DIAGNOSTICITY AND EFFECTS OF HAPTIC CUES IN SERVICE CONTEXTS

by

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Preface

The current dissertation includes two essays which examine the effect of haptic cues on perception and behavior. Essay I focuses on understanding the perception, and Essay II focuses on examining the behavior. I plan to submit the Essay I to Journal of Consumer Psychology and Essay II to Journal of Consumer Research in the next couple of months. These two journals are the top-rated journals in the field of consumer behavior.
Acknowledgments

Writing the acknowledgments for second Ph.D forces me to recall one person who has been constant in terms of support and love between the first Ph.D and the second Ph.D. She is none other than my wife, Lovely, who endlessly supported me to achieve my goal. Her love and support were unconditional so that I can complete two Ph.D work. I could not have completed this work on time without her support and love.

I would like to express my sincere appreciation to all those people who provided me with assistance during my research. I am especially thankful to all the dissertation committee members, Dr. George Deitz, Dr. Joann Peck, Dr. Daniel Sherrell and Dr. Alan Bush, whose constant encouragement and enthusiasm enabled me to complete my dissertation. Their intellectual support and extensive knowledge provided me with learning opportunities to explore and to enhance a number of research perspectives. Specially, I am highly obliged to Dr. Deitz and Dr. Peck for helping me shape up the dissertation. Their constant feedback improved the overall quality of my dissertation. Words will fall short of expressing my gratitude for the kindness, care and support they bestowed upon me.

I wish to thank my colleagues and faculty members who helped me for data collection: Sandy Sen, Phillip Hart, Minoo, Jared, and Dr. Babakus. I would also like to thank Dr. Babakus for his suggestions on data analysis. A special thanks goes to Prof. Sumit Kumar from IIMU who fostered my hope through difficult times of Ph.D program. I reserve distinct gratitude for my parents and parents-in-law who always give unconditional support to accomplish my ambition. I would like to thank Priyanka for formatting my dissertation. Last but not the least, I would like to thank IISSO for partly funding the data collection of my dissertation.
Abstract

While prior research has shown that haptic stimuli may influence many aspects of consumer behavior, the role of haptic cues in service context has not been explored. In two essays, this dissertation fills this void and finds that a simple haptic cue can positively influence perceptions and behavior in servicescape. Essay 1 examines the importance of haptic cues in shaping service quality perceptions. Through four studies - in the context of a bank, an airline, a restaurant and a health club - it extends understanding by examining the impact of different types of cues (e.g., hardness, weight, and texture) on the processes driving consumer response. Findings suggest that for individuals high in need-for-touch (NFT) individuals, a high quality haptic cue transfers to a high quality inference regarding the service quality. However, for lower NFT individuals, a haptic cue influences service quality through an affective transfer mechanism. In addition, essay 1 shows that the timing of haptic cue introduction during the service encounter influences the relationship between cue type and service quality perceptions. Specifically, it demonstrates that a haptic cue experienced at the end of service delivery is the most influential.

In Essay 2, the dissertation examines the effect of haptic cues on product choice in service contexts. With two studies, it shows that soft haptic cues affect the selection of more vice products than that of virtue products. In contrast, rough haptic cues result in the selection of more virtue products than that of vice products. In addition, results reveal that present-oriented consumers are favorably influenced by soft haptic cues, whereas future-oriented are not. As a result, present-oriented consumers choose more vice products than future-oriented consumers after experiencing soft haptic sensation. Overall, this dissertation contributes to the literature on services marketing and haptics.
Keywords: Haptic, service quality, need for touch, tangibility, vice and virtue products, temporal orientation
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ESSAY I

EFFECT OF HAPTIC CUES ON SERVICE QUALITY EVALUATION: MODERATING ROLES OF HAPTIC ORIENTATION AND TEMPORAL PROXIMITY
**Introduction**

“In the restaurant of my dreams, the food is thoughtful, the portions are reasonable, the service is impeccable but the napkins are an issue…. I’m not asking for much. A napkin should stay put on your lap and mop up threatening spots and spills, right? Maybe feel nice against your skin”.

*Benwick 2015*

Consider two friends who meet for lunch at a new restaurant. After they are seated, a waitperson provides them with menus. As they browse through their options, one remarks that the food quality is going to be great based on the feel of the quality of the menu. The other is skeptical of that claim, but enjoys touching the menu. Does touching the menu influence the perception of the service quality of the restaurant? As in the opening quote, would the feel of a napkin or flat wear make a difference on the perceptions of the service? More generally, does a haptic or touch cue influence service quality perceptions? And if so, what is the process by which touch can influence these perceptions? Finally, does the timing of the haptic cue matter?

This essay addresses these questions.

While making services tangible has been recognized as important in marketing (Ostrom et al., 2015; Vargo and Lusch, 2004), the role of haptic inputs in the course of service delivery is unclear. Possibly, this may be due to the fact that such cues, as in the restaurant example above, are often incidental to the actual delivery of the service. Nonetheless, it stands to reason that there may be important links between the sensation of touch and service tangibilization. After all, the word “tangible” comes from the Latin word *tangibilis*, which means to touch. While research has shown various types of haptic inputs (e.g., texture, weight, firmness) can influence product perceptions (Peck and Childers, 2003), willingness to pay (Peck and Shu, 2009), affective responses (Peck and Wiggins, 2006) and unplanned purchasing (Peck and Childers, 2006) the
link between haptic cues and the perceptions of service quality has not been studied. In addition, this essay considers how individual differences in preference for haptic information, Need for Touch (Peck and Childers, 2003a), play a role in shaping the process by which haptic cues influences service quality perceptions. I find that for people higher in need for touch (NFT), haptic information is accessible and a high quality haptic cue can transfer to the quality association of the service. This does not happen for those low in NFT. Instead, for low NFT subjects, the transfer process is more affective in nature, such that the pleasant feel of the haptic cue influences service quality perceptions. The final study examines the timing of the haptic cue and finds that it is more influential when a consumer encounters it at the end of the service experience, in comparison to the beginning.

The essay is organized as follows. First, I discuss the role of tangibility as a service quality dimension and the significance of service tangibilization efforts for improving service quality. Then, I present an overview of prior research on haptics in consumer research, clarifying the motivation for my study by establishing clear conceptual links between haptic information obtained by customers during the consumption and evaluation of service performance. I also consider the individual difference in preference for touch information (NFT) and hypothesize that a haptic cue will influence service quality perceptions for both high and low NFT individuals, but the process is different (see Figure 1 for conceptual framework). Then, I report four studies using various haptic cues and service contexts and also their corresponding results. This essay concludes with a discussion of theoretical and managerial implications as well as avenues for future research.
Figure 1: Conceptual Framework

Effect of Haptic Cues, Timing of Service Consumption, and Haptic Orientation on Service Quality Perceptions

<table>
<thead>
<tr>
<th>Diagnostic Cues</th>
<th>Psychological Mechanisms</th>
<th>Customer Outcome Variable</th>
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</thead>
<tbody>
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<td>Haptic Cues (Low Quality versus High Quality)</td>
<td>Affect transfer</td>
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Conceptual Development

Role of Tangibility in Service Evaluation

Grönroos (1978) has defined tangibility as elements of the servicescape that customers can feel, taste, smell, or touch while making a purchase. Similarly, Parasuraman, Zeithmal, and Berry (1988) have defined tangibility as that which can be seen, felt, tasted, or touched in the same manner in which goods can be sensed. According to Vargo and Lusch (2004), tangible things have a palpable and tactile quality. Though, service researchers have not unanimously defined tangibility, all the definitions suggest that tangibility is heavily related to the presence of tactile inputs (i.e., haptic cues) in the service evaluation.

Addressing constraints and issues arising from the intrinsic intangibility of services has remained a critical research agenda item throughout the development of the services research stream (Fisk, Brown, and Bitner, 1993; Ostrom et al., 2015; Vargo and Lusch, 2004; Zeithaml, Parasuraman, and Berry, 1985). Research has found intangibility negatively influences consumer perceptions of quality (Hogreve et al., 2016; Zeithaml and Bitner, 2000), increases uncertainty and perceived risk (Laroche et al., 2005; Lovelock and Gummesson, 2004; Murray, 1991), and produces greater customer dissatisfaction (Bebko, 2000; Jamal and Anastasiadou, 2009; Zeithaml, 1981). Research on “service tangibilization” has adopted various tacks aimed at mitigating the negative effects of intangibility. For instance, Berry and Clark (1986) suggest this problem may be alleviated through communication strategies, such as association, physical representation, documentation, and visualization with concrete cues. Others have stated that by altering physical cues (e.g., physical facilities, equipment) and employee appearance (e.g., uniforms) within a servicescape, consumers find it easier to tangibilize the service, ultimately resulting in more positive evaluations (Grönroos, 1980; Shostack, 1977; Zeithaml, 1981).
Given that the intangibility of a target object is defined by the absence of palpable, tactile qualities, it is striking to find little empirical work on examining the effect of haptic cues on service quality evaluation. The premise that haptic cues might influence service evaluation is in line with conceptual work that suggests that physical cues such as colors, texture, décor, furnishings and temperature are likely to affect service quality perceptions (Bitner, 1990; Lovelock and Gummensson, 2004) and even influence customer behaviors (Lee, Noble, and Biswas, 2016). I believe that evaluation of haptic cues in a servicescape may similarly affect consumer perceptions and behaviors. Importantly, I expect these effects may be persistent even when the cue itself is only tangentially related to the service delivery and consumption.

**Role of Haptic Cues in Decision Making and Quality Evaluation**

Haptic properties are those that are best ascertained by the sense of touch. In consumer behavior, these include factors such as texture, weight, hardness and temperature. Prior research has shown that haptics may play a key role in consumer decision making and behavior. For instance, Ackerman, Nocera, and Bargh (2010) demonstrate that weight, texture, and hardness can influence decisions regarding an unrelated object. For instance, job applicants are perceived as more trustworthy if their CVs are evaluated on a heavier clipboard rather than a lighter clipboard. Similarly, in a gambling task, participants’ bidding amount is higher when they have a smooth ball versus a rough ball in their hands. This finding is consistent with Jostmann, Lakens, and Schubert’s (2009) results in that holding a heavy clipboard (i.e., weight manipulation) increases the importance of an object evaluated on the clipboard. Overall, these studies suggest that the abstract concept of importance is grounded in bodily experiences of weight.

Other research has examined different haptic qualities and outcomes. Piqueras-Fiszman et al. (2011) find that the weight of the dish exerts a significant impact on participants’
perception of the food consumed from it. In addition, they observe that the perceived density, flavor intensity, expected price, and liking ratings increase in accordance with the weight of the dish. They also found that consumers’ quality and liking judgments concerning identical yogurt samples resulted in significantly higher scores when tasted with a stainless steel spoon compared with a plastic spoon with a metallic finish. In another example, Hong and Sun (2011) find that holding and drinking a cold drink facilitates preference for romantic movies compared to warm drinks, as there is an embodied association between hot or cold sensations and associated semantics related to romance. Haptic roughness induces more empathy than smoothness which leads to higher donation (Wang, Zhu, and Handy, 2016). In a recent study, Ruan et al. (2016) have found that rough sensation is likely to enhance more ownership than smooth sensation.

In line with these findings, consumers may evaluate service providers via their interaction with haptic cues. The interaction between the consumer and the service provider is a key component of service research. The interactive nature of services makes it necessary to study the role of haptic cues which can determine the overall service quality perceptions (Bitner, 1990; Holmqvist and Grönroos, 2012). Past research has suggested that physical cues such as colors, texture, temperature, comfort, quality of business cards are likely to affect the service quality perceptions (Bitner, 1990). In the same fashion, I suggest that interaction with the haptic cues in the servicescape is likely to affect the service quality perceptions because such cues have the potential to contribute to creation of customer experience and shape customers’ perception of the service provider (Baker and Cameron, 1996; Berry, Wall, and Carbone, 2006; Bolton, Lemon, and Bramlett, 2014; Fisk, Groove, and John, 2008). I argue that haptic cues are likely to create stronger and lasting customer experience in a service setting, therefore they will affect consumer perceptions towards service quality significantly (Krishna, 2013).
Consumers often lack the time and expertise to judge the quality of a service offering. As a result, they use available cues in the environment to infer the likely quality of a good or service. Services being intangible (i.e., lacking haptic input), quality assessment is more difficult; hence, haptic cues are likely to play a special role as a potential signal of service quality. Overall findings suggest that individuals’ traits are likely to affect the diagnosticity of cues in product evaluation depending on the nature of cues and their salience in quality evaluation (Dick, Chakravarti, and Biehal, 1990; Lee and Shavitt, 2006).

Haptically-oriented individuals (or higher NFT) are more strongly motivated to utilize haptic information as an evaluative attribute in their overall assessment of service performance (Krishna and Morrin, 2008). That is, for high NFT individuals, (a) haptic information is more accessible and more likely to be used to form judgements, and; (b) haptic information is weighted more heavily in their overall evaluations of service performance. Supporting the accessibility of haptic information, response latencies to haptic words are shorter for high NFT individuals (Peck and Childers, 2003a). Perceiving and evaluating a haptic cue is less effortful and more automatic for higher NFT individuals (Peck and Childers, 2003a). Further, Peck and Childers (2005) show that haptic qualities of products are mentioned sooner earlier in evaluation of products by high NFT subjects, indicative of haptic attributes being of higher importance for these individuals. Thus, higher NFT should lead subjects to make inferences about the quality of a service provider based upon quality associations derived from haptic inputs they encounter within the servicescape.

In essence, for high NFT individuals, a quality haptic cue transfers to an inference of a quality service experience. For example, a high quality paper napkin is likely to affect the service quality perceptions for high NFT individuals through a quality transfer from the haptic cue to the
service. In contrast, lower NFT individuals may not appreciate, nor even notice a high quality haptic cue. Instead, a haptic cue may only have an effect if it feels pleasant. There may be an affect transfer from the haptic cue to the service only when the haptic cue is pleasant to the touch. It is worth mentioning that type of haptic cue also determines the quality and affect transfers. For example, soft texture is likely to affect the service quality perceptions through affective process. In contrast, weight as a functional attribute may affect the service quality perceptions through haptic quality transfer (Childers and Peck, 2010).

**Overview of the studies**

Four studies are designed to test whether a haptic cue (a high quality cup) can influence perceptions of service quality. This essay also examines two different proposed processes. It is expected an overall positive effect of a higher quality haptic cue on perceptions of service quality. I also hypothesize that for high NFT, the effect will be through a high quality transfer from the haptic attribute to the service quality. For low NFT, I expect only an affective transfer. I summarize the results of each study in table 1. I next present the results of four studies, each designed to test the key predictions in figure 1.

**Table 1**

*Overview of Studies*

<table>
<thead>
<tr>
<th></th>
<th>Haptic cue</th>
<th>Service setting</th>
<th>Mediators</th>
<th>Major findings</th>
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<tbody>
<tr>
<td><strong>Study 1</strong></td>
<td>Hardness</td>
<td>Airlines</td>
<td>Not measured</td>
<td>• Haptic cue matters in shaping service quality perceptions</td>
</tr>
<tr>
<td><strong>Study 2</strong></td>
<td>Weight</td>
<td>Bank</td>
<td>Liking (i.e., affect transfer) and credibility image (i.e., quality)</td>
<td>• Haptic cue has significant impact on service quality perceptions</td>
</tr>
</tbody>
</table>
Methodology

Study 1: Hardness Experiment

Method

I conducted one factorial between subjects experiment with 2 (Type of Cup: hard; flimsy). The factor was manipulated using the guidelines of Krishna and Morrin (2008). I have adapted Krishna and Morrin’s (2008) airline service scenario (see Appendix B).

Pretest. I conducted a pretest to select two cups that varied significantly on perceived hardness dimension of haptic attribute. In order to choose the cups, I followed Krishna and
Morrin’s (2008) procedure of selecting two plastic cups that were the same size, shape, color (transparent), and weight, but differed in terms of hardness. I conducted a pre-test to ensure my cup selection was consistent with the research objectives. 26 MBA students enrolled in a marketing management class (53% male; mean age = 24 years) received two types of cups that differed only in hardness manipulations. They were asked to rate both of the cups on two, 10-point semantic differential items (low quality-high quality; flimsy-firm). The order in which the cups were presented was counter-balanced to minimize any response and order biases. I ran ANOVA to assess the differences between two cups ($M_{low\ quality} = 5.24$, $M_{high\ quality} = 8.01$, $F (1, 25) = 14.22; p<.001$; $M_{flimsy} = 3.12$, $M_{firm} = 8.12$, $F (1, 25) = 12.54; p<.001$). Based on these results, I was confident that my cup selections differed on the intended haptic association (i.e., hardness) and haptic quality.

*Sample and procedure.* One hundred and seven graduate students enrolled in a marketing management class (55% male; mean age = 24 years) participated in the study. They were randomly assigned to one of two manipulated cup conditions (firm vs. flimsy). Participants were instructed to imagine themselves as they were participating in evaluating Airlines service provider. The task was to evaluate the quality of the unbranded water sample. I used water to control for the effects of external variables (e.g., taste). After reading the instructions, subjects were served a cup of water with a straw of same color, shape and size. They were instructed to take five sips of water while holding the cup in their hand. Once they evaluated the service provider, participants were asked to write down their immediate thoughts, reactions, and ideas. It does not matter how simple, complex, relevant or irrelevant they may seem. Following this, the participants reported their physical condition and mood on a 7-point semantic differential scale (not at all thirsty-very thirsty, bad mood-good mood). Next, participants responded to the
measures for expected quality of service with the airlines on 10-point semantic differential items. Following this, they responded to two manipulation check items used in pretest for judging the quality of plastic cup on 10-point semantic differential items (low quality-high quality; flimsy-firm). Finally, participants completed their demographics and they were asked to relay their thoughts of the study’s true purpose (at which none succeeded). All measures are provided in Appendix A.

Results

Manipulation and realism checks. I began my analysis by examining the manipulation checks for the type of cup used in the main study. Participants perceived the overall quality of the cup more favorably in the hard plastic cup condition than in the flimsy plastic cup condition ($M_{low\ quality} = 3.94$, $M_{high\ quality} = 7.77$, $F (1, 105) = 87.96; p < .001$; $M_{flimsy} = 3.24$, $M_{hard} = 6.96$, $F (1, 105) = 99.78; p < .001$). Thus, manipulations of haptic quality associations worked as intended.

The participants’ thirst ($Ms > 3.65$) was moderate and mood ($Ms > 4.83$) ratings were positive and equivalent across both the conditions ($Fs < 1$).

Main effect of haptic cues on service quality perceptions. With the service quality perceptions, I ran ANOVA to examine the effect of cup on composite mean score of service quality and found that participants perceived the expected quality of the service to be higher in the firm cup condition than in the flimsy quality cup condition ($M_{flimsy\ cup} = 5.71$, $M_{firm\ cup} = 6.73$, $F (1, 105) = 8.62; p < .005$).

Discussion of Study 1

Study 1 establishes the effect of haptic cues on service quality perceptions. It supports that service quality is likely to be shaped by high quality haptic cue (i.e. firm cup vs. flimsy cup). While illuminating, this evidence also leaves several issues unexamined of research to the
service and haptic contexts. First, I do not know how haptic quality cue is transferred to service quality perceptions. Does it go through the quality transfer or affect transfer process? Second, are the underlying processes going to be different for high and low NFT individuals. Because, past literature suggests that people high on NFT are likely to notice the haptic cue more than the people who are low on NFT dimension (Peck and Childers, 2003a). It is also likely that low NFT individuals are going to be affected by affective route (Krishna and Morrin, 2008). Additionally, I am also cognizant of the fact that one service setting and one type of haptic cue (i.e., hardness) are not likely to provide enough evidence to support or reject our claim. Therefore, I have conducted follow up experiments in two different service settings -- banks and restaurants – along with two different kinds of haptic properties -- weight and texture – in order to better understand underlying mechanisms of haptic quality and affect transfers among NFT individuals in greater detail.

**Study 2: Weight Experiment**

**Method**

I conducted a 2 (Type of Bank Brochure: heavy, light) by 2 (NFT: Individual Trait) experiment using a between-subjects design. The first factor was manipulated following the approach of Jostmann, Lakens, and Schubert (2009) and Ackerman, Nocera and Bargh (2010). Every effort was made to ensure that the bank brochure would be as realistic and comprehensible as possible to student samples (see Appendix B).

*Pretest.* I conducted a pre-test to ensure that my brochure selection was consistent with the research objectives. I followed Jostmann, Lakens, and Schubert (2009) and Ackerman, Nocera, and Bargh (2010) procedure of manipulating weight dimensions. For the light weight condition, the brochure was empty and its weight was 0.22 pounds. In contrast, for the heavy
weight condition, the brochure weighed 1.32 pounds. 18 MBA students enrolled in a marketing management class (53% male; mean age = 24 years) received brochures that differed only in weight manipulations. They were asked to rate both of the brochures on a 10-point semantic differential scale (not heavy at all-very heavy). I ran an ANOVA to assess the differences between two brochures ($M_{\text{light weight}} = 5.24, M_{\text{heavy weight}} = 8.01, F(1, 17) = 16.14; p<.001$). The results suggest the weight manipulation worked as intended.

**Sample and procedure.** Ninety three graduate students enrolled in a consumer behavior class (51% male; mean age = 24 years; 100% = own a bank account) participated in the study. They were randomly assigned to either the heavy or light bank brochure condition. A fictitious bank name (e.g., XYZ Bank) was used to control for the effects of brand familiarity.

The subjects’ assigned task was to evaluate a new bank that is considering entering the market. They were invited into a behavioral lab to perform the task in groups of ten. I removed all chairs from the lab to better simulate the real bank scenario, with the brochures displayed upon table tops. Participants were told to read through the bank brochure and were asked to think about their impressions of the bank before responding to the structured questionnaire. This compelled the respondents to hold the brochure in their hand while they were evaluating the bank. After reading the brochure for one minute, participants were provided the structured questionnaire consisting of the scales assessing scenario realism, comprehensibility of the bank brochure, liking of the brochure, perceived credibility of the bank, and expected bank service quality (see Appendix A). Next, they scored the same manipulation check item used for judging the perceived weight of the brochure (not heavy at all-very heavy). Finally, participants completed the need for touch (NFT) scale, demographic items, and relayed their thoughts of the study’s true purpose (at which none succeeded).
Results

Manipulation and realism checks. ANOVA results suggest that participants in the light weight condition perceive the weight of the brochure to be less than the participants who were in the heavy weight condition ($M_{\text{light weight}} = 4.59$, $M_{\text{heavy weight}} = 7.70$, $F(1, 91) = 69.59$; $p < .001$). Thus, the weight manipulation worked as intended. The realism ($Ms > 7.26$) and comprehensibility ($Ms > 7.64$) ratings were high and equivalent across conditions ($Fs < 1$).

Interactive effect of haptic cue and NFT on service quality. Similar to Study 1, I conducted multiple regressions to examine the interaction effect of haptic cue and NFT on service quality perceptions. I found the significant positive main effect of haptic cue on service quality perceptions ($b = .34; t = 2.30; p < .01$). Additionally, I found that NFT moderates the effect of haptic cue on perceived service quality ($b = .25; t = 2.10; p < .01$). Providing further support for my predictions about NFT individuals, a floodlight analysis (Spiller et al., 2013) reveals that when individuals are higher ($MNFT > 4.5$) on NFT, they report significantly higher perceived service quality for a high quality haptic cue versus a low quality haptic cue ($p < .05$). This effect is attenuated for individuals lower ($MNFT < 4.0$) on NFT ($p < .05$).

Conditional mediation effect through haptic quality and liking transfers on service quality perceptions: I used model 8 in PROCESS with 5000 bootstrap samples to test the conditional mediation effect of brochure type on service quality through credibility image and liking among NFT individuals. The results show that credibility image mediates the effect of brochure type on service quality only for high NFT individuals (NFT$_{\text{Mean} + 1 \ SD}$; IE = .99, Boot SE = .25; CI$_{95}$ [.54, 1.54]) but not for low NFT individuals (NFT$_{\text{Mean} - 1 \ SD}$; CI$_{95}$ included zero). In contrast, liking towards the brochure did not mediate the effect of brochure type on service quality.
quality for NFT individuals (Low $NFT_{\text{Mean}} - 1 \text{ SD}; \text{CI}_{95}$ included zero and High $NFT_{\text{Mean}} + 1 \text{ SD}; \text{CI}_{95}$ included zero).

Discussion of Study 2

Study 2 replicates the findings of study 1 by showing the main effect of haptic cues on service quality perceptions. In addition, it finds that quality transfer takes place among the high NFT individuals only but affect based explanation is not significant among low NFT individuals. In light of the past literature (Peck and Childers, 2003b), I believe that weight is more accessible to high NFT individuals than that of low NFT individuals. Hence, liking does not play any significant role for low NFT individuals. Therefore, I conducted study 3 using texture as a haptic cue which will have quality and affective cues for NFT individuals. Secondly, I chose a bank service setting in study 2 that should have been relevant for students, I cannot rule out the possibility that students’ actual experiences with the bank may differ from the general population because of their usage pattern. Thus, in study 3, I used a restaurant service scenario to ascertain whether the pattern I observed in bank setting generalizes to other service settings.

Study 3: Texture Experiment

Method

I conducted a texture experiment that was a 2 (Paper Napkin: high quality, low quality) by 2 (NFT: Individual trait) between subjects design. The first factor was manipulated and the second factor was measured using the NFT scale (Peck and Childers, 2003a). Participants read a scenario about having lunch in a fictitious restaurant and evaluated the enclosed paper napkin before responding to the structured questionnaire. Every effort was made to ensure that the restaurant scenario would be as realistic and comprehensible as possible to student samples (see Appendix B).
Pretest. I conducted a pretest to determine choice of paper napkin used in a restaurant. In order to choose paper napkin that carried the appropriate haptic quality association, I selected eight paper napkins with equal size (32cm × 32cm), thickness (as measured by paper weight) and color (white) but varied on texture.

In the pretest, 24 graduate students enrolled in marketing management class (45% male; mean age = 23 years) evaluated the eight paper napkins. The order in which the napkins were presented was counter-balanced to minimize any response or order biases. After evaluating each napkin, participants indicated napkin quality using two, 10-point semantic differential items (low quality-high quality; rough-smooth). I used ANOVA to assess the differences among the eight paper napkins to ensure that there are significant differences in subject perceptions. The lowest and highest mean scores on two questions were significantly different from each other and were used for our manipulation ($M_{\text{low quality}} = 3.24$, $M_{\text{high quality}} = 8.01$, $F (1, 23) = 76.22; p<.001$; $M_{\text{rough}} = 3.12$, $M_{\text{smooth}} = 8.12$, $F (1, 23) = 82.54; p<.001$). Based on the magnitude of the mean differences, I am confident that my paper napkin selection differs on the intended haptic associations.

Sample and procedure. One hundred and seven graduate students enrolled in marketing management class (51% male; mean age = 23 years) participated in the main study, 2 (Paper Napkin: high quality, low quality) by 2 (NFT: high, low) between subjects design. They were randomly assigned to one of the two manipulated conditions. Participants were instructed to imagine themselves as the protagonist of the service encounter described in a presented scenario (see Appendix B). After reading the scenario and evaluating the enclosed paper napkin, participants completed a structured questionnaire which included measures of realism and comprehensibility, liking of the paper napkin, expected quality of food, and expected service
quality of the restaurant. Following this, subjects answered the two manipulation check items used in the pretest to judge the quality of the paper napkin (low quality-high quality; rough-smooth). Finally, participants completed questions related to need for touch (NFT) scale, demographics and relayed their thoughts of the study’s true purpose (at which none succeeded).

**Results**

*Manipulation and realism checks.* Similar to previous studies, I began my analysis by examining the manipulation checks for haptic quality associations using paper napkin. Participants perceived the overall quality of haptic association more favorably in the high quality paper napkin condition than in the low quality paper napkin condition ($M_{low\ quality} = 5.40$, $M_{high\ quality} = 7.77$, $F(1, 105) = 40.19; p<.001$). Thus, manipulations of haptic quality associations worked as intended. The realism ($Ms > 8.47$) and comprehensibility ($Ms > 8.83$) ratings were high and equivalent across both the conditions ($Fs < 1$).

*Interactive effect of haptic cues and NFT on service quality.* Similar to previous studies, using multiple regressions, I found the positive significant effect of haptic cue on service quality perceptions ($b = .24; t = 2.12; p<.01$). Additionally, I found the significant interaction effect of haptic cue and NFT on service quality perceptions ($b = .36; t = 2.22; p<.01$). In order to decompose the interaction effect, a floodlight analysis reveals that when individuals are higher ($M_{NFT} > 4.65$) on NFT score, they report significantly higher service quality perceptions with a high quality haptic cue (i.e., paper napkin with three ply) versus low quality haptic cue (i.e., paper napkin with one ply) (*all p’s < .05*).

*Conditional mediation effect through haptic quality and liking transfers on service quality perceptions.* Similar to study 2, I have used model 8 in PROCESS with 5000 bootstrap samples to test the conditional mediation effect of napkin type on service quality through food
quality among NFT individuals. The results show that food quality mediates the effect of paper napkin type on service quality only for high NFT individuals (NFT_{Mean} +1 SD; IE = .66, Boot SE = .26; CI_{95} [.19, 1.27]) but not for low NFT individuals (NFT_{Mean} - 1 SD; CI_{95} included zero). In contrast, I found that liking towards the napkin mediates the effect of brochure type on service quality only for low NFT individuals (NFT_{Mean} -1 SD; IE = 1.12, Boot SE = .31; CI_{95} [.50, 1.73]) but not for high NFT individuals (NFT_{Mean} + 1 SD; CI_{95} included zero), as expected. Overall, these results suggest that an affect transfer based explanation is valid for those individuals who are low on NFT score.

**Discussion of Study 3**

I conducted study 3 to extend the findings of previous two studies. I examined an additional haptic attribute (i.e., texture) to better understand how the overall pattern of processes differ based upon individuals’ haptic orientation. Overall, the results reveal that the mechanisms by which haptic inputs influence service quality perceptions are different for high and low NFT individuals. Food quality perception mediates the effect of napkin type on expected service quality only for high NFT individuals, our quality transfer process. With respect to the affect transfer based explanation, I have found that liking of the napkin mediates the effect of napkin type on service quality only for low NFT individuals.

Until now, I conducted all three studies assuming the service interaction is a discrete event. However, in many settings, consumers interact with the haptic cues on multiple occasions and at various points of time throughout delivery and consumption of the service. For instance in a restaurant service context, consumers may touch the menu, plate, flat wear, napkin, water glass, at different times during the service experience. Service scholars have observed the need for treating service delivery as a continuous interaction process (Sivakumar, Li, and Dong, 2014;
Vargo and Lusch, 2004). Therefore, it would be managerially and theoretically relevant to understand how the timing of the haptic cue impacts service evaluation. Are haptic cues more influential at the beginning or end of service consumption? Hence, I conduct study 4 to investigate the role of timing in understanding the effect of haptic cues on service quality perceptions.

**Role of Temporality in Evaluating Haptic Cues during Service Consumption**

Past research on service evaluation suggests that customers prefer a happy ending; an experience consisting of both a positive and a negative event is evaluated as more satisfactory if the positive event occurs last. Moreover, I rely on recency effect theory (Gurhan-Canli, 2003) and recent conceptual framework of understanding the service failure and recovery (Sivakumar, Li, and Dong, 2014) to argue that haptic cues experienced at the end of the service consumption will have stronger impact on service quality than haptic cues experienced at the beginning.

Temporal proximity between the service expectations and quality perceptions has positive effect in service literature (Anderson and Sullivan, 1993; Bolton and Drew, 1991; Boulding et al., 1993; Rust et al., 1999). More importantly, it has been found that expectations, perceptions and disconfirmations continuously change based on the on-going interaction with the service provider (Bolton and Drew, 1991; Boulding et al., 1993; Oliver and Burke, 1999; Parasuraman, Zeithaml, and Berry, 1994; Rust et al., 1999). This stream of literature suggests that timing of evaluating haptic cues in service consumption will have varying effect on service quality perceptions.

Extant literature on the combination or sequence of events has shown that latest experiences are valued more strongly than past experiences (Bolton et al., 2006; Ross and Simonsonm, 1991). Loewenstein and Prelec (1993) have shown that consumers prefer happy
endings to happy beginnings. This finding is consistent with the theory of recency effect in consumer behavior literature. Finishing strong in the service context is likely to have stronger impact on service quality perceptions.

**Study 4: Temporality and Haptic Cue Experiment**

**Method**

I conducted an experiment that was a 2 (Type of Brochure: good quality, Avg quality) × 2 (Temporality: before, after) between-subjects experiment between subjects design. Every effort was made to ensure that the brochure would be as realistic and comprehensible as possible to student samples (see Appendix B).

*Pretest.* I conducted a pretest to select the choice of paper for designing a brochure. In order to choose paper that carried a haptic quality association, I selected nine papers with A4 size in white color with same texture and glossiness but varied on thickness and heavy. The paper quality was decided using the Gram Per Square (GSM)¹. Nine papers ranging from 80 GSM to 400 GSM with a class interval of 40 GSM were provided to 24 graduate students enrolled in a marketing management class (45% male; mean age = 23 years). They were asked to evaluate the paper on three semantic differential scales, 10-point semantic differential items (low quality-high quality; light weight-heavy weight; not at all thick-very thick). I have counter balanced the order of nine papers to minimize any response and order biases. I used ANOVA to assess the differences among nine papers. To select one high quality and one low quality paper for the main study, I used the significant lowest and highest mean scores on three questions \(M_{Avg\ quality} = 3.42, M_{high\ quality} = 7.54, F\ (1, \ 23) = 46.22; p<.001; M_{light\ weight} = 3.12, M_{heavy\ weight} = 4.01, F\ (1, \ 23) =

¹ GSM is an acronym standing for ‘Grams per Square Meter’. Quite simply, it allows print buyers and print suppliers to know exactly about the quality of paper that is being ordered. The higher the GSM number, the heavier the paper and thickness (i.e., haptic properties).
2.54; $p > .10$; $M_{\text{not at all thick}} = 3.24$, $M_{\text{very thick}} = 5.01$, $F (1, 23) = 14.22; p < .001$). Using these results, I chose one low quality paper (GSM = 80) and one high quality paper (GSM = 400) for the main study. It is important to note that the paper varied only on haptic quality associations (quality/thickness).

Sample and procedure. One hundred and sixty graduate students enrolled in marketing management class (54% male; mean age = 25 years) participated in the study. They were randomly assigned to one of the four manipulated conditions of evaluating the health club. Participants were provided the high quality versus low quality brochures before versus after the presentation of a health club. I used a fictitious health club name (e.g., XYZ health club) to control for the effect of brand familiarity. The task was to evaluate a new fictitious health club that is considering entering the market. Participants read a professionally designed brochure of the health club for thirty seconds and attended the formal presentations recorded in a video for ten minutes. In another condition, participants first attended the presentations and then evaluated the brochure for thirty seconds to evaluate the health club. After a five-minute distraction task, participants were provided with structured questionnaire consisting of the established scales for measuring realism and comprehensibility of the health club brochure, liking of the brochure, provider image of credibility, expected service quality from the health club (see Appendix A). Next, they responded to the two manipulation check items used in pretest for judging the perceived haptic associations. Finally, participants completed questions related to need for touch (NFT) scale, demographics and relayed their thoughts of the study’s true purpose (at which none succeeded).
Results

Manipulation and realism checks. As per the recommendation of Perdue and Summers (1986), I have used full factorial ANOVA to examine the quality of brochure on the composite score of haptic quality association items. I found significant main effect of brochure quality on haptic quality perception ($M_{Avg\ quality} = 4.59$, $M_{good\ quality} = 7.70$, $F(1, 91) = 69.59; p<.001$). There were no significant main effect of timing of presentation or interaction effect between brochure quality and timing of presentation (all $p$’s > .22). Next, I found that the realism ($Ms > 7.26$) and comprehensibility ($Ms > 7.64$) ratings were high and equivalent across both the conditions ($Fs < 1$).

Effect of brochure quality and timing of presentation on service quality perceptions.
Using ANOVA, I found main effects of brochure quality ($M_{Avg\ quality} = 4.90$, $M_{good\ quality} = 6.32$, $F(1, 161) = 30.51; p>.005$) and of timing of presentation ($M_{before\ presentation} = 5.15$, $M_{after\ presentation} = 6.11$, $F(1, 161) = 13.02; p>.005$) on service quality perceptions. I also found a significant interaction effect between brochure quality × timing of presentation on service quality perceptions ($F_{3, 158} = 4.01; p<.05$). To understand the pattern of significant interaction, I examined the planned contrasts. It reveals that timing of the presentation does not have significant positive effect on service quality while evaluating a poor quality brochure ($M_{before\ presentation} = 4.70$, $M_{after\ presentation} = 5.11$, $F(1, 81) = 1.63; p>.005$). However, in the good quality brochure condition, timing of presentation has a positive main effect on service quality such that respondents reported significantly higher expected service quality when the brochure was presented at the end of presentation ($M_{before\ presentation} = 5.60$, $M_{after\ presentation} = 7.03$, $F(1, 80) = 13.24; p>.005$). These results offer support for H2 suggesting the good quality haptic cue matters more at the end of service consumption.
**Conditional mediation effect through liking and credibility image:** I have used model 8 in PROCESS with 5000 bootstrap samples to test the conditional mediation effect of brochure type and timing of the presentation on service quality through liking and credibility image. I dummy coded type of brochure (Average Quality Brochure = 0, High Quality Brochure = 1) and timing of presentation (Before = 0, After = 1). I find that liking (IE$_1$ = 0.85, Boot SE = .40; CI$_{95}$ [.03, 1.66] and credibility image (IE$_2$ = .75, Boot SE = .34; CI$_{95}$ [.10, 1.47] are the mediators between the timing of presentation and service quality only in good quality brochure condition. I did not find the direct effects of brochure quality and timing of the presentations on service quality in the presence of liking and credibility image. Overall, these effects suggest that liking and credibility are mediators between the haptic cues and service quality irrespective of the timing of presentations which are consistent with the previous studies.

**Conditional mediation effect through liking and credibility image among NFT people:** Since I did not find the three-way interaction effect of haptic cue and timing with NFT on service quality perceptions (b = .04; t = 0.30; p > .10), I have used model 8 in PROCESS with 5000 bootstrap samples to test the conditional mediation effect of brochure type on service quality through liking among NFT individuals. The results show that liking mediates the effect of brochure type on service quality only for low NFT individuals (NFT$_{Mean}$ -1 SD; IE = 1.26, Boot SE = .55; CI$_{95}$ [.17, 2.34]) but not for high NFT individuals (NFT$_{Mean}$ + 1 SD; CI$_{95}$ included zero). These results suggest that the affect transfer explanation is valid only for those individuals who are low on NFT score, irrespective of the timing of service consumption (before and after). I have used the same model (i.e., model 8) to examine credibility image as a mediator and have found that credibility image mediates the effect of brochure type on service quality only for high NFT individuals (NFT$_{Mean}$ +1 SD; IE = 1.37, Boot SE = .51; CI$_{95}$ [.23, 2.33]) but not for low
NFT individuals (NFT\text{Mean} - 1 \text{ SD}; \text{CI}_{95} \text{ included zero}). Overall, these results suggest that credibility image mediates the effect of brochure type on service quality only for high NFT individuals.

**Discussion of Study 4**

I conducted study 4 with two objectives. First, I wanted to examine the role of timing in influencing the effect of haptic cues on service quality perceptions. Second, I intended to extend the findings of previous studies using more subtle haptic cue (i.e., paper thickness) in service quality evaluation. I have shown that timing of the haptic cue is critical in service delivery. I have found that haptic cue experienced at the end of service delivery is the most influential one in affecting service quality perceptions. In addition, I have shown that haptic quality transfer is relevant for high NFT individuals. On the other hand, affect based transfer is more palpable for low NFT individuals.

**General Discussion**

This paper examines the role of haptic cues in shaping service quality perceptions. While previous studies have shown the effect of haptic cues on product quality perceptions, I conduct four studies to show that the effect of haptic cues on service quality perceptions using different types of haptic cues (i.e., hardness, weight and texture) in multiple service contexts (i.e., airline, banking, restaurant, gym). In addition, I demonstrate that haptic quality and affect transfers act as underlying mechanisms between the haptic cues and service quality perceptions for high and low NFT individuals differently. Finally, I examine that timing of experiencing the haptic cue moderates the effect of haptic cue on service quality perceptions. I have found that haptic cue experienced at the end of service delivery is the most influential.
Study 1 finds the positive effect of haptic cues on service quality perceptions of an airlines service provider. Study 2 uses different haptic cue (i.e., weight) and finds that quality transfer occurs only for high NFT individuals. However, I do not find support for affect transfer mechanism for low NFT individuals. In study 3, using texture as a haptic cue I find that quality transfer explanation is valid only for high NFT individuals but affect transfer is valid for low NFT individuals. Finally, study 4 confirms the findings of study 3 that haptic cue (i.e., thickness/high quality paper) affects the service quality perceptions through quality transfer only for high NFT individuals but affect based explanation is more pronounced for the low NFT individuals. Furthermore, study 4 supports my proposition that a haptic cue experienced at the end of service delivery is the most influential.

**Theoretical Implications**

This paper expands the understanding about the role of haptic cues in shaping service quality perceptions using multiple service contexts. Thus, this research makes several theoretical contributions. First, although past research has demonstrated the usage of cue-diagnostic and accessibility framework in a variety of contexts (including the service context, to a limited extent), applying the theory to understand the role of haptic cues in service setting is an important extension. Using the framework, I have conceptually and empirically showed the haptic quality and affect based transfers in shaping service quality perceptions. Additionally, Krishna and Morrin (2008) examined only the firm/flimsy touch-related cue as non-diagnostic cue in product evaluation. This essay extends their work by examining other touch-related dimensions, such as weight, texture, and thickness, as well as by exploring multiple service contexts.
Second, I examine the interactive effects of haptic cues and NFT on service quality perceptions. Using more robust tool (PROCESS), I have found that quality transfer occurs only for high NFT individuals but affect based explanation is valid only for low NFT individuals. Overall, I have shown that service quality perceptions are determined with the interactive effect of haptic cues and NFT individuals through different underlying processes (i.e., haptic quality and affect transfers).

Third, the findings of the study contribute to the service marketing literature heavily. I have examined the effect of haptic cues on service quality which is closely aligned with the tangibilization process of services. Although past research on service tangibilization has recognized the importance of physical cues as important elements to affect the service quality perceptions (Berry et al., 2006; Bitner, 1992; Bolton et al., 2014), there is little empirical support for this. Hence, the current study is a stepping stone for showing the importance of haptic cues in shaping service quality perceptions which ultimately help create positive perceptions towards the service providers.

Past literature has focused on examining the effect of haptic cues on product quality as a discrete interaction. However, within the service context, consumers interact with haptic cues throughout the service process. Thus, a fourth contribution relates to our examination of how temporality influences the relationship between haptic cue quality and service quality perceptions. By doing so, I have shown that experiencing the haptic cues at the end of service interaction provided the stronger impression on service quality perceptions than the beginning of service interaction. Furthermore, the findings offer a boundary condition of the primacy effect where this essay shows that first impression is less important than the last impression in service interaction.
Managerial Implications

The findings of this essay are likely to be useful for service providers. It is a common practice to use haptic cues to signal service quality, but my results suggest that this strategy is contingent on nature of haptic cues and when in the course of service delivery these cues are experienced. Study findings provide several key takeaways for service managers.

First, in designing service experiences, managers should pay close attention to the types of haptic inputs customers are receiving, even those that appear incidental to service performance. The results show that seemingly meaningless objects (paper napkin, brochure, cup, bowl, plate, paper bill etc.) can play a critical role in shaping overall perception about the service quality. For example, consumers in a checkout lane or at a restaurant table may be handed a credit receipt with a pen for signature as they see the total cost. During this time, consumers are receiving touch sensation from the way the pen feels while they perceive the service quality. Although consumers do not intend to allow their cognitive and affective reactions to touching the pen influence their reaction of the purchase as a whole, these reactions are not independent of one another. If the pen has a lightweight (heavy) feeling that a consumer has learned to associate with low (high) quality, there is an expectation that such touch evaluation would negatively (positively) influence the overall evaluation of service quality perceptions.

Second, service managers need to be cognizant of the fact a pleasant haptic cue experienced at the end of service consumption has stronger impact on service quality perceptions than the beginning of service consumption. In the service delivery process, consumers interact with several haptic cues. For example, in a restaurant service setting, dinner may begin with water service and end with presentation of a pay bill folder and pen. However, those cues
experienced closer to the end of the service encounter disproportionately affect service quality views.

Third, and finally, service managers invest considerable resources in training front-line staffs in order to leave more favorable customer experiences. However, there remains considerable heterogeneity in service performances due to heavy staff turnover, stressful work environments, fatigue, and other individual factors. Thus, the returns on these investments are uneven. More careful consideration of haptic elements of the service environment, including the timing of haptic cue introduction, may offer a viable means for managers to enhance service quality perceptions which is likely to lead profitability.

**Limitations and Future Research Directions**

Although this essay expands the knowledge about the roles of haptic cues in service quality evaluation, this essay acknowledges the limitations of this research and note the need for further research. First, I have examined the research questions using fictitious service scenarios to control for the effect of brand image on service quality; it will be worthwhile to investigate the effect of brand image in setting up the service quality expectation. It is likely that role of haptic cues may become more pronounced for high image service provider.

Second, haptic quality transfer is likely to be contingent on the prior exposure to any non-sensory cues (i.e., word of mouth, brand name, interaction quality) in the service context. For example, if consumers have very good experience with the service providers, they may not care for the haptic cues in service evaluation. Hence, it will be interesting to examine the effectiveness of non-sensory cues in setting up the service quality expectation even before consumers experience any haptic cues. Similarly, it will be worthwhile to examine the relative efficacies of sensory and non-sensory cues on service quality perceptions.
Third, sensory marketing literature is urging the researchers to examine the effect of multiple sensory cues in product evaluation (see Krishna, 2012; Krishna and Schwarz, 2014 for a review of sensory marketing findings). The findings suggest that servicescape would be an interesting context to examine the effect of multiple sensory cues on quality perceptions. In addition, it will enrich our understanding of multi-model interaction of sensory cues and their respective efficacies of multiple cues on service quality perceptions.

Fourth and finally, haptic orientation and timing of service consumption are likely to moderate the effect of haptic cues on service quality perceptions. It will be interesting to examine the role of haptic cues in the service failure context. It is likely that service failure in the beginning of service delivery may have less detrimental effect on service quality perception if the consumers experience multiple pleasant haptic cues in the overall service consumption.
ESSAY II

ROUGH TO VIRTUE AND SOFT TO VICE: THE EFFECT OF HAPTIC CUES ON PRODUCT CHOICE
Introduction

In this essay, I intend to examine the effect of haptic cues on behavioral outcome (i.e., product choice). More specifically, I predict that experiencing soft haptic (vs., rough haptic) cues will have stronger effect on the selection of vice products than that of virtue products. Secondly, I predict that affect and risk will act as the underlying mechanisms between effects of haptic cues on product choice. It is important to note that individual temporal orientation is likely to play an important role between the effect of haptic cues and product choice. I explain these theoretical frameworks below (see Figure 2).

I conduct two studies to test my predictions. The findings of this essay contribute to the literature at least in three ways. First, it contributes to research in the domain of sensory marketing and specifically to the domain of haptic cues. In particular, research on examining the effect of haptic cues on consumer choice of vice and virtue product is not available compared to other sensory cues (i.e., vision, olfactory, gustatory and auditory). Second, while prior research has examined different factors that can influence choices between vice (i.e., unhealthy) versus virtue (i.e., healthy) products, such as affective/cognitive states (Shiv and Fedorikhin, 1999), assortment structure (Khan and Wansink, 2004), self-control (Baumeister, 2002; Kivetz and Simonson, 2002), health claims (Chandon and Wansink, 2007), lateral display positions (Romero and Biswas 2016), body types of others (McFerran et al., 2010), and mode of payment (Thomas, Desai, and Seenivasan 2011), among others, no research has yet examined the effect of haptic cues (rough versus soft) on consumer choices of vice versus virtue products. Third and finally, it is likely to uncover affect and risk as the underlying mechanisms between haptic cues and consumer choice based on the two frameworks (i.e., rough to risk and soft to affect/comfort).
Figure 2. Conceptual Framework
The findings also have strong managerial and public policy implications. While past research has extensively examined different critical aspects of servicescape (Spence et al., 2013), such as ambient light (Biswas et al., 2017), scent (Morrin and Ratneshwar, 2003), music (Baker et al., 2002; Bruner, 1990), flooring (Meyers-Levy, Zhu, and Jiang, 2010), and ceiling effect (Meyers-Levy and Zhu, 2007), little is known about role of haptic cues in consumer choice of vice versus virtue products because consumers interact with several haptic cues in their purchase journey. For example, in a retail store, consumers consistently touch shopping carts while making the purchase decisions for vice and virtue products. It will be easy for the managers to direct the sale of vice and virtue products by changing haptic sensation (rough versus soft haptic cue) in shopping carts.

Following a brief background on two dimensions of haptic cues and how haptic cues affect consumer perception, I build my conceptual framework using rough to risk and soft to comfort and then develop hypotheses related to consumer choice of vice versus virtue products. I conduct two studies to test the hypotheses of this essay and then present potential implications for theory and practice.

Development of Hypotheses

Safety and Security Framework for Consumer Choice of Vice versus Virtue Products

I draw safety-security framework from developmental psychology. According to Field (2001), most fundamental and oldest sense is the sense of touch. It develops very early and helps the people to make sense of the world (Gallace and Spence, 2010; Hertenstein, Verkamp, Kerestes, and Holmes, 2006). For humans and animals, touching something soft is associated with the concept of safety, security and comfort. Children learn to relate the soft touch of their caregivers with the sense of safety, security and comfort when the caregivers cuddle, pat and
hold them (Bowlby, 1951; Hertenstein et al., 2006). Children experiencing soft touch have found to perceive less than the children who have not experienced the soft touch (Winnicott, 1953). Moving forward, minimal physical touch can increase a sense of security which lead them to take more risk in their decision making process (Levav and Argo, 2010). People who received comforting pat on the shoulder take riskier choice than the people who have not received such touch (Levav and Argo, 2010).

The above-mentioned research has focused much on the interpersonal touch. However, the recent research focuses on the link between softness-security using haptic cues of an object. In one experiment of Ackerman et al. (2010), it was found that people tend to take less risk when they experience rough ball compared to smooth ball while doing the negotiation with other party. Haptic roughness induces more discomfort compared to smooth haptic cues which result into more helping behavior (Wang et al., 2016). In contrast, Horen and Mussweiler (2014) have demonstrated that experiencing softness cues can allow the people to cope with the uncertain situation. These researches suggest that people would be willing to take more risk if they touch soft haptic cues. In contrast, it suggests that people would perceive more risk if they experience rough haptic cue. Taking this research in the context of consumer choice of vice and virtue product, it suggests that people would choose more vice products when they experience soft haptic cues but they would choose more virtue products if they experience more roughness.

The classification of vice and virtue products are determined with respect to the benefits accrued over a period of time (Thomas, Desai, and Seenivasan, 2012). Vice products have the characteristics to provide immediate benefits (i.e., good taste of ice cream) but delayed costs (i.e., sugar problem in the future). In contrast, virtue products are considered to have immediate costs (i.e., the bad taste of oat bran) but delayed benefits (i.e., good health in future). Using the
framework of impulsivity, it has been shown that people buy vice products more when their desire is activated by emotional imagery and associated sensations. On the other hand, virtue products are bought more when deliberate thinking takes place (Khan and Dhar, 2006; Shiv and Fedrokhin, 1999). In the current study, I hypothesize that haptic cues with softness association will make people more impulsive which led them to buy vice products more than virtue products. In contrast, roughness will heighten more risk which will make them think more deliberately and buy the more virtue products than vice products. Therefore, I would like to propose the following hypotheses based on the literature of haptics and vice versus virtue products:

H1: When given a choice between virtue and vice product options, consumers will have greater preference for virtue products when they experience rough haptic cues (versus soft haptic cues).

**Moderating Role of Temporal Orientation**

The temporal orientation literature has emphasized that there are individual differences in terms of how people place greater or lesser importance on present versus future delayed consequences of their actions (Joireman, Sprott, and Spangenberg, 2005; Joireman et al., 2008; Kees, Burton, and Tangari, 2010). Joireman and other writers (2005) show that temporal orientation influences the fiscal responsibility of consumers. Specifically, consumers who are more focused on the future tend to fulfill prevention goals and are likely to be more fiscally responsible when compared to present-oriented consumers.

One measure that has been developed to assess a person’s temporal orientation is consideration of future consequences (CFC). Over the years, CFC has evolved as a reliable and valid construct that can measure how people evaluate potential distant outcomes as a consequence of their present behaviors and how they are influenced by such outcomes (Strathman et al., 1994). People who are high on the CFC scale score higher on future time
orientation and lower on present time orientation (Joireman, Anderson, and Strathman, 2003; Zimbardo and Boyd, 1999). Past research on CFC has found that high-CFC, or future-oriented, individuals tend to report a stronger ability to delay gratification (Strathman et al., 1994).

I argue that CFC will moderate the effect of haptic sensation on the selection of vice and virtue products such that individuals with present-orientation are likely to choose more vice products when they experience soft haptic sensation than that of those individuals with future-orientation. Additionally, they would like to gratify the instant need of choosing the vice product. On the other hand, rough haptic cues are likely to influence the future orientated individuals because they will be heavily concerned with the long term impact of choosing vice products (Joireman, Sprott, and Spangenberg, 2005). As a result, they are likely to choose more virtue products than vice products in the rough haptic sensation. Therefore, I propose that low CFC consumers (e.g., present-oriented) will choose more vice product than virtue product. In contrast, high CFC consumers (e.g., future-oriented) are likely to choose more virtue products than vice products when they experience rough haptic cues. Hence I posit that:

H2: Given a choice between virtue and vice product options, people with present-orientation (versus future-orientation) will choose more (versus less) vice products when they experience soft (versus rough haptic cues).

Affect and Risk as Mediators

In the consumer behavior literature, many of the researchers believe that consumers process the information using dual-processing model. It is believed that dual process takes place depending on two levels of information processing, namely basic level and high level. In the basic level, the information is processed more through the affective routes. But in the high-level, the information is processed through the more cognitive routes. For example, Rook (1987) has
explained that at the basic level, consumers process the environmental cue more affectively and show the sudden urge of consuming the goods. In addition, Shiv and Fedorikhin (1999) have shown that when resources are constrained, consumers use basic level of thinking process and react more affectively. In contrast, the researcher like Epstein (1993) believes that cognitive-experiential route is more dominant when the consumer elaborates more on the decision. These dual routes have been supported by several researchers like Berkowitz (1993), Hoch and Loewenstein (1991), Zajonc (1980), and Strack and Deutsch (2004).

According to these researchers, the affective process is automatic which does not require any resources. It can happen without much deliberation (Zajonc, 1980). This suggests that soft cues make the consumers feel very comfortable and secure, therefore automatic routes take precedence over the cognitive routes and affects the product choice (Bowlby, 1951; Hertenstein et al., 2006). On the other hand, rough haptic sensation makes the consumers think about the environment as a risky environment because rough cues make the consumers uncomfortable (Wang et al., 2016). In the risky environment, consumers start thinking more on the higher-level. Therefore, in the selection of vice versus virtue products, consumers become conscious of their decision. As a result, they process the existing information through cognitive routes which result into the choice of virtue product.

Overall, I argue that haptic sensation present in the environment is likely to induce pleasure versus information seeking motivation. Thus, affect and health risk are likely to act as the underlying mechanisms between the haptic sensations and product choice. The interacting effects of haptic sensation along with CFC will impact product choice through the underlying mechanisms of impulsivity and perceived health risk. More formally,
H3: Affect and perceived health risk will mediate the moderating effect of CFC and haptic sensation on product choice.

Methodology

In order to test hypotheses, I have conducted two experiments. I describe each study below.

Study 1: Semantic Priming Experiment

Method

In this study, 230 students were recruited from SONA subject pool for Qualtrics online survey. They have been randomly assigned to five manipulated experimental conditions. In each condition, they have been asked to write the name of three objects or brands. In the control condition, they have been asked to write the name of three familiar brands. In the soft priming condition, they have been asked to list three soft objects (for example, a teddy bear). These objects should feel soft when they touch them using their hands. In the rough priming condition, these objects should feel rough (for example, a sand paper) when they touch them using their hands. In the hard priming condition, they have been asked to write three objects (for example, a brick). These objects should feel hard when they touch them using their hands. In the smooth priming condition, they should feel smooth (for example, a piece of silk cloth) when they touch them using their hands.

Design: 1* 5: The only factor manipulated in this study was the different kinds of haptic sensations (no haptic sensation, soft haptic sensation, rough haptic sensation, smooth haptic sensation and rough haptic sensation) using semantic priming.

Procedure: Participants have been invited to participate in two part studies. In the first part, they have been asked to complete the Positive and Negative Affect Schedule (PANAS;
Watson, Clark, and Tellegen, 1988). After responding to PANAS scale, all the participants have been asked to list three objects or brands. Tasks were used to manipulate the type of haptic sensations. In the second part, they participate in a “Dessert Choice Study” which has been ostensibly conducted by a fictitious restaurant to understand what types of dessert consumers would prefer when they come for the dining. They made the choice between vice (i.e., Cheesecake) and virtue (i.e., Fruit Salad) desserts. The images of the desserts were randomly ordered and picture of the products (approximately 2*2 centimeters) were presented to make the choice. I chose a dessert pair similar to that used by Shiv and Fedorikhin (1999). Shiv and Fedorikhin (1999) used chocolate cake and fruit salad, whereas I used cheesecake and fruit salad similar to Shen, Zhang, and Krishna (2016). Before they made the choice between two desserts, they have been asked to state how they felt about the task of writing three objects or brands on three items scale. Three-item scale was adapted from Streicher and Estes (2016).

After they made the choice between two desserts, all the participants were asked to write their thoughts, reactions, or ideas sequentially in the order that they occurred to them as they made the choice between desserts (i.e., Cheesecake Versus Fruit Salad). With a purpose to examine if having Cheesecake versus Fruit Salad might have triggered thoughts related to healthy/unhealthy lifestyle, I measured the health orientation using three-item scale adapted from Chandon and Wasink (2007). To confirm that my manipulation of dessert types served the intended purpose, I have asked one semantic differential question to assess healthiness aspect of Cheesecake and Fruit Salad on a seven point semantic differential question (1 = Unhealthy; 7 = Healthy).

In addition, I asked two questions each for Cheesecake and Fruit Salad. Similar to Siddiqui, May and Monga (2017), I informed the respondents, “A virtue is something that is not
very tempting now but may be more beneficial later on. A vice is something tempting that may have fewer benefits later on”. Participants then rated either eating Cheesecake or Fruit Salad on a scale from 0 to 100 (0 = vice; 100 = virtue). Finally, participants were asked to submit demographic and lifestyle information such as gender, age, dominant hand and whether they had a medical condition that restricted their diet (Thomas, Desai, and Seenivasan, 2011).

**Results**

*Attention and manipulation checks.* In order to examine the attention check, I have inserted one question stating, “this question is just to make sure that you are paying attention to this survey. Please mark “Strongly Agree” as your response. I found that 45 subjects have not paid attention to this question and have not marked strongly agree. Therefore, I dropped 45 subjects out of 247 subjects. I performed all the further analysis using 202 respondents.

Based on Perdue and Summers’ (1986) suggestions of examining the success of manipulation check for perceiving the Cheesecake and Fruit Salad as unhealthy and healthy desserts respectively, I used the paired sample t-test to examine the difference between Cheesecake and Fruit Salad on health perception. As stated earlier, health perception was measured using one semantic differential question. The findings show that the manipulation was successful, as significant differences were found between the Cheesecake and Fruit Salad such that Cheesecake was perceived unhealthier than Fruit Salad ($M_{\text{cheesecake}} = 1.98$, $M_{\text{fruit salad}} = 6.57$, $t(1, 193) = -47.85; p<.001$). In addition, I have checked their estimation of calories between the Cheesecake and Fruit Salad ($M_{\text{cheesecake}} = 521.43$, $M_{\text{fruit salad}} = 226.71$, $t(1, 197) = 11.09; p<.001$). I found that participants have estimated more calories in Cheesecake than in Fruit Salad. Similarly, I also checked whether these two desserts differ in terms of vice and virtue perceptions similar to Siddiqui, May and Monga (2016). I found that Fruit Salad was more virtue and
Cheesecake was more vice ($M_{fruit\ salad} = 71.51$, $M_{cheesecake} = 33.80$, $t (1, 192) = 10.27; p < .001$). In sum, these results show that fruit salad is perceived more of a virtue product than that of a vice product but cheesecake is perceived more of a vice product than that of a virtue product.

*Mood check.* Using the summated score of PANAS scale ($\alpha = .90$), I examined whether the mood was different across five experimental conditions. I found that subjects’ mood was not different across five different conditions ($F (1, 198) = 0.36; p = .833$).

*Task difficulty check.* In order to examine the difficulty level of assigned task for writing three objects/brands, I used ANOVA. Experimental condition was treated as an independent factor and summated score for difficulty level ($\alpha = .93$) was used as a dependent variable. I found that experimental tasks were being perceived differently across the five conditions ($M_{control} = 1.95$, $M_{soft} = 2.49$, $M_{rough} = 3.13$, $M_{hard} = 2.13$, $M_{smooth} = 2.87$, $F (1, 198) = 4.54; p < .001$). Benfronni tests suggest that task of writing three rough objects was perceived more difficult in comparison to all other tasks (*all p’s* < .001).

*Main tests.* Hypothesis 1 predicts that consumers will have greater preference for virtue products when they experience rough haptic cues (versus soft haptic cues) given a choice between virtue and vice product options. I conducted a binary logistic regression with the experimental condition as the independent variable (Soft = 1, Rough = 2) and the choice between two desserts serving as the dependent variable (0 = Cheesecake and 1 = Fruit Salad). Consistent with H1, I found that in the rough semantic priming condition, subjects have preferred fruit salad to cheesecake (64.40% versus 35.60%). On the other hand, subjects have chosen more cheesecake than fruit salad in soft semantic priming condition (63.40% versus 36.60%; $B = 1.14$, $SE = .45$, $z = 6.48$, 95% CI (1.30, 7.58 ), $p < .05$, $R = .07$). For other three conditions (Control =
0, Hard = 3 and Smooth = 4), I did not find any significant differences between the choice of vice and virtue products. Figure 3 graphically presents the key findings.

Figure 3. Dessert Choice

Past literature suggests that females prefer healthier options than that of males (Wardle et al., 2004). Therefore, I ran the analysis with gender as a covariate to rule out the alternative explanation of the effect being driven by gender distribution difference across the five conditions. After including gender as a control variable, the effects become weaker but remain significant (B = 1.03, SE = .45, z = 5.08, 95% CI (1.14, 6.86), p < .05, R = .06). Similarly, I have used health orientation as a control variable to examine its effect on dessert choice in light of the past literature. I found that after including health orientation as a control variable, the effects become weaker but remains significant (B = .85, SE = .47, z = 3.30, 95% CI (0.93, 5.91), p < .05, R = .10). I was able to demonstrate the effect of haptic sensation on dessert choice that is not driven by gender and health orientation.
Discussion of Study 1

The results of study 1 demonstrate that consumers would tend to choose more healthy (i.e., virtue) dessert than unhealthy (i.e., vice) dessert when they experience rough haptic cues. On the contrary, consumers would prefer more unhealthy (i.e., vice) dessert than healthy (i.e., virtue) dessert when they experience soft haptic cues. I also showed that these effects are not significant in other three conditions, namely control condition, hard condition and smooth condition. Specifically, these results lend support to the theoretical underpinnings being experiencing soft haptic cues would lead more unhealthy dessert choice but rough haptic cues would result more healthy choice.

The results of study 1 are informative but it is important to note that subjects have perceived the task of writing the rough objects to be the most difficult task. Hence, one can argue that the effect of rough haptic sensation on dessert choice is because of the perceived task difficulty. Past literature on neuroscience suggests that haptic and visual modalities are integrated (Streicher and Estes, 2016). Haptic objects accompanied with visual images are likely to help the respondents to access the haptic attributes (i.e., roughness, softness, smoothness and hardness) faster (Lederman and Klatzky, 2009). At the same time, I are not able to conclude why the effect of soft and rough haptic cues on dessert choice is occurring. What are the underlying mechanisms for such effects? Therefore, I designed study 2 with visual priming experiment to facilitate the task of writing the name of objects and to unravel the mediation mechanisms between haptic cues and healthy choice. In addition, I have used different product to enhance the generalizability of the findings.
Study 2: Visual Priming Experiment

Method

Pretest: Controlling for task difficulty and manipulation checks: In study 1, I found that writing three rough objects is the most difficult task. Therefore, the objective of this pretest is two folds. First, to come up the visual images which can allow the subjects to recall the haptic objects quickly. Second, the images chosen for the task should manipulate the respective haptic sensations (i.e., roughness, softness, hardness and smoothness). Every effort was made to ensure that the subjects are familiar with haptic objects and color of each object amplifies the respective texture. I choose three objects for each texture condition (i.e., roughness, softness, hardness and smoothness). For the control condition, I selected the brand logos that do not vary much in attractiveness and visual appearance.

To evaluate the stimuli, a sample of 90 undergraduate students (62.5% male; mean age = 21.4 (SD = 1.28, range 20 to 27) years) from a SONA subject pool at FCBE participated in this pretest. They were informed that the purpose of the study was to test the effectiveness and attractiveness of images. They have been randomly assigned to five conditions (i.e., roughness, softness, hardness, smoothness, and control) and instructed to answer the questions pertaining to each condition. They responded to three questions for measuring their visualization of touching, stroking and rubbing the objects. I have adapted these questions from Shiv and Fedhrokhin (1999) to measure the haptic visualization aspect of touching, stroking and rubbing each object using three semantic differential items on seven-point scale. Following this, they responded to four statements, one question each for different aspects of haptic sensation (i.e., softness, roughness, smoothness, and hardness) on a seven point scale (i.e., 1 = I did not feel the softness of each object; 7 = I felt the softness of each object). I have also asked one question related to
experiencing the weight of each object because my intention is to control the role of weight that might influence the choice. In addition, I have measured healthiness aspects of two beverages (i.e., Soda versus Lemon Water) using the same questions used in study 1 to confirm soda as an unhealthy drink and lemon water as a healthy beverage.

Using ANOVA, I have examined that perceived task difficulty of visualizing touching each haptic object does differ but from the control condition ($M_{control} = 4.02, M_{soft} = 5.60, M_{rough} = 5.87, M_{hard} = 5.78, M_{smooth} = 5.06, F(4, 68) = 3.59; p<.001$). Benfronni tests suggest that visualizing each haptic object is easier when the images of haptic objects are presented. In the control condition (i.e., brand logo) which does not have any haptic objects, visualization of touching, stroking and rubbing was significantly different from any haptic sensation conditions. Overall, subjects did not face any difficulty in visualizing the haptic objects in any haptic condition (all $p's<.001$).

To examine the success of manipulations for haptic sensations (i.e., softness, roughness, smoothness, and hardness), I ran independent sample t-tests. I used control group as a reference group and compared it with each haptic sensation condition. Firstly, I examined the success of softness sensation and found that subjects experienced the softness more than the control condition ($M_{control} = 2.38, M_{soft} = 5.70, t(1, 31) = -5.81; p<.001$). Secondly, I examined the success of roughness and found that subjects experienced the roughness more than the control condition ($M_{control} = 2.48, M_{rough} = 6.18, t(1, 22) = -5.73; p<.001$). With respect to smoothness and hardness, I ran the separate independent samples t-tests and found that subjects have experienced more smoothness ($M_{control} = 2.12, M_{smooth} = 4.79, t(1, 25) = -3.61; p<.001$) and hardness ($M_{control} = 2.42, M_{hard} = 5.50, t(1, 31) = -4.18; p<.001$) compared to the control.
condition. Overall, these results suggest that manipulations have worked the way they were being planned.

Next, I used the paired sample t-test to examine the difference between Soda and Lemon Water on health perception. I have used all the measures similar to study 1. The findings show that the manipulation was successful, as significant differences were found between the Soda and Lemon Water such that Soda was perceived unhealthier than Lemon Water ($M_{soda} = 1.72, M_{lemon water} = 6.55$, $t(1, 98) = -33.12; p < .001$). In addition, I have checked their estimation of calories between the Soda and Lemon Water ($M_{soda} = 314.60, M_{lemon water} = 65.19$, $t(1, 98) = 9.66; p < .001$). I found that participants have estimated more calories in Soda than in Lemon Water. Similarly, I also checked whether these two beverages differ in terms of vice and virtue perceptions similar to Study 1. I found that Lemon Water was more virtue and Soda was more vice ($M_{soda} = 75.78, M_{lemon water} = 26.03$, $t(1, 98) = 10.22; p < .001$). In sum, these results show that Lemon Water is perceived more of a virtue product than that of a vice product but Soda is perceived more of a vice product than that of a virtue product.

Main test. Similar to study 1, 277 students were recruited from SONA subject pool for Qualtrics survey. These subjects are different from the previous pool of the subjects used in study 1 and pretest. They have been randomly assigned to five different experimental conditions. Similar to pretest, the respondents had to evaluate three pictures (approximately 2*2 centimeters) in each condition. Their task was to write the name of each picture in the given space. In the control condition, they were being given the brand logo of three familiar brands (i.e., Microsoft, Audi and Amazon). They were asked to write the name of each logo in the respective space below. For all the haptic sensation conditions, I have taken the objects from Lederman and Klatzky (1989 and 1991). I gave them the instruction to imagine touching each object using their
hands to feel the softness, roughness, hardness and smoothness, depending on each haptic sensation condition. In the soft priming condition, I identified three images of the soft objects (i.e., blanket, teddy bear and towel). I kept the color of each soft object to be constant. In the rough priming condition, three objects (i.e., tree bark, upper part of coconut fruit and rough ball) were chosen. Similarly, I chose three objects each for hard priming condition (i.e., helmet, wooden wine cork and smooth ball) and smooth priming condition (i.e., drinking glass, plain wood and iron roller).

*Design:* 1* 5. The only factor manipulated in this study was the different kinds of haptic sensations (no haptic sensation, soft haptic sensation, rough haptic sensation, smooth haptic sensation and hard haptic sensation) using visual priming.

*Procedure.* Similar to study 1, the respondents received an invitation to participate in a two-part study. In the first part, I asked them to complete the Positive and Negative Affect Schedule (PANAS; Watson, Clark, and Tellegen, 1988). After responding to PANAS scale, all the participants have been asked to list three objects or brands based on three images they are exposed to. Tasks were used to manipulate the type of haptic sensations using visual imagery. Images were randomly ordered to overcome the order bias. They list the name of three objects or brands based on the respective instructions. In the second part, they participated in a “Consumer Choice Study” which would be ostensibly conducted by a fictitious beverage company to understand what types of beverages consumer would prefer to drink. I gave them the choice between soda and lemon water. They made the choice between vice (i.e., Soda) and virtue (i.e., Lemon Water) beverages. The images of the beverages (approximately 2*2 centimeters) were randomly placed in left or in right side of the computer screen.
In study 2, procedure for asking the questions is similar to study 1 with four differences. First, I have used one question each to confirm that manipulation of haptic sensation is working. For example, it is important to confirm that in the soft priming condition, it is only the softness which is manipulated not the other haptic attributes such as roughness, smoothness, hardness and weight. I asked five questions to support this claim. Second, I used three questions to measure the affective response of the subjects after they made choice between two beverages. These items were adapted from Shiv and Fedhrokhin (1999). I have also used two items to measure the health risk adapted from Biswal et al. (2016). Third, I have used 12 items need for touch scale adopted from Peck and Childers (2003a). And, fourth I have used 12 items for measuring the individual temporal orientation adapted from Joireman et al. (2003).

**Results**

*Attention and manipulation checks.* Similar to study 1, I have used one question to identify the participants who have not paid attention to the survey. I found that 32 subjects have not paid attention to this question and have not marked strongly agree. Therefore, I dropped 32 subjects out of 277 subjects. I performed all the further analysis using 244 respondents.

To examine the success of manipulations for haptic sensations (i.e., softness, roughness, smoothness and hardness), I ran independent sample t-tests similar to pretest. I found that subjects experienced the softness more than the control condition ($M_{control} = 3.13, M_{soft} = 5.29$, $t(1, 99) = -5.33; p<.001$). Similarly, roughness ($M_{control} = 2.98, M_{rough} = 5.27$, $t(1, 95) = -5.73; p<.001$), hardness ($M_{control} = 3.15, M_{hard} = 5.67$, $t(1, 81) = -5.27; p<.001$) and smoothness ($M_{control} = 3.36, M_{smooth} = 5.22$, $t(1, 92) = -4.78; p<.001$) were significantly different than that of control condition. Overall, these results suggest that manipulations have worked the way they were being planned.
To examine the difference between Soda and Lemon Water on health perception, I have used paired sample-t tests similar to pretest. The findings show that the manipulation was successful, as significant differences were found between the Soda and Lemon Water such that Soda was perceived unhealthier than Lemon Water ($M_{soda} = 1.67$, $M_{lemon\ water} = 6.74$, $t (1, 245) = -55.22; p<.001$). In addition, I have checked their estimation of calories between the Soda and Lemon Water ($M_{soda} = 212.60$, $M_{lemon\ water} = 39.28$, $t (1, 98) = 12.72; p<.001$). I found that participants have estimated more calories in Soda than in Lemon Water. Similarly, I also checked whether these two beverages differ in terms of vice and virtue perceptions similar to Study 1. I found that Lemon Water was more virtue and Soda was more vice ($M_{soda} = 69.76$, $M_{lemon\ water} = 30.73$, $t (1, 244) = 10.22, p<.001$). In sum, these results show that Lemon Water is perceived more of a virtue product than that of a vice product but Soda is perceived more of a vice product than that of a virtue product.

*Mood check.* Using the summated score of PANAS scale ($\alpha = .92$), I examined whether the mood was different across five experimental conditions. I found that subjects’ mood was not different across five different conditions ($F (4, 211) = 0.25; p = .90$).

*Task difficulty check.* Similar to pretest, I used ANOVA to examine the perceived task difficulty of visualizing touching each haptic object. I found that participants did not face the task difficulty of visualizing all kinds of haptic objects ($M_{control} = 3.62$, $M_{soft} = 5.72$, $M_{rough} = 5.77$, $M_{hard} = 5.73$, $M_{smooth} = 5.66$, $F (4, 211) = 15.39; p<.001$). Benfronni tests suggest that visualizing each haptic object is easier when the images of haptic objects are presented. In the control condition (i.e., brand logo) which does not have any haptic objects, visualization of touching, stroking and rubbing was significantly different from any haptic sensation conditions. Overall,
subjects did not face any difficulty in visualizing the haptic objects in any haptic condition (all $p$'s < .001).

**Main tests.** Similar to study 1, I first examined the H1 which predicts that consumers will have greater preference for virtue products when they experience rough haptic cues (versus soft haptic cues) given a choice between virtue and vice product options. I conducted a binary logistic regression with the experimental condition as the independent variable (Soft = 1, Rough = 2) and the choice between two beverages serving as the dependent variable (0 = Soda and 1 = Lemon Water). Consistent with H1, I found that in the rough semantic priming condition, subjects have preferred lemon water to soda (75% versus 25%). On the other hand, subjects have chosen more soda than lemon water in soft semantic priming condition (66.77% versus 33.33%; $B = 1.729$, SE = .466, $z = 13.78$, 95% CI (0.70, 0.44), $p < .05$, $R = .15$). For other three conditions (Control = 0, Hard = 3 and Smooth = 4), I did not find any significant differences between the choice of vice and virtue products. Figure 4 graphically presents the key findings.

![Figure 4. Beverage Choice](image)

Figure 4. *Beverage Choice*
Past literature suggests that the people who are high on need for touch (NFT) aspect would like to be more influenced by the haptic cues, such as soft haptic cues would affect high NFT individuals more than that of low NFT individuals (Peck and Childers, 2003a). Therefore, I ran the analysis with NFT as a covariate to rule out the alternative explanation of the effect being driven by NFT distribution difference across the five conditions. After including NFT as a control variable, the effects become stronger and remain significant (B = -1.86, SE = .49, z = 14.51, 95% CI (1.01, 2.07), p < .05, R = .06). I was able to demonstrate the effect of haptic sensation on beverage choice that is not driven by NFT.

**Mediation test.** I have tested one of the assumptions that affect and perceived health risk would mediate the relationship between experimental conditions and beverage choice. I performed the mediation analysis using Preacher and Hayes’s (2008) PROCESS macro model 4 with 5000 bootstrapped samples (Hayes, 2013). It shows the indirect effect of experimental conditions on beverage choice is not mediated by affect and perceived health risk as evidenced by the CI (confidence interval) including zero. Hence, these assumptions are not supported with this study.

**Moderated mediation test.** Given predictions concerning moderating effects, hypotheses were tested using multiple regression analysis. H2 was tested by regressing beverage choice on haptic sensation condition and temporal orientation (i.e., CFC). The adjusted R² for the model with beverage choice as dependent variable is .15, F (3, 220) = 6.83, p < .001. Consistent with the finding of study 1, I found that is a positive main effect of haptic sensation on beverage choice (B¹ = 5.73; t = 2.48, p < .001).

H2 predicted that CFC will moderate the effect of haptic sensation on product choice. The results show that CFC does moderate the effect of haptic sensation (B = -1.11, t = -2.27, p <

¹Unstandardized coefficients for the respective independent variables.
.001) on product choice. Given that the proposed moderator (CFC) was continuous, and capable of producing a wide range of values, I decomposed the interaction using Johnson and Neyman's (1936) technique and performed a floodlight analysis to carefully examine the influence of CFC on discount size. Supporting H2 a floodlight analysis (Spiller et al., 2013), reveals that participants less than 3.17 on CFC ($M_{CFC} < 3.1$) were significantly influenced by soft haptic sensation with more choice of vice products compared to the choice of virtue products ($p < .05$), and the effect strengthens as the participant’s CFC score drops. Specifically, very low CFC ($M_{CFC} = 2.5$) participants reported significantly higher choice of vice products in the soft haptic condition compared to the choice of virtue products ($M = 2.5; t = 2.80; p < .001$). This effect is attenuated for participants with high CFC ($M_{CFC} > 3.75; p > .05$). The reverse pattern was observed with respect to the participants more than 3.7 on CFC ($M_{CFC} > 3.75$). There were significantly influenced by rough haptic sensation with more choice of virtue products compared to the choice of vice products ($p < .05$), and the effect strengthens as the participant’s CFC score moves up. Specifically, very high CFC ($M_{CFC} = 4.75$) participants reported significantly higher choice of virtue products in the rough haptic condition compared to the choice of vice products ($M = 4.75; t = 2.37; p < .001$). Overall results support H2.

Conditional Indirect Effects of Haptic Sensation and CFC on Product Choice.

Hypothesis 3 predicts that a conditional indirect effect of haptic sensation will occur on product choice through the proposed mediator impulsivity. I use PROCESS model 8 (Hayes, 2013) with 10,000 bootstrap samples to examine this conditional mediation.

For haptic sensation, the soft and rough haptic conditions were dummy coded (Soft = 0, Rough = 1). CFC was used as a continuous scale as it measured consumer individual differences of temporal orientation. The most pertinent information to establishing the mediation effect is the
significance of the indirect paths. The findings of this study show that affect (indirect effect (IE) = .44; CI [.11, .94]) mediates the haptic condition x CFC interaction on choice when participants are low CFC$^2$. This indirect effect is the result of low CFC individuals showing a preference for vice products versus virtue products in soft haptic condition. As predicted in H3, this positive IE is reduced and becomes non-significant (bias-corrected bootstrap confidence interval contains zero) when consumers are high CFC in the rough condition. This suggests that high CFC participants demonstrate higher preference for virtue products given they have rough haptic sensation. However, with respect to perceived health risk as the underlying mechanism, I ran the same test and found that perceived health risk does not act as the mediator (i.e., CI includes zero). This overall pattern of results partly supports the conditional mediation predicted in H3.

**Discussion of Study 2**

The findings of study 2 help to replicate the results of study 1. In addition, it has allowed me to understand the underlying mechanisms between the effect of haptic cues on product choice. First, it replicates that participants while experiencing soft haptic cues would go more for the vice products than that of virtue products. In contrast, when they experience rough haptic cues, they are more likely to choose the virtue product than that of vice product. This effect is moderated by the individual temporal orientation such that the people with present orientation would like to choose more vice products than that of virtue products. On the other hand, the people with future orientation are likely to purchase more virtue products than that of vice product. In addition, it was found that present orientated individuals would like to purchase more vice products than virtue products because of their induced affective state. The findings of this study support this rationale that soft haptic cues are likely to induce more affective response

$^2$ CFC (low/medium/high) indicates the participants’ temporal orientation. Low = -1SD below mean, and High = +1SD above mean
which result in the purchase of more vice products than that of virtue products. However, this study was not able to answer why the rough haptic cues affected the future oriented people.

**General Discussion**

This essay examines the effect of haptic cues on product choice, with a focus on the choice of vice versus virtue products. While previous studies have shown that selection of vice and virtue products can be influenced by several environmental factors, specifically by several sensorial cues, I conduct two studies to show that roughness and softness aspects of haptic cues could influence the choice of vice and virtue products. The findings of this essay suggest that experiencing soft cues would lead more to the selection of vice product than that of virtue product. On the other hand, rough haptic cues would lead more to the selection of virtue product than that of vice product. I also found that individuals’ temporal orientation would moderate the effect of haptic sensation on product choice such that present-oriented individuals would choose more vice product than that of virtue product while experiencing the soft cues. In contrast, future-oriented individuals would choose more virtue products than of vice product when they experience rough cues. Finally, this essay finds the affective process as the underlying process between the interactive effects of haptic sensation and temporal orientation on product choice.

**Theoretical Implications**

This essay expands the understanding about the effect of haptic sensation on product choice using several service contexts. Thus, this research makes several theoretical contributions. First, although past research has demonstrated the usage of safety-security framework in a variety of contexts (such as in developmental psychology and in economics), applying the theory to understand the role of haptic cues in product choice is an important extension.
safety and security framework, I have conceptually and empirically showed that different types of texture (i.e., rough versus soft) would affect the selection of vice and virtue products.

Second, the findings of this essay suggest that experiencing soft cues is likely to result into the selection of vice product than that of virtue product. Similarly, experiencing rough cues would lead to the selection of more virtue products than that of vice product. This essay shows that people with present orientation would like to select more vice products than that of virtue products when they experience soft haptic cue. On the other hand, it shows that people with future orientation would choose more virtue products than that of vice products when they experience rough haptic cue. Theoretically, people with present orientation would like to gratify their need as quickly as possible by consuming vice product.

Third, the essay reports that the interactive effects of temporal orientation and haptic on product choice is mediated by the affective process for the present-oriented people. It supports the theoretical rationale of the present-oriented individuals seek more pleasures than the future-oriented people while making the decision. It is important to note that present-oriented people when they experience the soft haptic cues find it more pleasurable than the rough haptic cues. Therefore, they get involved into the low level of thinking. On the other hand, future-oriented individuals find the rough cues to influence the choice of more virtue products than that of vice products.

**Managerial Implications**

The findings of this essay are likely to be useful for managers. It is a common practice to guide the food choices using several environmental cues. Study findings provide several key managerial insights related to the effect of haptic cues on the selection of vice versus virtue products.
First, the essay adds to the implications for designing the retail atmospherics. Past literature on retail atmospherics has mainly focused on the sensorial aspects related to vision, olfactory, gustatory and auditory (Spence et al., 2014), left haptic cues. The current essay focused on one dimension of haptic, namely texture. It is important to note that texture can be induced using visual cues such as texture of the wall may look rough versus smooth depending the type of color used. This essay demonstrates that sensation with the rough cues would lead to the selection of more virtue products.

Second, although past literature asserts that the soft haptic sensation is likely to induce more affective response because of the pleasurable sensation. There is little evidence demonstrating that it can affect the choice of vice products. Additionally, it shows that present-oriented people would find more pleasure from the soft haptic cues than the future-oriented individuals which result into the selection of more vice products than that of virtue products.

Third, these results have implications for consumer welfare as well. It can guide to those people who are suffering from obesity to keep a distance from soft objects. This would allow them to select less vice products than that of virtue products. These people would be able to correct for their increased urge to eat vice products. Therefore, they would like to recall any rough objects to guard themselves from not eating the vice products.

Limitations and Future Research Directions

Although this study expands the knowledge about the different type of texture and their corresponding effect on the decision of vice versus virtue products, I acknowledge the limitations of this research and note the need for further research. First, this essay has examined the research questions using fictitious retail service providers to establish the causality; it will be worthwhile to investigate the effect of haptic cues using a field experiment. Second, I have not mentioned the
calories contents while showing the vice and virtue products, it may be possible that calories content may wash out the observed effect. If the vice and virtue products have same calories contents, it is likely that haptic sensation may not have the same effect.

Third, this essay was not able to explain the underlying mechanisms between the interactive effects of temporal orientation and haptic sensation for future-oriented people. Although, I have measured the health risk to test its effect as a mediator but it was not found to be a significant mediator. Therefore, future research should examine other potential mediators to explain why future-oriented people have chosen more virtue products. Fourth and finally, it is important to examine individuals’ goal orientation to examine whether individuals’ goals to eat more vice versus virtue products moderate the effect of haptic sensation on product choice. However, I have measured health orientation to control for its effect in the overall analysis but it is likely that individuals’ motivation to eat healthier food will moderate the effect of haptic sensation on the selection of vice versus virtue products.


Appendix A

Measures used in Essay I

Service Quality adapted from Brady and Cronin (2001)
Given your experience of evaluating the service provider, how would you expect the quality of service to be…
- One of the worst (1)-One of the best (10)
- Inferior (1)-Superior (10)
- Low quality (1)-High quality (10)

Cronbach alpha – Study 1 = .88, Study 2 = 0.95, Study 3 = 0.94, Study 4= 0.93

Credibility Image adapted from Watson, Clark, and Tellegen (1988)
Given your experience of evaluating the brochure of bank/health club, how would you rate the service provider on the following scale:
- Least Credible (1)-Most Credible (10)
- Not at all trustworthy (1)-Trustworthy (10)
- Insincere (1)-Sincere (10)
- Least reliable (1)-Most reliable (10)
- Least dependable (1)-Most dependable (10)

Cronbach alpha – Study 2 = 0.95, Study 4 = 0.98.

Food/Water Quality adapted from Krishna and Morrin (2008)
Please evaluate the quality of water/food on the following scale
- Bad taste (1)-Good taste (10)
- Low quality (1)-High quality (10)

Cronbach alpha – Study 1 = 0.98, Study 3 = 0.97.

Liking towards haptic cue adapted from adapted from Krishna and Morrin (2008)
(1 = did not like at all, 10 = liked very much)
How much did you like the feel of the cup/brochure/napkin/brochure of the service provider?

Need for touch (NFT) adopted from Peck and Childers (2003)
Please indicate your level of agreement with the following statements by circling one of the seven numbers that best reflects your opinion ( 1=Strongly disagree to 7=Strongly agree)
- When walking through stores, I can't help touching various kinds of products.
- Touching products can be fun
- When browsing in stores, it is important for me to handle various kinds of products
- I like to touch various kinds of products even if I have no intention of buying them
- When browsing in stores, I like to touch several products
I find myself touching several products in stores
I place more trust in a product’s quality when it can be touched before purchase
I feel more comfortable purchasing products after satisfying myself with physical examination
If I cannot touch a product in the store, I am reluctant to purchase the product
I feel more confident making a purchase decision after touching a product
The only way to make sure a product is worth buying is to actually touch it
There are many products that I would only buy if I could handle them before purchase

Cronbach alpha – Study 1 = .88, Study 2 = 0.95, Study 3 = 0.94, Study 4 = 0.93

Note: Across all the studies, we assessed discriminant validities and found support among the three measures (service quality, food quality and credibility image) by comparing the average AVE of the pair of measures to the square of the ϕ estimate between the three measures. For all the studies, the AVE exceeded ϕ², offering evidence of discriminant validity (Fornell and Larcker 1981).
Appendix B

Scenarios used in Essay I

Scenario for Study 1

We would like you to take part in the test of a new mineral water that XYZ airline is thinking of serving on its flights. The XYZ airline is also interested in your opinion of the cups they use to serve the water.

The mineral water is in front of you. Note that the cup has a straw in it. Here is what we want you to do. Please follow these instructions exactly. Please pick up the cup and then take five small sips of the water through the straw and taste it carefully.

Scenario for Study 2

We give you a brochure for a new bank that is considering entering the market. We would like you to evaluate the bank in one minute and make an impression about it. Following this, we would request you to respond to some questions about the bank. To simulate the real bank scenario, we would like you to evaluate the bank without sitting on the desk or chair.

Scenario for Study 3

Imagine that you are interested in eating lunch at Restaurant XYZ, a moderately priced restaurant. You book a table in advance and find it ready after you get there on time. Once you settle down, a waiter takes your order and serves the ordered dishes. After you’ve completed your meal, you use the enclosed Paper Napkin.

The server provides you with your bill, thanks you for coming.

Scenario for Study 4

You have watched (will watch) the presentation of a XYZ health club that is considering entering the market. We would like you to kindly respond to some questions about the XYZ health club based on the brochure and the presentation. There is no right and wrong answers to any of the question. It is your opinions and feelings that are important. Please respond to all the questions, as each is critical to the study.
Appendix C

Measures used in Essay II

PANAS adopted from Watson et al. (2001)
Before getting started with the study, we are interested in your current mood state. Please complete the items below…

- Negative (1)-Positive (7)
- Bad (1)-Good (7)
- Unpleasant (1)-Pleasant (7)
- Sleepy (1)-Awake (7)
- Tired (1)-Alert (7)
- Drowsy (1)-Wakeful (7)
- Anxious (1)-Stress-free (7)
- Tense (1)-Relaxed (7)
- Jittery (1)-Calm (7)
- Uncomfortable (1)-Comfortable (7)
- Out of control (1)-In control (7)

Cronbach alpha – Study 1=0.90, Study 2=0.93

Haptic visualization task adapted from Shiv and Fedhrokhin (1999)
With respect to your perceptions of the displayed objects/brands, please rate yourself on the following items.

- Not easy to visualize myself touching these objects/brands (1)-easy to visualize myself touching these objects/brands (7)
- Not easy to imagine myself stroking these objects/brands (1)-easy to imagine myself stroking these objects/brands (7)
- Not easy to imagine myself rubbing these objects/brands (1)-easy to imagine myself rubbing these objects/brands (7)

Cronbach alpha – Study 2 = 0.94.

Affective response adapted from Shiv and Fedhrokhin (1999)
Please reflect on your decision and answer each of the questions below

- It was based on rational thoughts (1)-It was based on emotional thoughts (7)
- It was not an impulsive decision (1)-It was an impulsive decision (7)
- It was a deliberate decision (1)-It was a careless decision

Cronbach alpha – Study 2 = 0.88.

Health risk adapted from Biswas et al. (2017)
Please indicate the level of agreement with the following statements( 1=Strongly disagree to 7=Strongly agree)

- My choice of drink has health risk
- My choice of drink would have a long term impact on my health
Cronbach alpha – Study 2 = 0.95.

*Health orientation adapted from Biswas et al. (2016)*
Please indicate your level of agreement with the following statements (1=Strongly disagree to 7=Strongly agree)
- Eating healthy is important for me.
- Calories levels influence what I eat
- I do not want to eat anything heavy

Cronbach alpha – Study 1 = 0.92.

*Need for touch (NFT) adopted from Peck and Childers (2003)*
Please indicate your level of agreement with the following statements by circling one of the seven numbers that best reflects your opinion (1=Strongly disagree to 7=Strongly agree)
- When walking through stores, I can’t help touching various kinds of products.
- Touching products can be fun
- When browsing in stores, it is important for me to handle various kinds of products
- I like to touch various kinds of products even if I have no intention of buying them
- When browsing in stores, I like to touch several products
- I find myself touching several products in stores
- I place more trust in a product’s quality when it can be touched before purchase
- I feel more comfortable purchasing products after satisfying myself with physical examination
- If I cannot touch a product in the store, I am reluctant to purchase the product
- I feel more confident making a purchase decision after touching a product
- The only way to make sure a product is worth buying is to actually touch it
- There are many products that I would only buy if I could handle them before purchase

Cronbach alpha – Study 2 = 0.93

*Consideration for Consequences (CFC) adopted from Joremann et al. (2003)*
Please indicate your level of agreement with the following statements by circling one of the seven numbers that best reflects your opinion (1=Strongly disagree to 7=Strongly agree)
- I consider how things might be in the future, and try to influence those things with my day to day behavior.
- Often I engage in a particular behavior in order to achieve outcomes that may not result for many years
- I only act to satisfy immediate concerns, figuring the future will take care of itself.
- My behavior is only influenced by the immediate (i.e., a matter of days or weeks) outcomes of my actions.
- My convenience is a big factor in the decisions I make or the actions I take.
- I am willing to sacrifice my immediate happiness or well-being in order to achieve future outcomes.
I think it is important to take warnings about negative outcomes seriously even if the negative outcome will not occur for many years.
I think it is more important to perform a behavior with important distant consequences than a behavior with less-important immediate consequences. I generally ignore warnings about possible future problems because I think the problems will be resolved before they reach crisis level.
I think that sacrificing now is usually unnecessary since future outcomes can be dealt with at a later time. I only act to satisfy immediate concerns, figuring that I will take care of future problems that may occur at a later date.
Since my day to day work has specific outcomes, it is more important to me than behavior that has distant outcomes.

Cronbach alpha – Study 2 = 0.84
Appendix D

Recruitment Email

All the subjects will be recruited using SONA system. FCBE maintains the subject pool for research purpose. Participants will be requested to participate in one of the studies displayed on the website. All the studies will be displayed in the SONA system. They are free to choose one of them based on their convenience.

The following information will be provided to the participants before they sign up for the following studies.

Study Name: Rough to Virtue and Smooth to Vices: Effect of Haptic Cues on Product Choice.
Study Type: One part study
Credits: 0.25 Credit
Duration: 20 minutes

Abstract: The participants will be asked to evaluate the haptic cues in a scenario based service experiment and respond to the questions related to vice and virtue products.

Descriptions: To participate in the study, you have to be 18-25 years old. You will be asked to evaluate the haptic cues related to the service provider and respond to the questions related to your choice of vice versus virtue products. You need to make a choice between vice and virtue products. You will be asked to report your demographic information in the questionnaire. All data gathered will be confidential and will be securely stored. Your name will not be linked to your responses.

Dr. George Deitz is the faculty sponsor of this study.
Eligibility Requirements: 18-25 years of age.

Researchers: My name is Subhash Jha, and I am a PhD Student here at the University of Memphis. I am conducting marketing research in conjunction with Dr. George Deitz the director at Customer NeuroInsights Research Lab here on campus.
Appendix E

Consent to Participate

This research study is about your perceptions of haptic cues and your choice of vice and virtue products. The researcher in charge of this study is Subhash Jha of the University of Memphis Department of Marketing. He is being guided in this research by Dr. George Deitz. By doing this study, we hope to learn about how consumers perceive the haptic cues and make the product choice. This study does not discriminate against any respondents for any reason. It will last from ten to twenty minutes. To the best of our knowledge, the things you will be doing have no more than minimal risk of harm than you would experience in everyday life. There is no guarantee that you will get any benefit from taking part in this study aside from any course credit your instructor may choose to give. Your willingness to take part, however, may, in the future, help society as a whole better understand this research topic.

If you decide to take part in the study, it should be because you really want to volunteer. You will not lose any benefits or rights you would normally have if you choose not to volunteer. You can stop at any time during the study and still keep the benefits and rights you had before volunteering. If you do not want to be in the study, there are no other choices except not to take part in the study. There are no costs associated with taking part in the study. This study will require you to view an advertisement and indicate your feelings to a variety of questions that pertain to the advertisement you will see. It will be conducted entirely through the Internet. That means that no one, not even members of the research team, will know that the information you give came from you. The data for this project are being collected anonymously. The data are being coded by assigning a random number for each participant. Also, by setting the survey to Anonymize, Responses the investigator will not be collecting this identifiable information.

Overall, survey responses are and will remain anonymous. Therefore, neither the researchers nor anyone else will be able to link data to a particular respondent, and each respondent’s privacy will be maintained throughout the survey and data analysis. The data for this project and information about each respondent will be kept confidential to the maximum extent allowable by law. The data will be stored on an external hard drive in the offices of the Principal Investigator at U of M behind a locked door.

If you decide to take part in the study you still have the right to decide at any time that you no longer want to continue. You will not be treated differently if you decide to stop taking part in the study. If you have any questions about your rights as a volunteer in this research, contact the Institutional Review Board staff at the University of Memphis at 901.678.2705.

The principal investigator,
Subhash Jha
Marketing Ph.D. Candidate
Faculty Advisor
Dr. George D. Deitz, Ph.D.
Associate Professor of Marketing
Director, Customer NeuroInsights Research Lab (C-NRL)
The University of Memphis
Fogelman College of Business & Economics
302 Fogelman College Administration Building
Memphis, TN 38152
gdeitz@memphis.edu

Please contact one of them with any questions relating to the study.
Clicking “Submit” below indicates your e-signature that you agree to take part in this survey.
Additional questions or concerns can be addressed to either irb@memphis.edu or by calling (901) 678-2705.
Appendix F

Institutional Review Board Approval

Institutional Review Board
Office of Sponsored Programs
University of Memphis
315 Admin Bldg
Memphis, TN 38152-3370

May 2, 2017

PI Name: Subhash Jha
Co-Investigators:
Advisor and/or Co-PI: George Deitz
Submission Type: Initial
Title: Rough to Virtue and Smooth to Vices: Effect of Haptic Cues on Product Choice
IRB ID: #PRO-FY2017-534
Exempt Approval: May 2, 2017

Approval of this project is given with the following obligations:

1. When the project is finished or terminated, a completion form must be submitted.
2. No change may be made in the approved protocol without prior board approval.
3. Exempt approval are considered to have no expiration date and no further review is necessary unless the protocol needs modification.

Thank you,
James P. Whelan, Ph.D.
Institutional Review Board Chair
The University of Memphis