TWO ESSAYS EXAMINING THE EFFECTS OF AIVA SEARCH ON COGNITION, EMOTION AND CHOICE

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AI-enabled virtual assistants (AIVAs) have become increasingly popular (e.g., Amazon Alexa, Google Home) and assist consumers with various tasks, including home automation, access to media, entertainment, and shopping.

Essay 1 focuses on the outcomes of consumers' lost autonomy after information search using AIVAs versus an online search engine (e.g., Google). Drawing on research in advances in AI technology, I predict that interacting with AIVAs (versus online search engines) will lead to several consumer outcomes: decreased cognitive task performance, word of mouth (WOM) intentions, and the desire for an unrelated subsequent search. I find support for my predictions across five studies, using different tasks to assess performance (verbal and quantitative), after interactions with both real (Amazon Alexa) and fake (Halo) AIVA brands, across different respondent populations (CloudResearch, MTurk, Prolific), thereby enhancing confidence in my findings.

In Essay 2, I consider a different consumer outcome - embarrassment, and also a different underlying process variable – social presence. I predict that when consumers engage in information search using an AIVA, they will subsequently experience greater embarrassment when asked about embarrassing products (e.g., condoms, medication for gas, etc.). The increased embarrassment occurs even when the information search is unrelated to the embarrassing products (e.g., searching for information on the local weather increases embarrassment related to anti-gas medication), suggesting that it is the process of interacting with the AIVA, rather than the content of such interaction which underlies this effect.

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INTRODUCTION OF DISSERTATION

Until recently, the idea of owning and using an artificial intelligence-enabled voice assistant (AIVA) was a fictional notion popularized by movies like Iron Man, with his AIVA JARVIS, who controlled Iron Man's music, lights, temperature, and security on Stark's verbal commands. With developments in AI technology, such assistants are no longer a fictional idea available only to the rich, and consumers today can acquire their very own AIVAs, spawning significant changes in the acquisition and consumption of information, goods, and services. AIVAs aid consumers in various tasks, including controlling home automation, accessing media, and consummating transactions. They make suggestions concerning what the user hears, watches, and buys through responding to verbal commands, and hence function as significant influencers on the consumer search process (Segan and Greenwald, 2020).

Understanding the effects of consumer interactions with AIVAs is invaluable to firms that develop these devices, consumers who interact with them, marketers who use them to interact with consumers, and policymakers who regulate them. While many consumers have adopted AIVAs, the circumstances brought about by Covid-19 (e.g., contactless shopping – expanding shopping and e-services; and remote working and learning), has shifted their use from a source of simple information and entertainment to a conduit for e-commerce. Recent research indicates that almost 60% of AIVA owners have used the device to make a purchase and predicts that voice commerce has the potential to reach $40 billion by 2022 (*Smart speakers statistics: Report* 2021). Despite increased usage of these devices (Khan, 2020), little is known about their impact on important outcomes, including consumer cognition, emotions, and choice. My dissertation addresses this gap by specifically focusing on consumers' task

performance (Essay 1) and perceptions of embarrassment and purchase intentions (Essay 2).

Essay 1 focuses on consumers' cognitive task performance after information search using AIVAs versus a screen-based online search (e.g., Google). Drawing on research in technology, cognition (Strayer and Johnston 2001; Sparrow et al., 2011; Ward et al., 2017) and perceived autonomy (Chen et al., 2016), I predict that interacting with AIVAs (versus screen-based search engine – hereafter SBSE) will lead to decreased task performance, and impact important downstream outcomes such as WOM intentions (Consiglio et al., 2018), and the desire for a subsequent unrelated search. I suggest that these effects arise because information search using AIVAs offers less perceived control making the consumer feel a loss of autonomy than a screen-based online search (e.g., inability to parse through a set of results, presentation of results controlled by AIVA), adversely impacting task performance. Research has shown that consumers will attempt to restore lost control using a variety of different strategies (Consiglio et al., 2018; Cutright 2012), leading me to predict that information search using AIVAs will lead to systematic differences in consumers' intentions to engage in WOM transmission, as well as their interest in a subsequent search, both consequential outcomes for marketers. I find support for my predictions across four studies, using different tasks to assess task performance (verbal and quantitative), after interactions with both real (participants personal Amazon Alexa or Google Home) and fake (Halo) AIVA brands, across different respondent populations (CloudResearch, MTurk, Prolific), thereby enhancing confidence in my findings.

In Essay 2, I consider a different consumer outcome - embarrassment, and also a different underlying process variable – social presence. Thus, I theorize that the human-like conversational characteristics of AIVA interactions will increase a user's perceptions of social

presence (Hoffman and Novak, 2017). Social presence has been defined as emotionally driven mental representations about being close to another person, which could arise through memories of interactions or could be completely metaphorical (imaginings) (Short et al. 1997). While previous research has ascribed several positive outcomes to enhanced social presence (Aron et al. 1991; Cialdini et al. 1997), I suggest that there could be a potential downside within the context of using AIVAs - embarrassment. Embarrassment is a type of social anxiety similar to shyness and shame, which occurs either in private or public contexts when people find themselves deliberating on perceived negative appraisals by others or negative appraisal by oneself for social transgressions (Edelmann 1985; Krishna et al., 2019). Four studies provide evidence that interactions with AIVA's (as compared to interactions with SBSEs) will increase the user's perceived social presence leading to the proliferation in consumer's feelings of embarrassment when purchasing or discussing embarrassing products (e.g., condoms, anti-gas medications), leading consumer's to be less inclined to use AIVAs for purchasing products that are embarrassing.

Together this dissertation extends our understanding of the highly unexplored area of consumer decision-making processes in the presence of AIVAs compared with screen-based online purchase environments.

ESSAY 1

IS MY AIVA REDUCING MY INTELLIGENCE? THE EFFECTS OF AIVA-ENABLED SEARCH ON CONSUMER COGNITION

Introduction

AI-enabled products and services such as autonomous vehicles, AI-enabled virtual assistants (e.g., Amazon's Alexa, Google's Home), virtual nurses, robot-advisors (e.g., digital financial planners) and personalized recommendation systems (e.g., Amazon's customer recommenders), have become increasingly popular among consumers and are changing how consumers interact with firms (Xie et al., 2016; Klaus and Zaichkowsky, 2022; Leone et al., 2021). More precisely, the advancements in AI technology, defined as systems and machines that demonstrate human intelligence and mimic human behavior by interpreting external data correctly, learning from such data, and exhibiting flexible adaptation (Haenlein and Kaplan, 2019; Shankar 2018;) have created a unique opportunity for firms to add value to their offerings by personalizing interactions with their customers (Payne et al., 2007), but have also introduced new challenges that require empirical investigation (Du and Xie, 2021; Huang and Rust 2018), leading to significant research in this area.

Thus, the impact of AI for marketing and the opportunities it provides have been the focus of much research over the last few years and many benefits of AI have been identified for both firms and consumers. Specifically, AI offers important advantages to consumers such as enhanced health from the use of health monitoring with wearable devices (Kent, 2020), improved customization through recommender systems (Konstan and Riedl, 2012), peace of mind by allowing homeowners to monitor their own security while away from home through

smart household products (Kaur et al., 2021), and convenient access to information with AI-enabled virtual assistants (McLean and Osei-Frimpong, 2019; Guzman, 2019). Despite all of these benefits, there is also a dark side to AI with considerable threats to consumer well-being (Guha et al., 2021; Longoni et al., 2019; Puntoni et al., 2020). Thus, past research has identified dimensions of AI that paradoxically create significant benefits for consumers (e.g., customization, convenience), while also posing threats to consumers' privacy and well-being including the loss of autonomy and control (Du and Xie, 2021; Grewal et al., 2021; Table 1.1). Autonomy and control can be defined as a consumer's ability to make decisions on their own without the influence of other agents, and AI predicated on recommender systems (e.g., smart speakers) inhibit consumers' autonomy by offering a reduced selection of choices and thereby reducing their control over the decision-making process (Wertenbroch et al., 2020). Indeed, it has been suggested that research into the effects of AI's reduction of users' autonomy may become one of the most essential areas of study into the AI-enabled consumer experience and there has been a call for research (see Table 1.2) that provides a deeper understanding of how AI can reduce consumer autonomy and the subsequent outcomes of such loss. I answer this call by documenting that a perceived loss of autonomy during interactions with AI-enabled technology leads to lowered task performance among consumers.

Table 1.1: Calls for research on AI's effects on consumer autonomy

Citation	Article type	Variable of Interest	Identified Research Question
Andre et al., 2017	Conceptual	Consumer autonomy	How will rapid automation of technologies affect consumers perceptions of autonomy and how will this impact consumers?
Davenport et al., 2020	Conceptual	Consumer autonomy	How do consumers perceive a loss of autonomy if AI can substantially control choice?

Citation	Article type	Variable of Interest	Identified Research Question
Du and Xie, 2021	Conceptual	Consumer autonomy	What are the ethical consequences for consumers of lost autonomy?
Berente et al., 2021	Conceptual	Consumer autonomy	What are the significant consequences when humans feel a loss of autonomy because of the control technology holds?
Lewis and Moorkins, 2020	Conceptual	Human cognition	What threat does technology have on human cognitive and how will this effect human behavior?
Puntoni et al., 2020	Conceptual	Human cognition and consumer autonomy	• How does the learner–AI interaction shape learning experiences and affect student satisfaction, motivation, and learning? • How do AI solutions that permeate epistemic boundaries between human and machine impact consumer autonomy?
Grewal et al., 2021	Conceptual	Tradeoffs of technology	What are the tradeoffs between the bright and dark side of AI?

Table 1.2: Relevant literature - AI, autonomy, and compensatory behaviors

Key Concept	Citations
Bright side of AI	Kent, 2020; Konstan and Riedl, 2012; Kaur et al., 2021; Guzman, 2018; Xie et al., 2016; Klaus and Zaichkowsky, 2021; Leone et al., 2021
Dark side of AI	Guha et al., 2021; Longoni et al., 2019; Puntoni et al., 2020; Du and Xie, 2021; Huang and Rust 2018
Autonomy is a fundamental human need	Rothbaum et al., 1982; Skinner 1996, Wegner and Wheatley 1999; Mittal and Griskevicius 2014; Staub et al., 1971
AI lowers consumer autonomy and control	Andre et al., 2017; Davenport et al., 2020; Du and Xie, 2021; Puntoni et al., 2020; Mende et al., 2019
Autonomy effects task performance	Windsor and Anstey, 2008; Spector 1986; Wielenga-Meijer et al. 2011; Wielenga-Meijer et al. 2012; Stillman et al., 2010; Mierke et al., 2017; Lanfred and Moye 2004; Spector, 1986; Schukaljow et al. 2011; Bieg et al.,2017; Soederberg et al., 1999; Skinner et al., 1990
Lost autonomy results in increased compensatory behavior	Consiglio et al., 2018; Kay et al., 2009; Langer 1975; Whitson and Galinsky 2008
Task performance, WOM behavior and search intention have significant impacts on marketing	Bettman et al., 1991; Weber et al. 2009

Further, a consideration of prior literature also reveals that while there is a general consensus on the prediction that AI-enabled technologies will reduce consumer autonomy, there has been relatively little empirical investigation into the effects of AI-interactions on autonomy, and a paucity of research focused on understanding how different types of AI-enabled technologies (e.g., AIVAs versus online recommenders) and different interaction contexts (e.g., entertainment versus search) may impact the effects of AI on autonomy. I begin to address this issue by focusing on a specific technology – AI-enabled virtual assistants, hereafter referred to as AIVAs – and a specific context – consumer search – while examining the effects of AI-interactions on consumer autonomy and its subsequent marketing outcomes.

We focus on AIVAs because they are an important segment of the AI industry and are commonplace in consumers' lives (Haenlein and Kaplan, 2019). In fact, as of 2019, 40% of the US population already own at least one AIVA, and 72 % of Americans have used one of these devices (*Smart speakers statistics: Report* 2021). While AIVAs provide a range of hedonic activities such as listening to music and entertaining content, they also allow for the consummation of voice commerce, with information search using AIVAs becoming prevalent (Mclean and Osei-Frimpong, 2019; *Smart speakers statistics: Report 2022*). The nature of the AI algorithm process in the AIVA experience (e.g., the control the AIVA exerts over the information provided to the user during the search process) leads us to predict that the user will feel a loss of autonomy over the results of the search process when using an AIVA as compared to the same search experience conducted with a screen-based technology. I also propose two important marketing outcomes that result from this loss of autonomy during the consumer search process. First, I show that consumers perform worse on unrelated tasks following a

search interaction using an AIVA as compared to a SBSE and second, I show that in an effort to reassert control over the search process, consumers will feel compelled to engage in continued search and feel a strong desire to participate in word-of-mouth (WOM) behavior following a search interaction with an AIVA (vs. SBSE).

This research extends our understanding of how consumer interactions with AIVAs may have unforeseen and counterintuitive effects on outcomes unrelated to the specific type of interaction. Thus, searching for information using an AIVA can reduce consumers' task performance and thereby lead to greater interest in engaging in compensatory behaviors such as further search and WOM. My findings extend prior work that has speculated on how loss of autonomy during AI interactions may have deleterious effects but have provided little empirical evidence for the same. Given the vast array of AI-enabled devices and the varied types of interactions that consumers have with these different devices, it is critically important to begin to offer empirical insights into when and how interacting with these devices can impact consumer autonomy and the effects of such loss of autonomy.

The remainder of this paper is structured as follows: In Section 2, I present the theoretical background of AI technologies, AI's implications on consumer autonomy, the impact of autonomy on task performance, word of mouth, and search intentions. Subsequently, in Section 3, I describe the research methodology and present the results of my analysis for four different experimental studies. In Section 4, I discuss the theoretical contribution and the limitations of the research. I then identify the managerial and practical implementation of my findings and limitations to this research. Finally, Section 6 presents a summary and concluding remarks.

Literature Review

AIVA, Interactivity, And Autonomy

The genesis of AI-enabled virtual assistants dates back to the beginning of the digital revolution, where Alan Turing (2004) inquired whether machines have the ability to "think" and complete intelligent human tasks. Five years later, the term artificial intelligence was first introduced, referring to intelligent machines and in 1956 AI was officially deemed a discipline. However, it is only recently that the idea of owning and using an artificial intelligence-enabled voice assistant (AIVA) has moved from being a fictional notion popularized by movies like Iron Man, with his AIVA JARVIS, who controlled Iron Man's music, lights, temperature, and security on Stark's verbal commands, to actual reality for consumers. Thus, with developments in AI technology such as the access to inexpensive data and fast processing speeds, such assistants are no longer a fictional idea available only to the rich. Consumers today can acquire their very own AIVAs, spawning significant changes in the acquisition and consumption of information, goods, and services. AIVAs aid consumers in various tasks, including controlling home automation, accessing media, and consummating transactions. They make suggestions concerning what the user hears, watches, and buys through responding to verbal commands and hence function as significant influencers on the consumer search process (Segan and Greenwald, 2020). The ability for these machines to perform tasks and communicate with the user in a way that resembles human thinking creates high interactivity that mirrors that of human-to-human interactions (Du and Xie, 2021; Grewal et al., 2021; Puntoni et al., 2020). Because interactions with AIVAs are synchronous, participative, modality rich, and anthropomorphic, these devices are by design high in consumer interactivity (Burgoon et al.,

2000; Marikyan et al., 2022), making them more likely to negatively affect consumer autonomy.

Since autonomy refers to the ability to make decisions without the influence of other agents (Wertenbroch et al., 2020), it is lost when people feel controlled by a source other than themselves. Loss of autonomy may be harmful to consumer wellbeing since self-determination theory suggests that autonomy is one of three essential elements of a person's true self and is vital for individual growth and long-term well-being (Dworkin, 2008; Deci and Ryan, 1987). I suggest that the ability of an AIVA to use sophisticated algorithms to determine what information the consumer should receive during a search interaction creates a sense of lost control, making the user feel that their autonomy has been threatened. Consider the example of searching for the current weather in a specific location using an AIVA versus a SBSE. The SBSE provides the weather information but also provides over 1.5 million search results with a pictorial depiction of the weather for the next week, along with links to ten different websites on the first page. In contrast, an AIVA often provides a single response (e.g., asking Amazon's Alexa, "what is the weather today?", elicited a much briefer response with just the current temperature and the day's highs and lows). Interestingly, all these devices usually use the same technology to search (a search engine – Google, Bing, or Yahoo). Hence, it is not the quality of the actual answer provided by a device in response to a query that underlies my predicted differences in perceived control but rather the user's ability to choose (e.g., autonomy over the selection process) among a wide set of possible answers. Thus, I predict that:

> *H1: AIVAs are likely to reduce perceptions of consumer autonomy during information search, as compared to SBSE.*

Autonomy and Task Performance

Though it seems as if the simplification of the search results when using AIVAs ought to be positive to the consumer, such highly controlled and personalized information can have a detrimental effect on individual autonomy by subtly manipulating preferences and depriving individuals of the opportunity to consider the options in search results or to make their own decisions about where to receive the information (André et al., 2017). The freedom to choose among multiple options gives people a sense of autonomy, leading to increased motivation (Deci and Ryan, 1987). In contrast, when choices are removed, autonomy is threatened, undermining the individual's motivation eliciting reactance to the threat (Brehm 1966; André et al., 2017). Research has identified several adverse reactions of degrading a person's right to choose. For example, reducing a person's freedom to choose has been shown to have damaging effects on prosocial attitudes (Baumeister et al., 2009; Vohs and Schooler, 2008), diminishes an individual's self-control (Rigoni et al., 2012) and lowered ability to process information (Ariely, 2000).

The ability for a person to feel in control of the outcomes of a performed task (in the context of AIVAs - the search for information) has been shown to be an influencer of task performance (Spector 1986; Wielenga-Meijer et al. 2011) in many contexts, including academic performance, workplace performance, and marketing. Specifically, educational research has found that learning and task performance are highly dependent on task autonomy – the degree to which people have control, independence, and discretion over tasks performed (Hackman and Oldham 1975; Spector 1986; Wielenga-Meijer et al. 2012; Wielenga-Meijer et al. 2011; Stillman et al., 2010) and that autonomy in the workplace has a positive relationship with task

performance (Mierke et al., 2017). Extending these findings to the context of consumer interactions with AIVAs, I therefore predict that:

> *H2: The reduced autonomy perceived during information search using AIVAs will negatively impact consumers' performance on subsequent tasks.*

Autonomy and Increased Search and Word-of-Mouth (WOM) Intentions as Compensatory Behaviors

Since people like to feel autonomous in their environments (Rothbaum et al., 1982; Skinner 1996, Wegner et al., 1999), I predict that the perceived loss of autonomy during information search using AIVAs will drive consumers to restore these feelings of lost control. Indeed, personal freedom has been argued to be one of the fundamental needs of humankind (Mittal and Griskevicius 2014; Staub et al., 1971), and when threatened, humans will seek ways to restore this need. Earlier research has established that individuals who feel like their sense of autonomy is threatened will engage in compensatory behaviors to restore feelings of control over their environment (Kay et al., 2009; Langer 1975; Whitson and Galinsky 2008) including seeking out structured consumption (e.g., more organized retail environments; Cutright 2012), utilitarian products (e.g., cleaning products; Chen et al.,2016), as well as engaging in WOM (Consiglio et al., 2018). Since information seeking behavior has been established as an important component of WOM communication (Reynolds and Darden 1971), I suggest that consumers who engage in information search using AIVAs (vs. SBSEs) are more likely to subsequently engage in WOM, as a means to restore lost control. Additionally, since the perceptions of lost autonomy are related to the process of information search, I also predict that the use of AIVAs will lead to greater interest in continued information search, as compared to the use of SBSE. Intentions to engage in WOM as well as search are also critically important

variables for marketers. Word of mouth has tremendous impact on consumer behavior from what movie to watch to which website one visits (Chevalier and Mayzlin, 2006; Chintagunta et al., 2010; Godes and Mayzlin, 2009; Trusov et al., 2009). Though it is clear that WOM occurs often and impacts consumer decisions it is important to understand what drives consumers to share (Berger, 2014). Additionally, search intentions have been shown to be an important precursor to purchase behavior particularly in the online context (Shim et al., 2001). Understanding how this new mode of interactions between customers and consumers (specifically AIVA) influences WOM and search intentions is therefore important for both firms and customers.

Thus:

H3: Perceptions of reduced autonomy will lead to greater intentions to engage in subsequent search as well as WOM, when using AIVAs versus SBSE for information search.

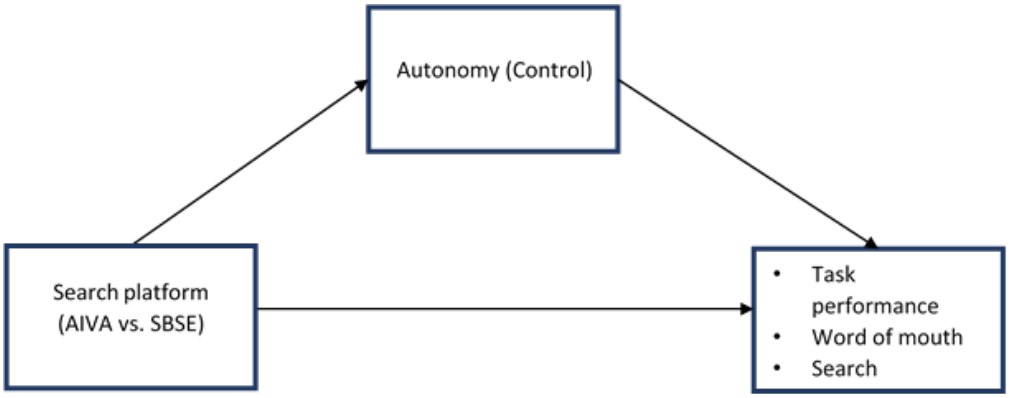


Figure 1.1: Conceptual model

Overview of Studies

I tested these predictions across four studies using different brands of AIVAs (e.g., Alexa/Google Home, fictitious brands), and different tasks (e.g., word anagrams, math problems). Across all studies, I dropped respondents who took longer than two standard

deviations from the mean time taken by all respondents to complete the study.

A pilot study offers support for my prediction that the use of AIVA (vs. SBSE) for search tasks reduce users' perceptions of autonomy by specifically showing that they feel lower perceptions of control over the results of the search. Study 1 provides evidence that information search using AIVAs, as compared to a SBSE results in decreased task performance among consumers. Study 2 indicates that this decline in performance extends across different types of tasks (verbal and mathematical), and that perceived control mediates this effect. Study 3 confirms that perceptions of autonomy are the underlying mechanism that leads to the decline in performance. Finally, Study 4 documents the downstream consequences of my findings by providing evidence of increased willingness to engage in WOM and information search using AIVAs. Details on my stimuli and measures are available in the appendices.

Pilot Study: AIVAs Lower Perceptions of Autonomy by Making the User Feel Reduced Control Over the Search Task Results

Design and Procedure

Seventy-six respondents, recruited on Academic Prolific (M_{age} = 30; 49% female) completed the study for monetary compensation and were randomly assigned to one of two conditions, AIVA vs. SBSE. Four participants were dropped for taking longer than two standard deviations from the mean to complete the study (*M* = 399.66 seconds, *SD* = 193.15), leaving a sample of seventy-one. Each participant participated in a short five-question information search that comprised questions often asked of AIVAs and SBSEs (e.g., what is the weather?). Depending on the condition they either experienced a simulated voice activated search created with an AIVA device or a SBSE.

Results and Discussion

Since autonomy can be described as a person feeling a loss of control over the outcome of a situation (Wertenbroch et al., 2020), I measured lost autonomy by assessing users' feelings of lost control over the results of the search task. Control has been operationalized in many ways in previous research. Since I wanted to confirm that user's feel like their autonomy is being inhibited by the controlling nature of the device I chose several measures for control used in previous research: three measures of control defined by Averill (1973) modified to fit interactions with technology devices and measured - behavioral control (assesses individual's perception of control over the procedure involved in a situation or event), cognitive control (involves the user's interpretation of the situation), and decisional control (the individual's feelings that they have alternative options in a situation), as well as two other measures of control used in previous marketing research and modified to fit the context of a technology search (see Appendix A for full table of measures).

Table 1.3: Results of control measures - pilot study.

Item	AIVA	SE	*F*-Statistic	*p*-value
Behavioral (α = .557)	3.54	5.17	50.4	.000
Decisional (α = .864)	3.26	5.0	21.5	.000
Cognitive (α = .853)	5.36	6.03	6.5	.013
Perceived control (Hui and Bateman) (α = .567)	3.94	4.57	6.4	.014
Perceived control – (Huang) (α = .759)	4.2	5.52	20.1	.000
Perceived control – (Dadholkar and Shen) (α = .847)	3.59	5.84	57.034	.000

A one-way MANOVA with technology type (AIVA vs. SBSE) as the independent variable and each control measure as the dependent variable revealed a significant main effect of technology type on all five perceived control measures (Table 1.3). These results confirmed my prediction that searching with an AIVA (vs. SBSE) lower perceptions of autonomy over the

search results and provide support for H1.

Study 1: AIVAs Lower Task Performance

Design

The objective of this study was to examine whether information search using AIVAs would reduce subsequent task performance. The dependent measure for performance was a set of ten anagrams that respondents had to solve after their search (Appendix). I chose anagrams due to their frequent use in past research on performance (e.g., Meyers-Levy and Zhu, 2007; Endler et al., 2001), and to use a measure that was unrelated to the information search task. I used the percentage of anagrams solved as the dependent measure (range 0-100). After completing the anagram task, respondents reported demographic variables (age, gender), neither of which had any significant effects in this study or any subsequent study and are hence not discussed further. I also included a measure of English proficiency to rule out the possibility that individual ability differences might affect the anagram results (no significant differences were found, and this variable is not discussed further).

To facilitate testing online participants, Study 1A used a simulation of an information search with an AIVA. Participants were instructed to make sure they had proper sound available on their computer and were asked to speak the questions aloud to simulate the information search interactions with an AIVA. After speaking the question, a recorded AIVA answer was provided to participants for each item. In the SBSE condition, a link to Google (www.google.com) was provided, and participants were asked to search for the answer to the question. In Study 1B I used a real interaction with an AIVA, rather than the simulated interaction in Study 1A. Thus, I recruited respondents on Cloud Research Panels, who owned

and had access to a smart speaker to allow them to actually ask the search questions to better mimic actual consumer interactions. This allowed me to use actual branded AIVAs and to measure the results following a more realistic interaction with the device.

Study 1A Procedure

Three hundred and fifty-one MTurk workers (Mage = 43.68; 39.9% female) participated in a between-subjects (Search platform: AIVA vs. SBSE vs. Control, no-search) study. One participant was dropped for taking longer than two standard deviations from the mean to complete the study (*M* = 925.12 seconds, *SD* = 3743.74), leaving a sample of three hundred and fifty; there were no significant differences in the dropout rate by experimental condition ($p > .519$). Respondents in the two search conditions were told that they would be asked to search for answers to some general questions (e.g., "What is the weather in ___ today?"), either using an SBSE – Google – or by using a fictitious smart speaker named Halo (Appendix). Participants in the control condition did not undertake any search, but directly completed the dependent measures.

Study 1A Results

An analysis of variance revealed a significant main effect of the search platform on performance (F (2, 349) = 18.046, $p < .001$), with AIVA respondents solving fewer anagrams (M = 51.192, SD = 32.56) than those in the SBSE (M = 67.753, SD = 29.46, $t = -4.097$, $p < .001$), or control conditions (M = 72.636 SD = 27.42, $t = 5.656$, $p < .001$). There were no differences in performance between the SBSE and control conditions ($t = 1.132$, $p = .258$). These results support my prediction that searching using AIVAs results in lower task performance as

compared to SBSE and provide support for H2.

Table 1.4: Results of the online simulated study (Study 1A).

	Task performance
AIVA	51.19 (32.56)
Search Engine	67.75 (29.46)
No Search	72.64 (27.42)

Study 1B: Real AIVA Interaction

Procedure

One hundred and fifty-four participants (average age = 36.61; 59.2% female) were recruited from CloudResearch to participate in a single factor (Search platform: AIVA vs. SBSE vs. None; between-subjects) study. Ten participants were eliminated for taking longer than two standard deviations from the mean (M = 667.64 seconds, SD = 541.68), leaving a sample of one hundred and forty-four participants; there were no significant differences in the dropout rate by experimental condition ($p > .216$).

The procedure for the study was identical to Study 1A with the exception that participants in the two search conditions were asked to perform the search either using a SBSE – Google – or by using their own personal AIVA.

Results and Discussion

An analysis of variance revealed a significant main effect of the search platform (F (2, 144) = 4.009, p = 0.02), with respondents in the AIVA condition scoring lower (M = 38.70, SD = 26.98) than those in the SBSE (M = 50.47, SD = 26.363, t = -2.090, p = .038), or control conditions (M = 53.04 SD = 26.895, t = 2.714 , p = 0.007). There were no differences in performance between the SBSE and control conditions (t = 0.478, p = 0.634). These results

further support H2 and my prediction that using an AIVA to search for information results in lower task performance as compared to SBSEs, even when using a real interaction as compared to the simulated interaction used in Study 1A.

Table 1.5: Results of the actual AIVA study (Study 1B)

	Task performance
AIVA	38.7 (26.98)
Search Engine	50.47 (26.36)
No Search	53.04 (26.90)

While Study 1 provides support for my predictions with both real and simulated AIVA interactions, it was limited to one measure of task performance and did not measure perceived control. Hence, in Study 2, I extend these results by using a different task – specifically, I considered common consumption related math tasks (e.g., calculations of final prices after considering discounts, computing serial discount effects) in an attempt to consider marketing relevant outcomes of decreased task performance. Additionally, I also included a measure of perceived control to test for its mediating role.

Study 2: Mediating Role of Perceived Control

Design and Procedure

Two hundred and fifteen TurkPrime respondents (M_{age} = 38.9 years; 43.3% female) participated in a 2 (Search platform: AIVA vs. SBSE) x 2 (Task type: Verbal vs. Numeric) between-subjects study. The procedure was identical to Study 1. The dependent measure to assess performance on the verbal dimension was a set of eight word anagrams similar to the ones used in the earlier studies, while the measure for performance on the numeric dimension was adapted from prior research (Chen and Rao, 2007), and comprised a set of eight questions

based on consumption contexts (e.g., "What is the final cost of a leather jacket on sale for 25% off with an original price of $120?" - Appendix). The percent of correct answers to each task (0-100) constituted my dependent measure. I used a three-item scale to measure control (Averill 1973), and adapted the scales to be specific to the AIVA (e.g., I believe that I had a lot of choice in the information I received from the smart speaker, Halo; α = .92) or the SBSE context (e.g., I believe that I had a lot of choice in the information that I received from the Google search engine; α =.91).

After completing the verbal or numeric tasks, respondents completed the same demographic measures as in Study 1.

Results

Eight respondents took longer than two standard deviations from the mean time taken by all respondents (M = 526.23 seconds, SD = 228.48), and hence, were dropped from the analysis, resulting in a final sample of two hundred and seven respondents; there were no significant differences in the dropout rate by experimental condition ($p > .74$).

Task Performance

An analysis of variance with search platform and task type as the independent variables and percentage of questions correctly answered as the dependent variable revealed only a significant main effect of the search platform (F (1, 203) = 20.89, $p < .001$), such that performance was lower in the AIVA (M = 69.20, SD = 20.49) as compared to the SBSE condition (M = 81.47, SD = 18.05). There was no significant effect of task type ($p > .774$) or interaction of search platform and task type ($p > .418$) on control perceptions.

Planned contrasts revealed that the AIVA condition elicited significantly worse performance as compared to the SBSE condition on the verbal task (M_{AIVA} = 69.89, SD = 21.48, M_{sSBSE} = 80.00, SD = 17.61, t (203) = -2.67, p = .008), as well as the math task (M_{AIVA} = 68.48, SD = 21.48, M_{SBSE} = 82.95, SD = 18.53, t(203) = -3.79, p < .001), suggesting that the negative effects of searching using AIVAs is similar regardless of the type of task.

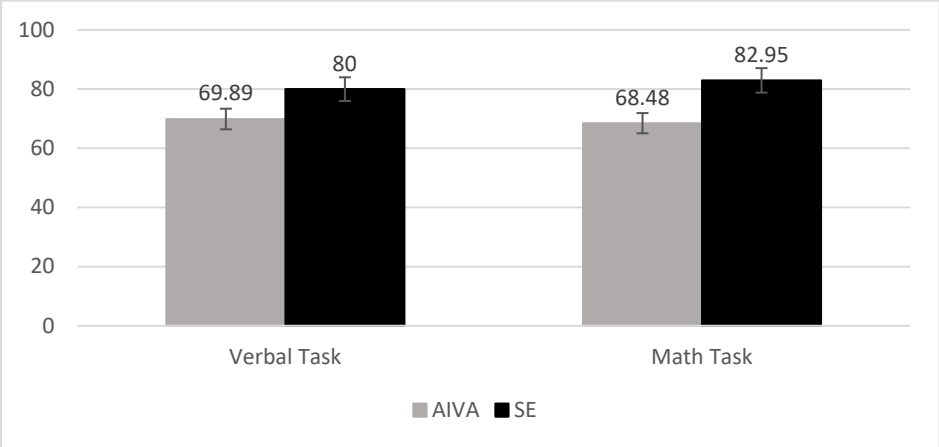


Figure 1.2: Study 2 results

Perceived Control

An analysis of variance revealed only the expected significant main effect of search platform F (1, 203) = 10.73, p < .001), such that respondents in the AIVA condition reported lower perceptions of control (M = 3.37, SD = 1.62) as compared to respondents in the SBSE condition (M = 4.14, SD = 1.71). There was no significant effect of task type (p > .50) or interaction of search platform and task type (p > .31) on control perceptions.

Mediation Analysis

A mediation analysis with search platform as the predictor variable (X), task performance as the dependent variable (Y) and perceived control as the mediator (M), using

the PROCESS macro (Hayes 2017, Model 4) revealed that the effect of search platform on task performance was mediated by perceived control (Indirect effect 95% CI [.0189, .2478]), confirming my prediction that differences in control underlie the decline in task performance after search using an AIVA.

Discussion

The results of Study 2 indicate that the decline in task performance from interacting with AIVAs appears robust across task context. Thus, regardless of whether performance was measured using a verbal (anagram) or numeric task, a similar decline was found after a search using an AIVA as compared to a SBSE. Further, I document that lowered perceptions of control over the search task mediate this effect.

To further confirm the contention that it is the loss of perceived control which underlies the decline in performance that I document in Studies 1-2, in my next study, I adopt a moderation by process design (Spencer, Zanna, and Fong 2005). Thus, I document that when control perceptions are enhanced, the differences in task performance between consumers using AIVAs versus SBSEs is attenuated.

Study 3: Enhanced Control Attenuates the Decline in Task Performance

Design and Procedure

Three hundred and forty-four Prolific panelists participated in a single factor (search platform: AIVA vs. AIVA with increased control vs. SBSE vs. control-no search) between-subjects study. All respondents, other than those in the no-search condition completed a search task similar to the earlier studies. However, respondents in the enhanced control condition were

provided the opportunity to ask additional questions of the AIVA device (i.e., "Would you like to hear more information about…"). I chose this manipulation to enhance perceived control because of its use in past research (control over information while using cell phone apps) to manipulate perceptions of control (Wang et al., 2015). My dependent measure was the percentage of a set of word anagrams that were correctly solved (0-100), similar to my previous studies.

Results and Discussion

An analysis of variance revealed a significant main effect (F (3, 343) = 3.542, p = 0.015) of search platform such that participants in the AIVA condition scored significantly lower (M = 44.52, SD = 24.87) than the other three groups (M_{SBSE} = 53.01, SD = 25.506, t = -2.258, p = .025, $M_{AIVA\text{-}control}$ = 52.33, SD = 24.908, t = 2.095 , p = .037, $M_{no\text{-}search}$ = 56.22, SD = 24.376, t = 3.1, p = .002), with no differences between these three groups (p's between .312 - .858). These results support my contention that the negative effects of AIVAs are driven by a loss of perceived control over the interaction. Thus, when the loss of control was mitigated, participants did not show differences in their task performance following the information search with AIVAs (vs. SBSEs).

Collectively, these studies confirm my predictions that the perceived loss of control while searching using AIVAs leads to lowered task performance. In my final study, I focus on documenting additional and marketing-relevant consequences of the loss of control during AIVA searches by examining WOM intentions and interest in subsequent search as ways to restore control. I also assessed memory for information about a new product that was encountered after the search process to examine whether the decline in task performance after

the AIVA search negatively impacts consumers' ability to learn new information. Finally, I included measures to assess consumer evaluations of the new product (attitude favorability, purchase likelihood).

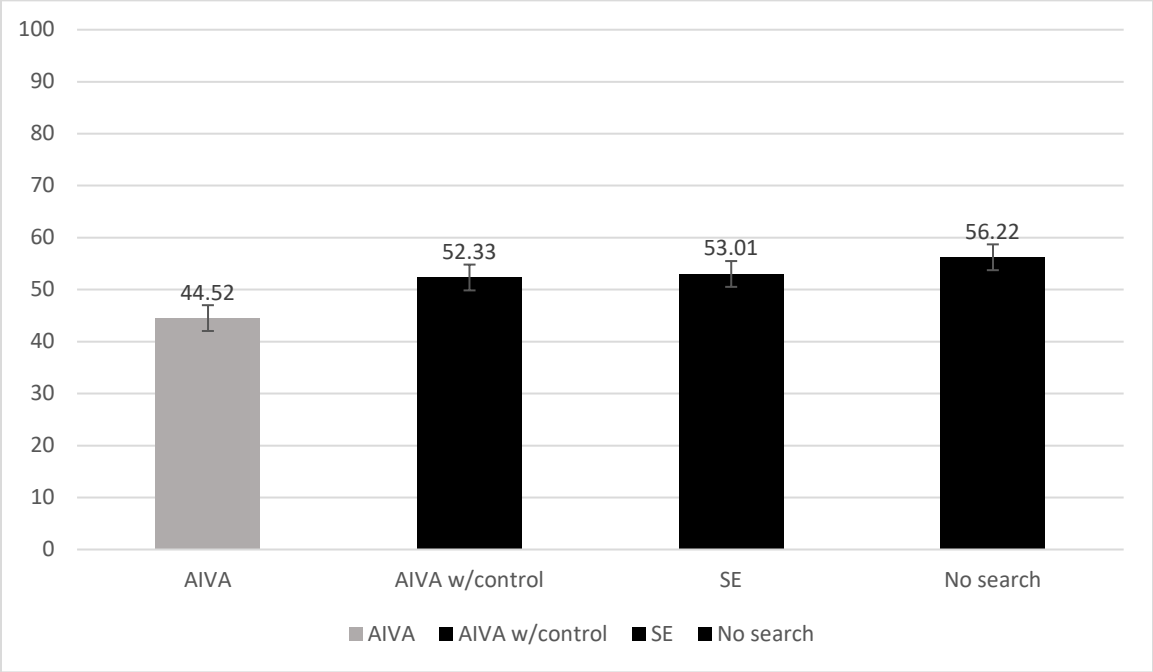


Figure 1.3: Study 3 results

Study 4: Marketing Outcomes of Lost Control

Design and Procedure

One hundred and thirty-eight American Prolific workers (M_{age} = 35.1, 47% female) participated in the study (search platform: AIVA vs. SBSE, between-subjects). Like in my previous studies, I dropped participants based on duration (M = 698.84 seconds, SD = 317.37); there were no significant differences in the dropout rate by experimental condition (p > .576). The search procedure was identical to the previous studies and involved searching using either Google or the Halo AIVA. Following the search, respondents viewed an article about a new product that was supposedly being launched very soon, a translator called Ili, and then shown a

print ad for the same product (Appendix). While they could take as much time as needed to read the news article and the ad, they were forced to view each for 30 and 15 seconds, respectively, to ensure that they had sufficient time to process the information.

After reading the article and the ad, respondents completed measures assessing their memory for the article and ad, purchase likelihood, attitudes, intentions to engage in further search about the new product, intentions to engage in word-of-mouth about the new product, and perceptions of perceived control. Memory was assessed using a recognition measure comprising twenty-eight statements, of which fourteen were true, and corrected recognition (total number of true statements selected – total number of false statements selected, range from -14 to +14) served as the dependent measure (Dalton and Huang 2014). Purchase likelihood was a single item scale (How likely are you to buy this product?), while attitudes (α= .83), search intentions (*r* = .7), WOM intentions (*r* = .59), and perceived control (α= .93) were measured using multi-item 7-point scales.

Results

There was a main effect of search platform on purchase likelihood ($F(1, 136) = 7.08$, $p = .009$), attitude favorability ($F(1, 136) = 6.05$, $p = .015$), search intentions ($F(1, 136) = 1.17$, $p = .076$), WOM intentions ($F(1, 136) = 8.58$, $p = .004$) and perceived control ($F(1, 136) = 14.71$, $p = .000$). There were no significant effects on the memory for the product information ($p = .610$), suggesting that the negative effects of searching using AIVAs may not impact the learning of subsequent information. In line with expectations, all measures, other than perceived control, were significantly higher when information search was conducted using an AIVA as compared

to the SBSE. As expected, perceived control was significantly lower in the AIVA as compared to the SBSE condition (Table 1.6).

Table 1.6: Study 4 results

	SBSE	AIVA
Purchase likelihood	3.15 (1.78)	3.99 (1.90)
Attitudes	5.10 (1.20)	5.57 (1.05)
Search intentions	3.48 (1.74)	3.81 (1.90)
WOM intentions	3.16 (1.48)	3.99 (1.81)
Memory	8.38 (3.29)	8.05 (4.24)
Perceived control	3.86 (1.24)	3.02 (1.35)

A mediation analysis using PROCESS (Hayes 2017, Model 4) revealed that the effects of search type on WOM intentions were mediated by perceived control (Indirect effect 95% CI [-.7093, -.1469]), and this mediating effect of perceived control was replicated for purchase likelihood (95% CI [-.5343, -.0551]) and search intentions (95% CI [-.6707, -.1300]).

Discussion

These results offer support for the important downstream implications of information search conducted using AIVAs as compared to SBSEs. I find that interest in subsequent search increases after searching using AIVAs as compared to SBSEs. Importantly, such interest appears to translate into greater interest in products that are advertised post the information search. Thus, even though the product that was showcased was unrelated to the search process, it appears that the loss of control that is experienced when searching using AIVAs has the effect of increasing interest in subsequent unrelated searches, as well the intentions to engage in greater WOM, as ways to reassert lost control.

In another study (reported in the appendix), I sought to examine whether the effects on search found in Study 4 would extend to actual search behavior. Using the same design and

stimuli as Study 4, I asked one hundred and twenty-eight Prolific respondents if they would be willing to watch an ad for the new product, Illi on YouTube. If respondents chose to do so, they were directed to the YouTube ad and had to watch the ad. Using this behavioral measure of search yielded results similar to Study 6 with a greater proportion of respondents in the AIVA condition (M = 64.6%) opting to watch the ad as compared to the SBSE condition (M = 44.4% , X^2 (128) = 5.253, p = .022), suggesting that the effects of AIVA search extend to actual behavior.

General Discussion

While the use of AIVAs has increased dramatically among consumers, little is known about the effects of interacting with these devices on consumer cognitions, emotions, and behaviors. My research begins to address these gaps and documents that information search using AIVAs lowers consumers' perceptions of autonomy, subsequently causing a decline in task performance. Attempting to restore lost autonomy increases consumers' interest in future search and word of mouth intentions and leads to more positive evaluations of subsequent product information. These results hold significant implications for research on the effects of cognition and technology.

While previous research has focused on the negative effects of technology on cognitive performance due to its role as a distraction (Ward et al., 2017; Strayer and Johnston 2001) and as a repository for information (Sparrow et al., 2011), my results suggest that perceptions of control over technology can also play an important role in subsequent performance, thus expanding our understanding of the processes underlying the effects of technology on humans. This is consistent with research which has found deleterious effects on learning and performance when learners lack control over their learning (Bieg et al., 2017). The

documentation of the effects of lost autonomy with the context of voice-activated devices is new and counter-intuitive, especially given how marketers have emphasized how these devices can be controlled by consumers. Thus, while consumers may perceive that AIVAs allow them greater control over their information search, ironically, their actions are in line with perceptions of reduced control.

An important contribution of my work is the empirical documentation of how AIVAs reduce consumers' perceptions of autonomy and the important downstream implications of such reduced autonomy. While prior research has speculated about the potential loss of autonomy due to the use of AI-enabled devices, I empirically test this prediction within a very specific context – information search, and for a very specific device – AIVAs. Such specificity is warranted and advisable since AI-enabled devices vary significantly in terms of their uses and scope, rendering an overall, general model of consumer effects somewhat improbable. Thus, my findings offer initial confirmatory evidence on the important role of perceived autonomy during human-technology interactions.

The outcomes of lost autonomy hold important implications for marketers in terms of search and word-of-mouth, suggesting that future research on these outcomes, as well as ways to attenuate/amplify them, will be beneficial. While I considered only numeric versus verbal tasks, it will be interesting for future research to consider other routine consumer tasks including mixed tasks such as reviews (numeric ratings as well as verbal descriptions), tasks such as listening to music or asking for a joke etc.

This research also offers significant implications for marketing practitioners. More than a half of consumers in the US use AIVAs for a variety of tasks (*Smart speakers statistics: Report*

2021), and due to the circumstances brought about by Covid-19 (e.g., contactless shopping – expanding e-shopping and e-services; and remote working/learning), this usage is likely to grow faster than originally predicted (Khan, 2020). This widespread adoption of AIVAs renders understanding the effects of such use on consumers highly critical. It is evident that both firms and consumers are fascinated by this new AI-enabled technology, but neither fully understand their capabilities or the effects they have on consumer behavior. Limiting consumers' cognitive functioning influences countless aspects of their everyday lives, from decision-making (Bettman et al., 1991) to enjoyment of experiences (Weber et al. 2009). Thus, the use of AIVAs for information search may consequently lead to sub-optimal consumer outcomes, including greater impulse purchases and choices favoring vices (e.g., unhealthy foods) over virtues (e.g., healthy foods), increased consumer spending (reduces searching effort – reducing fatigue), and increased susceptibility to persuasive advertising (especially if presented through the device), rendering this an important area for public policy makers.

For marketers, the differences between AIVAs and SBSEs offer significant implications in terms of structuring search results and integrating advertising with search for AIVAs. Much research has focused on the development on algorithms to render human interactions with AIVAs to be more natural and efficient (Longoni et al., 2019; Castelo et al., 2019; McLean and Osei-Frimpong, 2019). Adding the potential effects of specific types of searches on consumers' control perceptions, and receptivity to subsequent marketing efforts including advertising, will help enhance the effectiveness of marketing promotions using these devices.

Limitations and Future Research

This research focused on relatively limited types of tasks and greater research is needed

to examine a broader range of cognitive tasks. Given the differences that I find for simple word anagrams and math problems, the differences between AIVAs and SBSEs are likely to be more pronounced for more complex tasks such as decision trade-offs and complex information processing. However, it would be interesting to consider whether the decline in task performance due to loss of control impacts emotionally laden choices or tasks. It is possible that tasks that require emotional processing may not be subject to the same inimical effects as cognitively laden tasks.

My research was also limited to relatively general search tasks (e.g., weather, books), while AIVAs provide a wide range of functions to their users, including hedonic tasks (e.g., listening to music, books, and podcast, playing trivia games, and meditation guides) and utilitarian tasks (e.g., timers, notes, and information searches). While I focus on the cognitive processes linked to information search and use utilitarian searches as the stimuli, it is highly likely that hedonic searches will impact consumer emotions, which could have different and perhaps countervailing effects as compared to those engendered by the perceived loss of control. Thus, future research on unpacking the interaction between type of search and its effects on cognitions versus emotions will be useful. Previous research has found that emotions provided by hedonic benefits (delight and promotion) and utilitarian benefits (satisfaction and prevention) both directly affect important marketing outcomes such as WOM, purchase intentions, and repurchase intentions (Chitturi et al., 2008). Hence, it would be interesting to investigate if these different tasks evoke different consumer outcomes.

While I consider several marketing outcomes – interest in subsequent search, WOM intentions, attitudes and purchase likelihood, there is wide scope to consider other marketing

consequences. For example, past research has shown that consumers, when faced with a control threat, prefer high effort products to reassure themselves that high effort goal achievement is possible (Cutright and Samper 2014), exhibit more switching behaviors (Su et al., 2016) and prefer utilitarian products because these products are associated with solving problems that are associated with control.

Finally, while I find support for the loss of control as the reason for the decline in task performance, other possible variables exist, such as affect, that could also impact consumer outcomes, and future research may consider these alternate variables.

ESSAY 2

DID YOU REALLY SAY THAT?: AN INVESTIGATION ON AIVAS EFFECTS ON CONSUMER EMBARRASSMENT

Introduction

While a great deal is understood about how consumers make decisions in screen-based digital environments characterized by typed exchanges and online recommender systems (e.g., Diehl et al., 2003; Häubl and Trifts 2000; Xiao and Benbasat 2007), very little is known about how consumer decisions are impacted by active conversational interactions with AI-enabled voice assistants (AIVAs). Consumer decision processes are likely different in verbal exchanges as compared to typed interactions. For example, AIVAs can signal warmth through human-like cues of gender, tone, and effect while also exhibiting competence. This combination of warmth and competence enhances the user's trust in the device, allowing it to have greater influence over the consumers' decisions (Kim et al., 2019). In this research, I propose that verbal dialogs increase consumers' perceptions of social presence, leading to emotional outcomes, which subsequently impact consumer decision-making. I suggest that speaking as compared to typing elicits greater emotion, and therefore, when consumers interact with an AIVA during an information search, I propose they will experience increased feelings of embarrassment as a result of amplified perceptions of social presence.

Further, I demonstrate that consumer gender moderates this effect. Historically AIVAs have been intentionally presented as female (e.g., names, tone of voice), and previous research has indicated that embarrassment is amplified in exchanges where there is a mismatch between gender. For example, patients feel more embarrassed with a physician of the opposite

gender for intimate physical exams such as pelvic exams (Moettus et al., 1999) and rectal exams (Consedine et al., 2011), leading me to predict that when a male interacts with a female-gendered AIVA, they will feel higher levels of embarrassment when considering products for male issues (e.g., erectile dysfunction), and females will feel higher levels of embarrassment with a male AIVA for products for female issues (e.g., vaginal dryness). Building on this premise, I propose that when consumers use an AIVA to seek out information for embarrassing products, they will feel more comfortable when there is a gender match between the AIVA and the user.

By illuminating the impact of voice (vs. typed) interactions on the emotion of embarrassment and the impact this has on consumer decision making, this research adds to the literature on human-AIVA interactions and emotional impacts on consumer decisions while highlighting the underlying process of increased social presence in voice interactions as compared to screen-based interactions. I also add to the gender literature by illustrating that consumers prefer gender-matched voice interactions when seeking information on embarrassing gendered products, even when interacting with digital versus human actors.

I conceptualize the idea that spoken interactions increase embarrassment through perceptions of social presence by connecting the research on voice discourse (Shen and Sengupta 2018; Munz and Morowitz 2020; Park et al., 2020; Melumad, 2021), embarrassment (Krishna et al., 2019; Dahl et al., 2001), and social presence (Waterworth et al., 2015; Jacobson, 2001) to offer insight into the emotional effects of AIVA interactions on consumer embarrassment, likelihood to purchase and willingness to pay for a product through the respective devices. I then present evidence from four studies, examining when and how consumers feel embarrassment and how that leads to a reduction in purchase likelihood and an

increase in willingness to pay for embarrassing products. I conclude with a discussion on the theoretical and practical implications of voice-enabled technology on consumer emotions and behavior and discuss future research ideas addressing the implications of AIVA technology.

Theoretical Background

Voice Technologies

The idea of voice exchanges in e-commerce is a relatively new concept, having its genesis in the introduction of Apple's voice assistant "Siri," which was integrated into their popular iPhone in 2011, and other operating systems quickly followed suit. In 2014 using a personal voice assistant for voice-commerce became possible with the introduction of Amazon's Alexa enabled through their standalone smart speaker, "Echo." These standalone voice assistants were developed for home use and have been widely adopted by consumers (Juniper Research 2019).

With the increasing development in voice technology, a growing stream of research has emerged investigating this mode of interacting with consumers. This developing body of research has focused on consumer adoption of voice assistants (Coskun-Setirek and Mardikyan 2017; Liao et al. 2019), the types of activities conducted using voice technology (Sciuto et al. 2018; Ammari et al. 2019; Arnold et al. 2019; Sun et al. 2020), consumer privacy concerns with voice technology (Buvat et al. 2018; Cowan et al. 2017) and the impact these devices have on consumers reactions and behaviors (Munz and Morowitz 2020; Park et al., 2020; Melumad, 2021). Specifically, marketing research has begun to explore how auditory outputs from voice assistants impact consumers' product choice (Munz and Morowitz 2020; Park et al., 2020) and consumer search content (Guy, 2018; Melumad, 2021), but to my knowledge, little research has

investigated how these exchanges impact consumer embarrassment and the effects of this emotional response on purchase intentions.

The Effects of Voice vs Typed Exchanges

Voice commerce has the potential to make online transactions seem more like face-to-face human interactions. Psychology research has found that people impart human social norms to auditory voices even when they are aware that the voice is not coming from a human (Nass and Brave, 2005). For example, people perceive computerized voices to have human personality traits (Nass and Lee, 2001) and even apply gender roles to computer voices (Nass et al., 1997). Since people give human social norms to computer-generated auditory voices, it is safe to say that spoken interactions with AIVAs will have a different impact on consumers as compared to typed exchanges. Though research is investigating how voice assistants are impacting consumer behavior, little is known about how interactions with AIVAs might impact consumer embarrassment.

Research in both psychology and marketing (Akinnaso 1982; Chafe and Tannen 1987; Shen and Sengupta 2018) investigates the psychological differences between spoken and written communication. This stream of work provides us with the widely accepted idea that there are fundamental differences between these two forms of communication. For example, spoken exchanges tend to be more social in nature. In other words, the dyadic nature of speaking (e.g., speaking implies a listener) creates a social setting (Goffman, 1990; Jones and Pittman, 1982; Leary, 1995). This indicates that when speaking (vs. typing) a person will feel higher perceptions of being in the presence of others.

Perceptions of Social Presence

The concept of presence has become the focus of increasing attention as technology has developed. The idea of presence has had a wide array of definitions, including presence as a feeling of being in a location (Waterworth et al., 2015), an experience of being engaged (Jacobson, 2001), a perceptual allusion (Lombard and Ditton, 2006), and a sense of otherness (Cheyne, 2001). Lombard (2015) develop a framework for defining presence. In the context of spoken versus typed discourse, the concept of social presence is most pertinent. Social presence is the type of presence related to others or real and imagined social identities (e.g., human, electronic, or otherwise). Social presence, by definition, is an objective property of the mode of communication, which requires a two-way "human" interaction (Zhao, 2003). I argue that the dyadic communication users experience through spoken interactions (versus typed) increases one's perceptions of social presence. This increased perception that one is in the presence of "others" when interacting with technology through voice has the potential to change our understanding of consumer behavior in online settings. Previous research has shown that consumers prefer an online setting when purchasing embarrassing products because they feel a sense of anonymity (e.g., being alone) (Esmark Jones et al., 2018). With the introduction of voice exchanges in online commerce, these understandings might not hold.

Embarrassment Concerns

Previous research on the impact of speaking (vs. typing) on emotion has provided mixed findings. For example, research has found that when writing versus speaking, people use more emotional words (Brady et al. 2017; Jackson et al. 2019), but Berger, Rocklage, and Packard (2021) found that when speaking (vs. typing), people express more emotional attitudes. One

possible explanation for this is that writing is more deliberative and focused, while speaking is automatic and intuitive (Altenberg 1984; Ochs 1979; Rocklage and Fazio 2016). Another could be that speaking provides emotion to be expressed with manifestations other than words such as tone and pitch (e.g., Laukka et al. 2016; when people are happy, they tend to speak in a higher-pitched voice). Shen and Sengupta (2018) provide evidence that indicates that speaking creates a sense of presence. Specifically, they found similarities between participants who spoke their opinions about a brand to a technological device (vs. writing it on paper) and those who spoke to a human. Therefore, I deduce that speaking a search query to an AIVA inevitably creates a social interaction between the AIVA and the human that mimics interactions between a person and a human counterpart, leading me to predict that interacting with an AIVA for a search query about something embarrassing would lead to higher levels of the emotion of embarrassment due to the increased social presence.

Embarrassment is, by definition, a socially emerging phenomenon that comes from the concern a consumer feels about what others think about them (Miller, 1996). Therefore, embarrassment occurs when unwanted suggestions are conveyed about oneself to others. Prior research in social presence and technology (Lombard and Ditton, 2006), as well as psychology (Edelmann 1987; Miller and Leary 1992), indicates that this social other need not be physically present but can be imagined. Consequently, one must be aware of the presence of a real or perceived social presence to feel embarrassment. Naturalness or realness has been identified as one of the key contributing factors in feeling the social presence of another (Freeman, 2004). Given the natural (e.g., real) human-like quality of the voice presented by AIVAs and the nature of presenting the search as a two-way interaction, I propose that spoken interactions such as

those experienced with the use of an AIVA increase users' feelings of embarrassment as compared to the same search with a typed interaction (e.g., using a SBSE) and that the underlying explanation for these feelings of embarrassment is the increased perceptions of social presence perceived when one speaks versus types their search question.

The Role of Gender

AIVA devices have been intentionally designed with gendered characteristics. Previous research indicates that gender will play a role in perceptions of embarrassment. Specifically, an empirical meta-analysis showed that men and women had non-significant differences in the emotion of embarrassment (Else-Quest et al., 2012), but studies have found that both men and women prefer a same-gendered sales associate when purchasing embarrassing products (Arndt and Ekebas-Turedi, 2017). Combined with similar findings in physician-patient contexts where women prefer a woman physician for an emergency pelvic exam (Moettus et al.,, 1999) and patients prefer a same-gendered physician for rectal exams (Consedine et al., 2011), When taken together, these findings suggest that when a product is gender-specific, the gendered voice of the AIVA will heighten the effects of embarrassment when the human gender is the same as the one attributed to the device.

Voice Effects on Purchase Behavior

Previous research indicates that consumers will avoid embarrassing consumptions scenarios (Krishna et al., 2019). I suggest that though previous research has shown a preference for online channels when purchasing embarrassing products (Esmark Jones et al., 2018), when the technology exchange is conducted using voice, this preference is attenuated. In other

words, consumers will be less likely to purchase embarrassing products using voice commerce as compared to typed online e-commerce.

In conclusion, this research aims to determine when and why speaking creates greater embarrassment and how this increased embarrassment impacts buying decisions for embarrassing products. I further identify several moderators to the embarrassment. One, I illustrate that programming the device to match the gender of the user will attenuate the felt embarrassment. Second, I show that providing a means for the user to affirm social-self attributes (e.g., trustworthiness, kindness, generosity) will also reduce the effects of voice on felt embarrassment.

Overview of Studies

In this section, I present five studies (with both real and simulated voice interactions) investigating my predictions. First, I establish that consumer embarrassment is increased in a spoken (vs. typed) interchange (Study 1A and 1B). I then provide process evidence by illustrating that increased social presence mediates the effects of search modality (Spoken versus typed) on consumer embarrassment (Study 2). Next, I examine the moderating effects of female (vs. male) AIVA voice on embarrassment, specifically for gendered products (Study 3). Finally, in Study 4, I examine if self-affirmation will lessen consumers' overall perception of embarrassment.

Pilot Study: Effect of Spoken (vs. Typed) Search on Embarrassment

Method

A pilot study tested my hypothesis that individuals feel higher levels of embarrassment

when speaking as compared to typing about embarrassing products. I predict that speaking increases a person's perceptions of social presence, which in turn increases feelings of embarrassment when speaking about these products.

The study was a single factor Search Modality (Spoken vs. typed) between-subjects study with ninety-nine student participants from an American university (Mage = 23.93 years, 58.6% female). I first asked the respondents to either speak or type a question about an embarrassing product (e.g., "What is anti-odor foot powder?", What is anti-diarrheal medicine?). For comparison, I also asked participants to ask similar questions about non-embarrassing products (e.g., "What is toothpaste for sensitive teeth?", "What is dry skin medication?"). I asked the participants to rate their feelings of embarrassment after each question as well as how embarrassed they would feel purchasing these products. Following the spoken versus typed task and embarrassment measure, respondents completed measures of social presence and general demographic questions.

Results and Discussion

An analysis of variance on the mean embarrassment score across all products revealed a significant main effect of question modality (spoken vs. typed) ($F(2, 97) = 27.275$, $p = .000$), with respondents who spoke the question scoring higher ($M = 4.016$, $SD = 1.419$) than those who typed the question ($M = 2.488$, $SD = 1.492$).

I repeated this analysis with each product individually and found similar results (see Figure 2.1). I found that these results hold even with products that would be considered less embarrassing (e.g., treatment for dry skin and dandruff shampoo) ($F(2, 97) = 15.084$, $p = .000$), with respondents who spoke the question scoring higher ($M = 2.487$, $SD = 1.325$) than those

who typed the question (M = 1.55, SD = 1.042). However, in line with expectations, there were no differences in reported embarrassment for the non-embarrassing control products (e.g., toothpaste; p = .483). The findings of the pilot study thus support my hypothesis that speaking elicits higher feelings of embarrassment as compared to typing.

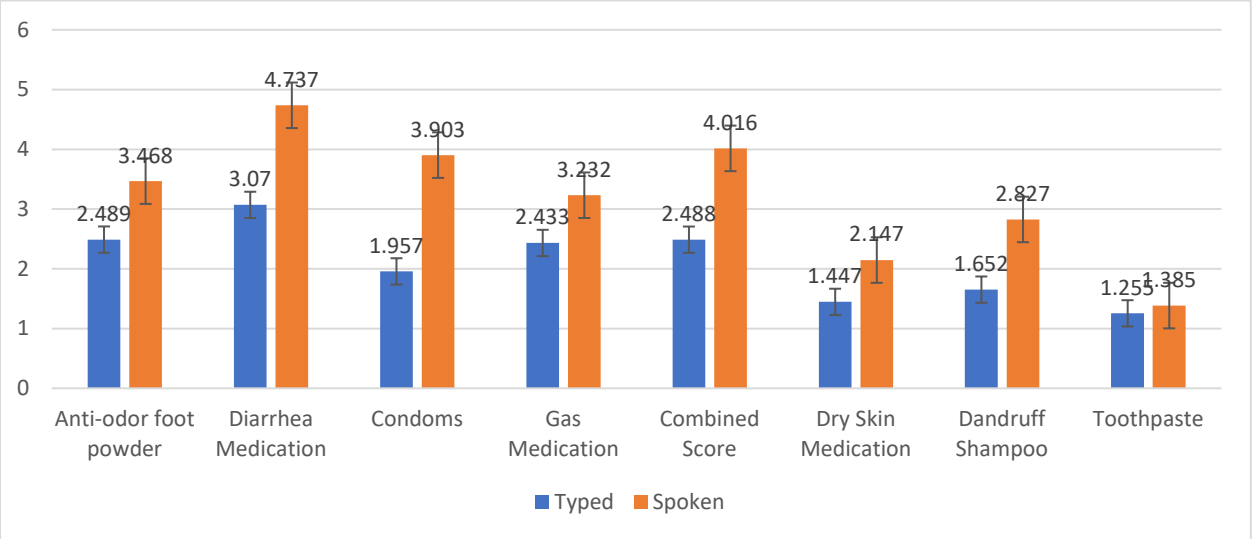


Figure 2.1: Pre-test results for each product

Study 1A: AIVAs Search Effects Subsequent Embarrassment

Study 1A aimed to initial evidence that the spoken interaction with an AIVA will result in respondents feeling greater embarrassment. I predict that following an interaction with an AIVA (vs. SBSE), consumers will feel higher levels of embarrassment when asked about embarrassing products.

Method

One hundred and twenty-one Prolific panelists (M_{age} = 27.57; 32% female) were recruited to participate in a single factor search modality – spoken (AIVA) versus typed (Google.com) versus control, no search between-subject design study. Respondents in the two

search conditions were told that they would be asked to search for answers to some general questions (e.g., "What is the weather in Dallas today?"), either using an online search engine – Google – or by using a smart speaker named Stro. Participants in the control condition did not undertake any search but directly completed the dependent measures.

To facilitate testing online participants, a simulation of an information search with an AIVA was developed. Participants were instructed to make sure they had proper sound available on their computer and were asked to speak the questions aloud to simulate the information search interactions with an AIVA. After speaking the question, a recorded AIVA answer was provided to participants for each item. In the search engine condition, a link to Google (www.,google.com) was provided, and participants were asked to search for the answer to the question.

My dependent measure for embarrassment was a set of statements about five products that evoke feelings of social transgressions (such as foot odor, gas medication, medication for diarrhea, etc.) that respondents had to rate using a three-item measure (not at all…to extremely embarrassed, uncomfortable and awkward) how embarrassed they would feel purchasing the item (e.g., "Please rate how embarrassed you would feel purchasing anti-odor foot powder using a smart speaker (or online search engine)."). I used the average of the measures for five products as a combined measure of embarrassment as my dependent measure (range 1-7). After completing the embarrassment measure, respondents reported demographic variables (age, gender).

Results

An ANOVA revealed a significant main effect of the search modality (F (2, 120) = 7.087, p = .001), with AIVA respondents scoring higher (M = 3.043, SD = 1.53) than those in the search-engine (M = 1.983, SD = 1.05, t = 3.528, p = .001), but not significantly different than the control conditions (t = -.893, p = .374). Consistent with previous research (Balasubramanian et al., 2005) embarrassment was lower between the search-engine and control conditions (M = 2.774, SD = 1.38, t = 2.802, p = .000). I performed an ANOVA on each individual product which produced similar results (see Figure 2.2). These results support my prediction that searching using AIVAs attenuate the benefits of using an online forum for embarrassing products.

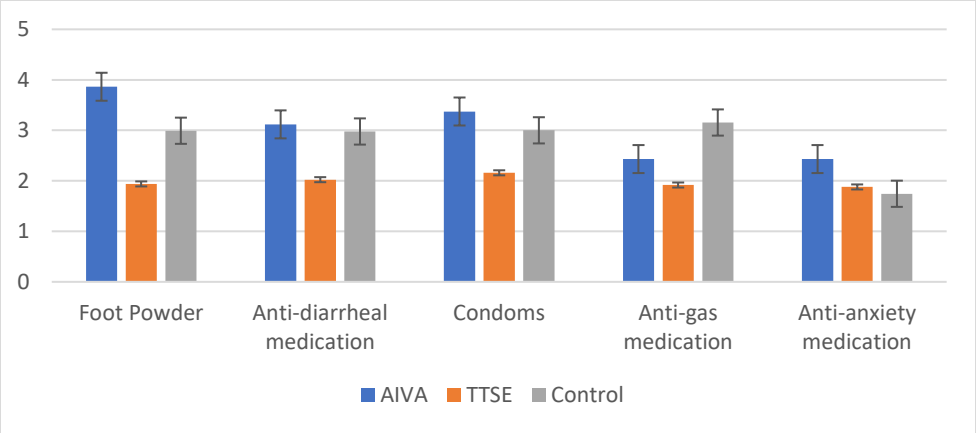


Figure 2.2: Results for individual products

Study 1B: Replicated Study 1A with Real AIVA Interactions

Study 1B was similar to Study 1A but was conducted in the lab, allowing respondents to participate in authentic interactions with an AIVA (Google Home). I also did not include a control condition in this study because I simply wanted to determine if the spoken interaction created more embarrassment when compared to the same search in a typed environment. I used similar search questions and dependent measures as were used in Study 1A with the addition of purchase likelihood for the embarrassing products.

Method

Eighty-three university students (46% females, M_{age} = 25) participated in a single factor (AIVA vs. SBSE) between-subjects study in exchange for course credit. Each participant was randomly assigned to interact with either a Google Home smart speaker (AIVA) or the screen-based search engine Google to complete a simple search task. During the search task, the study presented the same five search questions to the participants and asked them to find the answers using either the AIVA (Google Home) or an SBSE (Google.com). To ensure that the experience was similar for each participant, the same five search questions were provided (e.g., " What is the definition of an integer?"; " Who wrote the novel *To Kill A Mockingbird*?"; "Who was the 5th president of the United States?" "What is the weather in _____ today").

Following the search, respondents were presented with products that have been used in previous research to assess consumer's feelings of embarrassment (anti-odor foot powder, anti-diarrheal medication, condoms, and anti-gas) – Dahl et al., 2001; Blair and Roese 2013), and participants feelings on embarrassment were measured (3-items, α=.975, .974, .982, .973 respectively). Each product was analyzed separately, but I averaged the participants' scores for the final embarrassment measure. Participants' willingness to pay for an embarrassing product using the respective technology was measured by allowing participants to provide an amount within a reasonable range after being provided with an average cost of the item. I also used a two-item scale to measure participant's likelihood to purchase each product (e.g., "How likely are you to purchase this product using a smart speaker (an online search engine)?" Give from 1=Very Unlikely to 7=Very likely; 1=Very improbable to 7=Very probable), and social presence (5-items, α=.7) were measured using multi-item 7-point scales. Finally, respondents reported

demographic variables, including age and gender.

Results

Ten respondents (four from the AIVA condition and six from the search engine conditions) were dropped due to failing the attention check (e.g., inability to identify which search type they experienced), resulting in a final sample of eighty-three respondents.

Embarrassment

An analysis of variance revealed the expected main effect of technology search platform on embarrassment (F (1, 83) = 25.214, t = 4.883 $p < .001$), indicating that participants in the AIVA (Google Home) condition felt higher levels of embarrassment (M = 3.5, SD = 1.74) than those in the online SBSE (Google.com) condition (M = 1.75, SD = 1.07).

Purchase Likelihood and Willingness to Pay

An analysis of variance revealed a significant main effect of technology search platform (F (1, 73) = 22.758, $p < .001$) with participants in the AIVA (Google Home) condition less likely to purchase (M = 2.49, SD = 1.37) than those in the online SBSE (Google.com) condition (M = 4.14, SD = 1.59). A second ANOVA revealed significant main effect of technology search platform (F (1. 73) = 8.322, $p = .005$) on purchase likelihood, with participants in the AIVA (Google Home) willing to pay more for the embarrassing product (M = 11.26, SD = 3.18) than those in the online search engine (Google.com) condition (M = 9.02, SD = 3.42).

Mediation Analysis

Based on my prediction that increased feelings of embarrassment will decrease

participants' likelihood to purchase a product, I ran a mediation analysis using PROCESS (Hayes 2017, Model 4). In the analysis, I entered tech type (X) as the independent variable, embarrassment as the mediator (M), and purchase likelihood as the dependent variable (Y). The results of the conditional indirect effect of the tech type excluded zero (B= .3536, SE= .1854, *95% CI* = [.0218, .7658]). I, therefore, conclude that embarrassment mediated the effect of tech type on purchase likelihood for the embarrassing product. These results did not replicate for participants' willingness to pay for the embarrassing product. In my analysis, I entered tech type (X) as the independent variable, embarrassment as the mediator (M), and willingness to pay as the dependent variable (Y). The results of the indirect effect of tech type excluded zero (B= .2368, SE= .4866, *95% CI* = [-.8240, 1.121]).

Discussion

The lab study results provided robustness to my findings by illustrating that with a different population (students), following a more natural interaction, the results of interaction modality on embarrassment were consistent with my predictions. I was also able to eliminate any branding effect by using Google as the brand for both conditions. These results also confirm my predictions that following a spoken interaction with technology, people will be less likely to purchase embarrassing products and that this is driven by increased embarrassment.

Study 2: AIVA Interactions Increase Social Presence, which Mediates Embarrassment

The objective of Study 2 was to examine the mediating pathway of social presence on the perceptions of embarrassment following a search task using an AIVA (versus a search engine), while also investigating two important marketing outcomes - likelihood to engage with

an ad for the embarrassing product and likelihood to purchase. I predicted that increased perceptions of social presence during the search interaction with AIVAs would lead to increased feelings of embarrassment, diminishing one's likelihood to engage with an ad for the embarrassing product as well as the likelihood that the participant would purchase the product.

Method

The study was a single factor (AIVA vs. search engine) between-subjects study with two hundred and seventy-one American Prolific workers (M_{age} = 30.64 years, 46.2% female). I limited the participant pool to respondents between 18-55 years of age and native English speakers. The five information search questions were similar to my previous studies (e.g., what is the weather in Chicago? Who wrote "To Kill a Mockingbird"?). The search was conducted using either a fictitious brand of AIVA – Stro or a Google online search.

Following the search, respondents were presented with products that have been used in previous research to assess consumer's feelings of embarrassment (anti-odor foot powder, anti-diarrheal medication, condoms, anti-gas, and Viagra (male participants) and RePhresh (female participants) - Dahl, Manchanda and Argo 2001; Blair and Roese 2013), and participants feelings on embarrassment were measured (3-items, α=.939, .976, .97, .975, .977 respectively). Each product was analyzed separately but I averaged the participants' scores for the final embarrassment measure. Participants willingness to engage with an ad about the embarrassing product (3-items, α= .926, .920, .930, .905, .891 respectively) and social presence (5-items, α=.7) were measured using multi-item 7-point scales. I also used a single-item scale to measure participants' likelihood to purchase Viagra (male participants) and RePhresh (female participants) products only (e.g., how likely are you to purchase this product?). Finally,

respondents reported demographic variables, including age and gender.

Results

Five respondents (two from the AIVA condition and three from the search engine conditions) were dropped due to previous participation in a similar study, resulting in a final sample of two hundred and sixty-six respondents.

An analysis of variance revealed the expected main effect of technology search platform on embarrassment ($F(1, 264) = 29.623$, t = 4.883 $p = .000$), indicating that participants in the AIVA condition felt higher levels of embarrassment (M = 3.18, SD = 1.90) than those in the Google search condition (M = 2.19, SD = 1.41) (see Figure 2.3 for results for each measure individually).

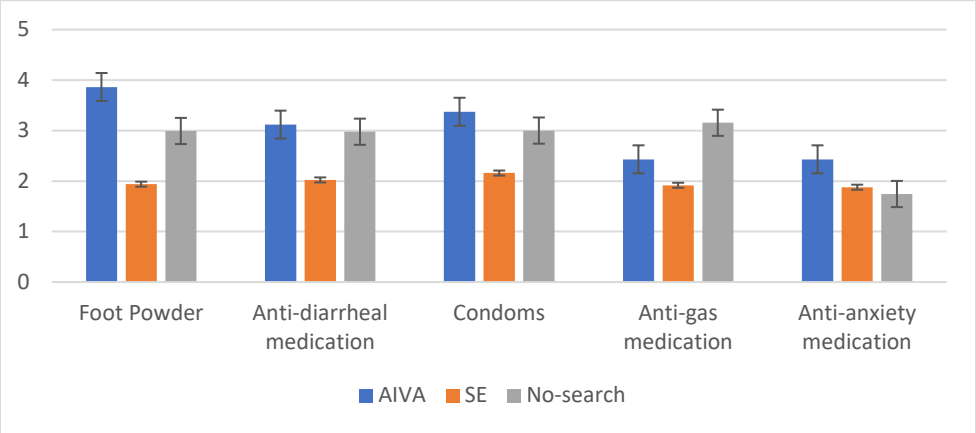


Figure 2.3: Study 2 results

A second analysis of variance revealed a main effect of type of technology platform on perceptions of social presence ($F(1, 264) = .001$, t = 2.294 $p = .023$), demonstrating that participants in the AIVA condition had increased perceptions of social presence (M = 2.53, SD = 1.39) than those in the google search condition (M = 2.13, SD = 1.37).

As expected, a third analysis of variance of technology type on purchase likelihood for Viagra/RePhresh medication revealed a significant main effect ($F(1, 264) = 80.694$, t = -4.818 p = .000), and were significantly lower in the AIVA search exchange (M = 1.51, SD = 2.0) as compared to the search engine condition (M = 2.46, SD = 2.0).

A mediation analysis using PROCESS (Hayes 2017, Model 4) revealed that the effects of search type (Spoken versus typed) on feelings of embarrassment was mediated by social presence (Indirect effect 95% CI [-.1790, -.0031]), and this mediating effect of social presence was replicated for purchase likelihood (Indirect effect 95% CI [-.1590, -.0022]).

A second mediation analysis assessing the serial mediation using PROCESS (Hayes 2017, Model 6) revealed that the effects of search type on purchase likelihood was partially mediated by both social presence and embarrassment (Indirect effect 95% CI [-.0573, -.0012]), and this mediating effect was replicated for purchase likelihood (95% CI [-.5174, -.0307]) and search intentions (95% CI [-.6461, -.0962]).

Discussion

Together findings of Studies 1 and 2 confirm the hypothesis that following a search using an AIVA, participants will feel higher levels of social presence, leading to increased embarrassment when asked about embarrassing products. The results for Study 2 affirm my prediction that the underlying mechanism of this phenomenon is the increase in social presence that is felt when a person speaks versus types during a search interaction using technology and that these perceptions affect the users in subsequent tasks. I also show that the conversational environment presented by an AIVA makes consumers feel less inclined to purchase embarrassing products.

Study 3 was designed to examine the moderating role of the gendered AIVA voice on gendered products. My prediction is that when the gender of the AIVA and the user match, the embarrassment felt for gendered products will be heightened.

Study 3: The Role of Gender

Method

Five hundred and eighty-nine Prolific panelists (M_{age} = 27.6; 53% female) were recruited to participate in a 3 (Modality type: typed, Male AIVA, Female AIVA) x 2 (participant gender) between subject x 2 (gender-matched product) within-subject mixed design. All respondents completed a search task using the same question that was used in Study 2 (unrelated to product), but in the male AIVA condition, I manipulated the voice to sound masculine versus the feminine tone in the female AIVA condition. The typed response was the same as the one used in Study 2. My dependent measure was the repeated measure of embarrassment with the embarrassment measure for my non-gender specific products (anti-odor foot powder, diarrhea medication, condoms, and gas medication) and the embarrassment score for one gender-specific product (erectile dysfunction for males and vaginal dryness for females).

Following the search task, respondents completed the embarrassment measures and general demographic questions.

Results

A two-way mixed ANOVA indicated a significant main effect of the embarrassing product on feelings of embarrassment (F (3.816, 2224.561) = 69.839, p = 0.000) with the gender specific product indicating higher feelings of embarrassment (M = 3.872, SD = .093) than the

non-gender specific products (M_{FP} = 3.262, SD = .076), ($M_{Diarrhea}$ = 3.235, SD = .083), (M_{Condom} = 2.675, SD = .079), (M_{Gas} = 2.962, SD = .078).

Interaction. There was a significant interaction between embarrassment and the mode of interaction (*F* (7.631, 2224.561) = 8.984, *p* = 0.000). This indicates that the product type had different effects on respondents' level of embarrassment depending on the type of search they experienced. The interaction between embarrassment and the respondent's biological gender was insignificant (p > .1). As I predicted, these results did reveal a significant three-way interaction between embarrassment, search mode, and respondent's biological gender (*F* (7.631, 2224.561) = 2.197, *p* = 0.027), demonstrating that when the product is gender-specific, and there is a mismatch in the AIVA voice with the biological gender of the respondent's embarrassment is heightened (see Figure 2.4). As seen in previous studies, an ANOVA revealed a significant between-subject effect of the search mode on embarrassment (*F* (2, 583) = 6.675, *p* = 0.001).

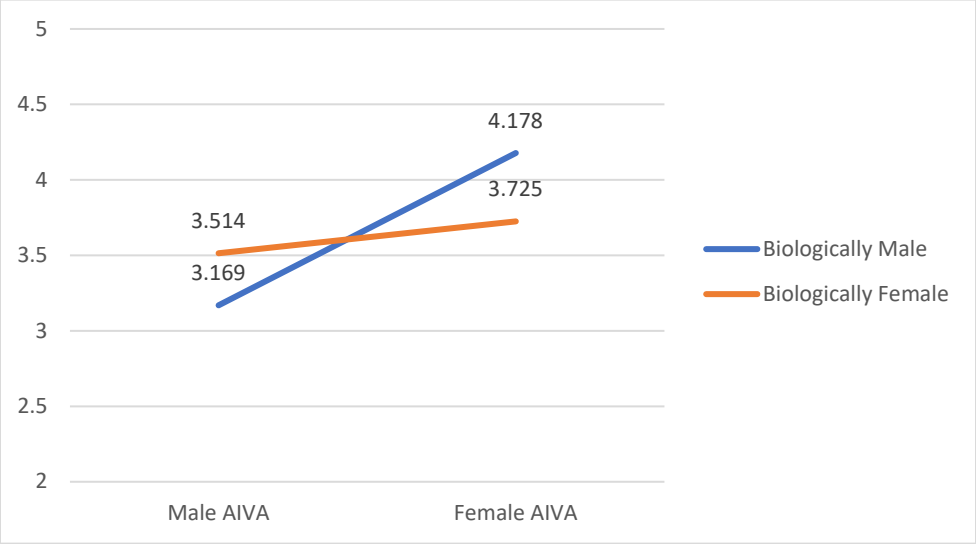


Figure 2.4: Study 3 interaction results

Discussion

These results provide support for my prediction that the gendered human voice of the AIVA will affect the user if the product type is a gender-specific product. Specifically, when the product is gender-specific male respondents prefer a female AIVA voice and female respondents preferred a male AIVA voice.

General Discussion

Recently online purchases have begun to outnumber in-store purchases in many retail categories. Research shows that the use of voice-based technology for purchases has grown exponentially, and voice commerce is predicted to reach $40 billion in revenue by 2022 (*Smart speakers statistics: Report* 2021). Much is understood about how consumers purchase products in a screen-based environment, but little is known about how the human-like nature of AIVAs can impact consumers' emotions and choice (Dellaert et al., 2020). This research focuses on one negative emotion – embarrassment and the purchase consequences of increased embarrassment in voice-based interactions. The results of this study hold important implications for research on consumer choice and embarrassment in exchanges in different technology platforms.

Specifically, I show that voice interactions compared to typed interactions significantly increase respondents' feelings of embarrassment. Previous research has encouraged the use of online stores for marketing and purchasing embarrassing products (Balasubramanian et al., 2005), but this research illustrates that as voice technology begins to overtake SBSE technology, this recommendation will not hold. Further, I show that the underlying mechanism driving these results is the perceptions of social presence felt from the human-like conversational

nature of the AIVA. These results imply that encouraging the use of promoting and purchasing embarrassing products should be done in a screen-based online interaction versus a voice-based online interaction to reduce the feelings of consumer embarrassment and encourage the purchase of such products. I also contribute to the literature by showing that the gendered voice of the AIVA increases these perceptions of embarrassment. Therefore, when a product is gender-specific and embarrassing, marketers would want to refrain from promoting these products through voice interactions and use a screen-based promotional technique.

Limitations

This research has several limitations that could be addressed in future research. First, my studies do not capture the entire range of emotional and psychological outcomes associated with the use of voice-activated technology interaction. It might be interesting for future research to investigate other emotions such as fear, disgust, joy, and excitement. Second, this project only looks at social presence as a contributing factor to the increased negative emotion of embarrassment. Other factors potentially could be involved in the increased emotional response to a voice-based interaction. I also only briefly examined respondent's feelings when they spoke the questions. There potentially could be differences in consumer responses with mixed modes of interactions (e.g., consumer types the question on their phone, but Siri responds verbally).

DISSERTATION CONTRIBUTIONS

My dissertation extends our understanding of the nascent area of consumer interactions with AIVAs. It provides a deeper understanding of how these devices can impact consumer cognitions, emotions and associated important marketing outcomes.

The results of my first essay demonstrate that an attenuated sense of control over information search using AIVAs reduces subsequent cognitive performance. Attempting to restore lost control elevates consumers' interest in future search and word-of-mouth intentions, leading to more positive evaluations of subsequent information. These results significantly extend the research on technology and cognition by adding a new mediator – perceived control, thereby expanding my understanding of how verbal technological interactions can impact human cognition. The outcomes of lost control (future search and WOM intentions) hold important implications for marketers, suggesting that future research on these outcomes and ways to attenuate/amplify them will be beneficial. Finally, the finding that the similarity between the search and cognitive tasks moderates my findings is a significant contribution and suggests an important boundary condition to my effects.

My second essay suggests that the human-like nature of AIVAs can increase perceptions of social presence, thereby eliciting greater feelings of product-related embarrassment and reducing purchase intentions. These findings extend the literature on embarrassment by showing that, even within online shopping for embarrassing products, the use of AIVAs versus search engines can have distinctly different outcomes. Thus, while prior research has found online search and purchase to be one way by which consumers deal with the embarrassment of having to purchase certain products, I find that not all online search and shopping are equal.

APPENDIX A

ESSAY 1 STIMULI AND DEPENDENT MEASURES

Essay 1 Stimuli

Study 1: Directions for the AIVA simulation information-search:

"We are interested in how consumers interact with smart speakers. You will be provided with a few questions that we would like you to ask out loud, as if you were interacting with a smart speaker. Please imagine that you are asking these questions of your smart speaker named "Halo". Please ask the question like you would normally engage with a smart speaker."

Participant Question	AIVA (Halo) Response
"Halo, what is the weather in Dallas today?"	"Currently in Dallas Texas it's 54 degrees Fahrenheit with cloudy skies. Today, you can expect intermittent clouds with a high of 61 degrees and a low of 52 degrees."
"Halo who wrote the novel *To Kill A Mockingbird*?"	"*To Kill A Mockingbird* was written by Harper Lee and published in 1960"
"Halo, when is Memorial Day?"	"Memorial Day is on Monday May 25, 2020"
"Halo, who was the 5th president of the United States?"	"The 5th president of the United States was James Monroe, who was in office from March 4, 1817 to March 4, 1825"

Study 2: Directions for the AIVA simulation information-search:

"We are interested in how consumers interact with smart speakers. You will be provided with a few questions that we would like you to ask out loud, as if you were interacting with a smart speaker. Please imagine that you are asking these questions of your smart speaker named "Halo". Please ask the question like you would normally engage with a smart speaker."

Participant Question	AIVA (Halo) Response
"Halo, what is the weather in Chicago today?"	"Currently in Chicago Illinois it's 31 degrees Fahrenheit with cloudy skies. Today, you can expect intermittent clouds with a high of 34 degrees and a low of 30 degrees."
"Halo, who is the oldest living person in the world?"	"The oldest person is Kane Tanaka"
"Halo, when is Labor Day?"	"Labor Day is on Monday September 7, 2020"

Study 2: Directions for the AIVA simulation information-search with Enhanced Control:

Following the initial answer to the questions above we asked participants

"Would you like more information about…?"

- Yes
- No

If participants answered yes, they received an additional AIVA recording:

Would you like to hear more information about the weather in Chicago?	"Chicago Illinois' normal average temperature is 52 degrees Fahrenheit; its normal annual precipitation is 38 inches and its normal annual snow fall is three feet one inch"
Would you like more information about Kane Tenaka?	"Here's the Wikipedia article on Kane Tenaka. Kane Tenaka is the Japanese supercentenarian who at age 117 years, 196 days is the world's oldest verified living person and 6th oldest verified person in human history. Would you like me to keep reading?"
Would you like more information about the history of Labor Day?	"On the website History.com, they say it was created by the labor movement in the late 19th century and became a federal holiday in 1894."

Study 4: Directions for the AIVA simulation information-search:

"We are interested in how consumers interact with smart speakers. You will be provided with a few questions that we would like you to ask out loud, as if you were interacting with a smart speaker. Please imagine that you are asking these questions of your smart speaker named "Halo" Please ask the question like you would normally engage with a smart speaker."

Participant Question	AIVA (Halo) Response
"Halo, what is the weather in Chicago today?"	"Currently in Chicago Illinois it's 31 degrees Fahrenheit with cloudy skies. Today, you can expect intermittent clouds with a high of 34 degrees and a low of 30 degrees."
"Halo, who is the oldest living person in the world?"	"The oldest person is Kane Tanaka"
"Halo, who wrote the national anthem?"	"The Star-Spangled Banner's author is Francis Scott Key"
"Halo, when is Labor Day?"	"Labor Day is on Monday September 7, 2020"
"Halo what revenue made the most money at the box office?"	"Here's something I found on reference.com some of the highest grossing movies as of 2015 include Avatar, Titanic and Jurassic World"

Dependent Measures

Study 1 and 2 Verbal task: Anagram

	Place unscrambled word here
	Answer
MTOEHR	
BALTE	
ASHKR	
ARCHI	
CECOSR	
ARKMET	
BEEPTERMS	
BALKSTABLE	
NIGHCRAM	
HUESINNS	

Study 2 Pretest: Perceived Control

"We are interested in how you feel about each statement at this moment. Please consider each statement and indicate your level of agreement at this moment."

- *When interacting with the technology, I felt in control.*
- *I felt I had no control over my interaction with the technology.*
- *The technology device allowed me to control the technology interaction.*

Study 3 Verbal task – SAT questions

1. Which of the following demonstrates correct comma usage with adjectives?
   - o He had a large, densely packed, highly organized bookshelf in his office.
   - o He had a, large densely packed highly organized, bookshelf in his office.
   - o He had a large densely packed, highly organized bookshelf in his office.
   - o He had a large, densely packed highly organized bookshelf in his office.

2. When quotation marks are involved, which of the following demonstrates the correct usage of a comma?
   - o ''It's going to be, gorgeous weather outside today'' the teacher said.
   - o ''It's going to be gorgeous weather outside today'', the teacher said.
   - o ''It's going to be gorgeous weather outside today,'' the teacher said.
   - o Commas are not used with quotation marks.

3. 'Because he had already missed a quiz once this semester, John made sure to study extra hard for the midterm.' What is the subject of this sentence?
   - o Midterm
   - o Because
   - o John
   - o Semester
   - o Quiz

4. In the following sentence,__is the subject noun and____is the verb. 'The two girls, as they stroll past the park, hear the faint sound of church bells chiming the hour.'
   - o two; sound
   - o girls; hear
   - o bells; hour
   - o the; hear

5. Choose the answer that best replaces the underlined portion of the sentence (or the answer choice that keeps it the same, if there is no error): We bought three different flavors of <u>ice cream,</u> <u>chocolate,</u> vanilla, and strawberry.
   - o Ice cream, chocolate

- Ice cream: chocolate
- Ice cream. Chocolate
- Ice cream, being chocolate
- Ice cream; chocolate

6. Which sentence in the following passage is irrelevant? Vehicle maintenance is important to extend the life of your car. Corvettes are very fast. Changing the oil every five thousand miles is good for the engine. Rotating the tires on a vehicle several times a year is important for maintaining the vehicle.
   - Vehicle maintenance is important to extend the life of your car.
   - Rotating the tires on a vehicle several times a year is important for maintaining the vehicle.
   - Changing the oil every five thousand miles is good for the engine.
   - Corvettes are very fast.

7. What changes, if any, should be made to the following sentence to make it active voice? If you liked it, then you should have put a ring on it.
   - No change because it is already in active voice.
   - A ring should have been put on it if you liked it.
   - If you liked it, then a ring should have been put on it.
   - If you liked it, you should have put a ring on it then.

8. Identify the most appropriate conjunction and the correct comma placement for the following sentence:
   - I don't always use commas however, when I do I use them correctly.
   - I don't always use commas, however when I do I use them correctly.
   - I don't always use commas and, when I do I use them correctly.
   - I don't always use commas, but when I do, I use them correctly.

9. Which tense is the verb *have met* in the following sentence? *I have met many interesting people in my classes.*
   - Future perfect tense
   - Present perfect tense
   - Past perfect tense
   - Past tense
   - Present tense

10. What is a problem with the following sentence? Looking for his favorite pair of glasses.
    - It is a sentence fragment.
    - It has a comma splice.
    - It is a regular run-on sentence.

- o It lacks an exclamation point at the end.

11. The position of a social worker is one that involves a delicate balance of compassion and strength when dealing with difficult situations such as helping children in unsafe environments.

    As used in the sentence, ''involves'' most nearly means
    - o includes
    - o comprises
    - o concerns
    - o requires

12. The mother concurred with her daughter that she should finish her homework assignments before the family goes out for dinner. As used in this sentence, ''concurred'' most nearly means
    - o consented
    - o agreed
    - o disputed
    - o recognized

13. The crumbs on the child's face was a salient indication that he had eaten a cookie even though his mother had told him not to eat any more sweets before dinnertime. Which of the following is most closely related to the word, ''salient'', in this sentence?
    - o conclusion
    - o questionable
    - o conspicuous
    - o suspicious

14. The students wanted to form a cohesive plan to build the Homecoming float. In the context of this passage, which of the following is most closely related to the word ''cohesive''?
    - o profitable
    - o robust
    - o unified
    - o expedited

Study 4 Numeric task

Instructions: Now please answer the following questions as accurately and quickly as possible.

You are not allowed to use a calculator for these questions. If you do not know

the answer, please choose the answer you think may be correct.

1. At store A cereal is on sale 3 boxes for $10.00. At store B the same cereal is discounted by 25%. If the original price of the cereal was $4.50 per box of cereal, which store has a better price for each box of cereal?
    - o Store A
    - o Store B
    - o The cost is the same at both stores
2. What is the final cost of a leather jacket on sale for 25% off with an original price of $120?
    - o $100
    - o $80
    - o $90
    - o $95
    - o $30
3. How much would you pay for $5.00 coffee mug that is discounted 20%?
    - o $1.00
    - o $2.00
    - o $3.00
    - o $2.50
    - o $4.00
4. Theater tickets are 10% off this weekend. If the original cost of a ticket is $7.50, how much will you pay for each ticket?
    - o $7.00

- $6.75
- $6.50
- $6.00
- $5.00

5. Store A has soda on sale for $1.00 off. Store B has the same soda on sale for a 20% discount. If the original cost of the soda was $4.99 at both store, which store has a better deal?
   - Store A
   - Store B
   - The discount is the same at both stores

6. Season tickets to the local symphony are on sale for 35% off the original cost of $150. What is the discounted cost of the season pass?
   - $52.50
   - $100.0
   - $97.50
   - $105.0
   - $102.5

7. Please read the following scenario very carefully and answer the questions that follow.

The price of gasoline has fluctuated very dramatically over the past couple of months. So, you have started to pay attention to a price report on your local news app, which keeps track of the changes in gas price for all major gas stations in town. Two gas stations in the report, Station A and Station B, are closest and are about the same distance from your apartment.

When you purchased gas last week, the prices were the same at the two gas stations. Since then, the price at Station A has been adjusted once: it decreased by 25%. The price at Station B has been adjusted twice: it first increased by 25% and then decreased by 40%.

Which Station would you choose to purchase gas this week?

- o Station A
- o Station B

8. Which Station has a better price on gas?
    - o Station A
    - o Station B
    - o There is no difference in the price of gas

9. What is the *overall* price decrease at Gas Station B from last week?
    - o 40%
    - o 25%
    - o 15%
    - o Other

Please read the following scenario very carefully and answer the questions that follow.

At the end of the winter season the local department store has placed all of the winter coats on sale for 50%. In order to make space for the new spring styles the store needs to quickly get rid of the winter coats, so they decide to have a two-day winter clearance this weekend which discounts the coats an additional 20%

10. What is the *overall* price discount on the coats?

- o 50%
- o 60%
- o 70%
- o Other

11. If a coat was originally priced at $200, what will be the final discounted price of the coat?
    - o $60
    - o $80
    - o $75
    - o Other

12. While shopping at the store you find a coat you want to purchase, but you decide to look at the reviews online. While online you find the same coat discounted for 65% at another store's website. Both coats are the same brand and have the same original asking prices. Which coat is a better deal?
    - o The local department store
    - o The online retailer
    - o Both stores have the same deal on the coats

Study 4: Dependent measures

Search intentions

Are you interested in getting more information about this product? Here is the link for the commercial of Ili on YouTube: https://youtu.be/B6ngM0LHxuU, how likely are you to watch the commercial after finishing this survey? (1 = Not at all likely; 7 = Very likely), How likely are you to search for this product on Google? (1 = very unlikely; 7 = very likely).

WOM intentions

How likely are you to share information about this product with others on social media? (1 = very unlikely; 7 = very likely)

How likely are you to talk about this product with others? (1 = very unlikely; 7 = very likely)

Attitudes

What is your overall opinion about this product? (1 = very unfavorable/undesirable/dislike; 7 = very favorable/desirable/like)

Purchase likelihood

How likely are you to buy this product (1 = Very unlikely; 7 = Very likely)

Memory

Please select all the correct information about this new product. Select all the details that match those as described in the article and the ad.

- ☐ *Google translate*
- ☐ *company name Lontar*
- ☐ *two languages translation system*
- ☐ *translate up to 50,000 words*
- ☐ *requires Internet connection*
- ☐ *version 1 can translate English, Japanese, Korean*
- ☐ *version 2 can translate French, Thai, Hindi*
- ☐ *version 3 can translate Spanish, Italian, Arabic*
- ☐ *press, translate, become friends*
- ☐ *6 times louder than the smartphone speaker*
- ☐ *potential price $180*
- ☐ *target students*
- ☐ *partner with restaurants*

- ☐ *unveiled on 2020 Consumer Electronics Show*
- ☐ *Apple dictionary*
- ☐ *company name Logbar*
- ☐ *three languages translation system*
- ☐ *translate up to 55,000 words*
- ☐ *does not need Internet connection*
- ☐ *version 1 can translate English, Japanese, Chinese*
- ☐ *version 2 can translate French, Thai, Korean*
- ☐ *version 3 can translate Spanish, French, Arabic*
- ☐ *push, talk, become friends*
- ☐ *4 times louder than the smartphone speaker*
- ☐ *potential price $200*
- ☐ *target travelers*
- ☐ *partner with hotels*
- ☐ *unveiled on 2020 Innovative Technology Show*

Perceived control (Adapted from Averill 1973 and Dabholkar and Sheng 2009)

We are interested in how you felt about each of the following statements during the first part of the survey when you were asked to search for answers to the questions. Please consider each statement and indicate your level of agreement as you felt when you were searching earlier.

I believe I had a lot of choice in the information I received from the smart speaker, Halo (the Google search engine).

I had a great deal of choice in how I received the answers to the questions I asked the smart speaker, Halo (the Google search engine).

I believe I was given options in regards to the answers to the questions I asked the smart speaker, Halo (the Google search engine).

I felt I was in control of my own information search while using the smart speaker (search engine).

The smart speaker(search engine) allowed me to select any answer to my question I wanted.

I felt in control throughout the search process with the smart speaker (search engine)

Study 4 Stimuli

Ili: The New Frontier in Translation!

Language barriers can be a hurdle for travelers abroad, and while apps like Google Translate simplify communication in real time, users sometimes lose nuances as they fiddle with smartphones while at dinner or in a taxi.

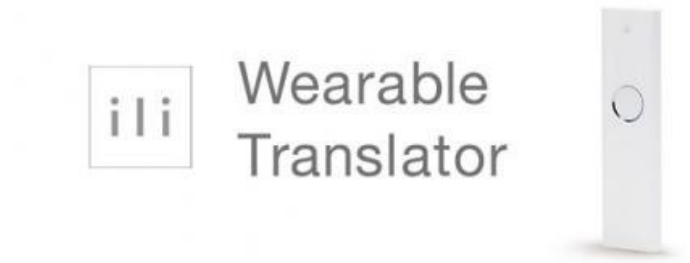
Ili, a wearable translator from company Logbar, aims to change that. It automatically translates languages at the push of a button to help people talk to each other in English, Japanese, and Chinese. The company unveiled its product at the 2020 Consumer Electronics Show on Monday.

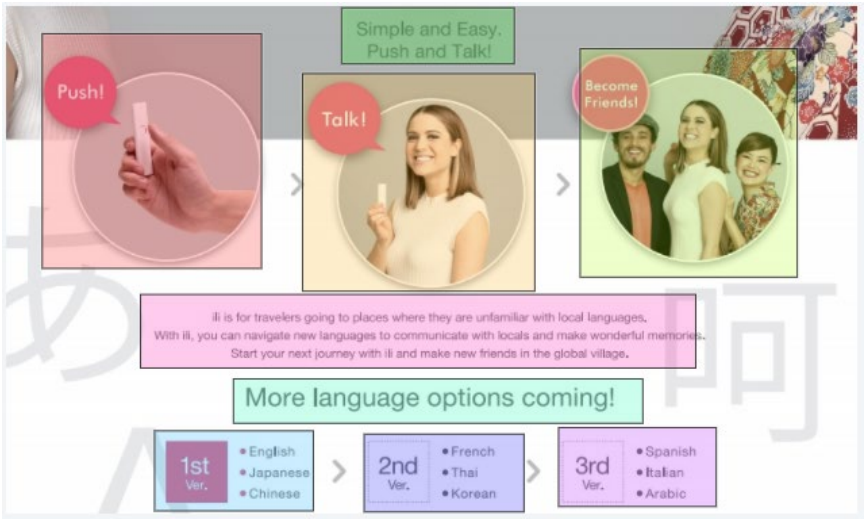
Each Ili device contains a two-language translation system—English-Japanese, Japanese-Chinese, or Chinese-English. The wearable supposedly lets you translate up to 50,000 words and phrases without Wi-Fi or mobile data, powered by the operating system contained on the device.

The devices are targeted at travelers, and Logbar is looking to partner with hotels and travel agencies to test the prototype project early this year. When it's widely available, Ili could cost up to $200 and offer one day of battery life, but Logbar hasn't set a price yet. It also plans to roll out more languages, including French, Thai, Korean, Spanish, Italian, and Arabic, though it didn't give a timetable for those rollouts.

To translate a conversation, you press the button and talk into Ili. When you release the button, it translates through a microphone that is four times louder than the speaker on our

smartphones.





APPENDIX B

RESULTS OF MEDIATION ANALYSES FOR ESSAY 1 STUDY 4 AND ADDITIONAL STUDY

Study 4 Mediation Analysis

1. Y = Purchase Likelihood, X = Search Platform, M = Perceived Control

   Direct effect of X on Y: Effect = 1.1043, se = .3249, *t* = 3.4089, *p* = .0009, 95%CI [.4636, 1.7450]

   Indirect effect of X on Y: Effect = -.2677, SE = .1215, 95%CI [-.5334, -.0622]

2. Y = Search Intentions, X = Search Platform, M = Perceived Control

   Direct effect of X on Y: Effect = .7217, se = .3100, *t* = 2.3277, *p* = .0214, 95%CI [.1085, 1.3348]

   Indirect effect of X on Y: Effect = -.3931, SE = .1450, 95%CI [-.7125, -.1449]

3. Y = WOM Intentions, X = Search Platform, M = Perceived Control

   Direct effect of X on Y: Effect = 1.2165, se = .2791, *t* = 4.3587, *p* = .0000, 95%CI [.6645, 1.7684]

   Indirect effect of X on Y: Effect = -.3877, SE = .1439, 95%CI [-.7064, -.1412]

4. Y = Attitudes, X = Search Platform, M = Perceived Control

   Direct effect of X on Y: Effect =.5592, se = .2018, *t* = 2.7710, *p* = .0064, 95%CI [.1601, .9584]

   Indirect effect of X on Y: Effect = -.0860, SE = .0702, 95%CI [-.2403, .0418]

Chapter 1 Additional Study: Actual Behavioral Outcome

The current study was designed to examine whether participants will actually choose to participate in activities that provide more information about an unrelated product. To achieve

this, we asked the participants to choose whether they would watch a video ad using a YouTube link that we provided.

Method

One hundred and forty-seven American Prolific workers (M_{age} = 27.47, 39% female) participated in the study (search platform: AIVA vs. search engine, between-subjects). We eliminated participants based on duration using two thresholds - participation who watched the video ad ($M_{watched\_ad}$ = 1040.8, SD = 520) and those that did not (M_{no_ad} = 738.5, SD = 283.5), leaving one hundred and thirty-two participants; there were no significant differences in the dropout rate by experimental condition ($p > .934$).

The search procedure was identical to our earlier studies and involved searching using either Google or the Halo AIVA. Following the search, respondents viewed the same article and ad used in study 6. While they could take as much time as needed to read the news article and the ad, they were forced to view each for 30 and 15 seconds, respectively, to ensure that they had sufficient time to process the information.

After reading the article and the ad, we asked respondents if they would be interested in more information about the product ("Are you interested in getting more information about this product?"), and if they responded yes, they were directed to a video ad (on YouTube – https://www.youtube.com/watch?v=rIiGyn_HfcI). If respondents answered "no," they moved on to complete the study without watching the ad.

Results

There was a significant main effect of search platform on respondents' willingness to watch the video (X^2 (132) = 5.065, p = .024), indicating that when participants searched using an

AIVA they were more likely to watch an ad (64.62%) about an unrelated product than those who performed a search using the Google search engine (44.44%; see Figure B.1).

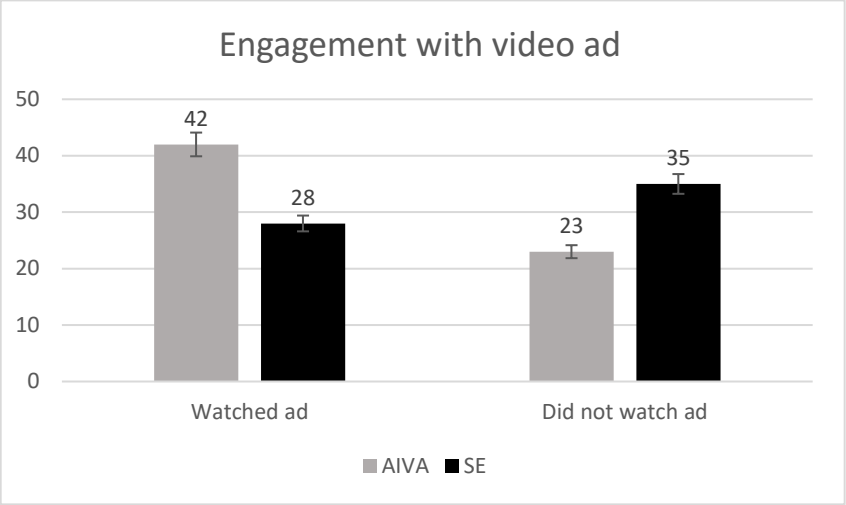


Figure B.1: Results for additional study.

Discussion

These results provide robustness to our predictions that people will be more willing to seek more information following an AIVA search as compared to those who used a search engine. Thus, we were able to illustrate actual search behavior – willingness to watch an ad about the product, thereby adding to our previous findings that focused on intentions to search.

APPENDIX C

ESSAY 2 STIMULI AND DEPENDENT MEASURES

Stimuli

Pretest

Typed condition

Typed Condition

Please type the following question into the text box.

"What is anti-odor foot powder?"

Please type the following question into the text box.

"What is dry skin medication?"

Please type the following question into the text box.

"What is anti-diarrheal medicine?"

Please type the following question into the text box.

"What is anti-dandruff shampoo?"

Please type the following question into the text box.

"What are condoms?"

Please type the following question into the text box.

"What is toothpaste for sensitive teeth?"

Please type the following question into the text box.

"What is anti-gas medicine?"

Spoken condition

Please SPEAK the following question out loud.

"What is dry skin medication?"

Please SPEAK the following question out loud.

"What is anti-dandruff shampoo?"

Please SPEAK the following question out loud.

"What are condoms?"

Please SPEAK the following question out loud.

"What is toothpaste sensitive teeth?"

Please SPEAK the following question out loud.

"What is anti-gas medicine?"

AIVA stimuli

Participant Question	*AIVA (Stro) Response*
"Stro, what is the weather in Chicago today?"	*"Currently in Chicago Illinois it's 31 degrees Fahrenheit with cloudy skies. Today, you can expect intermittent clouds with a high of 34 degrees and a low of 30 degrees."*
"Stro, who is the oldest living person in the world?"	*"The oldest person is Kane Tanaka"*
"Stro, who wrote the national anthem?"	*"The Star-Spangled Banner's author is Francis Scott Key"*
"Stro, when is Labor Day?"	*"Labor Day is on Monday September 7, 2020"*
"Stro what revenue made the most money at the box office?"	*"Here's something I found on reference.com some of the highest grossing movies as of 2015 include Avatar, Titanic and Jurassic World"*

Dependent Measures

Embarrassment

Please rate how embarrassed you feel typing (speaking) the question about (each product name was placed here). (1 = Not at all embarrassed (uncomfortable, awkward); 7 = extremely embarrassed (uncomfortable, awkward))

Please rate how embarrassed you feel purchasing the question about (each product name was placed here). (1 = Not at all embarrassed (uncomfortable, awkward); 7 = extremely embarrassed (uncomfortable, awkward))

Social Presence

I perceive that I am in the presence of another person in the room with me. (1 = strongly disagree; 7= strongly agree)

I feel that the person is watching me and is aware of my presence. (1 = strongly disagree; 7= strongly agree)

The person appears to be sentient, conscious, and alive to me. (1 = strongly disagree; 7=

strongly agree)

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