TELLING THE AUGMENTED STORY – HOW CAN WEB-BASED AUGMENTED REALITY BE USED IN DESIGNING NARRATIVES FOR BRANDS?

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by

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The undersigned, appointed by the dean of the Graduate School, have examined the dissertation entitled.

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HOW CAN WEB-BASED AUGMENTED REALITY BE USED IN DESIGNING NARRATIVES FOR BRANDS?

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TABLE OF CONTENTS

LIST OF TABLES

Table Page

LIST OF FIGURES

Figure Page

TELLING THE AUGMENTED STORY –
HOW CAN WEB-BASED AUGMENTED REALITY BE USED IN DESIGNING NARRATIVES FOR BRANDS?

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ABSTRACT

The advance of website-based augmented reality (Web AR) enables advertisers to create and lets consumers receive mobile AR (MAR) content easily, necessitating research on Web AR used to design advertising messages and on its effects on different consumer groups. This study examines how a brand story that is designed with high, low, and non-AR content matching through Web AR affects consumers with different levels of imagery ability and captures responses to the story and brand. The sample consists of 290 individuals - sampled to represent the major group of consumers who use AR - recruited by a Qualtrics panel in an online experiment. Results confirm Web AR used to design augmented stories with high levels of content matching outperformed those with low levels of content matching, particularly among those with high imagery ability. Narrative engagement and perceived persuasive intent are two serial mechanisms mediating the interaction between AR content matching and imagery ability on consumers' responses. These findings contribute to advertising theory by providing a constructive theory building block, boundary conditions, and both positive and negative mediating roles, contributing to a more nuanced and comprehensive understanding of AR advertising's effectiveness. This study also found that Web AR provides both potential benefits and drawbacks in practical brand storytelling, suggesting that nuanced strategies for effective

design and potential care should be taken due to possible adverse effects of using Web AR in advertising.

Chapter 1

Introduction

Augmented reality (AR) is a promising technology that allows advertisers to provide consumers interactive experiences with brands without physical or geographic limitations (Fetisov & Talochka, 2022). The global market size of AR, including digital goods (e.g., purchases in AR apps) and ad placements, is projected to reach $88.4 billion U.S. dollars with an estimated 1.73 billion mobile AR (MAR; smartphone, tablets) users worldwide by 2025 (Statista, 2022). Currently, 65% of online consumers use AR to discover and receive product/brand information (Designhubz, 2022), and 90% of brand advertisers are planning to use or are already using AR in their brand advertising campaigns (Bona et al., 2018). Of note is website-based AR (Web AR; using HTML, JavaScript, and CSS web technologies), a novel and popular platfrom used for designing and accessing MAR content. Web AR allows advertisers to create virtual, branded AR content that consumers can interact with easily as never before (Chen & Lin, 2022). The success of Web AR is supported by the fact that it is projected to reach $21 billion in market capitalization by 2024, with 64% of flagship brands having already invested in Web AR (Serebryantseva, 2022).

Advertisers believe that brands can use the immersive and interactive experiences provided by AR technologies to create an emotional connection with users, which will aid in generating better positive associations with the brand (Rogers, 2019). With the flexible uses of AR in advertising, advertisers have integrated AR with narratives to connect consumers with brands by bringing virtual story content into consumers' real worlds (Thakkar, 2021; Skulocal.com, 2019). A good instance of this is the bakery-café

brand Panera's YouMix2 campaign (2020). This campaign allows consumers to interact with virtual objects in the brand's story content of promoting healthy foods and eating patterns—such as illustrating the company's source of food ingredients and introducing their products and services—all while keeping in touch with their physical world via AR filters on Facebook and Snapchat. This example shows that AR has the potential to optimize performance in brand storytelling, since narratives in AR form can combine advertised objects with story content and bring them into consumers' physical surroundings (Realityxd, 2022). AR, therefore, fills the gap between virtual story worlds and real-world environments (Nam, 2015) that was usually bridged by consumers' own imaginations in non-AR stories. Additionally, AR utilizes algorithms to take consumers' dispositional characteristics and personal information (e.g., facial features, room settings, etc.) and design virtual content meant to target consumers (de Ruyter et al., 2020). Thus, consumers do not just read or view story content passively and without participation (Realityxd, 2022); their different dispositional characteristics (e.g., imagery ability) and personal information regarding their physical surroundings could influence the effectiveness of using AR for brand storytelling.

Although AR technology provides a great opportunity for advertisers to promote their brands, only 10% of those that are using AR think that AR is well integrated into their promotion strategies (Boston Consultancy Group, 2020). Viewing AR as a one-size-fits-all tool that can be used in the same way for brands across global markets might be risky (Feng and Mueller, 2018). AR's uses and effects in advertising could be influenced by a number of different factors, such as the media device and channel by which AR is presented (Wafa & Hashim, 2015), the advertising messages with which AR is used

(Feng & Mueller, 2018), and the consumers to whom AR communicates (Eyueboglu, 2011). Thus, to allow consumers to have the unique experience of brand stories through AR-formed content and positively influence their responses toward the brand, advertisers need to know in detail: 1) how to use AR's unique function to design brand stories (Chandukala et al., 2022); and 2) who will and will not be affected by brand stories (Davis, 2020). This provides a potential outline for understanding and using Web AR in advertising, but research has not kept pace and, hence, evidence and clear guidelines for the effectiveness of Web AR in advertising are urgently needed.

Furthermore, some practitioners suggest that the experience of immersion into the virtual, commercial environments facilitated by AR has a dark side, such as creating deceptive (mis)information—to make the advertising more persuasive but less identifiable—and generating unwanted interactions for consumers (Basu, 2016; Heller & Bar-Zeev, 2021). However, the Federal Trade Commission (FTC) still does not have any specific policies for using AR in advertising, which is likely to create a negative impact on consumers (Cook, 2019), thereby justifying examination of its effects. Indeed, the legal battles and new ethical challenges caused by using AR in advertising suggest the urgent need for studies on the negative influences of AR by advertising researchers and for providing guidelines for advertisers (Cook, 2019; Slater et al., 2020).

Studies on the effects of AR's functions (e.g., Smink et al., 2019; 2020; Baek et al., 2018; Feng & Xie, 2019), as well as on AR in conjunction with both advertising messages (e.g., Tsai et al., 2020; Yaoyuneyong et al., 2016) and individual differences in advertising (Hopp & Gangadharbatla, 2016; Baek et al., 2018; Smink et al., 2022), mainly focus on AR's technological aspects at a surface level. These studies investigate

AR in advertising by examining AR's technological applications at the level of medium, whereby consumers' responses are influenced by AR solely as a media device or channel. Consequently, in these studies, AR's functions are not connected to advertisers' work on designing messages or consumers' individual differences in receiving content as a whole communication process. Further, studies that have investigated the underlying mechanisms for explaining why and how AR advertising influences consumers' responses have focused on mediators that demonstrate how AR's technological aspects influence consumers' experiences and their responses toward products or brands (e.g., Sung & Cho, 2012; Yaoyuneyong et al., 2016; Tsai et al., 2020; Mauroner & Best, 2016; Yang et al., 2020; Park & Yoo, 2020; Park & Kim, 2021; Carrozzi et al., 2019) rather than those related to other communication elements (e.g., messages and receivers), leaving gaps in our understanding.

On the other hand, studies have found negative effects of AR related to the use of AR's technological functions in advertising, which might backfire on the products/brands (e.g., Feng & Xie, 2019) or even negatively impact consumers' interests or well-being (Lee & Cho, 2019; Smink et al., 2019). Additionally, the use of AR for commercial purposes has been recognized to potentially create ethical issues related more to advertising itself, such as camouflaging the commercial intent (see Grigorovici & Constantin, 2004) or inciting unnecessary consumption (see Kozinets et al., 2017; Denegri-Knott & Molesworth, 2010). These issues could become even more problematic when advertisers couple AR with specific genres of advertising messages, such as narrative (as used in this study), to make the products or brands more enticing. This might further exacerbate AR's negative impact when advertisers target specific segments

of consumers who may be more susceptible to AR-formed advertising (Yim & Park, 2019).

This study advances from the literature's previous focus on AR at the level of the medium to engage with the levels of message and audience by investigating AR's effects, underlying mechanisms, and potentially negative influences in advertising. In this study, the term "medium" refers to AR, "message" refers to narratives, and "audience" refers to consumers. It thus aims to examine how Web AR (the medium examined) specifically functions with brand stories (the message examined) and how brand stories interact with individual differences of consumers of brands/products advertised via AR (the audience examined), which are highly related to the features of advertising communication. Web AR provides advertisers with more opportunities to design brand stories in an AR format and lets consumers experience the augmented story content in various ways, based on their different preferences and abilities.

This study, therefore, proposes and conceptualizes an "augmented story" as a change in advertisers' storytelling techniques and in consumers' experiences and responses when a virtual overlay of brand story content, combined with consumers' physical surroundings, are designed and viewed. The extent of AR's content matching, which is noted as a message design feature of AR in advertising (de Ruyter et al., 2020), and consumers' imagery ability, which is found to moderate the effects of narrative messages (Petrova & Cialdini, 2005), are proposed to influence the augmented story's effects. Consumers' attitudes toward advertisements and brands, purchase intentions, and self-brand connections are also examined. This study proposes that the well-documented process of narrative persuasion – narrative engagement – is one underlying mechanism

enhanced by the interaction between content matching and imagery ability to further influence consumers' responses. Finally, this study provides a test of perceived persuasive intent that, when delivered via AR, could become lower as a consequence of engaging consumers in a story world becoming problematic for advertisers (Slater & Rouner, 2002; Moyer-Gusé, 2008; Bilandzic & Busselle, 2013; Fitzgerald & Green, 2017). This may demonstrate the possibility of a negative impact and act as an early warning about how augmented stories may infringe on consumers' rights to receive truthful and fair advertising with the problems of unidentifiable information, hidden persuasion, or unethical manipulation.

Research Questions

To conduct this study and address the gaps in the literature, four broad questions are proposed to guide the current research:

> **RQ1:** What are consumers' responses toward ads and brands when virtual story content and advertised objects in the augmented story more or less match with consumers' real surroundings?
>
> **RQ2:** How does consumers' imagery ability influence their responses toward brands using the augmented story? Does imagery ability moderate AR's content matching effects on consumers' responses toward ads and brands?
>
> **RQ3:** How does the interaction between AR's content matching and consumers' imagery ability influence consumers' narrative engagement and further their responses toward ads and brands?

RQ4: How does consumers' narrative engagement influence the perceived persuasive intent of the augmented story and further their responses toward ads and brands?

Research Contributions

This research can contribute to the theoretical development and practical application of AR in advertising and provide a potentially greater understanding of ethical/political concerns pertaining to AR's use by advertisers. In terms of theory, this study has significant value in the theoretical and conceptual domains. One contribution is proposing and explicating the concept of the augmented story to respond to recent calls for conceptualizations of AR advertising (e.g., de Ruyter, 2020). The explication conducted in this research is rooted in advertising and narrative literatures that anchor the theoretical foundation for other researchers interested in studying the augmented story as well as adding and communicating knowledge to advertising and narrative literatures and beyond.

This study also advances the literature on AR and advertising by investigating AR's content mapping, which is proposed to work with narrative messages and further influence consumers' responses. This research represents a potential step forward building on previous works that provide ample findings on the technological effects of AR as a media device or channel. The present study instead focuses on the effects of one of AR's specific functions, content matching, that is coupled with a particular genre of message, narrative, on influencing consumers' responses. This will aid in developing the understanding of AR advertising in detail. This emphasis also facilitates theory building for AR advertising by examining and answering the calls for more AR studies on specific

building blocks (i.e., content matching) proposed in the advertising literature (de Ruyter et al., 2020).

This research also helps to build a theoretical framework that explains when and why consumers respond differently to AR and advertising in terms of their individual differences. In this study's framework, consumers' imagery ability is proposed and examined as a key moderator which influences their responses toward augmented stories and furthers the brands given AR's content matching function. In correspondence to calls for more research on individual differences (Baek et al., 2018; Smink et al., 2022), this study expands the AR and advertising literature by investigating the conditions that influence the effects of AR in advertising - a subfield of communication - and thereby contributing to the broader communication literature.

Importantly, this study identifies and applies the classic theory of narrative engagement used to explain the process and effects of narrative advertising to understand the effects of augmented stories on consumers' advertising/brand responses. In doing so, advances theory development in advertising by adapting, testing, and validating established narrative theory in the technological applications of AR. This is a potentially important undertaking since it provides the needed underlying mechanisms not only aroused by the technological functions of AR, but also by the specific genre of advertising message and individual differences among consumers. To contribute to the narrative literature, this study examines how consumers' narrative engagement can be changed by AR's content matching and consumers' imagery ability to become unique virtual-physical experiences with narrative messages. This updates our understanding of the nature of narrative engagement as well as the process/mechanism of narrative

persuasion while AR is involved, thus uncovering the influence of AR and advertising in a narrative domain.

Though positive effects of AR have been found in previous advertising studies, investigations into the negative consequences of using AR in advertising are urgently needed in advertising literature (Yim & Park, 2019; Slater et al., 2020; Wedel et al., 2020). This study examines the potential camouflaging effects of engaging in a story on consumers' perceived persuasive intent discovered in previous studies (e.g., Slater & Rouner, 2002; Moyer-Gusé, 2008; Bilandzic & Busselle, 2013; Fitzgerald & Green, 2017) in the context of the augmented story, thereby expounding upon ethical and policy implications of advertising in narrative literature.

Practically speaking, this study can benefit advertising practitioners by providing scientific evidence as well as clearer guidelines and suggestions for designing messages and targeting potential consumers while drawing on AR's unique functions. Practitioners will be informed of how AR's content matching can be used to design their brand stories for enhancing consumers' responses, rather than blindly using AR. Further, by examining the effects of content matching, this framework can provide guidance for matching a brand's virtual story content and information with consumers' real-world surroundings. This research can also let practitioners know not only who will be affected, but also who will not be affected by the augmented story, through the examination of consumers' imagery ability. This study therefore can help managers make better decisions about designing augmented stories' messages and targeting audiences, ultimately enhancing understanding of the strengths and potential limits of AR narrative in advertising.

Additionally, this study can inform advertising executives about how consumers experience augmented stories and the process of how consumers are influenced to respond differently toward ads and brands. The investigation on narrative engagement and perceived persuasive intent will help advertisers determine whether augmented stories represent an effective and ethical means of advertising. If the research discovers that consumers engage in the augmented story and easily change their responses toward the ads and brands without paying attention to the persuasive information or intent, then practitioners should be cautious about such deception and find potential solutions for legal or moral ambiguities. Conversely, if this study finds that the augmented story does not persuade consumers in any unwanted negative way, then practitioners can argue for the legitimacy of using augmented stories for advertising when they are facing future policy challenges from the FTC.

This study's value is due not only to its contributions to theory advancement and practice guidance for advertisers but also to its ethical and political implications for researchers, practitioners, and governmental organizations. This study responds to calls for more investigations into the potential negative influence of using AR in advertising for regulation purposes (e.g., Cook, 2019), which can assist in laying the ongoing debate between advertisers and governmental organizations about AR's ethical concerns to rest. By examining the perceived persuasive intent of augmented stories, this study can help move the debate beyond the simple dichotomy of using AR or not and push it into a "gray area" where advertisers can still use AR for commercial purposes, but under regulation. To that end, governmental organizations, such as the FTC, can have a

reference for future legislation and policy establishment related to the potential negative and unwanted consequence of using augmented stories tested in this study.

The remaining chapters of this research include an explication of the main concept used here - namely, the augmented story (Chapter 2), literature review and hypotheses (Chapter 3), method (Chapter 4), results (Chapter 5), and discussion and conclusion (Chapter 6).

Chapter 2

Concept Explication of the Augmented Story

Augmented reality (AR) creates opportunities for advertisers to design advertising messages in a novel way that blends physical and virtual worlds to allow interactive experiences between brands and consumers. Although AR has been defined in various fields (e.g., computer science, engineering, healthcare, communication, education, marketing, etc.) including advertising (e.g., Kim & Kim, 2014; Yaoyuneyong et al., 2016; Baek et al., 2018; Lee & Cho, 2019; Tsai et al., 2020; de Ruyter et al., 2020; Smink et al., 2021, etc.) (see Table 1), it is still expanding its applications in advertising and thus needs corresponding definitions. Studies have not provided definitions for specific types of advertising messages that change their nature due to using AR, making it difficult to design and evaluate their effects accurately. In particular, no study has defined advertising that uses AR in conjunction with narrative messages, even if it is widely practiced in the advertising industry. Technological developments and changes in AR raise the need for new definitions that are used to clearly define and manipulate new applications in advertising (Bergkvist & Eisend, 2022). Hence, it is critical to know how the use of AR technology with narrative messages in advertising constitute the augmented story and to delineate what makes the augmented story unique. To address the concern of precisely identifying, designing, and evaluating the augmented story in the advertising field, this study conducts a concept explication of the augmented story in this section. This definition is then used to develop the hypotheses and to operationalize and examine the effects of the augmented story for advertising/branding purposes in the literature review and method (i.e., experimental design) sections, respectively.

For developing a clear and precise definition, this study follows the recommended procedures for concept explication (e.g., Chaffee, 1991; McLeod & Pan, 2004) to define the augmented story. The first step is reviewing studies in the literature that have conceptualized the concepts related to the augmented story. The augmented story is a concept that comes from connecting AR functions with story structures (Nam, 2015). It, therefore, contains AR and narrative as the two concepts that should be reviewed. Second, one must examine the operational properties related to these concepts which can facilitate the concept's conceptualization. This study examines the operational properties related to the augmented story that were used to operationalize AR and narrative in previous studies across contexts and time. The next step is to develop the conceptual definition of augmented story by abstracting and merging the key components and dimensions of AR and narrative that constitute the augmented story. This is based on the results of the literature review and observation of practices that reveal the connections between conceptual definitions and operational properties of AR and narrative. Finally, the augmented story is defined operationally by searching for empirical indicators from the operational properties. Overall, this study focuses on the components and dimensions of both AR and narrative that can be used to directly manipulate and observe the indicators of the augmented story in the real world.

Literature Review on Definitions

Augmented reality definitions. Previous studies that have conceptualized AR can be traced back to the field of computer science. The original definition of AR was "systems that have the following three characteristics: 1) combines real and virtual 2) interactive in real time 3) registered in 3-D" (Azuma et al., 1997, p. 356). This definition

reveals that AR is traditionally defined by its technological origin and focuses on technological functions. This emphasis influenced the subsequent approach to defining AR, leading theorists to focus on and refine AR's technological aspects. For example, one definition of AR, derived from Azuma et al. (2007), describes an AR system as "one that combines real and computer-generated information in a real environment, interactively and in real time, and aligns virtual objects with physical ones" (Höllerer & Feiner, 2004, p. 2). This definition overlaps highly with the original one but revises the phrase "registered in 3-D" into "computer-generated." This technologically focused approach can cover a broader range of message genres which apply AR technology and can be used to define AR applications in various contexts other than computer science, thereby influencing the development of AR definitions in other fields.

In other fields, the technological functions of AR are retained as the basic elements in their definitions (i.e., combines real and virtual and interactive in real time). However, these definitions of AR also consider elements from a communications perspective (e.g., the messages, receivers, etc.) to define AR used for certain communication tasks. For instance, AR in an educational context can be defined as "a wide spectrum of technologies that project computer-generated materials, such as text, images, and video, onto users' perceptions of the real world" (Yuen et al., 2011, p. 120). This definition adds and emphasizes the forms in which messages are presented and receivers' responses to these presentations. Furthermore, the technological functions and communicative elements in different AR definitions have also been adapted to the specific features of the contexts. For example, in marketing, AR has been defined as "a computer-simulated interactive technology that overlays a projected 3-D visualization of

products on the user's view of the real world" (Yim & Park, 2019, p. 582). In this definition, the 3D objects or computer-generated messages are transformed into "products" for marketing communication.

To analyze the foci of the definitions of a technology-related concept in mass communication contexts, Kiousis' (2002) table cells (see Figure 1) used to explicate interactivity serves a good framework. In this figure, definitions can be categorized according to two dimensions: the object emphasized, and the intellectual perspective originated. Object emphasized means the specific elements focused by scholars in the definitions, including technology, communication, and perceiver elements. Intellectual perspective means the fields/contexts in which these concepts are defined and used, divided into communication or non-communication fields/contexts. This figure can help to 1) categorize and analyze previous definitions of AR in various communication contexts; 2) reveal what is emphasized or decentralized from AR's technological origin; and 3) highlight what is added or removed regarding the communication aspect and further the journey of defining AR in advertising.

In this figure, the definitions of AR that originate from the field of computer science are mostly situated in the top-right quadrant, where technology is emphasized in the non-communication field/context. In the advertising field, the evolutionary route of AR definitions is similar to those in other contexts where AR is used for communication purposes. Unsurprisingly, these definitions usually focus on AR's technological functions at the beginning. For example, scholars had regarded AR as "a concept of supplementing the real world with the virtual world" (Kim & Kim, 2014, p. 386). This can be situated in the top-left area of Kiousis' (2022) graphic, where technology is still the object

emphasized but has begun to be used in the context of communication. Over time, definitions started to emphasize the elements more related to communication. For example, Yaoyuneyong et al. (2016) defined AR as "technology in which virtual information is superimposed over users' perceptions of the real world" (p. 16), which stressed receivers' perceptions in communication. Baek et al. (2018) regarded AR as a "digital technology that imposes computer-generated information such as images and sounds on a user's real-world view" (p. 422), which considered the message types. Lee & Cho (2019) emphasized more communication elements (i.e., message, receiver, and channel) to define AR as "a technology that places augmented 3D images into print ads, which are viewed using an app on consumers' mobile phones or on tablet computers in real time" (p. 22). Compared with the definitions situated in the top-left area of Kiousis' (2022) figure, these definitions start to move downward, where the aspects of communication and perceiver are emphasized more and more within communication contexts. The most recent definitions of AR in advertising have adapted the technological aspect of AR and general communication elements to the advertising context more closely and directly. For instance, AR in advertising is defined as "an advanced form of image interactivity technology that can not only simulate direct product experience but also deliver multisensory (e.g., visual, motion, interactivity), enjoyable brand experience in consumers' own physical environments" (Tsai et al., 2020, p. 245). Smink et al. (2021) identified AR that "enables contextually relevant advertising experiences by overlaying digital content onto the consumer's physical surroundings in real time" (p. 1). From these more recent definitions of AR in the advertising field, the definitional focus is moving toward the bottom-left area in Kiousis' (2022) figure. They tend to associate AR's

technological functions with communicative elements within the advertising context in a more detailed way.

Narrative definitions. Compared with AR, the use of narrative in communication contexts is not a new technique/practice and thus has a longer history. Scholars have defined narrative used in various communication contexts (e.g., health, politics, science, education communication, etc.). For example, Kreuter et al. (2007) defined narrative as "a representation of connected events and characters that has an identifiable structure, is bounded in space and time, and contains implicit or explicit messages about the topic being addressed" (p. 222), a definition which can be used to capture a wide range of story types in health domain. Drawing on various studies on narrative, a meta-analysis of narrative studies in communication contexts defined narrative as "any cohesive and coherent story with an identifiable beginning, middle, and end that provides information about scene, characters, and conflict; raises unanswered questions or unresolved conflict; and provides resolution" (Hinyard & Kreuter, 2007, p. 778). These definitions remain the key message features of narrative (i.e., story elements, identifiable structure, and the topic being addressed), even when narrative is defined and used for different purposes.

Many scholars have also defined narratives used in advertising specifically. The definitions of narrative in advertising not only have already stressed the communication perspective but also have adapted narrative's message features to advertising. For example, Escalas (1998) has conceptualized narrative as a type of ad that tells a story by depicting "one or more episodes consisting of actors engaged in actions to achieve goals" in a "sequence initiated by some events and actions result[ing] in outcome(s)" (p. 273). Chang (2013) adapted this description to define narrative advertising as that which

"depicts product consumption and its consequences or employs plots associated with what people desire, such as romance, achievement, adventure, or hopes" (p. 55). The most recent definition of narrative advertising is "a type of advertisement that conveys the message of interest to the consumer about the brand and product through a plot by using narrative elements such as narrative characters, temporality, and spatiality" (Şahin & Yilmaz, 2022, p. 13). This definition adapts the "topic being addressed" from early definitions into "promoting products/brands to consumer" for the advertising context.

Based on the results of reviewing studies that have conceptualized AR and narrative, the task of defining "augmented story," a type of advertising that connect AR's technological functions with narrative's message features (Nam, 2015), needs to focus on three critical points: 1) keeping AR's essential technological functions and narratives message features used for advertising foregrounded, 2) emphasizing the communication perspective and elements of advertising, and 3) connecting AR's technological functions to narrative's message features in a way that can be adapted to advertising.

Examining Operational Properties

Following McLeod and Pan's (2005) steps for concept explication, the examination of a concept's operational properties from the units of analysis in other studies can help to explain how the concept might manifest in empirical executions and further facilitate the conceptualization in turn. Hence, this study examines the operational properties of AR and narrative in previous studies to conceptualize the concept of the augmented story.

Operational properties of augmented reality. Previous advertising studies have

illustrated that the core aspect of AR that enables its various practical applications in advertising is the contextualization of advertising content (de Ruyter et al., 2020). Contextualization, defined as the ability to tailor content based on consumers' physical environments in real time, connects advertising content with consumers' immediate environments to influence consumers' experiences and responses toward the advertised objects (Zhao & Balague, 2015). Contextualization is proposed to be the critical antecedent for AR evaluations, as it is the core practical design feature of AR advertising (de Ruyter et al., 2020; Zhu & Owen, 2008) and the main reason for its success (e.g., Hilken et al., 2017). According to McLeod and Pan (2005), examining a concept's operational properties in terms of its antecedents shown in previous studies can assist with conceptualizing the concept. Therefore, an examination of the operational properties of AR in terms of contextualization discussed in other studies can help with conceptualizing the augmented story. Studies have identified the three dimensions of contextualization that represent AR's operational properties: context mapping, content matching, and consumer experience (de Ruyter et al., 2020).

Context mapping is the ability to locate physical objects in the consumers' physical environments and compute consumers' perspectives toward these objects when applying AR to advertising practice (de Ruyter et al., 2020). In previous studies that have operationalized AR (e.g., Yaoyuneyong et al., 2016; Tsai et al., 2020; Javornik et al., 2016; Poushneh, 2018; Smink et al., 2019; 2020; Sung et al., 2022), participants first used their mobile devices (e.g., smartphone, tablet) to aim the camera and scan their physical environments. Through this action, context mapping helps to visualize and simulate consumers' perceptions of their real-world surroundings through their eyes and builds a

map for putting virtual advertising content in suitable, correct positions, thereby enabling subsequent AR experiences (Silva et al., 2003). Hence, context mapping underscores that the conceptualization of the augmented story must take consumers' physical environments as the basis that is captured by AR for placing the virtual story content.

Content matching means adapting advertising messages to consumers' physical surroundings in real time (de Ruyter et al., 2020), another operational property of conducting AR advertising. After AR in these studies builds maps of consumers' physical environments and simulates their perceptions, it overlays virtual advertising content onto consumers' real-world surroundings (Yaoyuneyong et al., 2016). Through this process, participants see virtual AR advertising content embed into and connect with their physical environments in various creative executions which provide information fitted to their needs and respond to their actions in real time (de Ruyter et al., 2020). Hence, the operation of content matching in AR advertising practice informs the definition of augmented story that the story elements and structures are presented to consumers based on their surroundings, actions, and needs in real time.

Consumer experience refers to consumers' unique experience of contextualization resulting from real-time context mapping and content matching of consumers' physical surroundings (de Ruyter et al., 2020), which can be discerned from empirical AR operationalizations in previous studies. While consumers are perceiving and freely controlling the virtual advertising content based on and fitted to their physical environments, needs, and actions, they experience a feeling of "non-mediation" (Lombard & Ditton, 1997). This means consumers have the sense of virtual advertising content "being here" in their real-world surroundings, rather than "being there" in the

virtual environment (Wedel et al., 2020), without recognizing the role of media technology in enabling the experience (Wirth et al., 2017). The creation and observation of participants' AR experience in other AR studies facilitate the conceptualization of the augmented story by underscoring that the definition needs to emphasize consumers' unique contextual experience of perceiving story content.

Operational properties of narrative. In the literature surrounding narrative, narrative has been operationalized and examined in numerous studies and various contexts, such as politics, education, health, law, and advertising (Ryan, 2007). Although narrative has been operationalized in different ways based on the studies' purposes and contexts, there are three main operational properties – story elements, an identifiable structure, and the topic being addressed – that can facilitate the conceptualization of augmented story.

Story elements refer to the story events, characters, scenes/settings, and other supporting objects that are jointly used to tell a story (Branigan, 2013). In the operationalizations of story, one or more scenes would consist of characters engaging in actions to achieve goals that are initiated by some events and result in certain outcomes (e.g., Escalas, 1998). Hence, the operationalizations of narrative in previous studies would contain certain story elements and depict their relationships that are designed to work in telling a story (e.g., Escalas, 2003; 2004; 2007; Chang, 2009; 2013). This informs the conceptualization of the augmented story by emphasizing that the virtually overlaid AR contents are the story elements, which have certain relationships with each other and with consumers' physical environments to tell the augmented story.

Identifiable structures mean that stories are typically organized with specific structures to configure story elements into plots for story progression (Polkinghorne, 1995). Among the operationalizations of narrative components in previous studies (e.g., Escalas, 2003; 2004; 2007; Chang, 2009; 2013; Lien & Chen, 2013), two important structural features are chronology and causality. Chronology means that story plots are organized in terms of a series of events occurring over time (Polkinghorne, 1991). Causality means that story plots have events structured based on causal relationships among them to be inferred (Escalas, 1998). For the conceptualization of the augmented story, this means that the virtually overlaid story content is structured based on the chronology and causality of story plots.

The topic being addressed refers to the fact that there is typically a central idea expressed explicitly or implicitly by a story, which usually aims to influence viewers' responses toward the causes and solutions to a problem (Kreuter et al., 2007). In advertising studies, the topics expressed in narratives are usually related to the advertised objects, such as products or brands encouraging consumption by employing plots associated with people's needs and problems that can be solved by consuming the product/brand (Chang, 2012; 2013). This informs the conceptualization of the augmented story by pointing out that the topics and ideas expressed in virtual augmentation are promoting the advertised products or brands.

Conceptual Definition of Augmented Story

Based on the literature review of the previous definitions of AR, which reveals the key points of AR's and narrative's meanings, and the examination of the operational properties of AR and narrative, which informs the conceptualization of augmented story

in advertising context, this study proposes the conceptual definition of the augmented story by the following steps:

The first step is to select and sort out AR's technological functions and narratives' message features from previous definitions. Although there are various ways used to describe AR's technological functions and narratives' message features, they generally share some commonalities. For AR's technological functions, previous definitions have described AR as a technology that "supplements the real world with the virtual world" (Kim & Kim, 2014, p. 386), "allows computer generated virtual imagery to exactly overlay physical objects in real time" (Zhou et al., 2008, p. 193), and "combines real and computer-generated digital information into the user's view of the physical real world" (Olsson & Salo, 2012, p. 2779). What each of the different definitions of AR have in common, even among the differing contexts, is that they speak of "superimposing virtual content over users' real world" from a technological aspect. For narratives' message features, this study has summarized previously that story elements, an identifiable structure, and the topic being addressed are the key message features in narrative definitions.

The second step is to emphasize the communication perspective of advertising for the augmented story. This study focuses especially on previous AR definitions in advertising or the approaches to defining AR in an advertising context. This study finds that the elements described in original AR and narrative definitions should be translated into advertising-related terms specifically. Hence, the "users" in definitions of AR and "topic being addressed" in definitions of narrative are translated into "consumers" and "promotion of a product/brand," respectively for stressing the communication perspective

of advertising.

Third, the definition of the augmented story needs to connect AR's technological functions with the message features of narratives that can be adapted to advertising. The key points resulting from the analysis of operational properties of both AR (i.e., context mapping, content matching, and consumer experience) and narrative (i.e., story elements, structure, and topic being addressed) in advertising practices can inform their connection. These key points are also added to the proposed definition of augmented story in this study. The definition requires that, through AR's technological functions, the story elements and structure 1) are superimposed over consumers' physical environments, 2) are presented based on consumers' real-time surroundings and actions, and 3) can let consumers have contextually realistic and relevant story experiences.

Accordingly, the conceptual definition of augmented story proposed in this study is "a story that superimposes virtual story content over consumers' real-time, physical environments to enable contextual story experiences for promoting a product/brand." This definition highlights the importance of understanding the effects of using AR in conjunction with narrative messages, thereby expanding theoretical discussions and practical applications of AR technology in the advertising domain.

Defining the Augmented Story Operationally

After proposing the tentative conceptual definition, the next step is to define the concept operationally by identifying practices of the concept's dimensions as empirical indicators that can be directly observed or created in the real world of experience (Chaffee, 1991; McLeod & Pan, 2004). Hence, this study searches and investigates AR's

context mapping, content matching, and consumer experience as well as a narrative's story elements, structure, and topics being addressed as revealed in real-world AR advertising practices to define augmented story operationally.

Empirical indicators of augmented reality. In real-world AR advertising practices, context mapping is achieved by four practical techniques used in AR: 1) image classification that uses computer vision and machine learning to recognize, classify, and interpret physical objects for advertisers to understand consumers' real surroundings (Restrepo-Rodriguez et al., 2019); 2) gaze tracking that uses consumers' cameras to records and simulates their eye movement patterns in real surroundings to gain additional insights about consumers' points of view of their physical objects and surrounding environments (van der Meulen et al., 2017); 3) real-time analytics that gathers information and performs analyses of consumers' behaviors towards nearby physical objects for advertisers to learn about the meaning and motivational significance of these objects to consumers (Binetti et al., 2019); and 4) affordance recognition that estimates the relevance and purpose of physical objects to consumers and generates corresponding advertising messages (de Ruyter et al., 2020). Then, AR would instruct/recommend locations to consumers for placing virtual advertising content or connect it with their real-world practices (Stevens, 2019). For example, before consumers put virtual couches in their houses, the designers of the IKEA Place App need to recognize the spaces within consumers' houses and understand how consumers would see and use a couch. Then, the designers can recommend locations (e.g., living room) in which consumers could place the virtual couch. Hence, classifying physical objects, tracking consumers' eye movements, analyzing consumers' behaviors, and estimating the relevance and purpose

of consumers' physical objects for putting advertising messages are the indicators for operationalizing context mapping of the augmented story.

Content matching can be operationalized by three tactics identified by advertising scholars: 1) embedding virtual objects that make virtual advertising content as well integrated into consumers' environments as possible (Hilken et al., 2017); 2) creative executions (e.g., different 3D models, diverse materials like video, and/or methods of overlay such as virtually "trying-on") that are applied to deepen the connection between virtual advertising content and consumers' environments in real-time (Hilken et al., 2017); and 3) fitting information to the task that provides details matching consumers' real-time surroundings, actions, or needs while they are viewing the AR advertising content (Baek et al., 2018). For example, the designers of Panera's YouMix2 (2020) App need to make 3D models of meals to be well placed on a consumer's table. Additionally, the app allows consumers to zoom in/out and rotate the models if they want to inspect the dish to discern what ingredients are in the meals. It can also add extra information (e.g., calories) for illustrating the ingredients of the meals when consumers want to know that. Therefore, the extent to which the augmented story embeds virtual story content, uses creative executions, and fits information to consumers' surroundings, actions, or needs are the indicators for the operationalization of content matching in the augmented story.

Consumer experience is the goal of conducting AR advertising since it allows consumers to feel that they are interacting with real, instead of virtual, advertising content as part of their real environments and in turn, to make the advertising content more personal and relevant (Hilken et al., 2017). For instance, when consumers are virtually trying on sunglasses that fit their faces on Ray-Ban's Virtual Mirror AR website, they

may feel the sunglasses are real and there on their face without noticing the screen and further think the sunglasses are relevant to them. To sum up, the extent to which the augmented story lets consumers feel the story content is contextually realistic, personalized, and relevant to them are the indicators which operationalize consumer experience of the augmented story.

Empirical indicators of narrative. For narrative's real-world practices in advertising, story is operationalized by four elements: 1) events that take place and transform the world from one state into another meaningfully as the basis of the story's plots (Polkinghorne, 1991), 2) scenes/settings that contain temporal and spatial situations to express where and when the story events occur (Murray, 2003), 3) characters that execute specific actions or behaviors to present their personalities, mental attitudes, and relationships within the events (Yong et al., 2013), and 4) other supporting objects such as audio and visual media or stage props that help to tell the story (Phillips & McQuarrie, 2010). Of note is that these story elements compose the basis for telling a story, but they are not always necessary or present in a story, such as when a story is based on a visual or event without characters (Brown et al., 2019). For example, the COVID-19 AR filter on Instagram tells the story of the coronavirus pandemic with pure narration, and there is no main character in the story. Hence, the inclusion of story events, scenes/settings, characters, and/or supporting objects is an indicator of the operationalization of story elements in the augmented story.

Moreover, in storytelling practices, story is structured in three main ways based on the features of chronology and causality: 1) chronological order that arranges and presents the causal relationships among the story events from the earliest to latest points

of their occurrences; 2) backward order that proceeds from the latest to the earliest points of the story's events to lets viewers see the consequences before they see the causes, and 3) non-chronological order that arranges and presents the story events in a certain order for specific understandings of the causal relationships (e.g., flashback, embedded, flashforward) (Ushiro et al., 2011). Therefore, the ways the story events are arranged and presented in terms of their chronology and causality are the indicators for operationalizing the augmented story's structure.

The topics being addressed in narrative practices vary due to the many uses of narrative for different purposes, which can be broadly categorized into solving problems, presenting and resolving conflict, expressing interpersonal relations, and exploring human experience (Ryan, 2007). When a narrative is used in product advertising or brand storytelling practices, the main goal is to convey information about the advertised product and brand, including the creation and evolution of the product or brand, the features of consuming and interacting with it, and the consequences of using it (Solja, Liljander, and Söderlund, 2018). Hence, the indicator for operationalizing the topic being addressed in the augmented story is promoting the product or brand.

Based on the investigation and findings on the empirical indicators of AR's and narrative's dimensions, this study next reviews the literature on AR and narrative, proposes hypotheses, and develops a reliable and valid method to operationalize the augmented story for examining its effects in advertising.

Chapter 3

Literature Review and Hypotheses

Augmented Reality

Augmented reality (AR) is an advanced technology that has been increasingly applied to advertising and is reshaping interactions among consumers, advertisers, and products or brands (Dacko, 2017; Hilken et al., 2017; Javornik, 2016; Yang et al., 2020). Previous studies have examined AR's influence on products such as furniture, costume, cosmetics, automobile, food, toiletries, and so on, in a shopping context, whereby advertisers can deliver information and appealing messages about products while consumers are virtually trying them on (e.g., Smink et al., 2020; Rauschnabel et al., 2017; 2019; Javornik, 2016; 2021; Sung & Cho, 2012; Hilken et al., 2017; Yim et al., 2017; Yim & Park, 2018; Poushneh, 2018; Park & Kim, 2021; Carrozzi et al., 2019; Heller et al., 2019a; 2019b; Yang et al., 2020). While these studies support the use of AR in advertising, they take AR as a standalone media device or channel without connecting it to either the messages or the consumers in advertising that this study mainly investigates. Even studies that have examined the features of a messages (e.g., informative/entertainment values, Yaoyuneyong et al., 2016; imaginative/realistic images, Tsai et al., 2020) or consumers' dispositional characteristics (self-efficacy, Hopp & Gangadharbatla, 2016; narcissism, Baek et al., 2018; demographics, Smink et al., 2022) in AR advertising do not associate the influence of advertisers' work or consumers' individual differences with AR in regard to designing and targeting advertising messages. Instead of focusing only on the media device or channel,

considering the components of advertising messages and audiences is critical to advertising research (Thorson & Rodgers, 2019). This supports the aim of this study to connect AR's specific design features, narrative, and consumers' individual differences in relation to AR and narrative processing in advertising.

Furthermore, previous AR studies have found that AR functions in advertising in four different ways. First, AR allows virtual product try-ons in which consumers can virtually put the products on themselves or in their surroundings to interact with the products and preview their benefits/effects before they make purchasing decisions (Javornik et al., 2016; Hilken et al., 2017). Second, AR provides content visualization that utilizes 3D images and models to let consumers examine and get extra information about products while they are viewing AR content (Zhu et al., 2004). Third, AR offers multisensory modalities that enable consumers to have perceptual interactions with and gain feedback from products in various ways to engender multisensory experiences with products (Heller et al., 2019b). Last, AR stimulates mental imagery generating images based on perceptual information from consumers' minds and transforming them into realistic conditions and ways of using products in their real lives for further cognitive processing and decision making (Heller et al., 2019a).

Yet, these functions are not the core design features of AR that can be used with specific types of advertising messages and would thus make them distinguishable from those in non-AR advertising (de Ruyter et al., 2020). A great example of this is virtual reality (VR). VR advertising messages can also be attached to products which are virtually tried on by consumers (Liu et al., 2020), presented in 3D image format with

products/brands (Oh et al., 2008), shown in various sensorial ways (e.g., visual, audio, or tactile) to interact with consumers (Brengman et al., 2022), and depicted to help with generating consumers' mental images of using products (Loureiro et al., 2022). The key difference here, however, is that messages in VR are in a completely virtual world, while those in AR are still connected with the real world (de Ruyter et al., 2020). Thus, advertisers' work in designing messages and consumers' responses influenced by their individual differences in viewing advertising should differ accordingly.

Additionally, there are three categories of AR platform that have been examined in the literature: 1) AR apps on mobile devices (e.g., Yaoyuneyong et al., 2016; Yang et al., 2020; Tsai et al., 2020; Smink et al., 2019; 2020), 2) AR mirrors at fixed physical locations (e.g., homes, retail stores) (e.g., Javornik et al., 2021; 2022; Baek et al., 2018, Smink et al., 2019; 2020), and 3) AR filters on social media (e.g., Javornik et al., 2022; Ibáñez-Sánchez et al., 2022; Flavián et al., 2021). Web AR on mobile devices is a fourth category not previously investigated in advertising and is therefore a novel channel for conducting advertising in AR format. Web AR using website technologies offers both a very simple, user-friendly design interface for creating (Panou et al., 2018; Yaoyuneyonget al., 2016) and a very convenient and easy way for viewing AR content on websites directly accessed by mobile devices (Nguyen et al., 2019; Qiao et al., 2019). It allows advertisers to have more control and freedom in creating and designing advertising in AR format on their own, without requiring extensive training/knowledge or relying on other professionals in AR programming (Li et al., 2015; Yaoyuneyong et al., 2016). Web AR also affords greater accessibility to consumers, allowing them to view

AR content without installing apps, relying on fixed-point devices (e.g., a computer or smart mirror), or having a social media account (Nguyen et al., 2019; Qiao et al., 2019). This is crucial for shifting the emphasis in the literature, underscoring that advertisers are no longer to passively create messages and target specific audiences for advertising by merely deciding to use AR or not. They can actively design advertising messages via Web AR to promote their products/brands and target consumers with specific individual differences, a move that is highly critical for advertising researchers to understand how the advances in AR technology are changing advertising.

The literature provides evidence of the benefits that AR has brought to advertising, including positive influences on consumers' perceptions of messages' informative and entertaining values (Tsai et al., 2020; Yaoyuneyong et al., 2016; Sung & Cho, 2012; Yim et al., 2017), novelty, effectiveness (Yaoyuneyong et al., 2016), attention/interest (Yang et al., 2020; Lee & Cho, 2019), and attitudes toward ads (Hopp & Gangadharbatla, 2016; Yim & Park, 2019; Tsai et al., 2020; Yim et al., 2017), and consumers' attitudes (Tsai et al., 2020; Hopp & Gangadharbatla, 2016), engagement (Singh & Pandey, 2014), purchase intentions (Baek et al., 2018; Yim et al., 2017; Park & Kim, 2021), and self-brand connections (Baek et al., 2018) toward brands. However, there is also a burgeoning recognition of the negative effects on consumers and ethical issues that AR can bring to persuasion processes as well as the negative consequences resulting from its immerse and virtual-physical combination nature (e.g., camouflaging commercial intent, Grigorovici & Constantin, 2004; inciting unnecessary consumption, Kozinets et al., 2017; and privacy invasion, Kang & Su, 2022). An investigation into

AR's potentially harmful persuasion processes and consequences for the potential legal battles (Cook, 2019) and ethical challenges (Slater et al., 2020) of using AR for advertising is urgently needed and consequently addressed in this study.

This study offers the first examination that specifically focuses on the effects of content matching of Web AR and consumers' imagery ability on processes related to narratives and responses toward brands. Although the literature has explained *what* AR can do to consumers, this study examines *when* and *why* advertisers can use AR to create effective messages and attract potential consumers as well as how advertising could introduce both positive effects and potentially negative influences, a critical ethical issue that remains important to consider while using interactive technologies in advertising (Lombard & Snyder-Duch, 2001; Rodgers & Thorson, 2017).

Contextualization

In advertising literature, various concepts have been taken as the antecedents for explaining the success of using AR in advertising. For example, the interactivity (Tsai et al., 2020), informativeness (Yaoyuneyong et al., 2016; Yang et al., 2020), entertainment (Yaoyuneyong et al., 2016), novelty (Mauroner & Best, 2016), and spatial ability (Jung et al., 2021) of AR have all been used to explain the cause-and-effect relationship between of AR and advertising effects. However, these antecedents are neither the core of AR nor directly deployable for designing messages as they are highly technical with high tech barriers rather than involving messages controlled by advertising. For example, although informativeness can be achieved in advertising by using AR to design messages that provide additional information about the product (Yaoyuneyong et al., 2016), it is not exclusive to AR and can be achieved by advertising on other media, such as Web

advertising (Tsang et al., 2004). Spatial ability is the unique antecedent of AR's effectiveness that recognizes and utilizes the spaces between objects and users for interactions between physical objects and digital content. However, it is achieved by technologies such as GPS (global positioning system) and image classification that are not controlled by advertisers themselves (Jung et al., 2021).

Contextualization, which is the process of real-time adaptation of content based on consumers' real-world, physical contexts in response to their cognitive needs when they are interacting with content in a virtual-physical environment, has been proposed as the core aspect of AR (e.g., de Ruyter et al., 2020; Zhu & Owen, 2008) and one of the reasons for AR advertising's success (e.g., Hilken et al., 2017). It is a concept that has advanced AR studies in the marketing literature (e.g., Wedel et al., 2020; Scholz & Duffy, 2018; Zhu et al., 2004; Zhu & Owen, 2008; Kannaiah & Shanthi, 2015), but it has merely been proposed and has not been thoroughly investigated in advertising. It is a recommended step for studying AR in advertising (de Ruyter et al., 2020), one which will be taken by this study.

Contextualization works in AR advertising through three components that fulfil the real-time modification (adding and/or changing) of consumers' perceived surroundings for the interactions among consumers, environments, and content (Zhu & Owen, 2008).

The first component is context mapping, which utilizes consumers' devices with cameras to scan and locate objects in their physical surroundings and lets advertisers see consumers' real worlds through consumers' eyes (de Ruyter et al., 2020). Context mapping has been studied mainly in the fields of computer science and engineering (e.g.,

Seo & Lee, 2013), and so it features in only a few discussions in the advertising literature (e.g., de Ruyter et al., 2020; Ahn et al., 2022). Studies have illustrated that context mapping is achieved by the techniques of image classification (Restrepo-Rodriguez et al., 2019), gaze tracking (van der Meulen, Kun & Shaer, 2017), real-time analytics (Binetti et al., 2019), and affordance recognition (de Ruyter et al., 2020). Although these techniques used in AR do play important roles in making advertising messages unique compared with those in non-AR advertising, they are usually dependent on and operated by experts in extremely technological fields (e.g., computer science or engineering), rather than advertising message design professionals. Hence, this study proposes that the high-tech barriers of context mapping might be the reason why the research has had such a slow pace in studying AR in advertising. Instead of focusing on context mapping's technological aspect and effects on advertising, to progress the study of how AR can be used in designing advertising messages, research can investigate advertising preparation work at the next stage (e.g., understanding the consumers' real objects, behaviors, and patterns in their physical surroundings).

The second stage after context mapping is content matching, which adapts virtual advertising content to consumers' personal surroundings and cognitive needs (Zhu & Owen, 2008) as the connecting point for creating a virtual-physical world (Nam, 2015). Studies have investigated content matching in various advertising contexts, such as algorithmic/computational advertising (Dave & Varma, 2014; Abd Halim, 2013; Choi et al., 2020), online contextual advertising (e.g., on computer website/page, Zhang & Katona, 2012; Levin & Milgrom, 2010; Anagnostopoulos et al., 2011; or on mobile websites, Jing et al., 2010), native advertising (e.g., Terjesen-Søm, 2014; Wang & Li,

2017), in-stream video advertising (e.g., Li & Lo, 2015; Song et al., 2020), and TV advertising (Wang et al., 2013). However, in these studies, content matching typically means matching the advertising message content with either consumers' behaviors or the virtual media contexts where the advertising messages are presented. There is no study that has focused on matching advertising messages with consumers' physical surroundings, which is the main feature of presenting advertising messages through AR. Content matching works by employing embedding (Hilken et al., 2017), creative executions (Hilken et al., 2017), and information fit to task (Baek et al., 2018) within the scope of AR in advertising. Compared to the techniques of context mapping, these tactics can be operated by advertising professionals based on their knowledge and skills in designing advertising messages. Hence, this study proposes that content matching is the component of contextualization that is highly pertinent to designing advertising messages in AR and should be further studied in advertising research.

The final component of contextualization is consumer experience, which is the unique experience formed after consumers receive content that has been contextually mapped and matched (de Ruyter et al., 2020). It is an indirect, mediated, and virtual experience (Zhu et al., 2004) in which consumers' perceptions or feelings of "non-mediation" (i.e., do not perceive the role of technology) are enhanced due to how their physical surroundings are used to make the AR content more authentic and engaging (de Ruyter et al., 2020). Studies have used telepresence (e.g., Sung & Cho, 2012; Yaoyuneyong et al., 2016; Tsai et al., 2020; Mauroner & Best, 2016) and spatial presence (e.g., Smink et al., 2019; 2020) to study consumers' experiences and have taken them as the underlying mechanisms for explaining why and how AR influences consumers'

responses. These concepts highlight the role of AR in generating consumers' distinctive virtual-physical experience and are helpful in explaining how AR influences consumers' responses in advertising. However, these studies have overly focused on consumers' experiences with AR as the media device/channel solely. They did not consider how advertising messages and consumers' personal differences impacted their experiences of viewing/processing AR content in advertising. Moreover, these studies have looked exclusively at the bright side of consumers' experiences with AR in advertising. However, studies also suggest that AR could engender consumer experiences with negative impacts (e.g., perceived intrusiveness and privacy concerns, Feng & Xie, 2019). Therefore, this study proposes that to deepen the understanding of consumers' experience as the underlying mechanism for explaining the effects of AR on advertising, it is critical to examine consumer experience by considering specific aspects of AR, advertising messages and consumers' individual differences, and AR's potential dark side.

This study envisions augmented story's interactive nature and effects through contextualization and proposes content matching as the design feature that can be directly manipulated by advertisers on Web AR and that can engender consumer experiences, containing both positive and negative meanings, and further influence consumers' responses.

Augmented Story

The current research is based on Nam's (2015) idea that AR allows consumers direct control over story content interwoven with and tailored to consumers' changing settings and personal needs in real time to generate positive story experiences. The augmented story is conceptualized in this study as a change in consumers' responses

when they are viewing a virtual overlay of story content onto their physical surroundings. Although the augmentation reflects an actual story, AR renders the content contextually aware (Zhu et al., 2004), interactive, and personalized to individuals (de Ruyter et al., 2020).

The augmented story is contextually aware since the story content is blended with both virtual overlays and real objects. They are not like stories in other media contexts which contain/present purely virtual story content. For instance, "Genie in a Bottle AR" projects the 3D objects of TruLyfe's supplement bottles, as well as fruits and plants which represent the supplements' ingredients, onto consumers' dining tables to tell the story of how the brand produces the supplements.

The augmented story becomes contextually interactive by allowing consumers to directly control the story content based on their contextual choices and actions in their physical surroundings. A story in standard formats present its contents by placing them at given locations without handing over any control to consumers. At most, it can only let the interaction happen in a completely virtual story world without considering consumers' real-time surroundings and movements. Taking Panera's AR filter as an example, when consumers yawn into this filter, it triggers a virtual sunrise. In the next scene, when consumers flip their cameras over, a steaming cup of hot coffee and wrap are served up on a digital tray, accompanied by an introduction to this meal.

The augmented story is also contextually personalized in that its content is tailored to consumers' personal needs for understanding the story. Story content in

other media is usually presented in a uniform way without personalization. Even though some content can be personalized, the personalization is not related to consumers' contextual actions or needs. For example, when consumers are in a bar wondering what wine fits their taste best, they can place a virtual distillery and life-size wine bottles on the bar counter via the Patrón Experience AR App. The app will present the story of the drink's unique features, aging processes, and tasting notes of different types of tequila while consumers are ordering them.

Through contextualization, consumers can: 1) choose where, when, and how to view the story; 2) receive story content joined with their real temporal and spatial surroundings; and 3) experience story content based on their personal needs. Augmented stories thereby put story content around the consumers, who feel they are in the story's world, and the story is also around them in their surroundings, which enhances consumers' virtual-physical experiences.

Compared to other platforms, augmented stories created by Web AR, which allows for more control over designing AR content (Panou et al., 2018; Yaoyuneyonget al., 2016), enable advertisers to embed story content in consumers' surroundings and fit it to their personal needs. Consumers also have greater accessibility to AR content through Web AR (Nguyen et al., 2019; Qiao et al., 2019), which allows them to enter the story world and put the story content around them more easily. The effects of the ways and extent to which advertisers make the augmented stories' content match with consumers' contextual choices, surroundings, and needs through Web AR are critical and require further examination. Consumers also have greater accessibility to AR content through

Web AR (Nguyen et al., 2019; Qiao et al., 2019), which allows them to enter the story world and put the story content around them more easily.

Content Matching of Augmented Story

Web AR enables the virtual modification of a narrative, which allows advertisers to promote brands in a more meaningful way by creating an immersive brand story (Snyder, 2021; Singh, 2022), a story that conveys information about the brands' creator and evolution, or the consequences of using the brand through events with a theme, plot, causality, and temporality (Solja et al., 2018). A brand story has been found to be an effective way to positively influence consumers' responses (i.e., ad attitude, brand attitude, self-brand connection, purchase intention) (e.g., Escalas, 2004; Lim & Childs, 2020; Granitz & Forman, 2015; Panigyrakis et al., 2020; Chand & Fei, 2021). This is because consumers fit their life experiences into a story to interpret the meanings ascribed to brands, an act that further builds connections between consumers and the brand and allows them to take on the perspectives of the brand story (Escalas, 2004).

Content matching works by realistically embedding virtual objects into consumers' real-world settings, using creative execution to deepen the connections between virtual content and consumers' environments, and fitting information to consumers' needs while viewing AR (de Ruyter et al., 2020). Based on the conceptualization of the augmented story, contextualization that augments the real world with virtual content (de Ruyter et al., 2020) makes consumers' surroundings become the settings of augmented stories and brings story content around them. Story settings and content are critical and influence consumers' viewing experiences and subsequent responses (Appel & Richter, 2007). This study argues that the content matching of

augmented stories alters how consumers' physical environments are used as story settings and how advertisers design story content. It plays a key role in influencing consumers' experiences of augmented stories and interpretations of brands' meanings. This affects how consumers take on the perspectives of brand stories and build connections with brands.

This study examines consumers' ad attitudes, brand attitudes, purchase behavioral intentions, and self-brand connections as the main outcomes of viewing augmented stories with different levels of content matching. This is based on the idea that the key elements of storytelling (e.g., setting, content, plot) designed by advertisers can change how consumers process experiences of brand stories and their responses toward brands (Houghton, 2021). Story settings that match consumers' environments with which consumers are already familiar can increase the persuasiveness of the story (Green, 2004; Avery & Ferraro, 2000; Dal Cin et al., 2004). Relatedly, story content can stimulate consumers to relate the story events to their personal experiences and positively affect consumers' story-consistent beliefs, attitudes, and behaviors (Shank, 1990; Shank & Abelson, 1995; Escalas, 2004). This study anticipates that when content matching is high (vs. low) in the augmented story, consumers' personal surroundings will become well utilized story settings for telling the brand story. The brand information and advertising messages will be well embedded, presented by creative execution connecting with consumers' surroundings, and fitted to consumers' tasks and needs while they view the augmented story. This will help consumers fit their life experiences into the augmented story, relate the brand's meaning to themselves, and eventually have stronger ad and brand attitudes and purchase behavioral intentions and connections toward the brand.

Conversely, the augmented story with a low extent of content matching means that consumers' personal and familiar surroundings will not be well utilized story settings while telling the brand story. The brand information and advertising messages will be poorly embedded, presented with executions disconnected from consumers' physical surroundings, and mismatched with consumers' tasks and needs while viewing the brand story. This will make consumers cognizant of the mismatch—or even conflict—between the story content and their life experiences. Consequently, a low content matching augmented story will impede consumers' interpretation of the brand's meaning and result in poorer ad attitude, brand attitudes, behavioral intentions, and connections toward the brand.

For instance, the 3D wine bottles in the Patrón Experience AR that are well placed on consumers' dining tables and filled with tequila that changes its colors when consumers are wanting to know the unique features of different types of tequila will help consumers to experience and get meanings from the brand story. In contrast, if the wine bottles are placed on the floor and added with colorless liquids that do not match consumers' needs for knowing the tastes of Patrón's tequila, consumers will not have a great viewing experience or get the meanings from the brand story.

To summarize, this study expects that the augmented story with high content matching (vs. low) can better embed brand information in consumers' familiar settings, use effective creative executions, and fit with consumers' needs. This can engender better responses toward the brand, which cannot be achieved by a low content matching augmented story, as proposed in hypothesis 1 (see Figure 1 for the conceptual model of hypotheses):

H1: Participants exposed to the augmented story with high content matching (vs. low and non-AR) will have higher a) ad attitudes, b) brand attitudes, c) purchase intentions, and d) self-brand connections toward the brand.

Consumer Imagery Ability

If content matching controlled by advertisers through Web AR can influence augmented stories' effects on consumers' responses, to whom with specific dispositional features will it be more effective? Web AR enhances the ease and accessibility of viewing AR content on mobile devices by avoiding the hassle of downloading an app or having a social media account (Nguyen et al., 2019; Qiao et al., 2019). This provides advertisers a much more efficient way to reach consumers but also increases the importance of investigating consumers' characteristics to identify and target effective audiences for transmitting advertising messages through Web AR (Valjus et al., 2012; Qiao et al., 2019).

Consumers' imagery ability is the dispositional ability to create vivid mental images of story events and has been found to be an important individual difference in influencing narrative's effects (Zheng & Phelps, 2012; Zheng, 2014). It is consumers' internal process of generating sensory representations of perceived information (Fenigstein et al., 1975; Petrova & Cialdini, 2005; 2018) that influences consumers' story content processing and their subsequent responses (Zheng & Phelps, 2012; Zheng, 2014). Studies (e.g., Bone & Ellan, 1996; Petrova & Cialdini, 2005) have found that consumers with high imagery ability (high imagers) tend to and are more able to create the images of story events with their own minds, and thus their responses (e.g., attitudes and behaviors)

are less influenced by external aids (e.g., audio and visuals) when depicting the story. On the contrary, those with low imagery ability (low imagers) have more difficulty creating mental images by themselves and rely on supplementary depictions to imagine the story content and further change their responses.

Providing consumers with commercial images of consuming products or brands in media could increase the ease of the imagining process and, consequently, the accessibility of mental representations of story content, which would influence decision making (Petrova & Cialdini, 2018). This suggests that consumers' imagery ability and the supplemental story depictions provided in media will interact with each other to influence consumers' imagination of the story content and further influence their viewing experiences and responses toward the story. Compared with the functions of non-AR media (e.g., storybooks, videos, etc.), content matching can provide stronger external-depicting aids for consumers' imagination of augmented stories' contents created by Web AR. Content matching that works to adapt augmented contents with consumers' physical surroundings in real time (de Ruyter et al., 2020) can put story content around consumers who feel they are in the story world, and the story is also around them in their surroundings. This will help with consumers' imagination processes for generating mental images of augmented stories' contents in their real-life experiences.

However, this study predicts that content matching is not effective on all consumers. Consumers' different levels of imagery ability will moderate the effects of content matching in augmented stories. Low imagers have difficulty in creating images and tend to rely on external aids to imagine the story content (Petrova & Cialdini, 2005; 2018). Hence, content matching in augmented stories is more helpful for consumers with

low imagery ability, as it will help them imagine the story and further influence their responses. When low imagers are viewing high (vs. low) content matching augmented stories in which story content is well-embedded, connected, and fitted to their personal surroundings, tasks, and needs, they will have better responses toward the brand. On the contrary, high imagers can easily create mental images by themselves (Petrova & Cialdini, 2005; 2018) and invest less in media for their imagination process (Green et al., 2004). Hence, content matching might not be helpful for consumers with high imagery ability, as they can and prefer to use their own minds to imagine the story events happening in their real lives regardless of whether they are viewing high or low content matching augmented stories.

In short, consumers' imagery ability is hypothesized to interact with content matching such that, compared with low imagers, the effects of high content matching on high imagers' responses will be impaired, as articulated in hypothesis 2:

> **H2:** Participants' imagery ability will moderate the effects of augmented story's content matching on participants' responses such that high content matching effects on a) ad attitudes, b) brand attitudes, c) purchase intentions, and d) self-brand connections will be stronger among participants with low (vs. high) imagery ability.

Narrative Engagement

Narrative engagement, or transportation, is used to describe consumers' experiences of "absorption into a story" (Green & Brock, 2000, p. 701) and to explain the process of narrative persuasion. It is consumers' experience of understanding, being pulled into, and emotionally engaging with a story and temporarily losing awareness of

the real world that influences their responses (Busselle & Bilandzic, 2009). Narrative engagement works by consumers' mental imagery of imagining themselves undergoing story events in their real lives (Chang, 2013) and vicariously experiencing the story characters' thoughts and feelings transferred to their own minds (Green, 2004).

AR has a high performance in regards to mental imagery since it can help to generate and transfer consumers' mental images of the virtual content and to match them to their existing environments, which in turn assists consumers' decision-making processes (Heller et al., 2019a). A high extent of content matching means that virtual content is well embedded, connected, and fitted to consumers' physical surroundings, tasks, and needs (de Ruyter et al., 2020). Hence, this study expects the augmented story with high (vs. low) extent of content matching will better help with mental image generation and transfer to enhance consumers' engagement with the augmented story and further have stronger responses toward the ad and brand.

Additionally, AR provides a first-person perspective for consumers viewing virtual content overlaid onto their real world, which can positively influence their responses (Rochlen, 2017). This lets consumers not only relate to the characters, but also become the primary character and have first-hand experience of contextually matching the virtual content with their personal surroundings. Consumers are more likely to process contextually relevant information and alter their responses (Olsson et al., 2013). This study predicts that the augmented story with a high extent of content matching, one that matches story content with consumers' contextual objects, behaviors, and needs well, can boost consumers' experiences of thinking and feeling as a character in the story. This

will strengthen consumers' narrative engagement and eventually their story-consistent responses toward the brand.

However, content matching's effects on narrative engagement will also be moderated by consumers' imagery ability, as consumers' processing of narrative is found to be influenced by their ability in generating the mental images of, thoughts relating to, and feelings on the story events (Petrova & Cialdini, 2005). Low imagers who prefer and need external aids for their imagination process (Petrova & Cialdini, 2005) will rely on the augmented story with a high extent of content matching to create and transfer mental images and to think and feel as the story characters. High imagers who gravitate towards exerting their own ability—rather than relying on external depictions—to image the story's contents (Petrova & Cialdini, 2005) will supply their own mental imagery and become the characters by themselves, regardless of whether they view the augmented story with a high or low extent of content matching. Hence, this study predicts that consumers' engagement, which is facilitated by the augmented story with high levels of content matching, will only influence the responses of low imagers—and not high imagers—toward the ad and brand, leading to hypothesis 3:

> **H3**: Narrative engagement mediates the interaction between content matching and imagery ability (i.e., mediated moderation) on a) ad attitudes, b) brand attitudes, c) purchase intentions, and d) self-brand connections toward the brand.

Perceived Persuasive Intent

Consumers' perception of the persuasive intent of narrative is one of the processes occurring after consumers engage with a story and further influences their responses

toward the advertised objects (Bilandzic & Busselle, 2013). When persuasive messages are well embedded in the story content, letting consumers engage in the story world without noticing them, consumers' perceptions of the messages' persuasive nature are reduced (Moyer-Gusé, 2008). The decrease in perceived persuasive intent would help with mitigating consumers' resistance to persuasive messages and, therefore, increasing the likelihood of attitudinal and behavioral changes (Moyer-Gusé & Nabi, 2010).

AR as a highly immersive technology can decrease or even completely mask persuasive intent (Pase, 2012). The augmented story can use Web AR to achieve a high degree of content matching that better embeds and connects advertising messages to consumers' surroundings as the story settings and better fits them to consumers' tasks and needs while viewing the story. This will let consumers feel they were in the story world and pay less attention to the advertising messages' persuasive nature. Therefore, when consumers are highly engaged in the augmented story world that is facilitated by a high extent of content matching, their perception of the story's persuasive intent will be decreased, and they will subsequently have stronger responses toward the ad and brand. Thus, this study proposes (see Figure 2 for the conceptual model of hypotheses):

> **H4:** Perceived persuasive intent mediates the influence of narrative engagement on a) ad attitudes, b) brand attitudes, c) purchase intentions, and d) self-brand connections toward the brand.

Chapter 4

Methodology

Study Design

To test the hypotheses, this study conducted a between-subject online experiment with three AR content matching conditions: high content matching, low content matching, and non-AR (control) brand story. Since AR overlays virtual content onto consumers' real life personal environments, it was both important and valid to conduct an online experiment (vs. laboratory experiment) to let participants view the stimuli in their own physical spaces for reflecting real-world AR advertising practices and contexts (see Geuens & De Pelsmacker, 2017). Claims about healthy foods and eating awareness, as one of the biggest issues used by advertisers for promoting brands (Koinig et al., 2022), were selected as this study's context. This would help to enhance the mirroring of the real-world advertising context and study the effects of Web AR on health promotion while advertising the brand. This study reports all manipulations, measures, and exclusions used in the experiment.

Participants

Out of 368 U.S. participants recruited through a third-party (Qualtrics) research panel, the final sample was narrowed down to 290 participants (44% male; average age = 29.69, *SD* = 8.76) in total. Specific exclusion criteria were used for the experiment's validity. Excluded were 78 participants who a) made multiple attempts/exploited virtual private servers (VPS) with the same or concealed IP addresses (n = 4, see Dennis et al., 2020; Anwyl-Irvine, 2020); b) were speeders, procrastinators, or straight liners (n = 11,

see Ford, 2017); or c) failed instructional manipulation (n = 27), attention (n = 16), mobile audio function (n = 18), or CAPtcha bot (n = 2) checks (see Anwyl-Irvine, 2020). Participants were a) native English speakers born in the U.S. to control for the language barrier while viewing stimuli (Manzur & Jogaratnam, 2007); b) 18–44 years old, the main age group using AR (Statista, 2022); and c) using a mobile device for accessing Web AR (Qiao et al., 2019). For the study to have 95% power to detect a medium effect of 25%, with a significance level of .05, at least 75 participants were in each of the three conditions (see Little, 2013). The final sample satisfied these requirements. Participants were offered monetary compensation after receiving approval by the researcher's internal review board (IRB) and participant consent before proceeding.

Stimuli and Design

The main purpose of this study is to examine how high or low extents of content matching augmented through Web AR and non-AR influence the responses of consumers with high or low levels of imagery ability to otherwise identical stories. The augmented story is defined as a 3D story that presents a storyline, visual objects, and other story elements overlaid onto participants' physical surroundings in real-time. The stimulus was a story of a healthy food brand using a previously tested fictitious brand name (i.e., Situs, see Rodgers 2003). The augmented story was created with the JigSpace Web AR platform and pre-tested on both iOS and Android mobile device systems (see Anwyl-Irvine, 2020). The story content (see Appendix A) was designed by adapting a step-by-step guide and template for building a genuine brand story in real life industries (Paul, 2020). The brand story was organized into five chapters centering on: 1) the

user/audience that the brand targets through identifying consumers' needs/problems, 2) the solutions to these problems, 3) the features of the brand, 4) the actions that the brand calls for consumers to take, and 5) the results/effects achieved by using the brand.

To increase the story's credibility and validity, the content/information regarding the claims about healthy eating and food were based on recommendations by credible health organizations (e.g., WHO, CDC) and evaluated by a licensed physician specializing in nutrition. The brand story was also evaluated by advertising agencies who have created brand stories used in their advertising campaigns.

Independent variables. The experiment consisted of one primary manipulation, i.e., content matching (high vs. low vs. non-AR) and one moderator (i.e., imagery ability) as the two independent variables to examine their relationships with consumers' responses toward the augmented story and brand. Since this study is the first to examine AR's content matching in advertising, there is no existing way to directly manipulate content matching in advertising literature. Therefore, a procedure was developed based on the prior definitions and operational practices of content matching. Content matching was operationally defined as adapting advertising messages to consumers' real-time surroundings, and two dimensions that considered advertisers' practical techniques were used: embedding virtual objects and fitting information to consumers' tasks (see de Ruyter et al., 2020) were used. These two dimensions rely on the programming of AR and the messages designed and information provided in advertising, including advertisers' instructional, imperative messages in advertisements. For example, the messages instructing consumers to use their imagination for processing the product

information is one way to manipulate consumers' vivid imagery of the products in advertisements or stories (see Petrova & Cialdini, 2005; Keller & Block, 1997; Krishnamurthy & Sujan, 1999; McGill & Anand, 1989). In the same manner, this study applies instructional manipulation (Oppenheimer et. al. 2009, see Figure 3 for details) in conjunction with advertising messages shown in the augmented story to manipulate content matching.

The high content matching condition augmented story thus asked participants to place 3D objects (e.g., plates of meal, food ingredients) on a dining table where was appropriate for placing foods/meals, and provided the models and information based on participants' temporal and spatial surroundings (e.g., slim steak is good on your dining table) (see Figure 4). The low content matching condition augmented story asked participants to place 3D objects on the floor which was unsuitable for food/meals/ingredients (e.g., put meat on the floor) and provided information unrelated to participants' temporal and spatial surroundings (e.g., meals'/foods' names such as "classic can Coca Cola") (see Figure 5). As for the control (non-AR) condition, a non-AR story is defined as lacking the AR features manipulated by creating an identical narrative for balancing internal and external validity (Geuens & De Pelsmacker 2017). Based on similar procedures from previous studies (see Hilken et al., 2017; Smink et al., 2019; Yaoyuneyong et al., 2016; Yim & Park, 2019), the non-AR story was manipulated in a 2D video with a black background to ensured that content matching, as one dimension of contextualization enabling AR, was controlled.

Imagery ability, as another independent variable moderating the effects of Web AR's content matching, was measured by employing the previously used, validated, and updated Vividness of Visual Imagery Questionnaire (VVIQ) to access participants' dispositional differences in imagery vividness (Marks, 1973; Petrova & Cialdini, 2005; Campos & Pérez-Fabello, 2009; Campos, 2011). In regard to the visual modality, this scale has been used to demonstrate the impact of consumers' dispositional imagery ability on processing narrative messages (e.g., Isberner et al., 2019; Gavilan & Avello, 2021; Adkins, 2017) and responses toward extended reality technologies (e.g., AR, Gaggioli et al. 2005; Chiquet et al., 2022; and VR, Park, Choi & Rhee, 2021). This matches the purpose of studying consumers' imagery ability and its effects on narrative using AR technology and is thereby justifiable in this study.

Procedures

There were two phases of the protocol of the experiment: a pilot study, followed by the main experiment. The pilot study tested logistics (e.g., the amount of time to completion) and confirmed the validity of the experimental manipulation with an early data set, which informed the main study. Twenty students (65% female, average age 30) at a large midwestern university were asked to view the augmented stories, complete the survey, and answer open-ended questions about the suggestions for improving the experiment. The content of augmented stories and scales were revised accordingly (e.g., letting the instruction "Please find, sit comfortably, and place the 3D models on your table/the floor" repeat in the voice narration at the beginning of the story). The augmented stories were tested on the primary systems used on mobile devices (i.e., iOS

and Android) and ensured to be working properly (see Anwyl-Irvine et al., 2020). The early data showed that the manipulation of content matching and scales used in this study were promisingly successful and valid for the main study.

In the main study, participants were directed to the online experiment on Qualtrics.com where they were asked to give consent and then randomly assigned to either 1) the high content matching, 2) the low content matching, or 3) the control condition. To minimize unintended variations in exposure to stimuli, specific procedures were used. Each participant 1) viewed a 10-second video followed by two forced-response multiple-choice items (i.e., What did you hear/see in the testing video?) to verify the audio functionality of participants' mobile devices and that behaviors outlined in the instructions were followed; 2) took the pre-exposure survey of imagery ability, as the vividness of the imagery to the participant would be influenced if they were exposed to the stimuli before self-reporting their imagery ability (Marks 1973); 3) followed the instructions to view story stimuli automatically opened in the topmost new window on participants' mobile devices as a control feature (Hastall & Knobloch-Westerwick, 2013); 4) responded to instructional manipulation check questions (e.g., Did you follow the instructions to view the AR advertisement successfully? Where did you place the 3D models of the AR advertisement on?) (see Oppenheimer et al. 2009); 5) completed three additional measures to verify that their attention was focused on story content (i.e., How many chapters in total did the Situs advertisement have/would you say you viewed in total?; In the Situs advertisement you just viewed, which of the items below is true?); 6) responded to the post-exposure survey and an open-ended question to solicit any issues

that might have arisen during the experiment; and last, 7) were debriefed and thanked for their time.

Measures

Four general types of measurement were used in this study (see Appendix B for all measurement scales/items used in this study): 1) a measurement of independent variables (manipulation check for content matching; dispositional imagery vividness measure for imagery ability); 2) a measurement of story-related responses (narrative engagement and perceived persuasive intent); 3) a measurement of advertising-related responses (ad attitudes, brand attitudes, purchase intentions and self-brand connections); and 4) measures of covariates and demographics.

Manipulation check and moderator. Since there is no existing scale for measuring AR's content matching, the operational definition, properties, and sub-dimensions of content matching in the advertising literature (de Ruyter et al., 2020) were used to develop a 7-point Likert scale measuring participants' perceptions of content matching ($\alpha = .88$; $\omega = .88$, [confidence intervals, CI = .85, .91]; three items) manipulated in this study. As for the imagery ability, 16 items from the VVIQ ($\alpha = .95$; $\omega = .95$ [CI = .93, .96]) measured participants' dispositional imagery vividness of four specific scenes/images (i.e., four items for each scene/image, Marks 1973; Petrova & Cialdini, 2005; Campos & Pérez-Fabello 2009; Campos, 2011).

Story-related responses. Participants' narrative engagement ($\alpha = .85$; $\omega = .87$ [CI = .84, .89]; six items adapted from Busselle & Bilandzic, 2009) and perceived persuasive intent ($\alpha = .52$; $\omega = .57$ [CI = 51., .59]; three items adapted from Moyer-Gusé, 2008;

Wang & Shen, 2019) toward the augmented story were measured with 7-point Likert scales. These two scales have been used and validated to measure consumers' narrative engagement and perceived persuasive intent toward narratives in the context of persuasion. This matches with the study's purpose of using narrative in conjunction with AR technology to advertise brands and promote health behaviors. Specifically, Busselle & Bilandzic's (2009) scale was reduced from twelve to six items to remove the items measuring participants' engagement with the characters. This is because AR makes users become the main character by letting them view and interact with the story from a first-person perspective (Barhorst et al., 2021), and there were no other characters in the augmented story.

Advertising-related responses. As noted, advertising was defined in terms of brand storytelling. Participants' attitudes toward the ad ($\alpha = .91$; $\omega = .91$ [CI = .89, .93]; six items from Bergkvist & Langner, 2017), brand ($\alpha = .93$; $\omega = .93$ [CI = .91, .95]; eight items from Spears & Singh 2004; Bergkvist & Langner, 2017), purchase intentions ($\alpha = .95$; $\omega = .95$ [CI = .93, .96]; three items from Spears & Singh 2004), and self-brand connections ($\alpha = .95$; $\omega = .95$ [CI = .94, .96]; seven items from Escalas, 2004) were measured with 7-point Likert scales adapted from previously used, tested, and validated scales in the advertising literature.

Covariates. A total of six covariates identified in previous studies were used to reduce potential confounds in data collection (Geuens & De Pelsmacker, 2017) regarding the augmented story on which this study focused. The covariates were categorized into two groups in terms of AR technology and narrative as the two major components

combined into the augmented story. Participants' responses could differ depending on pre-existing perceptions and individual differences in using AR technology (Gatter et al., 2022). Hence, the first four covariates related AR technology were participants' privacy concerns about using AR (α = .86; ω = .86 [CI = .83, .89]; five items from Feng & Xie, 2019), and three demographics, including educational level, gender and age that have been found as the representative individual differences of the population influencing AR technology adoption (Smink et. al 2022).

In online experiments, participants might misrepresent themselves as having completed the contents or face some uncontrollable issues with viewing the augmented story that could further influence the results (Ford, 2017). Therefore, the last two covariates measured were the extent of participants' completion (one item) and fluency (Chang, 2013) of viewing the augmented story (α = .88; ω = .88 [CI = .85, .91]; three items from Germelmann et al., 2020).

Chapter 5

Results

Manipulation Check

The statistics package with analysis of variance (ANOVA) in the R Studio (4.3.0.) statistical software was used to check the manipulation of content matching. ANOVA results showed that participants' perceptions of contact matching were significantly different among high, low, and control conditions ($F(2, 287) = 42.16$, $p < .001$, $\eta^2 = .23$ [CI = .16, .29]). Participants' contact matching perceptions in the high content matching condition ($M = 5.47$, $SD = .99$) were higher compared with those in the low content matching condition ($M = 4.78$, $SD = 1.21$, $p < .001$) and those in the control condition ($M = 3.93$, $SD = 1.34$ $p < .001$). Participants' contact matching perceptions in the low content matching condition were also higher than those in the control condition ($p < .001$). These results of ANOVA indicated that the manipulation of content matching was successful.

Analytic Procedure

The lavaan package utilizing structural equation modeling (SEM) (Rosseel, 2012) was applied to test all hypotheses. The effects of the two independent variables regressed on multiple mediating and dependent variables were estimated at the same time, which was more comprehensive by examining the effects among a set of variables (Collier 2020). The robust Maximum Likelihood (MLR) was applied to estimate the hypothesized model (Figure 2), which included content matching and imagery ability as the independent variables, ad attitudes, brand attitudes, self-brand connections, and purchase

intentions as the dependent variables, narrative engagement and perceived persuasive intent as the layer one and two mediators, respectively, and AR privacy concern, story fluency and completion, and consumers' demographics (education, gender, and age) as the covariates. All variables were regressed on the proposed covariates and demographics to control for the potential confounds on the outcome variables. The effects of the content matching were assessed by creating a dummy variable for each experimental condition (high and low) with the control (non-AR) condition as the referent group. The interaction term between content matching and imagery ability was created at the item level, which was orthogonalized to restrain the correlated residuals between items to zero (see Schoeman, 2021).

This study applied two major methods to determine statistical significance for each hypothesized path. First, a series of nested models were specified in which each path was constrained to zero (iteratively) and the resulting increase in the chi-square estimate of model misfit was compared to the critical value of chi-square on one degree of freedom (see Holbert & Grill, 2015). This presents a formal test of the null hypothesis that the actual value of the path is zero. Second, the 5000-bootstrapped confidence interval for each path was inspected. A confidence interval that does not include zero is the evidence in favor of the research hypothesis. Mediation was tested using 5,000 bootstrapped sampling confidence intervals for the product of the direct and indirect effects (Preacher & Hayes, 2008).

Based on the recommended criteria of model fit indices (see Hu & Bentler, 1999; Cho, 2020), the results of confirmatory factor analysis for the initial measurement model

showed the model fit was acceptable ($\chi^2(1106) = 1963.323$, $p < .001$, CFI = .905, NNFI/TLI = .900, RMSEA = .052 [CI = .048, .055], SRMR = .057). Parceling was used to minimize correlated error terms and preserve just identification for the variables measured by more than three items (see Little et al., 2013). The model fit of the parceled measurement model was improved ($\chi^2(150) = 229.649$, $p < .001$, CFI = .981, NNFI/TLI = .978, RMSEA = .047 [CI = .034, .058], SRMR = .041). The global model fit of the initial hypothesized model ($\chi^2(262) = 510.061$, $p < .001$, CFI = .962, NNFI/TLI = .949, RMSEA = .053 [CI = .045, .062], SRMR = .080) was acceptable. However, the local model fit statistics (e.g. modification indices and the residual matrix) was inspected to identify potential misspecification masked by global fit (see Goodboy & Kline, 2016). The inspection of the modification indices revealed a potential re-specification. Narrative engagement was associated with perceived persuasive intent (B = .728, *SE* = .136, $\Delta\chi^2 = 22.256$, $p < .001$) and ad attitude was associated with brand attitude (B = .733, *SE* = .070, $\Delta\chi^2 = 33.694$, $p < .001$). The cross-associations between these two pairs of variables were freed in the final model to achieve improved model fit ($\chi^2(261) = 488.224$, $p < .001$, CFI = .963, NNFI/TLI = .951, RMSEA = .051 [CI = .042, .059], SRMR = .074). Path estimates are presented in Table 3 and depicted in Figure 6.

Hypothesis Tests

Hypothesis 1 predicted that participants who were exposed to the high content matching condition for the augmented story would have the highest ad attitudes, brand attitudes, self-brand connections, and purchase intention. Results indicated that participants in the high content matching condition had higher ad attitudes (B = 1.080, *SE*

= .171, $\Delta\chi^2$ = 33.724, p < .001), brand attitudes (B = .693, *SE* = .183, $\Delta\chi^2$ = 11.753 , p < .001), purchase intentions (*B* = .940, *SE* = .181, $\Delta\chi^2$ = 34.115, p < .001), and self-brand connections (B = .571, *SE* = .169, $\Delta\chi^2$ = 10.441, p = .001) than those in the non-AR (control) condition. Additionally, participants in the low content matching condition had significantly higher ad attitudes (B = .600, *SE* = .184, $\Delta\chi^2$ = 7.404, p = .007), brand attitudes (B = .369, *SE* = .163, $\Delta\chi^2$ = 4.139 , p = .023) and purchase intentions (B = .373, *SE* = .166, $\Delta\chi^2$ = 5.030, p = .025), but not self-brand connections (*B* = .244, *SE* = .159, $\Delta\chi^2$ = 2.105, p = .147) than those in the non-AR (control) condition. This showed the general positive effects of AR's content matching, no matter the condition (high or low), on participants' responses. The results of a formal test revealed that the difference in high versus low content matching conditions' effects were statistically distinguished from zero on participants' ad attitudes ($\Delta\chi^2$ = 10.589, p = .001), brand attitudes ($\Delta\chi^2$ = 4.337, p = .037), purchase intentions ($\Delta\chi^2$ = 14.045, p < .001), and self-brand connections ($\Delta\chi^2$ = 4.942, p = .026). These indicated that participants exposed to a high content matching augmented story (vs. low and non-AR) had stronger ad attitudes, brand attitudes, purchase intentions, and self-brand connections. Hence, Hypothesis 1 was supported.

Hypothesis 2 predicted that there is an interaction between content matching and imagery ability such that augmented story's content matching will only be effective for the participants with low imagery ability (vs. high) to make their responses different. The results revealed that the effects of high content matching on participants' ad attitudes (B = .116, *SE* = .049, p = .018), brand attitudes (B = .171, *SE* = .059, p = .004), purchase intentions (B = .176, *SE* = .062, p = .005), and self-brand connections (B = .130, *SE*

= .065, p = .044) were greater as participants' imagery ability got higher. When participants were exposed to the low content matching augmented story, their ad attitudes (B = -.096, *SE* = .070, p = .169), brand attitudes (B = -.011, *SE* = .076, p = .888), purchase intentions (B = -.043, *SE* = .070, p = .536), and self-brand connections (*B* = -.052, *se* = .070., p = .460) did not significantly differ no matter their imagery ability was higher or lower. This showed that the effects of content matching on participants' responses were different while considering participants' imagery ability as the moderator. However, the results were opposite to the direction of the prediction that when participants' imagery ability was high, the effects of content matching would be impaired and when participants' imagery ability is low, the low content matching augmented story (vs. high) would let them have weaker responses. Therefore, hypothesis 2 was partially supported.

Hypotheses 3 and 4 predicted that narrative engagement and perceived persuasive intent would mediate the interaction between augmented story's content matching and participants' imagery ability on their responses in a sequential order. The results of mediation analysis with 5000-bootstrapped confidence intervals (see Table 4) revealed mediated moderations that the high content matching augmented story moderated by imagery ability indirectly influenced participants' ad attitudes (*B* = .091, *SE* = .53, [CI = .005, .230]), brand attitudes (*B* = .039, *SE* = .029, [CI = .004, .120]), purchase intentions (*B* = .127, *SE* = .120, [CI = .006, .410]), and self-brand connections (*B* = .131, *SE* = .077, [CI = .010, .380]) through their narrative engagement. The indirect effects of the interaction between low content matching and imagery ability through engagement on

participants' ad attitudes (*B* = -.056, *SE* = .054, [CI = -.207, .038]), brand attitudes (*B* = -.021, *SE* = .028, [CI = -.090, .035]), purchase intentions (*B* = -.058, *SE* = .080, [CI = -.282, .036]) and self-brand connections (*B* = -.067, *SE* = .066, [CI = -.282, .039]) were not significant. These results revealed that narrative mediated the interaction between augmented story's content matching and consumers' imagery ability on their responses, supporting hypothesis 3. However, by increasing participants' perceptions of persuasive intent, engagement only indirectly influenced participants' ad attitudes (*B* = .251, *SE* = .067, [CI = .138, .373]) and brand attitudes (*B* = .172, *SE* = .051, [CI = .068, .290]) but not purchase intentions (*B* = -.053, *SE* = .064, [CI = -.169, .074]) nor self-brand connections (*B* = -.069, *SE* = .056, [CI = -.036, .210]). This indicated that persuasive intent only mediated the effects of engagement on ad attitudes and brand attitudes but not purchase intentions and self-brand connections, partially supporting hypothesis 4.

To summarize, the results of data analysis supported hypotheses 1 and 3, indicating that high content matching in the augmented story had positive effects on participants' ad attitudes, brand attitudes, purchase intentions, and self-brand connections through narrative engagement. Hypotheses 2 and 4 were partially supported, indicating that participants' imagery ability did moderate the effects of the augmented story's content matching on participants' responses, but the effects of content matching were stronger among participants who had a high, rather than a low level of imagery ability. Perceived persuasive intent only mediated the influences of narrative engagement on ad attitudes and brand attitudes, but not on purchase intentions nor self-brand connections toward the brand.

Chapter 6

Discussion and Conclusion

Augmented reality (AR) technology is found to affect consumers' experiences of and responses toward products and brands (Heller et al., 2019; Smink et al., 2019). But what is AR's specific function, and how AR's specific function can be employed by advertisers, and how can it work with consumers' individual differences to change consumers' viewing processes and responses toward ads and brands using narratives? This study reveals that content matching, one specific function of AR, affects consumers' responses and interacts with consumers' imagery ability to influence the effectiveness of AR advertising in terms of brand storytelling.

First, the results reveal that the augmented story with a high content matching elicited stronger responses toward the ad and brand in their consumers' attitudes, behaviors, and connections in comparison to low content matching and non-AR stories. Web AR lets advertisers have high control over, and allows consumers to easily access to AR advertising content from the augmented story to that matches consumers' surroundings enhancing their attitudes, behaviors toward, and connections with the brand. In general, this study confirms the effectiveness of using Web AR in conjunction with storytelling to design advertising and branding. Therefore, this study responds to the need for a more nuanced and in-depth understanding of AR advertising's effectiveness (de Ruyter et al., 2020; Hilken et al., 2022), such as matching content to impact consumers' responses discovered in this study. In line with the AR-related studies in existing

advertising literature (e.g., Yaoyuneyong et al., 2016; Yang et al., 2020; Tsai et al., 2020; Smink et al., 2019; 2020; Sung et al., 2022;), this finding supports the idea that AR technology used in advertising is effective to in enhancing consumers' positive responses toward ads and brands. It further extends advertising and narrative literature by validating a more effective way of using AR with advertising and narratives. Results indicate that augmented stories can operate differently to influence consumers' responses effectively by matching the virtual persuasive story content with their real surroundings.

Importantly, results indicate that the effectiveness of the augmented story does not only occur in consumers' attitudinal and behavioral changes as the fundamental responses outward the ad and brand but also in consumers' self-brand connections incorporating the brand into their inner self. This corresponds with the studies in AR advertising (e.g., Baek et al. 2018; Sun et al., 2022) and narrative literature (e.g., Escalas, 2004; Escalas & Bettman, 2009; Granitz & Forman, 2015) that AR technology and narrative can respectively assist consumers apply their perceptions and experiences with the brand to associate with their self. This study discovers that even a low content matching augmented story can enhance consumers' attitudes and behavioral intentions toward the ad/brand in comparison with a non-AR story. More importantly, only a high content matching augmented story can strengthen consumers' self-brand connections. This further advances the literature by demonstrating how combining AR and narrative in a specific way—matching virtual story content to consumers' real surroundings—can help them construct their self associated with the brand and present it to others.

Second, results confirm the conditionally positive effects of connecting augmented story's content matching with consumers' specific dispositional difference—their imagery ability—as a moderator to influence consumers' responses in brand storytelling. Although the results are not consistent with the predicted direction and findings in the literature (e.g., Hilken et al., 2022), the high content matching augmented story is found to be more effective for consumers who have a high, rather than a low, level of imagery ability. One possible explanation for the reversed direction is that AR technology is generally more helpful for low imagers in bridging the imagination gaps between virtual content and their physical surroundings, as low imagers would have more difficulty, and thus benefit more from AR, with reducing the distance between reality and virtual products (Hilken et al., 2022). However, even though AR may initially be helpful for low imagers, viewing AR consumes excessive amount of consumers' cognitive resources (Zheng & Li, 2023). When virtual content matches consumers' surroundings well and provides additional information, evaluating more personally relevant product or brand information might increase consumers' cognitive loads even further (Hilken et al., 2022).

While AR's content matching could enhance consumers' responses, its effects depend on consumers' dispositional ability to imagine story content. Hence, the effects of AR might veer from generally supportive to conditionally additive: only helpful to consumers who have the corresponding imagery ability when content matching is enhanced. A high content matching augmented story might require cognitive resources exceeding low imagers' cognitive ability and only benefit high imagers. For instance,

consumers with low imagery ability might find evaluating virtual meals that are simply overlaid on their table via AR to be easy, but they might not be able to imagine and evaluate healthy meals on their table when presented in conjunction with additional nutritional information. This further implicates consumers' imagery ability as the "predisposition" (Hilken et al., 2022, p. 5) for processing messages in augmented stories and using them to form their story experiences or change their responses when content matching is enhanced. This predisposition suggests that the imagination gaps exist not only between virtual content and physical surroundings but also between consumers' ability to use AR and imagine virtual content really crossing the boundary between the virtual world and their real lives.

Additionally, the results show that a high content matching augmented story, compared to a low content matching and non-AR story, is more effective for allowing consumers with high imagery ability to engage in the virtual-physical story world when their experiences of processing advertising and narrative messages and responses are enhanced. Consequently, this study confirms the positive effects of connecting AR content matching with consumer imagery ability as an interaction term on consumers' responses through the serial narrative engagement followed perceived persuasive mediating mechanism. This is useful for uncovering when and why advertisers can use AR's specific function to influence consumers with certain individual differences through their virtual-physical experiences and their perceptions of processing messages in both the advertising and the narrative persuasion domains. The mediated conditional effect discovered in this study shows that consumers' feelings of absorption into narratives are

boosted by matching story content to the real-world surroundings of consumers who have high imagery ability in particular. These feelings further mitigate their perceptions of the augmented story's persuasive intent that helps to mask the story's advertising nature, highlighting AR's role in enhancing consumers' story experiences (Moyer-Gusé, 2008; Moyer-Gusé & Nabi, 2010; Pase, 2012). This finding advances the literature by providing both positive and negative mediating roles of augmented stories. It forms a more complete picture of the underlying mechanisms for explaining how consumers process augmented stories, especially when closely matching consumers' surroundings and high imagery ability.

However, results show that perceived persuasive intent only mediates the influence of narrative engagement on consumers' ad and brand attitudes. One possible explanation for the insignificant mediating effects on purchase intentions and self-brand connections is that perceived persuasive intent has an "inertia" in its different effects on changing consumers' responses (Moyer-Gusé, 2008, p. 417). Inertia means consumers would resist persuasion to different extents based on their existing beliefs, attitudes, or behaviors. This may result in consumers' selective avoidance of arguments in the persuasion that strive to change but contradict their existing beliefs, attitudes, or behaviors to different extents. Although a high content matching augmented story could enhance engagement by camouflaging perceived persuasive intent, the effects might still be based on the uneven inertia and selective avoidance which only change consumers' attitudes toward ads and brands but contradict their consumption behavior and self. For example, consumers might have positive, strong attitudes toward consuming healthy

foods and brands, but their existing behaviors and self-image could contradict the healthy eating behaviors and images proposed in the augmented story, even if they are absorbed in, and perceive less persuasive intent in the story.

Importantly, this study uses Web AR to really create and design an augmented story and studies its effects on consumers' responses. This is different from most previous studies focused on existing AR apps, mirrors, and filters (e.g., Yaoyuneyong et al., 2016; Yang et al., 2020; Tsai et al., 2020; Smink et al., 2019; 2020; Javornik et al., 2021; 2022; Baek et al., 2018; Ibáñez-Sánchez et al., 2022; Flavián et al., 2021), as advertising researchers and practitioners do not actually design or have control over them. Studying Web AR as the newest category of AR technology extends the literature by advancing knowledge about the effects of different types of AR technologies in advertising. It further advances advertising research and practice by responding to the growing need for more advertising scholars and professionals to get a more direct understanding of and experience with using AR in advertising without relying on other professions (Li et al., 2015; Yaoyuneyong et al., 2016). This is crucial in changing the emphasis of the literature and developing methods used for studying and acquiring the first-hand knowledge and skills of using AR in the advertising field independently, which is beneficial for academic and industrial development.

Theoretical Implications

The findings of this study contribute to the literature by deepening conceptual understanding of the nature of AR and narrative, bringing results into the advertising and narrative domain. By proposing and explicating the concept of the augmented story, this

study provides a thorough and useful definition that can be used by other researchers to identify and clarify the popular phenomena of using AR with narrative in advertising. The augmented story concept, as a new theory-building block, is necessary and beneficial for the development of theories incorporating AR in the advertising field (de Ruyter et al., 2020).

With the findings of how well AR's content matching overlaying virtual story content to consumers' surroundings can influence consumers' responses, this study adds to verifying a theory-building block that can be used to understand the effectiveness of AR advertising. This extends the research in AR and advertising literature that shows that content matching is a constructive concept in understanding AR's effects in relation to other key concepts, e.g., context matching, privacy concerns, etc. (de Ruyter et al., 2020), building a more nuanced and comprehensive theory of AR advertising. The results show that consumers' attitudes, behaviors toward, and connections with the ad and brand are enhanced when the overlaid advertising and story content closely matches their real environments. This suggests that the concept of content matching advances knowledge of AR's effectiveness in advertising by highlighting the importance of not merely using AR, but considering consumers' real surroundings and fitting virtual content to them in influencing consumers' responses.

The finding of the moderating role of consumers' imagery ability in the effects of content matching enriches the literature by shedding light on the role of consumers' individual differences in AR advertising and narratives. This corresponds with the importance of studying advertising at not only the medium level but also the audience

and message levels (Thorson & Rodgers, 2019). By taking AR as a media device/channel that interacts with the features of the consumer (i.e., imagery ability), message (i.e., narrative), and context (i.e., health), this study provides more avenues for understanding the effectiveness of AR advertising. The reversed direction of interaction between imagery ability and content matching found in this study, which differs from previous findings (e.g., Hilken et al. 2022), reveals the divergent point for AR's effects in advertising and narratives when accounting for consumers' dispositional difference with AR's specific function. The results suggest that content matching as a core aspect of designing AR ads can veer AR's supportive effects on low imagers to high imagers. This further implies more complicated and nuanced conditional effects of AR advertising depending on its different design and types of consumers, which is important for advancing the knowledge about the effectiveness of AR advertising (Hilken et al. 2022; Kowalczuk et al., 2020; Yim et al., 2017).

This study also adds to theorizing in narrative and engagement by underscoring the serial mediating effects of narrative engagement and the consequent perceived persuasive intent when AR is applied. Results show AR's role in enhancing consumers' experiences of absorption in the story and masking their perceptions of the nature of the story's persuasion, suggesting both beneficial effects for advertising and potential detriments for consumers. This extends previous narrative studies (e.g., Green and Brock, 2000; Slater and Rouner, 2002; Green, 2004; Escalas, 2007; Feng, 2018) that have mostly focused on the positive effects of narrative engagement for advertisers and brands, overlooking the problems of using narratives for consumers. The findings suggest that

potential drawbacks, such as unidentifiable information, hidden persuasion, and deception issues, could be triggered by camouflaging persuasive intent introduced by augmented stories, touching off a pressing concern in narrative research.

The insignificant mediating effects of perceived persuasive intent on consumers' purchase intentions and self-brand connections help to reveal the underlying mechanisms used to explain how AR works with individual differences in narrative persuasion. Results show that AR's content matching, when working in conjunction with consumers' imagery ability, can enhance their attitudes toward the ad and brand, purchasing behaviors toward and connection with the brand, and engagement with the story by masking the persuasive nature of story content. However, these effects can be indirect—by going through—or direct—without passing through—the decreased perceived persuasive intent. This extends previous studies' findings that AR offers both informative and affective values in advertising (e.g., Smink et al., 2019), as the current study finds separate mechanisms explaining the influences on consumers' attitudes versus their behaviors and self. This finding can extend the understanding of the mechanisms for explaining AR's affective effects, which might be independent of behavioral influence and connecting self toward the brand in narratives. This suggests that closely matching story content to the surroundings of consumers with a high imagery ability to engage them might heighten their affective responses and attachment to the ad and brand through camouflaging the persuasive intent. However, the effects of hidden persuasion on purchase intention and self-brand connection might be weakened by providing information and meanings about the brand that are more resistance-provoking. For

example, a high content matching augmented story about a healthy food brand might let high imagers feel that the story and brand are good. Yet, the product and brand information might contradict their actual behaviors and sense of self when it comes to using the product and incorporating the brand to construct and present their self.

Last but not least, the basic context behind this study involved health promotion (i.e., healthy eating and foods), showing that advertisers can promote their products or brands while simultaneously encouraging healthy consumption behaviors in the story by augmenting consumers' real worlds. This broadens the health communication literature by demonstrating that behaviors and products advocated in advertising, especially in conjunction with AR and story, have the potential to promote health and decrease risks, suggesting that advertisers might consider the other uses of AR technology.

Practical Implications

One of the major contributions of this study is providing significant implications for AR advertising practices by focusing on and operating the specific AR content matching, as well as consumer imagery ability, to examine the augmented story through Web AR technology. First, this study provides evidence for the effectiveness of using Web AR with brand storytelling in advertising and health contexts to promote products and brands. This suggests that advertisers can continue developing and incorporating Web AR to create augmented stories by themselves in their advertising practices, increasing the effectiveness of, efficiency of, and control over their AR advertising design without the high expense and reliance on other professionals.

Second, advertisers not only can select how and decide whether to let consumers interact with the products or brands through AR or not, but also can go one step further by designing AR content that matches consumers' surroundings to achieve better effects with Web AR technology. This study informs advertisers that embedding well-integrated virtual objects into consumers' environments and fitting information to consumers' needs while viewing the AR advertising, especially in a story format, can enhance AR advertising's effectiveness in engendering consumers' positive responses toward their ads and brands. This is a practical and effective strategy for advertisers to incorporate and implement in their AR advertising campaigns.

Additionally, the findings regarding consumers' imagery ability show advertisers that they can use augmented stories more effectively and decrease the risk of invalid strategy by targeting consumers with high or low imagery ability, respectively. Although AR might generally be more beneficial for advertising to low imagers, it might be futile —or even more effective on high imagers—when the advertising content matches consumers' surroundings well. This informs advertisers that they should have more nuanced message designs and consumer targeting plans when using Web AR to create compelling augmented stories, depending on different content matching designs or groups of consumers with high or low imagery ability. This can help advertisers to maximize their effectiveness and minimize any wasted investment while using AR technology for advertising their products/brands.

Fourth, this study further informs advertisers that they can not only use Web AR to let consumers interact with the products/ or brands, but also the advertising and

narrative messages to elicit more powerful virtual-physical experience of engaging in brand stories. To let consumers engage more deeply in this experience, advertisers should make messages and products match consumers' personal surroundings and needs, especially when targeting consumers with high imagery ability as their primary audience of their augmented stories. This is an effective way for enhancing consumers' positive responses by decreasing perceptions of commercial/ or persuasive intent that might arouse consumers' resistance. However, the findings also suggest that advertisers might need to be informed about the (in)/direct effects of augmented stories on consumers' responses through the masking perceived persuasive intent. Advertisers should learn be aware that the masking persuasive intent of augmented stories is the process of influencing influences consumers' attitudinal responses but not behavioral changes nor connections with the brand. This can help advertisers to explain to their clients how the augmented stories work and what goals they can be achieved, which are important to their advertising campaign proposals.

Moreover, advertisers should understand potential ethical concerns regarding masked persuasive intent which might cause further issues. For instance, if consumers do not perceive the persuasive intent of advertising, then they are unable to mount cognitive defenses and are hence put at risk of being unethically manipulated by advertisers, which is especially problematic for vulnerable groups (e.g., children, Nairn & Dew, 2007). Advertisers should thus consider if their augmented stories use Web AR to overly conceal their persuasive nature and discipline themselves, given the lack of regulations for using AR in advertising (Cook, 2019).

With the findings regarding perceived persuasive intent, this study, therefore, provides political implications for governmental organizations to establish policies regulating the use of augmented stories in advertising as well. This study informs the policymakers that regulations should move beyond the simple dichotomy of using AR or not, into making policies that account for the nuanced uses and effects of AR in advertising. Specifically, governmental organizations such as the FTC can refer to the findings that show the risks that viewing augmented stories that mask their perceived persuasive intent by pairing AR's content matching with consumers' imagery ability can have. This can assist in regulating advertisers by helping to determine to what extent they should reveal their persuasive intent, minimizing ethical issues and negative consequences on consumers while using Web AR to design augmented stories and target specific consumers.

Limitations and Directions for Future Research

This study provides evidence that Web AR is a new, effective advertising channel and format in combination with narrative and certain dispositional differences of consumers in the real world. It is notable for researching and using AR in both advertising academia and industry for developing advertising theory and practice within certain limitations.

First, this study uses an online experiment to let participants experience the augmented story in their own real environment through Web AR, which enhances the particular important external validity by reflecting real-world AR advertising practices and contexts (Geuens and De Pelsmacker, 2017). However, it inevitably compromises

some internal validity and brings its own challenges (e.g., relatively less experimental control) (Geuens and De Pelsmacker, 2017). For example, even though participants followed the instructions to place the 3D models on their dining table/floor at the beginning, it was difficult to be one hundred percent sure that participants did so throughout their entire experience of viewing/using the AR (participants might, for example, move models around in the middle of the experiment). Future studies can balance both internal and external validity by creating settings that highly simulate participants' own physical environments in laboratory experiment settings or conducting in-person experiments in participants' real-life, personal spaces for higher experimental control.

Second, although this study is meant to focus on the broad, general health context, it investigates the utmost societal relevant healthy foods and eating issue for health promotion and uses the participants who are the major groups of using AR from a broader population. Since more and more advertisers are using many other types of health claims/appeals (e.g., disease control, treatment, additive behaviors cessation) to influence consumer's purchase decisions (Khanna, 2016), extra studies on other health contexts or even certain health issues (e.g., cancer prevention, drug/cigarette/beverage cessation, etc.) and samples for replicating and/or extending the current findings are needed. For instance, many natural, non-GMO foods or dietary supplement brands claim that their products (e.g., TUCAN Holistic's Organic Extra Virgin Olive Oil) can reduce the risk of developing cancer or cardiovascular diseases and use AR to illustrate that (Samit 2017). It is necessary to examine the effects of Web AR in conjunction with storytelling on

consumers' responses not only toward the ads, brands, or health-promoting behaviors but also consumers' risk-reducing behaviors, especially when it comes to diseases that threaten consumers' health and well-being.

Furthermore, food products and services were an important product type in the health context of this study, which was conducted for the tremendous uses of AR in health promotion, and consumers value and pursue health-promoting products, such as healthy foods, nutritional goods, and dietary supplements, now more than ever. However, previous studies have shown that other product types using AR in their advertisements can have different influences on consumers' responses toward the ad or brand (Tsai et al., 2020; Du, Liu & Wang, 2020). This suggests future studies may investigate the influences of products that are not health-related and other product types (e.g., cosmetics, furniture, (sun)glasses, clothing) using Web AR and brand storytelling.

Lastly, this study finds that consumers' dispositional differences in imagery ability work to make the augmented story conditionally effective. This not only shows on whom the augmented story is more effective but also shows who might be beyond its reach. The finding is useful for targeting a certain segment of consumers but, due to the scale-based measuring method used in this study, is limited to a relatively passive market investigation perspective compared with advertisers' active message design work. Besides conducting market surveys, advertisers can design instructional and imperative types of advertising messages to trigger consumers' imagery ability (Petrova & Cialdini, 2005; Keller & Block, 1997; Krishnamurthy & Sujan, 1999; McGill & Anand, 1989). Using other methods (e.g., message priming) to actively manipulate participants' imagery

ability in experiments is recommended for future studies to expand the current finding of imagery ability's moderating role in augmented stories' effects.

Conclusion

Website-based augmented reality (Web AR) is increasingly used with narratives by advertisers to promote brands, especially for brand storytelling. This study addresses this trend and confirms the effectiveness of using Web AR to create brand stories with content highly matching the surroundings of consumers with a high imagery ability to enhance attitudes, purchase intentions toward, and connections with ads and brands. This may be explained by consumers' virtual-physical experiences of engaging in the story that further camouflages perceptions of persuasive intent when the augmented story content matches high imagers' surroundings well. The results also suggest potential drawbacks (e.g., unidentifiable information, hidden persuasion, unethical manipulation, etc.) that could arise while consumers are highly engaged in and unable to perceive the persuasive nature of AR stories, suggesting caution and regulations due to drawbacks might be needed.

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Appendix A

Healthy Food Brand Story Content

Cover:

Welcome to Situs Diet Plan Service. Please find, sit at, and place the 3D models on a clean **DINING TABLE/FLOOR**.

Chapter 1 - Unhealthy Eating:

Are you one of the many Americans nowadays that do not have a healthy diet? In just one of the meals or snacks on your table today, it is possible for you to consume more than the recommended daily amount of sodium and sugar. Weeks after, you gradually put on weight and you feel tired and fatigued, so you go to a doctor. The doctor tells you that your unhealthy eating habits are increasing your risk of type 2 diabetes, and you need solutions to make more healthy food choices.

Chapter 2 - Healthy Foods Choice:

You learned from the doctor that healthy food choices are a solution to a bad diet for your body, and reduce your risk of type 2 diabetes. The doctor suggests foods that are nutritious and well planned so you can meet your body's nutritional requirements and wellness goals. You learn about the Situs Diet Plan Service, which provides diet plans scientifically designed by nutritionists to let you get a healthy diet and foods.

Chapter 3 - Features of Situs:

Since February 2000, originating in Iceland, a country that has the healthiest diet in the world. Situs has provided safe and wholesome meals to over 20,000 customers in Europe based on their healthy diet plans in the last 20 years. In the U.S., now you can

gain the nutrition and energy needed every day. The Situs Diet Plan Service provides you with healthy meals designed by their exceptional nutritional team to help you make positive, lasting improvements in your eating health.

Chapter 4 - Take Actions:

As you start the Situs Diet Plan Service online, the Situs Diet Plan Service's nutritional team designs the diet plan based on ideal health, living environment, and daily routine. You will have a healthy diet plan to maintain ideal body health away from obesity/leanness problems and chronic diseases. The only thing you do is just go to Situs Diet Plan Service's website to start your new healthy eating now.

Chapter 5 - Benefits:

Then, Situs Diet Plan Service searches the area in which you live to find and prepare the healthiest ingredients for you under food safety and hygiene regulations. You will have the correct and balanced amount of various nutrients with sufficient energy from these high-quality ingredients. The ingredients are designed and ready to be cooked in minutes through the easy-to-follow recipes from Situs Diet Plan Service's certified chefs. All the foods and recipes will arrive in one box freshly delivered to you, which lets you have the easiest way for making your delicious healthy meals. Your mental health is also benefited from releasing the stress of preparing healthy meals and enjoying tasty foods. When you stick to Situs Diet Plan Service's healthy diet and meals, you're setting yourself up for physically and psychologically healthy eating habits and away from chronic diseases. Situs Diet Plan Service, eat healthily and live healthily.

Appendix B

Measurement Items

No.	Item/Source
Manipulation Checks	
Content matching (High vs. Low) (de Ruyter et al. 2020)	
Stem	When I was receiving the Situs healthy food brand story, the story content…
1	was well embedded in my real surroundings.
2	was connecting with my physical environments.
3	was fitting with my needs.
Imagery ability (High vs. Low) (Marks 1973)	
Stem	Please rate the vividness of each image in the empty space beside the number questions by reference to the rating scale:
1	No image at all (only "knowing" that you are thinking of the object)
2	Vague and dim
3	Moderately clear and vivid
4	Clear and reasonably vivid
5	Perfectly Clear and as vivid as normal vision
Stem	Think of some relative or friend whom you frequently see (but who is not with you at present) and carefully consider the picture that comes before your mind's eye. Then rate the following items:
1	The exact contour of face, head, shoulders, and body.
2	Characteristic poses of head, attitudes of body, etc.
3	The precise carriage, length of step, etc., in walking.
4	The different colors worn in some familiar clothes.
	Visualize a rising sun. Carefully consider the picture that comes before your mind's eye. Then rate the following items.
5	The sun is rising above the horizon into a hazy sky.
6	The sky clears and surrounds the sun with blueness.
7	Clouds. A storm blows up, with flashes of lightning.
8	A rainbow appears.
	Think of the front of a shop to which you often go. Consider the picture that comes before your mind's eye. Then rate the following items.
9	The overall appearance of the shop from the opposite side of the road.
10	A window display including colors, shapes, and details of individual items for sale.
11	You are near the entrance. The color, shape, and details of the door.
12	You enter the shop and go to the counter. The counter assistant serves you. Money changes hands.

	Finally, think of a country scene which involves trees, mountains and a lake. Consider the picture that comes before your mind's eye. Then rate the following items.
13	The contours of the landscape.
14	The color and shape of the trees.
15	The color and shape of the lake.
16	A strong wind blows on the trees and on the lake, causing waves.
Augmented story processes	
Narrative engagement (Busselle & Bilandzic 2009)	
Stem	While viewing the Situs brand story...
1	My body was in the room, but my mind was inside the world created by the story.
2	A new world was created, and then that world suddenly disappeared when the story ended.
3	The story world was closer to me than the real world.
4	The story affected me emotionally.
5	I could keep my mind on the story.
6	I could make sense of what was going on in the story.
Note: six items that were reversed or used to measure engagement with story characters were removed as fewer mistakes would be made with items posed in the same direction (see Suárez-Alvarez, 2018) and there is no character in the Situs brand story.	
Perceived persuasive intent (Moyer-Gusé 2008; Wang & Shen 2019)	
Stem	About the Situs brand story…
1	It was designed to entertain people.
2	It was created to persuade people.
3	Its purpose was to change people's opinion.
Advertising-related Responses	
Ad attitudes (Bergkvist & Langner 2017)	
Stem	In general, I think the Situs brand story is…
1	Good/Bad
2	Appealing/Unappealing
3	Positive/Negative
4	Favorable/Unfavorable
5	Pleasant/Unpleasant
6	Soothing/Irritating
Brand attitudes (Spears & Singh 2004; Bergkvist & Langner 2017)	
Stem	In general, I think the Situs healthy food brand is...
1	Unfavorable/Favorable
2	Bad/Good
3	Unpleasant/Pleasant
4	Dislikable/Likable
5	High-quality/Poor-quality
6	Valuable/Not valuable
7	Appealing/Unappealing

8	Positive/Negative
Self-brand connections (Escalas 2004)	
Stem	About the Situs healthy food brand and myself, I think…
1	The Situs healthy food brand reflects who I am.
2	I can identify with the Situs healthy food brand.
3	I feel a personal connection to the Situs healthy food brand.
4	I (can) use the Situs healthy food brand to communicate who 1am to other people.
5	I think the Situs healthy food brand (could) help(s) me become the type of person I want to be.
6	I consider the Situs healthy food brand to be "me" (it reflects who I consider myself to be or the way that 1want to present myself to others)
7	The Situs healthy food brand suits me well.
Purchase intentions (Spears & Singh 2004)	
Stem	My intention to purchase Situs healthy food is…
1	With very low purchase interest/With very high purchase interest
2	Probably not buy it/Probably buy it
3	Definitely do not intend to buy it/Definitely intend to buy it
Covariates	
Privacy concern (Feng & Xie 2019)	
Stem	My feelings about my privacy while using AR…
1	I would not be comfortable sharing my information with AR service providers.
2	All things considered, AR services cause serious privacy problems.
3	I am sensitive about the way AR service providers handle my personal information.
4	To me, it is the most important thing to keep my personal information intact from AR service providers.
5	I am concerned about threats to my privacy while using AR service.
Story completion extent (the authors)	
Stem	How many of the story chapters would you say you viewed in total?
1	None/Few/Some/Most/All
Story viewing fluency (Germelmann et al. 2020)	
Stem	Please rate your answers to the following questions about the Situs brand story you viewed
1	How easy was it to evaluate the story?
2	How easy was it to understand the story?

3	How easy was it to process the story?
Education (the author)	
Stem	What is your highest completed education level?
1	Did not finish high school
2	High school degree/GED
3	Some college/currently in college
4	Associates (2-year) degree (community college)
5	Bachelor's (4-year) degree
6	Trade school certification
7	Graduate/professional degree
8	Prefer not to say
Gender (the author)	
Stem	With which gender do you identify?
1	Male
2	Female
3	Transgender
4	Other (please specify)
Age (the author)	
Stem	How old are you today?
1	Text enter

Tables

Table 1

Augmented Reality Definitions

Author(s)	Field	Definition
Azuma et al. (1997)	Computer science	"systems that have the following three characteristics: 1) Combines real and virtual 2) Interactive in real time 3) Registered in 3-D" (p. 356).
Höllerer & Feiner (2004)	Computer Science	"an AR system as one that combines real and computer-generated information in a real environment, interactively and in real time, and aligns virtual objects with physical ones" (p. 2).
Zhou et al. (2008)	Computer science	"a technology which allows computer generated virtual imagery to exactly overlay physical objects in real time" (p. 193).
Carmigniani & Furht (2011)	Computer science	"a real-time direct or indirect view of a physical real-world environment that has been enhanced/augmented by adding virtual computer-generated information to it" (p. 342).
Mine et al. (2012)	Computer science	"the use of projection technology to augment and enhance 3D objects and spaces in the real world by projecting images onto their visible surfaces" (p. 32).
Shiva & Raajan (2013)	Computer science	"a live camera feed information of a natural environment whose components are augmented by the common techs like GPS device, video, animation...etc." (p. 1).
Craig (2013)	Computer science	"a medium in which digital information is overlaid on the physical world that is in both spatial and temporal registration with the physical world, and that is interactive in time" (p. 20).
Milgram et al. (1994)	Engineering	In the broad sense, AR refers to "augmenting natural feedback to the operator with simulated cues" (p. 283). On the other hand, the restricted approach emphasizes the technology aspect and is defining AR as "a form of virtual reality where the participant's head-mounted display is transparent, allowing a clear view of the real world" (p. 283).
Reitmayr & Drummond (2006)	Engineering	"A promising user interface technique for mobile, wearable computing and location-based systems" (p. 109).
Van Krevelen &	Engineering	"Technology to create a 'next generation, reality-based interface' and supplements the real world

Poelman (2010)		with virtual (computer-generated) objects that appear to coexist in the same space as the real world" (p. 1).
Mihelj et al. (2014)	Engineering	"Augmenting an image of the real world with a computer-generated image that provides additional information" (p. 195).
Kim & Kim (2014)	Advertising	"augmented reality is a concept of supplementing the real world with the virtual world" (p. 386).
Yaoyuneyong et al. (2016)	Advertising	"technology in which virtual information is superimposed over users' perceptions of the real world" (p. 16).
Baek et al. (2018)	Advertising	"digital technology that imposes computer-generated information such as images and sounds on a user's real-world view" (p. 422).
Lee & Cho (2019)	Advertising	"a type of virtual reality that is augmented by computer-generated sensory input, such as sound or graphics… a technology that places augmented 3D images into print ads, which are viewed using an app on consumers' mobile phones or on tablet computers in real time" (p. 22). AR applications must share three properties: (a) a blending of virtual- and real-world elements that are (b) interactive in real time and (c) accurately aligned in 3D interfaces
Tsai et al. (2020)	Advertising	"an advanced form of image interactivity technology that can not only simulate direct product experience but also deliver multisensory (e.g., visual, motion, interactivity), enjoyable brand experience in consumers' own physical environments" (p. 245).
de Ruyter et al. (2020)	Advertising	"AR, which, with the aid of mobile computing technology, embeds digital content in the customer's view of the physical environment, contextualization of advertising becomes a natural extension of the technology" (p. 109).
Smink et al. (2021)	Advertising	"AR enables contextually relevant advertising experiences by overlaying digital content onto the consumer's physical surroundings in real time" (p. 1).
Pozharliev et al. (2021)	Advertising	"the integration of digitally created media within an existing real environment (p. 1).
Liao & Lee (2015)	Communication	"a technology that mixes the real environment with the virtual, is registered in three-dimensions, real-time, and interactive" (p.1418).

Jung et al. (2019)	Health communication	"augmenting the physical world by projecting and overlaying 3D virtual images on physical objects or the environment" (p. 142).
Hong et al. (2019)	Health communication	"systems that enable real-time interactions between virtual and real objects that coexist in the same space" (p. 163).
Seals et al. (2021)	Health communication	"whereas AR technology layers digital content onto the real world, self-focused AR visually augments the self, layering digital content onto the self. One technology enabling self-focused AR is video filters, which superimpose computer-generated content onto a user using their web or smartphone camera" (p.).
Faust et al. (2012)	Marketing	"the superposition of virtual objects (computer generated images, texts, sounds etc.) on the real environment of the user" (p. 1164).
Olsson & Salo (2012)	Marketing	"AR is a technique that combines real and computer-generated digital information into the user's view of the physical real world in such a way that they appear as one environment" (p. 2779).
Sood (2012)	Marketing	"AR converges the physical world with virtual objects, augmenting the view of the physical world with streams of information from the Web" (p. 10).
Scholz & Smith (2016)	Marketing	"augmented reality (AR) is the practice of displaying digital information over people's real-time view of objects, people, or spaces in the physical world" (p. 149).
Javornik (2016)	Marketing	"an interactive technology that modifies physical surroundings with superimposed virtual elements" (p. 253).
Hwangbo et al. (2017)	Marketing	"AR refers to the computer graphic technology that visualizes things that exist in the natural environment by combining computer-generated sensory inputs such as sound, video, graphics, or GPS data from the physical, real-world environment" (p. 4).
Pantano et al. (2017)	Marketing	"AR is defined a real-time view of the physical world augmented with virtual computer-generated information" (p. 83).
Poushneh & Vasquez-Parraga (2017)	Marketing	"AR is a series of technologies that integrate real world and virtual information, enhancing a specific reality" (p. 229).

Rese et al. (2017)	Marketing	"AR integrates computer-generated objects with the real environment and allows real-time interactions" (p. 869).
Poushneh (2018)	Marketing	"an interactive technology that generates three-dimensional virtual content and then maps it onto the user's reality" (p. 169).
Watson et al. (2018)	Marketing	"AR is a system that layers virtual elements over physical environments, and blends virtual worlds with reality" (p. 433).
Yim & Park (2019)	Marketing	"a computer-simulated interactive technology that overlays a projected 3-D visualization of products on the user's view of the real world" (p. 582). Although many different definitions of AR have been proposed by prior scholars, these definitions all share a common theme based on AR's primary features of being interactive, simultaneous, real-time, and computer-generated (Azuma, 1997; Baek et al., 2018; Faust et al., 2012; Huang & Liao, 2015).
Caboni & Hagberg (2019)	Marketing	"AR is technology-enabled augmented content that combines with the real environment to develop an augmented real environment where people can have an augmented experience" (p. 1128).
Heller et al. (2019)	Marketing	"AR allows for a digitally enhanced view of reality, overlaying it with information and visuals to support the decision-making process" (p. 94).
Yang et al. (2020)	Marketing	"AR mobile applications contextualize products and modify physical surroundings with superimposed virtual elements" (p. 1).
Rauschnabel (2021)	Marketing	"AR – a medium that integrates virtual information in real-time into a user's field of view" (p. 1).
Wedel et al. (2020)	Marketing	"a distinct type of VR is augmented reality (AR), in which digital devices are used to overlay supplementary sensory information (sounds, objects, avatars, graphics, labels, etc.) on the real world" (p. 443).
Klopfer & Squire (2008)	Education	"a situation in which a real-world context is dynamically overlaid with coherent location or context sensitive virtual information" (p. 205).
El Sayed et al. (2011)	Education	"the technology of adding virtual objects to real scenes through enabling the addition of missing information in real life" (p. 1045).
Yuen et al. (2011)	Education	"Augmented reality (AR) refers to a wide spectrum of technologies that project computer generated materials, such as text, images, and video, onto users' perceptions of the real world" (p. 120).

Munnerley et al. (2012)	Education	"the product of any activity that creates new dimensions to the physical spaces we usually inhabit" (p. 41).
Cuendet et al. (2013)	Education	"AR refers to technologies that project digital materials onto real world objects." (p. 1).
Bacca et al. (2014)	Education	"system allows for combining or "supplementing" real world objects with virtual objects or superimposed information." (p. 133).
Tan et al. (2015)	Education	"a technique is to display virtual contents superimposed upon real-life objects." (p. 138).
Uzunboylu & Yildiz (2016)	Education	"a live and interactive environment constituted with adding objects on real image taken from camera" (p. 239).
Sirakaya & Cakmak (2018)	Education	"augmented reality (AR) is defined as a technology in which real world and virtual objects are combined with a simultaneous interaction" (p. 298).
Yildiz (2021)	Education	"a reality environment where digital media products are used instead of real-world objects" (p. 1).
Moro et al. (2021)	Education	"augmented reality (AR) projects augmented visuals to the user via optical see-through displays or see-through video displays. The technology works by overlaying computer-generated graphics or virtual objects on the user's natural setting to enhance the experience and provide a composite view" (p. 682).
Thomas (2012).	Gaming	"augmented reality is the registration of computer-generated graphical information over a user's view of the physical world." (p. 3:2).
Hamari et al. (2018)	Gaming	"AR applications specifically aim to combine 'virtual and real elements instead of totally replacing the real space by the virtual one'" (p. 805).
Tan & Soh (2019)	Gaming	"augmented Reality (AR) generally refers to a synthesized perspective of the real physical environment using computer-generated imagery" (p.).
Caci et al. (2019)	Gaming	"AR is an immersive experience that superimposes virtual 3D objects upon a user's direct view of the surrounding real environment, generating the illusion that those virtual objects exist in that space" (p. 1303).
Berlage (1998)	Medicine	"augmented reality is defined as enhancing perception of the real world with virtual reality presentations" (p. 170).

Dubois et al. (1999)	Medicine	"a system that enables the user to perform tasks that have their target in the real world (target of the task = real world)" (p. 357).
Samset et al. (2008)	Medicine	"the visual overlay of computer-generated imagery over real world imagery in a spatially and temporally registered fashion" (p. 1).
Chicchi Giglioli et al. (2015)	Medicine	"augmented reality can be a set of techniques and tools that add information to the physical reality. A new technological system that allows inserting virtual contents in the real world in order to run in the same representation and, in real time, enhancing the user's sensory perception of reality" (p.).
Herron (2016)	Medicine	"AR is a complex system that, in a simple explanation, involves a target activating the virtual trigger which will introduce virtual presences into users' reality" (p. 51).
Vávra et al. (2017)	Medicine	"a fusion of projected computer-generated (CG) images and real environment, the system provides the surgeon with computer-processed imaging data in real-time via dedicated hardware and software." (p. 1).
Sutherland et al. (2018)	Medicine	"augmented reality refers to a largely real environment with few virtual elements, while the less relevant concept of augmented virtuality (AV) is composed of a predominately virtual environment with elements of the real world" (p. 39).
Touati et al. (2019)	Medicine	"AR is a type of technology in which an environment is enhanced through the process of superimposing computer-generated virtual content over a real structure" (p. 2).
Moro et al. (2021)	Medicine	"augmented reality (AR) projects augmented visuals to the user via optical see-through displays or see-through video displays. The technology works by overlaying computer-generated graphics or virtual objects on the user's natural setting to enhance the experience and provide a composite view" (p. 682).
Dhar et al. (2021)	Medicine	"augmented reality (AR) is a relatively new technology that allows for digitally generated three-dimensional representations to be integrated with real environmental stimuli. A type of mixed reality, is a real-world based experience that is enhanced by digital objects or information." (p. 1).

Vidal-Balea et al. (2021)	Health care	"a technology that provides an environment in which virtual objects are combined with reality, thus integrating computer-generated objects in the real world" (p. 2).
Bui et al. (2021)	Health care	"augmented reality (AR) is defined as a form of immersive experience in which the real world is enhanced by computer-generated three-dimensional content, which is tied to specific locations and/or activities" (p. 69).
Grier et al. (2012)	Human factors and ergonomics	"augmented reality (AR) is defined as a live direct or an indirect view of a physical, real-world environment whose elements are augmented by computer-generated sensory input, such as sound, graphics or GPS data" (p. 1352).
Billinghurst at al. (2015)	Human interface technology	"AR system, namely that it has to have a display that can combine real and virtual images, a computer system that can generate interactive graphics the responds to user input in real time, and a tracking system that can find the position of the users' viewpoint and enable the virtual image to appear fixed in the real world" (p. 77).
McMillan et al. (2017)	Aquatic science	"augmented reality is defined as: a technology that superimposes a computer-generated image on a user's view of the real world, thus providing a composite view. In other words, it's an enhanced version of reality that uses technology to overlay digital information on an image of something being viewed through a device (such as a smartphone camera)" (p. 163).
Baker et al. (2017)	Museology	"augmented reality (AR) involves the introduction of virtual objects into the real environment in order to obtain an augmented environment. This augmented environment is the direct superimposition of physical objects and computer-reproduced objects." (p. 171).

Table 2

Summary of Research Hypotheses, Concepts, Measures, and Statistics

RQ/Hypothesis	Concept	IV	DV	Manipulation/Measures	Statistical Analysis
H1: Participants exposed to the augmented story with high content matching (vs. low and non-AR) will have higher a) ad attitudes, b) brand attitudes, c) purchase intentions, and d) self-brand connections toward the brand.	1. AR content matching 2. Attitudes toward the ad and brand 3. Self-brand connections 4. Behavioral intentions toward the brand	Content matching: high vs. low (2 levels)	1. Ad attitudes 2. Brand attitudes 3. Self-brand connections 4. Purchase intentions	IV: de Ruyter et al.'s (2020) definition for the manipulation and check of content matching. DVs: 1. Bergkvist & Langner's (2017) scale for the measure of ad attitudes 2. Spears & Singh's (2004) scale for the measure of brand attitudes 3. Spears & Singh's (2004) scale for the measure of purchase intentions 4. Escalas' (2004) scale for the measure of self-brand connections	1. t-test for manipulation check 2. Reliability analysis for the scales (α and ω) 3. SEM for hypothesis testing
H2: Participants' imagery ability will moderate the effects of augmented story's content matching on participants' responses such that high content matching's effects on a) ad attitudes, b) brand attitudes, c) purchase intentions, and d) self-brand connections will be stronger as participants has low (vs. high) imagery ability.	1. Consumers imagery ability 2. Other concepts are same as H1	1. Content matching: high vs. low 2. Imagery ability: high vs. low	Same as H1	IV: Marks' (1973) median split procedure and scale for the for the manipulation and check of imagery ability. DVs: Same as H1	Same as H1

H3: Narrative engagement mediates the interaction between content matching and imagery ability (i.e., mediated moderation) on a) ad attitudes, b) brand attitudes, c) purchase intentions, and d) self-brand connections toward the brand.	1. Narrative engagement 2. Other concepts are same as H1	1. Content matching: high vs. low 2. Imagery ability: high vs. low	Mediator: Narrative engagement DVs: Same as H1	Mediator: Busselle & Bilandzic's (2009) scale for the measure of narrative engagement	Mediation analysis with 5000 bootstrapping resamples in SEM
H4: Perceived persuasive intent mediates the influences of narrative engagement on a) ad attitudes, b) brand attitudes, c) purchase intentions and d) self-brand connections.	1. Perceived persuasive intent 2. Other concepts are same as H1	Narrative engagement	Mediator: Perceived persuasive intent DVs: Same as H1	Mediator: Wang & Shen's (2019) scale for the measure of perceived persuasive intent	Mediation analysis with 5000 bootstrapping resamples in SEM

Table 3

Coefficients from the Final Path Model

	Ad Attitude					Brand Attitude					Purchase Intention					Self-brand Connection				
	B	*SE*	β	95% CI		B	*SE*	β	95% CI		B	*SE*	β	95% CI		B	*SE*	β	95% CI	
PC	-.034	.057	-0.27	-.146	.078	-.122	.056	-.118*	-.231	-.120	-.076	.051	-.075	-.176	.024	-.019	.051	-.019	-.119	.080
Fluency	.493	.099	.363***	.300	.686	.305	.087	.276***	.135	.467	.145	.086	.134*	.053	.371	.212	.081	.189**	.053	.371
Completion	.071	.082	.042	-.089	.231	.094	.068	.069	-.039	.228	-.115	.075	-.086	-.261	.031	-.149	.062	-.107*	-.271	-.027
Education	.011	.047	.011	-.082	.103	.067	.043	.084	-.017	.151	.054	.043	.069	-.029	.137	.051	.040	.063	-.027	.129
Female	-.070	.108	-.027	-.281	.142	.090	.109	.043	-.123	.304	-.339	.100	-.165*	-.535	-.142	-.336	.101	-.158**	-.525	-.138
Age	-.010	.009	-.055	-.027	.007	.000	.008	-.003	-.016	.015	-.011	.008	-.077	-.026	.005	-.007	.009	-.049	-.025	.011
HCM	1.080	.177	.318***	.733	1.428	.693	.183	.250***	.333	1.052	.940	.181	.347***	.585	1.295	.571	.169	.203**	.239	.902
LCM	.600	.184	.170**	.240	960	.369	.163	.128*	.050	.688	.373	.166	.133*	.047	.699	.224	.159	.084	-.067	.555
IA	.167	.084	.108*	.002	.332	.120	.090	.095	-.057	.296	.177	.072	.144*	.035	.318	.201	.081	.158*	.041	.360
HCM*IA	.116	.049	.101*	.020	.231	.171	.059	.155***	.055	.286	.176	.062	.153**	.054	.298	.130	.065	.116*	.003	.257
LCM*IA	-.096	.070	-.088	-.232	.004	-.011	.076	-.010	-.159	.138	-.043	.070	-.041	-.180	.094	-.052	.070	-.048	-.188	.085
ENG	.627	.155	.472***	.402	1.066	.267	.127	.256*	.011	.541	.871	.518	.686**	.336	2.211	.900	.238	.675***	.500	1.466
PPI	-.363	.109	-.300***	-.604	-.145	-.249	.070	-.263***	-.380	-.088	.077	.092	.066	-.101	.253	-.100	.086	-.082	-.318	.045

Note: PC = Privacy Concern; H/LCM = High/Low Content Matching; IA = Imagery Ability; ENG = Engagement; PPI = Perceived Persuasive Intent. Above dotted line are covariates. *$p < .05$, **$p < .01$, ***$p < .001$. Global model fit = $\chi^2(261) = 488.224$, $p < .001$, CFI = .963, NNFI/TLI = .951, RMSEA = .051 [CI = .042, .059], SRMR = .074

Table 4

Coefficients from the mediation paths

Paths	B	*SE*	β	95% CI	
Interaction between HCM and IA on responses through ENG					
HCM*IA > ENG > Ad Attitude	.091	.053	.059*	.005	.230
HCM*IA > ENG > Brand Attitude	.039	.029	.032*	.004	.120
HCM*IA > ENG > Purchase Intention	.127	.120	.084*	.006	.410
HCM*IA > ENG > Self-Brand Connection	.131	.077	.085*	.010	.380
Interaction between LCM and IA on responses through ENG					
LCM*IA > ENG > Ad Attitude	-.056	.054	-.037	-.207	.038
LCM*IA > ENG > Brand Attitude	-.021	.028	-.018	-.090	.035
LCM*IA > ENG > Purchase Intention	-.058	.080	-.046	-.282	.036
LCM*IA > ENG > Self-Brand Connection	-.067	.066	-.047	-.282	.039
ENG on responses through PPI					
ENG > PPI > Ad Attitude	.251	.067	.189***	.138	.373
ENG > PPI > Brand Attitude	.172	.051	.166**	.068	.290
ENG > PPI > Purchase Intention	.053	.064	.042	-.169	.074
ENG > PPI > Self-Brand Connection	.069	.056	.052	-.036	.210

Note: All estimates were generated in the same way as represented in Table 3. Every possible indirect path that hypothesized in the research was presented.

Figures

Figure 1

Focus of AR Definitions

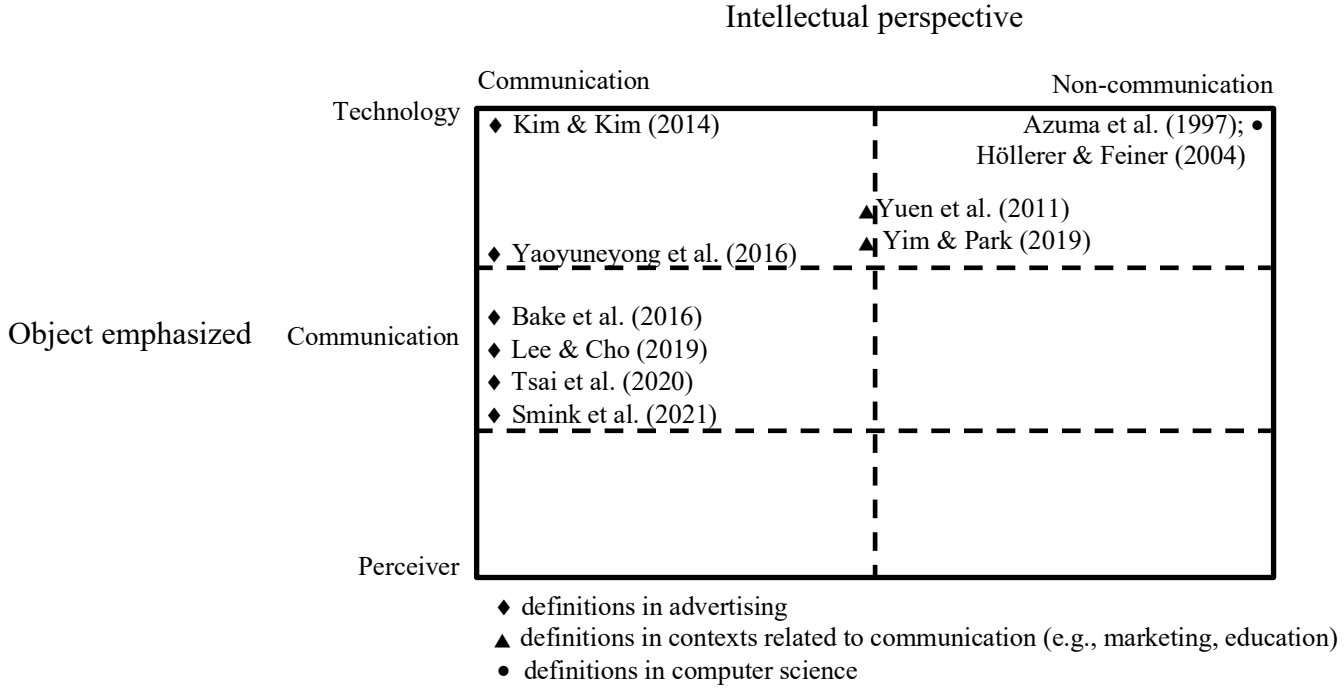


Figure 2

Conceptual Model of Hypotheses

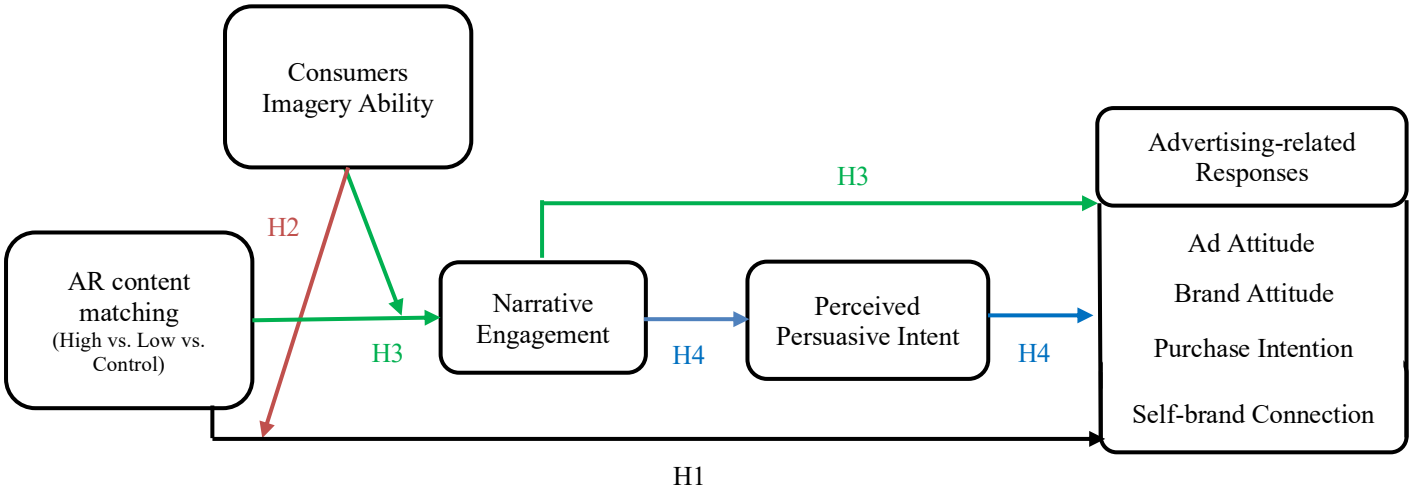


Figure 3

Instructional Manipulation for Content Matching

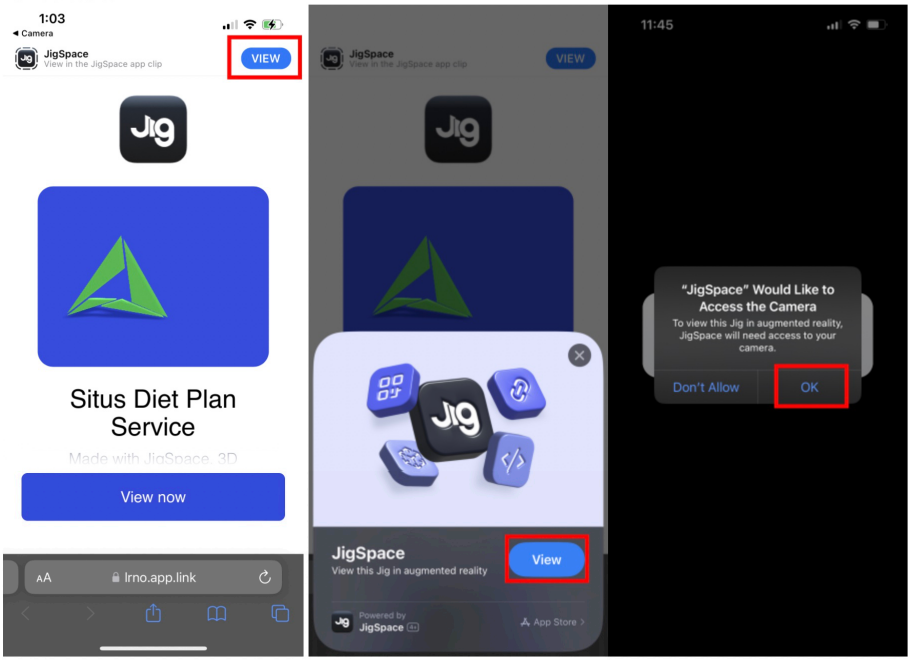
Next, you are going to view an **augmented reality (AR) advertisement** that will open at the top of your screen by clicking a link.

First, please read the instructions below to know what you will need to do after you click the link provided later:

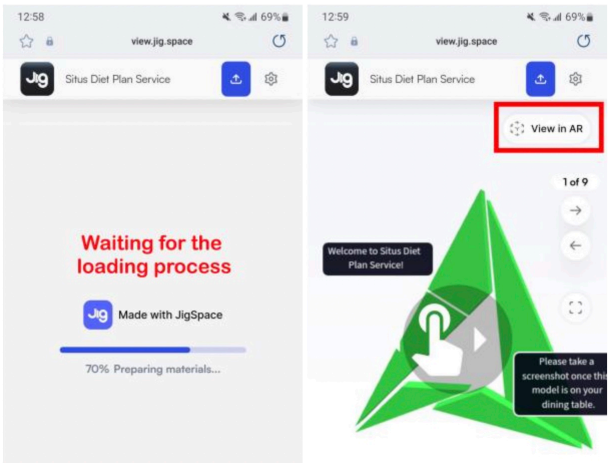
1. Find and sit at a **DINING TABLE**.

2. Press the "View (in AR)" buttons and allow camera access (shown in the red boxes below) on your screen. Your privacy is protected and no picture can be taken without your permission.

For iOS users:

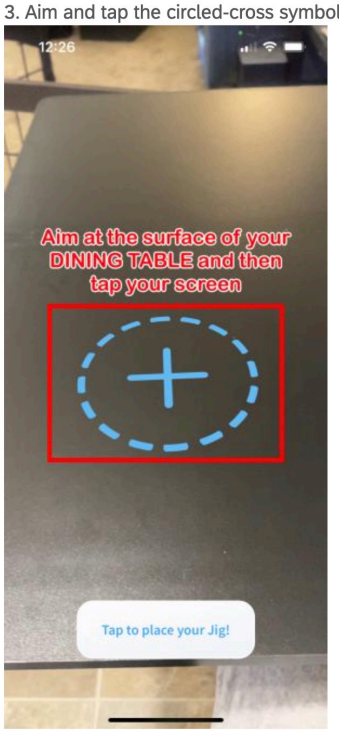


For Android users:

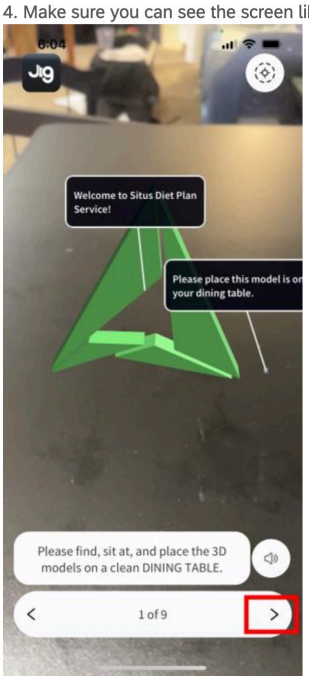


Continued on next page

3. Aim and tap the circled-cross symbol to place the 3D model on your **DINING TABLE**.



4. Make sure you can see the screen like the picture below:



Continued on next page

5. While viewing the AR advertisement, you can freely rotate, zoom in/out the 3D models and press the "right arrow" (shown in the red box above) to go to the next chapters.

6. Be sure to view all chapters of the AR advertisement. There will be a brief quiz after you finish.

To get the AR advertisement link, please select:

- ○ I do not understand the instructions above and I would like to quit the survey.
- ○ I have read and understood the instructions above and I would like to continue.

Figure 4

High Content Matching Condition

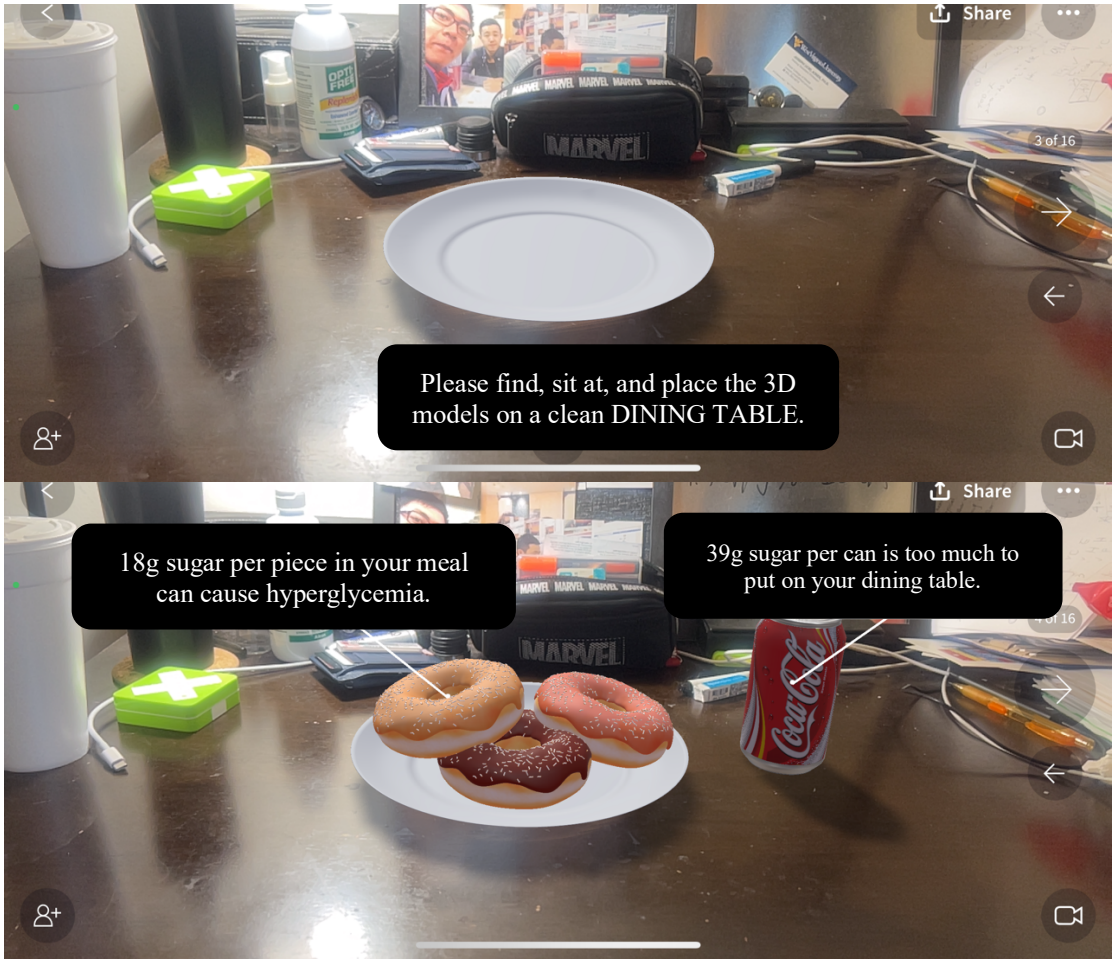


Figure 5

Low Content Matching Condition

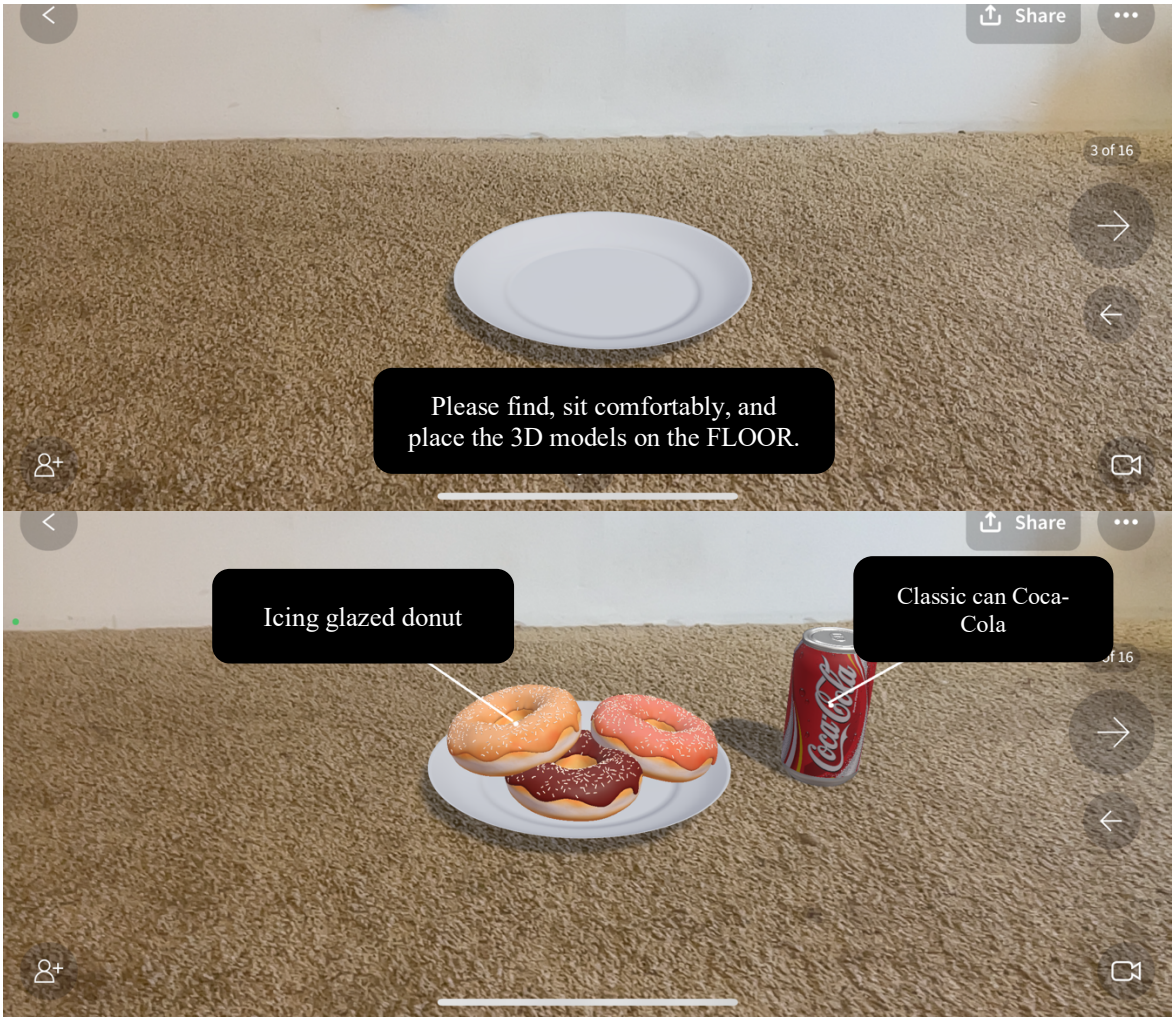
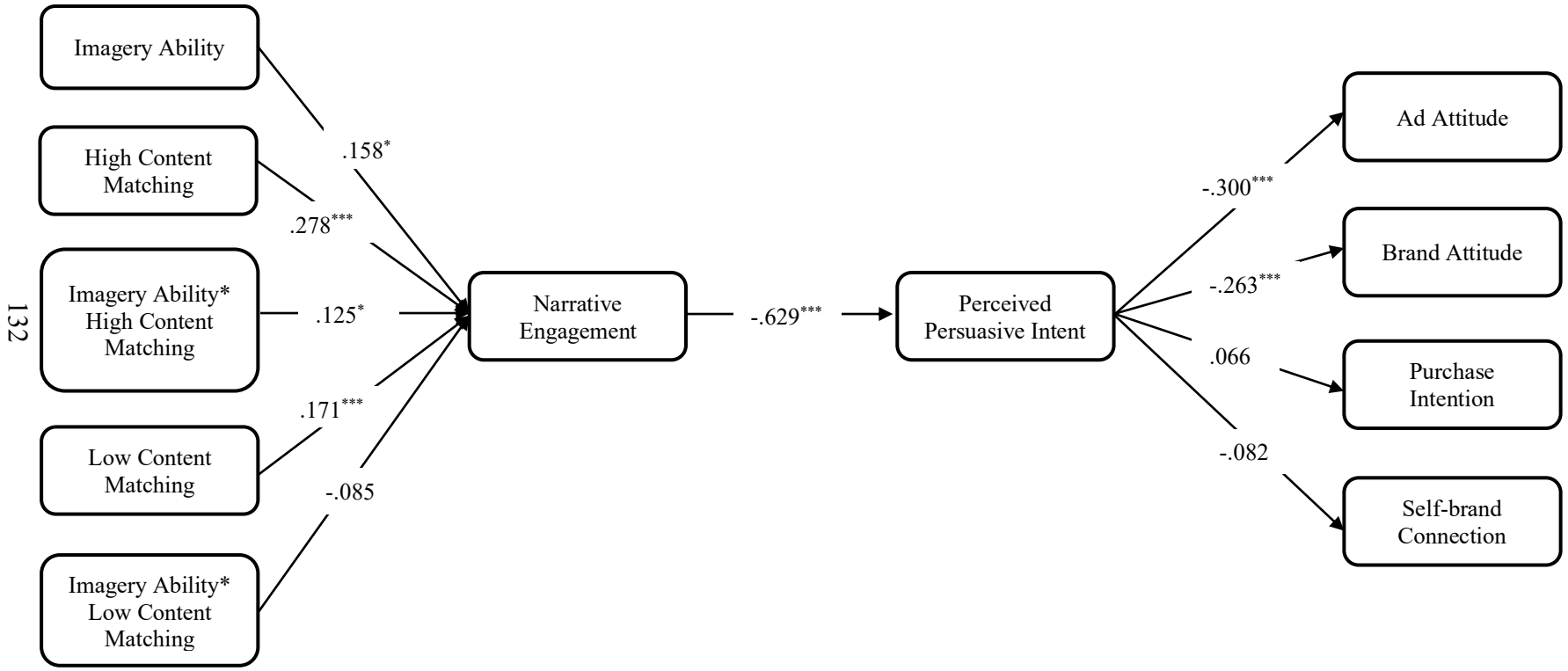


Figure 6

Final Path Model



Vita

Ting-Hao, Tsou is a Ph.D. candidate (ABD) in Strategic Communication at the Missouri School of Journalism. He earned both his M.A. and B.A. in Public Relation and Advertising at Shih Hsin University in Taipei, Taiwan. His research investigates the effectiveness and validates a theoretical model for using extended reality technology (i.e., augmented reality, AR, and virtual reality, VR) in digital advertising. Currently, Ting-Hao is actively conducting research on interdisciplinary, funded projects, including 1) the effects of AR in conjunction with narratives on promoting health behaviors and products/brands, 2) artificial intelligence targeting in personalized social media advertising, 3) the effects of VR on CSR communication, and 4) the approaches for defining advertising in leading journals. He also works for the Maxine Wilson Gregory Research Program as a central hub of Dr. Shelly Rodgers' endowed chairship to guide students from all disciplines in conducting research of their interests.