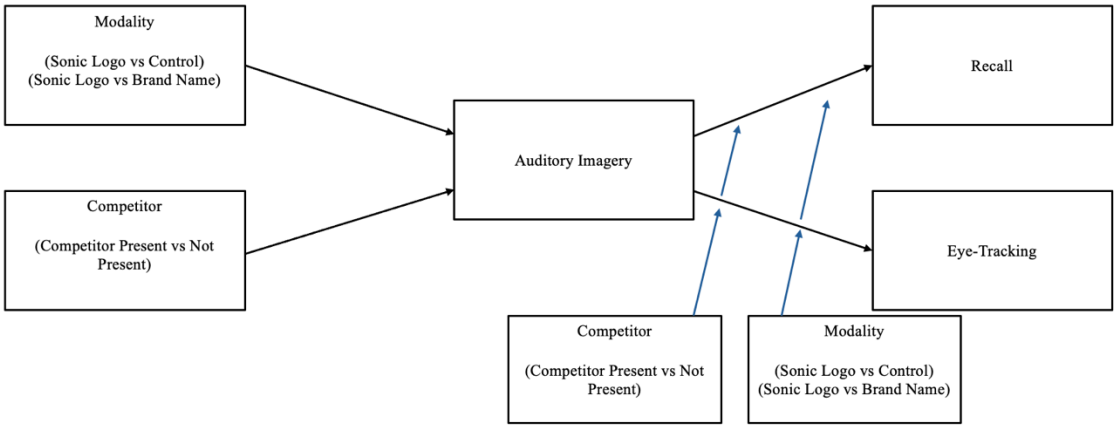


Figure 6.9 Study 5 SEM Model

For the empirical analysis, we ran seven SEM models. Each model included recall as a dependent variable, as well as one eye-tracking dependent variable. We test seven eye-tracking variables, thereby creating seven SEM models. It is standard to keep eye-tracking variables in separate models, as each metric represents a different component of visual processing (Atalay et al., 2012; Holmqvist et al., 2011; Pieters & Wedel, 2004; Wedel & Pieters, 2008). From a statistical viewpoint, eye-tracking variables are often highly correlated, which creates estimation problems when included in the same model (Orquin & Holmqvist, 2018). The eye-tracking variables were z-standardized to account for differences in unit of measurement. Recall was coded as a dichotomous variable (1 = brand recall, 0 = no recall). Between the eye-tracking and recall measures, residual covariances were fixed to zero. In keeping with Study 4, we test for indirect effects and moderated mediation using bootstrapping. Lastly, to account for the repeated measures design we use cluster-robust standard errors for participants.

As previously mentioned, we divide our seven eye-tracking variables into three groups: orienting (hit time, time to first fixation), exploration (gaze dwell time, dwells with saccades, saccade count), and effortful processing (average fixation duration, fixation count). Across our models, specifications are identical, with the exception of which eye-tracking variable is the DV. The results are largely similar for variables within the same grouping, as such, we present in-text results for one eye-tracking variable from each grouping (save for the last, effortful processing where two are discussed), while our tables present results from all seven models.

Results

Considering the a-path to Auditory Imagery

Given our 3-group categorical independent variable for auditory modality (sonic logo, brand name, no sound), we dichotomize to create a sonic logo versus control variable and a sonic logo versus brand name variable. Our competitor manipulation is dichotomous, either present or absent.

For auditory imagery, there was a significant difference between the sonic logo and the control condition, such that sonic logos induce more auditory imagery than the control condition (B = -.709, SE = .240, p = .003, 95% CI[-1.182, -.239]). However, sonic logos and brand names induce similar levels of auditory imagery (B = .051, SE = .238, p = .830, 95% CI[-.414, .519]). Additionally, levels of auditory imagery did not differ based on competitor presence or absence (B = -.288, SE = .193, p = .136, 95% CI[-.681, .081]).

Recall

Auditory imagery had a significant, positive effect on brand recall (B = .074, SE = .025, p = .003, 95% CI[.023, .121]). There was no significant difference between sonic logo versus control in predicting recall (B = .178, SE = .135, p = .188, 95% CI[-.100, .430]) or for the

comparison between sonic logos and brand names (B = -.004, SE = .154, *p* = .980, 95% CI[-.303, .301]). Again, there was no direct effect of the competitor manipulation on recall (B = .014, SE = .116, *p* = .907, 95% CI[-.224, .242]).

For interaction terms, the effect of auditory imagery on recall was significantly stronger in the sonic logo condition compared to the control condition (B = -.077, SE = .031, *p* = .012, 95% CI[-.134, -.015]). However, there was no significant difference in strength of auditory imagery on recall between the sonic logo and brand name condition (B = .018, SE = .032, *p* = .570, 95% CI[-.043, .080]). Additionally, recall did not differ based on presence of a competitor (B = -.016, SE = .025, *p* = .535, 95% CI[-.065, .035]).

The indirect effect of sonic logo versus control on recall mediated by auditory imagery is significant (B = -.052, *p* = .030, 95% CI[-.114, -.015]). However, the indirect effect for sonic logo versus names (B = .004, *p* = .840, 95% CI[-.029, .048]) and presence of competitor (B = -.021, *p* = .181, 95% CI[-.065, .002]) were not significant. The index for moderated mediation between the sonic logo and control condition is significant (index = .054, 95% CI[.013, .126]), which means the indirect effect for the control group is significantly weaker compared to the sonic logo condition. No other index of moderated mediation was significant.

Eye-Tracking Orienting

For the orienting response, we present time to first fixation in-text, while hit time is presented in Tables 6.2 and 6.3. There is a significant negative relationship between auditory imagery and time to first fixation, such that auditory imagery increases the speed at which individuals first draw their eyes to the brand's visual logo (B = -.245, SE = .082, *p* = .003, 95% CI[-.398, -.083]). The direct effect of sonic logo versus control on time to first fixation was significant (B = -1.146, SE = .446, *p* = .010, 95% CI[-2.047, -.296]), as was the comparison of

sonic logo versus brand names (B = -1.615, SE = .446, $p < .001$, 95% CI[-2.535, -.781]). The presence of a competitor did not have a direct effect on time to first fixation (B = -.145, SE = .353, $p = .681$, 95% CI[-.862, .502]).

For interaction terms, the relationship between auditory imagery and time to first fixation is significantly different for sonic logos versus control (B = .263, SE = .093, $p = .005$, 95% CI[.086, .452]) and sonic logos versus brand names (B = .334, SE = .091, $p < .001$, 95% CI[.163, .517]), such that the effect of auditory imagery on time to first fixation for sonic logos is stronger than both control and brand names. The interaction term between auditory imagery and competitor presence was not significant (B = .030, SE = .076, $p = .689$, 95% CI[-.115, .187]).

The indirect effect through auditory imagery of sonic logo versus control was significant (B = .174, $p = .033$, 95% CI[.049, .385]). However, the indirect effect through auditory imagery for sonic logos versus brand names (B = -.013, $p = .836$, 95% CI[-.147, .101]) and for competitor presence (B = .071, $p = .177$, 95% CI[-.008, .205]) were not statistically significant. Reflecting these findings, the index of moderated mediation was significant for sonic logo versus control (index = -.187, 95% CI[-.427, -.050]). No other index of moderated mediation was significant.

Eye-Tracking Exploration

In representing visual logo exploration, we report saccade count in-text, while gaze dwell time and dwells with saccades are presented in Tables 6.2 and 6.3. There was a significant, positive effect of auditory imagery on saccade count (B = .308, SE = .080, $p < .001$, 95% CI[.158, .478]). Additionally, the direct effects of the modality manipulation were also significant predictors of saccade count, such that the sonic logo condition resulted in a greater saccade count when compared to control (B = .643, SE = .347, $p = .064$, 95% CI[.046, 1.433]) and brand names (B = 2.029, SE = .737, $p = .006$, 95% CI[.643, 3.556]). While the p-value for

the sonic logo versus control condition is not below p = .05, the confidence interval excludes zero, providing evidence for statistical significance. There was no significant difference in saccade count based on competitor presence (B = .383, SE = .364, *p* = .293, 95% CI[-.309, 1.136]).

For interaction terms, the effect of auditory imagery on saccade count is stronger for sonic logos than both the control group (B = -.229, SE = .098, *p* = .020, 95% CI[-.454, -.064]) and the brand names group (B = -.441, SE = .159, *p* = .006, 95% CI[-.778, -.155]). The interaction between auditory imagery and competitor presence was not significant for saccade count (B = -.110, SE = .089, *p* = .215, 95% CI[-.278, .066]).

The indirect effect through auditory imagery on saccade count is significant when comparing sonic logos to the control condition (B = -.218, *p* = .026, 95% CI[-.473, -.073]), but not for the sonic logos versus brand name comparison (B = .016, *p* = .831, 95% CI[-.137, .162]). Additionally, there was no indirect effect when comparing presence versus no presence of a competitor (B = -.089, *p* = .175, 95% CI[-.249, .018]). Reflecting these findings, the index of moderated mediation is significant for sonic logos versus control (index = .162, 95% CI[.037, .447]). No other index of moderated mediation was significant.

Eye Tracking Effortful Processing. For effortful processing, results differ slightly between average fixation duration and fixation count, as such we report both in-text. When considering average fixation duration, there is no significant effect of auditory imagery (B = -.057, SE = .063, *p* = .369, 95% CI[-.176, .074]). Additionally, there is no direct effect for sonic logos versus control (B = -.090, SE = .305, *p* = .767, 95% CI[-.683, .524]), sonic logos versus brand names (B = .118, SE = .647, *p* = .855, 95% CI[-.998, 1.566]), or for competitor presence (B = -.021, SE = .314, *p* = .946, 95% CI[-.609, .640]). Further, no interaction effects were

significant, there was no significant indirect effect, and no significant index of moderated mediation.

For fixation count, there was a significant positive effect of auditory imagery (B = .199, SE = .074, *p* = .007, 95% CI[.048, .336]). Additionally, there was a direct effect for sonic logos versus names (B = 1.178, SE = .548, *p* = .032, 95% CI[.140, 2.307]), but not for sonic logos versus control (B = .271, SE = .296, *p* = .360, 95% CI[-.263, .896]).

For interaction terms, the effect of auditory imagery on fixation count was stronger for sonic logos compared to brand names (B = -.308, SE = .120, *p* = .010, 95% CI[-.553, -.078]). However, the effect of auditory imagery on fixation count did not differ between sonic logo and control (B = -.111, SE = .079, *p* = .161, 95% CI[-.277, .033]), nor between competitor conditions (B = -.032, SE = .073, *p* = .659, 95% CI[-.175, .111]).

The indirect effect through auditory imagery for fixation count was significant, based on 95% confidence intervals for the sonic logo versus control comparison (B = -.141, *p* = .059, 95% CI[-.336, -.034]), but not for sonic logos versus names (B = .010, *p* = .834, 95% CI[-.085, .119]) or competitor presence (B = -.057, *p* = .208, 95% CI[-.185, .007]). No index of moderated mediation reached significance.

Table 6.2 Study 5 Path Coefficients

	b	SE	*p*	95% BCa CI
Panel A. a-paths: IVs → Auditory imagery (shared across all models)				
Modality (Control vs. Sonic Logo) → Auditory imagery	**-.709**	**.240**	**.0031**	**[-1.182, -.239]**
Modality (Names vs. Sonic Logo) → Auditory imagery	.051	.238	.8295	[-.414, .519]
Competitor (Present vs. Not Present) → Auditory imagery	-.288	.193	.1355	[-.681, .081]
Panel B. b-paths, interactions, and direct effects				
Eye-Tracking Orientation				
Hit time				
Auditory imagery	**-.261**	**.073**	**< .001**	**[-.398, -.115]**

Auditory imagery × Competitor	.052	.072	.4715	[-.088, .194]
Auditory imagery × Modality_Control	**.248**	**.090**	**.0058**	**[.079, .431]**
Auditory imagery × Modality_Names	**.311**	**.087**	**< .001**	**[.145, .485]**
Control vs. Sonic Logo → ET	**-1.129**	**.425**	**.0079**	**[-1.970, -.336]**
Names vs. Sonic Logo → ET	**-1.585**	**.431**	**< .001**	**[-2.460, -.763]**
Present vs. Not Present → ET	-.204	.334	.5415	[-.900, .417]
TTFF				
Auditory imagery	**-.245**	**.082**	**.0026**	**[-.398, -.083]**
Auditory imagery × Competitor	.030	.076	.6888	[-.115, .187]
Auditory imagery × Modality_Control	**.263**	**.093**	**.0047**	**[.086, .452]**
Auditory imagery × Modality_Names	**.334**	**.091**	**< .001**	**[.163, .517]**
Control vs. Sonic Logo → ET	**-1.146**	**.446**	**.0102**	**[-2.047, -.296]**
Names vs. Sonic Logo → ET	**-1.615**	**.446**	**< .001**	**[-2.535, -.781]**
Present vs. Not Present → ET	-.145	.353	.6807	[-.862, .502]
Eye-Tracking Exploration				
Gaze dwell time				
Auditory imagery	**.244**	**.123**	**.0478**	**[.042, .536]**
Auditory imagery × Competitor	-.088	.080	.2732	[-.268, .054]
Auditory imagery × Modality_Control	-.148	.091	.1060	[-.358, .008]
Auditory imagery × Modality_Names	**-.262**	**.112**	**.0189**	**[-.489, -.050]**
Control vs. Sonic Logo → ET	.359	.314	.2533	[-.190, 1.052]
Names vs. Sonic Logo → ET	**1.009**	**.440**	**.0217**	**[.158, 1.906]**
Present vs. Not Present → ET	.124	.304	.6825	[-.419, .788]
Dwells w/ saccades				
Auditory imagery	**.267**	**.070**	**< .001**	**[.131, .406]**
Auditory imagery × Competitor	**-.146**	**.073**	**.0452**	**[-.300, -.010]**
Auditory imagery × Modality_Control	**-.160**	**.068**	**.0191**	**[-.294, -.027]**
Auditory imagery × Modality_Names	**-.432**	**.150**	**.0038**	**[-.734, -.139]**
Control vs. Sonic Logo → ET	.481	.285	.0915	[-.086, 1.046]
Names vs. Sonic Logo → ET	**2.163**	**.746**	**.0038**	**[.668, 3.602]**
Present vs. Not Present → ET	.594	.350	.0897	[-.051, 1.337]
Saccade count				
Auditory imagery	**.308**	**.080**	**< .001**	**[.158, .478]**
Auditory imagery × Competitor	-.110	.089	.2145	[-.278, .066]
Auditory imagery × Modality_Control	**-.229**	**.098**	**.0195**	**[-.454, -.064]**
Auditory imagery × Modality_Names	**-.441**	**.159**	**.0056**	**[-.778, -.155]**
Control vs. Sonic Logo → ET	**.643**	**.347**	**.0636**	**[.046, 1.433]**
Names vs. Sonic Logo → ET	**2.029**	**.737**	**.0059**	**[.643, 3.556]**
Present vs. Not Present → ET	.383	.364	.2927	[-.309, 1.136]
Eye-Tracking Effortful processing				

Fixation count				
Auditory imagery	**.199**	**.074**	**.0070**	**[.048, .336]**
Auditory imagery × Competitor	-.032	.073	.6593	[-.175, .111]
Auditory imagery × Modality_Control	-.111	.079	.1605	[-.277, .033]
Auditory imagery × Modality_Names	**-.308**	**.120**	**.0104**	**[-.553, -.078]**
Control vs. Sonic Logo → ET	.271	.296	.3597	[-.263, .896]
Names vs. Sonic Logo → ET	**1.178**	**.548**	**.0316**	**[.140, 2.307]**
Present vs. Not Present → ET	-.085	.302	.7790	[-.703, .499]
Ave fixation duration				
Auditory imagery	-.057	.063	.3685	[-.176, .074]
Auditory imagery × Competitor	-.008	.071	.9115	[-.151, .123]
Auditory imagery × Modality_Control	.003	.065	.9577	[-.125, .130]
Auditory imagery × Modality_Names	.048	.133	.7175	[-.229, .292]
Control vs. Sonic Logo → ET	-.090	.305	.7668	[-.683, .524]
Names vs. Sonic Logo → ET	.118	.647	.8552	[-.998, 1.566]
Present vs. Not Present → ET	-.021	.314	.9460	[-.609, .640]
Memory Recall				
Auditory imagery	**.074**	**.025**	**.0031**	**[.023, .121]**
Auditory imagery × Competitor	-.016	.025	.5346	[-.065, .035]
Auditory imagery × Modality_Control	**-.077**	**.031**	**.0123**	**[-.134, -.015]**
Auditory imagery × Modality_Names	.018	.032	.5697	[-.043, .080]
Control vs. Sonic Logo → Recall	.178	.135	.1881	[-.100, .430]
Names vs. Sonic Logo → Recall	-.004	.154	.9800	[-.303, .301]
Present vs. Not Present → Recall	.014	.116	.9065	[-.224, .242]

Note. Bold = 95% bootstrap BCa CI excludes zero (5,000 resamples, clustered by participant). Sonic Logo = reference condition. ET variables are z-scored. Models estimated via MLR in lavaan; missing data estimated via FIML.

Table 6.3 Study 5 Indirect effects and index of moderated mediation

	Indirect Effect			Modality Moderation		
	Indirect	***p***	**95% BCa CI**	**Index**	***p***	**95% BCa CI**
Eye-Tracking Orientation						
Hit time						
Control vs. Sonic Logo	**.185**	**.0209**	**[.062, .391]**	**-.176**	**.0422**	**[-.406, -.046]**
Names vs. Sonic Logo	-.013	.8338	[-.152, .108]	.016	.8345	[-.137, .173]
Present vs. Not Present	.075	.1681	[-.010, .210]			
TTFF						
Control vs. Sonic Logo	**.174**	**.0325**	**[.049, .385]**	**-.187**	**.0407**	**[-.427, -.050]**
Names vs. Sonic Logo	-.013	.8359	[-.147, .101]	.017	.8342	[-.146, .186]
Present vs. Not Present	.071	.1771	[-.008, .205]			
Eye-Tracking Exploration						
Gaze dwell time						
Control vs. Sonic Logo	**-.173**	**.1269**	**[-.528, -.027]**	**.105**	**.1865**	**[.001, .351]**
Names vs. Sonic Logo	.013	.8442	[-.107, .163]	-.013	.8413	[-.161, .118]
Present vs. Not Present	-.070	.2823	[-.291, .005]			
Dwells w/ saccades						
Control vs. Sonic Logo	**-.189**	**.0208**	**[-.399, -.063]**	**.113**	**.0688**	**[.021, .283]**
Names vs. Sonic Logo	.014	.8329	[-.116, .146]	-.022	.8369	[-.254, .191]
Present vs. Not Present	-.077	.1790	[-.223, .011]			
Saccade count						
Control vs. Sonic Logo	**-.218**	**.0256**	**[-.473, -.073]**	**.162**	**.0862**	**[.037, .447]**
Names vs. Sonic Logo	.016	.8314	[-.137, .162]	-.023	.8373	[-.244, .204]
Present vs. Not Present	-.089	.1753	[-.249, .018]			
Eye-Tracking Effortful Processing						
Fixation count						
Control vs. Sonic Logo	**-.141**	**.0585**	**[-.336, -.034]**	.079	.2340	[-.011, .267]
Names vs. Sonic Logo	.010	.8344	[-.085, .119]	-.016	.8391	[-.182, .139]
Present vs. Not Present	-.057	.2080	[-.185, .007]			
Average Fixation Duration						
Control vs. Sonic Logo	.040	.4023	[-.041, .156]	-.002	.9596	[-.101, .096]
Names vs. Sonic Logo	-.003	.8876	[-.070, .027]	.003	.9425	[-.055, .097]
Present vs. Not Present	.016	.4837	[-.012, .092]			
Memory Recall						
Control vs. Sonic Logo	**-.052**	**.0304**	**[-.114, -.015]**	**.054**	**.0500**	**[.013, .126]**
Names vs. Sonic Logo	.004	.8399	[-.029, .048]	.001	.9177	[-.012, .029]
Present vs. Not Present	-.021	.1805	[-.065, .002]			

Note. Bold = 95% bootstrap BCa CI excludes zero (5,000 resamples, clustered by participant). Indirect effect = evaluated at Sonic Logo + Single reference. Moderation indices not applicable to Multiple vs. Single IV.

Discussion

In Study 5, we hypothesize that sonic logos will improve eye-tracking orientation and exploration of visual brand logos, and that this effect will be mediated by auditory imagery. Across two eye-tracking orientation variables and three eye-tracking exploration variables, our results are as hypothesized. While sonic logos and spoken brand names induce similar levels of auditory imagery and related recall, the results demonstrate that orientation and exploratory processing are improved by sonic logos as compared to brand names. This provides important managerial considerations for marketing managers when able to choose sonic logo versus a spoken brand name in marketing communications. Further, in situations where use of a sonic logo is inappropriate (e.g., when introducing a sponsored athlete) or is not allowed, auditory presentation of a brand name is shown to work similarly for eliciting both auditory imagery and recall. As such, in contexts where orienting and exploring a visual brand logo is irrelevant, brand names function similarly to sonic logos.

We predicted that auditory imagery for sonic logos improves brand outcomes due to an increase in ease of exploratory processing compared to effortful processing. The results for the effortful processing eye-tracking variables provide support for the prediction. Our findings demonstrate that sonic logos and auditory imagery improve ease of exploratory processing, but not effortful processing, which supports H3a and H3b.

General Discussion

Across five studies, we demonstrate in the field and in the lab, that auditory imagery has important consequences for brands in terms of recall, brand choice, and visual attention. Whether

auditory imagery is induced by auditory brand names or by sonic logos, it is a consistent predictor of recall and favorable brand outcomes. Our results highlight that in usage situations where sonic logos are prohibited, exposure to an auditory brand name improves recall rates and brand choice behavior. We introduce auditory imagery as an important factor for brand recall, choice, and perception, especially in contexts like sponsoring where auditory brand name use may be the only option. However, when marketing managers want to increase visual orientation and exploration of a visual brand logo, using a sonic logo is advantageous compared to the auditory brand name.

As marketing platforms in broad use evolve, research examining processing and effects of marketing outcomes must also evolve. Marketers seeking and securing brand activation with venues, events, and individuals receive brand exposures of various types, including auditory mentions, that bring distinctive value both in combination with other sensory exposures and as an independent contributor to brand outcomes. Our research is the first empirical investigation of auditory imagery in embedded contexts and demonstrates the benefits of auditory imagery in determining brand recall, brand choice, brand perceptions, and visual attention.

The current research while providing the first empirical examination of auditory imagery in embedded marketing, comes with limitations. Firstly, our field study is limited to track and field; however, auditory imagery has wide application in all manner of sponsoring, brand placement, social media content, and influencer marketing. The field study could also be criticized for not linking a specific auditory exposure with a brand outcome. We offset this shortcoming with lab studies showing that auditory imagery is effective in supporting memory and choice behavior based on a single exposure. Nonetheless, additional research in the lab and field is needed to understand the best exposure strategies to support auditory imagery for brands.

As well, our literature review and theory development identified several marketing goals, brand considerations and individual level differences that would be important in future research. Our findings invite new research on auditory imagery that intersects with an array of past findings related to brand naming, brand associations, sound symbolism, and individual level differences. Table 6.4 presents an overview of future research for auditory imagery in embedded marketing contexts.

Table 6.4 Future Research for Auditory Imagery in Embedded Marketing Contexts

Marketing Research Area	**Auditory Imagery Research Questions**	**Related Research**
Reminder Effects	How do auditory brand mentions in contexts such as event/activity sponsoring and content streaming (e.g., Twitch, Youtube) influence brand outcomes?	Use of imagery-evoking sound effects in radio advertising (Miller & Marks, 1992).
	Does consistency of sonic logo usage or auditory presentation across touchpoints matter for brand awareness and recall?	Consistent brand symbolism supports communication of brand attributes (Klink & Wu, 2014).
Pronounceability Considerations	Does brand pronunciation fluency impact perceptions of the brand?	Product perceptions are influenced by spokesperson voice or background music (Lowe & Haws, 2017).
Low Awareness Brands	What is the impact of sound symbolism on recall and brand favorability for an unknown brand and can sound symbolism be leveraged in contexts with low levels of marketer control?	Brand sound created through sonic imbeds create symbolism that in turn influences brand meaning (Klink & Wu, 2014).
Brand Name Characteristics	How are brand names with differing characteristics received in embedded marketing?	Linguistic cadence (Argo et al., 2010), connotative brand meanings (Motoki et al., 2022), and perceived brand plurality (Gupta et al., 2025) influence brand perceptions.

	How are possessive brands (e.g., Mrs. Smith's) communicated and perceived in auditory only presentation. How are brand names with feminine associations received when announced during male sporting events? How are connotative meanings altered by the context in which they are heard?	Auditory code of prices varies based on presence of commas and periods (Coulter et al., 2012) Femininity associations (Pogacar et al., 2021). Sound symbolism creates inherent brand meaning (Klink, 2000; Yorkston & Menon, 2004).
Individual Level Effects	How do individual differences in auditory imagery vividness impact responses to sonic branding?	Reactions to sonic branding stimuli (Krishnan et al., 2014).
	Does childhood experience with musical training influence later-life brand perceptions of sonic logos?	Musical ability (Hubbard, 2010).
	Does experience with sports or videogames influence reactions to auditory branding?	Musical imagery frequency related to music and videogame experience (Floridou et al., 2022).
	Do individual differences in brand auditory imagery need to be measured differently from general auditory imagery individual differences?	Scale development (Andrade et al., 2014).
Consumer Neuroscience	Do sonic logos elicit more consistent brand understanding than auditory brand names?	Neural similarity improves evaluations (Barnett & Cerf, 2017)
	How does neural activity reflect the relationship between individual differences in auditory imagery and brand awareness/perceptions?	Individual differences in self-report auditory imagery related to brain activity (Halpern, 2015; Hubbard, 2010).
	Does imagining a sonic logo versus spoken brand name impact orientation and exploration of visual logos?	Eye-movements reflect content during exposure and during recollection (imagining; Johansson, 2013)

Reminder Effects

Established brands do not need to build general awareness but may need reminders for desired brand behaviors. In our field study data, we observe that some well-known brands such as Coca-Cola and Hershey's Chocolate were not recalled. As noted previously, brand recall is not essential for positive brand related behaviors (Cornwell & Humphreys, 2013). For example, past research suggests that brands not recalled may still benefit from sponsorship exposure by entering consumer consideration sets (Herrmann et al., 2011). Future research can investigate how auditory imagery functions implicitly to influence brand choice behavior. Similarly, work conducted with the Dutch State Lottery found a significant increase in purchase following reminder radio and television advertising (He & Klein, 2023). Future research should investigate the extent to which auditory reminder effects in sponsoring support consideration and purchase.

Pronounceability Considerations

Brand pronounceability has been found to influence brand credibility in marketing communications (Xiao et al., 2025). The supplement brand, Prevagen, is pronounced "PREV-uh-gin" and not difficult to pronounce once heard; however, emphasis placed on "pre" can result in a different pronunciation, which anecdotally was heard at the event. The supplement was introduced to consumers in 2007 by Quincy Bioscience but began sponsoring track and field in 2023 (Medow, 2023). Increases in recall rates for Prevagen may have to do with increased pronounceability from exposure over time. Additionally, Prevagen may have an awareness advantage, which new brands benefit from in cluttered sponsorship ecosystems (Jahn & Cornwell, 2025), or from other marketing communication exposures found in daily life (e.g.,

commercials). Research on pronounceability of brand names is called for, especially in natural settings.

Low Awareness Brands

Researchers Klink and Wu (2014) highlight how sound symbolism is best embedded in the creation of brand names. For example, brand meaning can be communicated by placing an imbed after the first syllable of the brand name. The architecture of imbeds in a brand name is important to convey perceptions of product attributes, particularly for new brands, whose pronunciation may vary at first. In the new auditory landscape of brand communications, early decisions on brand names and sub brands may be important to the development of brand image.

Already established brands with low awareness may benefit from repeated auditory presentations that are coupled with visual logo or product presentation that links the brand name with the product category. In Study 3, the Kettle & Fire brand of bone broth was recalled better than established brands such as Xfinity telecommunications and Hershey's chocolate. This may have been due to the brand name components that support auditory and visual imagery or to the use of both sounds that are "stops" (e.g., the letter "k") and "fricatives" (e.g., as in the letter "f") which support both hard and soft imagery (see Klink, 2000). Future research examining how sound symbolic elements influence memory and brand outcomes in various marketing contexts is warranted.

Brand Name Characteristics

Research on brand names finds several characteristics that may perform differently in natural settings than in advertising and marketing presentations in traditional media. Connotative brand meanings (Motoki et al., 2022), brand plurality (Gupta et al., 2025), femininity associations (Pogacar et al., 2021) and sound symbolism (Klink, 2000; Yorkston & Menon,

2004) may be perceived differently in contexts. For example, sponsored sporting and music events, romance and action movies, and craft and fitness communication contexts may interact in supportive or destructive ways with overarching symbolism when presented in embedded communication contexts.

Individual Level Effects

While musical ability was first proposed as being related to a greater ability to engage in auditory imagery (Seashore, 1939), the relationship between musical ability and auditory imagery has not been widely studied (Hubbard, 2010). There are, however, a handful of studies that suggest individuals with musical training perform better on auditory imagery tasks such as pitch acuity in imagery (Janata & Paroo, 2006). Additionally, auditory imagery has been linked to improvements in sight reading (Kornicke, 2021) and musical performance (Highben & Palmer, 2004). A causal relationship between musical ability and auditory imagery ability has yet to be identified, with calls for additional research on this area (Hubbard, 2010). In marketing, one may consider whether childhood musical training impacts auditory imagery ability later in life, with downstream consequences for brands utilizing sonic logos or jingles.

Work on individual differences has also taken a scale development approach in aiming to understand how to best measure auditory imagery ability. Individual differences scales exist for both vividness (Andrade et al., 2014) and clarity (Willander & Baraldi, 2010) of auditory imagery. Lastly, one could consider how life experiences such as sports or videogame exposure impact reactions to sonic branding.

Consumer Neuroscience

In Essay 3, we take into consideration how sonic logos versus spoken brand names function as predictors of eye-tracking orientation and exploration of visual logos. However,

additional considerations from a consumer neuroscience perspective are warranted. Individual differences in self-reported auditory imagery have been linked to consistent differences in brain activity (Halpern, 2015). Future research could consider how individual differences in auditory imagery relate to auditory branding responses or whether neural activity can reflect the relationship between individual differences in auditory imagery and brand perceptions. In relation to brand activity, Barnett and Cerf (2017) demonstrate that neural activity during movie trailer viewing can predict box office sales. Specifically, consumers exhibiting high correlations between their brain activity during movie trailer viewing represents extracting the same meaning and understanding of the content, and this common understanding is what drives box office sales (Barnett & Cerf, 2017). In a similar vein, we question whether one of the advantages to sonic logos versus spoken brand names is an increase in a common understanding of what the brand represents, and whether that common understanding is carried through auditory imagery.

Research demonstrates that imagining and perceiving information activates the same brain regions (Zvyagintsev et al., 2013). Extending to eye-tracking, Johansson (2013) provides further evidence that when exposed to stimuli and when imagining the stimuli during recall, eye-tracking can reflect the content of the stimuli. One may question whether imagined sonic logos and imagined spoken brand names function differently when perceived in the real world (as tested in this essay) versus when they are imagined. Overall, consumer neuroscience is a promising area to see future research on auditory imagery.

Conclusion

Marketing has evolved in areas such as sponsoring, brand placement, and influencer marketing with auditory branding featured strongly in each. While marketing research has often considered visual imagery, auditory imagery, particularly when stemming from auditory

branding, is under researched. Our work identifies auditory imagery as an important predictor of sponsor brand recall, brand choice, and visual attention. Additionally, we provide an overview of how auditory imagery in marketing may progress with future research.

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CONCLUDING CHAPTER

General Discussion

This dissertation is comprised of three independent essays that all center on the theme of consumer response to indirect marketing efforts in complex contexts. Across the essays we take a multi-method approach to understanding consumer memory broadly, and in specific contexts such as sponsorship and auditory branding. Throughout the dissertation, we address three key themes: updated theorizing, consumer responses to a cluttered brand environment, and the use of multiple methodologies. This dissertation offers multiple theoretical, methodological, and managerial contributions to the literature presented in the following sections.

Regarding updated theorizing, much of the consumer memory literature draws on spreading activation theory; however, there is also an orientation towards constructive memory theory and the accessibility-diagnosticity framework. The accessibility-diagnosticity framework is growing in popularity, as it is the only major memory theory that originates in marketing. In addition to covering these "big three" memory theories (i.e., spreading activation, constructive memory, accessibility-diagnosticity framework), we also provide insight as to source memory, state-dependent memory, and encoding variability theory. Beyond presenting the theories, Essay 1 also highlights areas of theoretical interest that can be included in future research such as phonological processes in reconstructing memories, memory-offloading, and creating a framework that explains how the constructive memory processes support brand memory versus when they induce memory distortions.

In addition to presenting the theoretical orientations in consumer memory, we also provide novel theorizing on sponsor identification (Essay 2). While previous literature has relied on heuristic-based explanations, we introduce the ecosystems-based view bringing forward

global activation and global matching models from psychology and neuroscience to marketing. The ecosystems-based view conceptualizes the sport sponsorship environment as an ecosystem consisting of sponsors and events that extends back in time and is multi-layered. A dense sport sponsorship ecosystem highlights the need to understand how consumers mentally represent such an ecosystem. It is in trying to understand the sponsorship ecosystem mental representation that we introduce computational memory network modeling, as well as theorizing on how network characteristics such as average path length and the clustering coefficient are of consequence to consumer memory.

Essay 2 and Essay 3 both emphasize the consequences of a modern world in which consumers are exposed to a vast number of brands every day. The sponsorship ecosystem is dense with not only new brand partnerships forming, but also a layered history of previous brand partnerships. Consumers must store these brand associations in memory and are subject to biases in retrieval mechanisms that stem from the cluttered ecosystem. Specifically, we argue that consumers with flexible memory networks can cope with the clutter; however, for the average consumer, they collect these brand associations in one large mental pool and without organization, memory for new sponsors suffers. These findings hold key implications for marketing managers, who can better understand how branding clutter is of consequence to their own brands.

We also address the cluttered brand environment in relation to brands adopting auditory branding to complement their visual branding strategy. While most brands work to establish a strong visual logo, an increasing number of businesses are starting to also prioritize auditory branding, whether through sonic logos or brand partnerships where the brand name is often spoken (e.g., stadium naming rights). Consequently, brand activations no longer occur solely in

the visual modality, but also in the auditory modality. As such, we examine the impact of auditory imagery on brand recall, brand choice, and visual attention mechanisms such as visually orienting to the brand and visually exploring the brand logo. In doing so, we provide managerial evidence towards the efficacy of both sonic logos and spoken brand names.

Our third theme summarizing the dissertation is focused on methodology. Marketing has many methodological traditions that researchers can draw on, and combining methodologies provides a fruitful endeavor. In Essay 3, we present traditional experiments, but also a sporting event field study, and a separate eye-tracking study. To our knowledge, field studies and eye-tracking methodologies are rarely used in the same research project, with most exceptions occurring in retail environments (e.g., Chandon et al., 2009). One limitation of eye-tracking research is ecological validity, while field studies provide strong ecological validity; as such, including both methodologies in a manuscript allows for a robust understanding of the mechanism under investigation. For example, we demonstrate in a field study that auditory imagery predicts memory recall for sponsors in the real-world; and with eye-tracking, that auditory imagery drives visual orientation and exploration of visual logos embedded in a sports clip. Sponsorship is prevalent both in-person at sporting events, and on broadcast or streaming services. By using both methodologies, we gain a more complete understanding of what behaviors are and are not elicited by auditory imagery.

Further, by adopting methodologies from other disciplines, we can test long-held claims in marketing that previously were not addressed empirically. For example, Essay 1 finds that memory network structure is often identified as a causal mechanism in consumer memory, however, historically, there has been little investigation on quantitatively measuring memory network structure in marketing. By drawing on psychology and network science methodologies,

we introduce the first quantitative investigation of memory network structure that empirically compares structure across groups and against matched randomly generated networks.

Future Research

While all three essays provide considerations for future research, we highlight three areas most suitable for future research: memory-offloading (Essay 1), a framework for constructive memory (Essay 1), and extending the memory network modeling paradigm (Essay 2). Additional future research directions related to auditory imagery can be found in the general discussion of Essay 3.

In reviewing the consumer memory literature in Essay 1, we find two studies that support a counterintuitive understanding of memory. While individuals typically purchase souvenirs (Marcoux, 2017) and write down experiences (Roehm, 2016) to try preserve memory, doing so reduces memory rather than preserving it. We propose that these behaviors "off-load" memory, essentially serving as external hard drives for the memory. In other words, when consumers have an external record of an event, the need to mentally maintain the memory is reduced.

Recent research in psychology addresses this claim and finds that individuals can strategically offload information to an external source and typically do so for high-value words; however, memory for those words is reduced (Murphy, 2023). This presents an interesting area for marketing, in which behaviors meant to preserve the most important memories can reduce recall for those memories. As a consumer behavior extension, one can consider whether brands associated with the off-loaded memory impact brand evaluations. Consumer research highlights that brands that are forgotten can still implicitly impact behavior (Herrmann, Walliser, & Kacha, 2011). Alternatively, experiencing difficulty during recall can harm evaluations of the related brand (Wanke, Bohner, & Jurkowitsch, 1997). If off-loaded memories are harder to remember,

brand evaluations may be negatively impacted. This provides managerial implications; many events offer "swag bags," souvenirs, and pictures by which to "remember" the experience; we question whether these event-related objects can reduce memory for the event and subsequently the brand and brand evaluations.

Our second future research direction stems from the repeated findings that the constructive memory process can both facilitate recall as well as promote memory distortions. Although constructive memory is a prominent theory in consumer memory, a framework towards understanding how constructive memory functions for consumer has yet to be addressed. In addition to needing a framework of when and how constructive memory promotes versus distorts memory, psychology identifies episodic reconsolidation as a key component of constructive memory (Hupbach, Gomez, Hardt, & Nadel, 2007); however, episodic reconsolidation has yet to be addressed systematically in marketing. Further, constructive memory is an adaptive feature related not only to remembering the past, but also in planning the future (Schacter & Addis, 2007). Given that prospective memory is largely unaddressed in marketing empirically, a framework of constructive memory in consumers should also address memory for the future, not just the past.

Our third area for future research stems from the computational memory network modeling utilized in Essay 2. In Essay 2, we provide the first evidence that individual memory network structure mediates the relationship between engagement and memory recall. While our work identifies different memory network structures for students versus MTurk participants, we do not address how those memory networks developed. Given that a flexible memory network structure work promotes memory for sponsorship, while a poorly structured memory network decreases memory, it is important for marketing managers to understand how they can help

create flexible network structure for their target consumers. Additionally, we do not address outcomes other than memory. Future research can consider whether memory network structure functions more broadly to predict brand evaluations and purchase behavior.

Limitations

While the current dissertation provides multiple contributions, it is not without limitations. In our empirical work, we use sport sponsorship as the primary context for the research. Focusing on a single context lacks generalizability; as such, future research should aim to replicate the findings across contexts. For example, would measuring memory networks in relation to brands in other ecosystems such as music function similarly to sport sponsorship?

One can also consider whether a promotion strategy such as product placement would elicit similar findings on auditory imagery. In Essay 3, we find that sonic logos and auditory brand names both induce auditory imagery; but only sonic logos increase visual attention to the brand. Product placement often integrates a spoken brand name with a brand visual embedded in the show or movie; it is possible that in relation to product placement (a context where sonic logos are largely inappropriate), auditory brand names do improve visual attention?

As another limitation, Essay 2 does not include a field study. While we do find, in a tightly controlled experimental setting, that memory network structure predicts recall, we do not know whether the finding would hold in the field. If we measured memory network structure at a track and field event, would we find that network structure predicts recall for actual event sponsors? Similarly, students, MTurk, and Prolific participants likely do not have extensive in-person experience with all sporting events presented in the studies (e.g., Rugby Currie Cup). Conducting a study with attendees of a sporting event would allow us to assess how exposure

embedded in the live context influences the relationship between network structure and sponsor recall.

Lastly, in considering Essay 1, we specifically focus on consumer memory papers published in A* level marketing journals. However, consumer memory papers are also prevalent in lower-tier journals. It is possible that areas of research that are largely unaddressed in the A* journals are presented in more specialized or lower-tier journals. While these papers were beyond the scope of our PRISMA review, future research may consider a broader set of journals than considered in this dissertation.

Conclusion

In conclusion, this dissertation presents a review of consumer memory research and includes two applications of modern memory theorizing in an applied context. We examine how consumers respond to indirect marketing efforts by emphasizing the role of memory in consumer behavior. Throughout the dissertation, we highlight multiple theoretical perspectives and use methodologies ranging from a field study and experiments to eye-tracking. It is my hope that the dissertation can serve as inspiration to call for a renewed interest in consumer memory.

Concluding Chapter References

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