Architecture of Choice:

Exploring the Impact of Built Environments on Consumer Behavior

by

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DEDICATION

To the bridges between people, cultures and ideas

And to my parents and the love of my life, Mahya

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PREFACE

This dissertation is an effort to build a bridge between two disparate academic fields that have much to learn from one another: Marketing and Architecture. It attempts to tackle the evidence of everyday interactions between people and the buildings they occupy, and the importance of these interactions to the way people feel, think and act. In so doing, it recognizes the contribution that well-thought built environments may make in nudging consumers towards making better decisions. In a broader sense, it bridges two disciplines together in recognition of their mutual contributions.

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ABSTRACT

Every day, we are continually exposed to various architectural features in our living and working settings—by the spatial configuration, furniture, lighting, acoustics and views in our homes and offices. Although we may pay little attention to ordinary and seemingly innocuous shifts in our exposure to our surroundings, these subtle shifts can have tremendous impact on our thoughts and behavior (Damasio, 1994; Niedenthal, 2007). Despite the crucial interaction between people and their physical environment, there is little research showing how architectural elements affect behavior and choice in the consumer domain. Identifying such factors would be extremely important to understand consumers' context-relevant behavior and decision processes.

I combine theory and research methods from social and environmental psychology, design studies, and marketing to shed light on these important, yet rarely explored effects. In two essays, I investigate the interactions between consumers and their surroundings and how factors in the physical and social environment interplay to affect behavioral outcomes and decisions. The first essay examines the influence of physical elevation in built environments on risk-taking behavior. In a series of three field studies, this work demonstrates that people are more likely to display risky behavior when they are on higher levels of a building. Results from this study indicate that elevation influences risk-taking behavior by means of affecting sense of power, especially when

others are present. In the second essay, I investigate the role of illumination on socially conscious behavior. The literature on lighting's effects on social behavior is inconclusive. Using postulates of embodied cognition, construal-level theory of psychological distance, and incorporating an identity-signaling perspective, results from this work suggest that illumination promotes socially desirable behaviors such as conformity, fairness, perspective-taking, charity donations, and healthy eating behavior. This occurs by means of an increase in public self-consciousness in brightly lit environments. This essay also addresses and reconciles discrepancies in the literature regarding the psychological consequences of illumination.

Taken together, these essays introduce novel empirical findings on how architectural attributes (i.e., physical elevation and illumination) in combination with social attributes (i.e., mere social presence and social reference groups) influence social constructs (i.e., power and public self-consciousness) with downstream effects on consumer behavior and decision making (i.e., risk-taking, and socially conscious behavior). The main intention of this dissertation is to demonstrate that consumer behavior is more tightly connected to our physical surrounding than current literature may suggest. In a broader sense, the goal of this work is to bridge between architecture and marketing, two fields that have so far been disparate. I would call the outcome of this link the “architecture of choice” – which entails an understanding of the psychological impact of architectural design on consumers. This may, for instance, lead to the design of spaces that facilitate pro-social behavior, nudge consumers toward healthy choices, inhibit risky behavior and improve consumer welfare guidelines.

CHAPTER ONE:

INTRODUCTION

"*We shape our buildings; thereafter they shape us*." - Winston Churchill

Studies have shown that the design of the physical environment deeply but subtly affects us. For instance, it influences our health (McCormick & Shepley, 2003), creativity (Meyers-Levy & Zhu, 2007), safety (Joseph and Rashid, 2007), social judgment (Williams & Bargh, 2008), moral judgment (Danziger, et al, 2011), conformity (Huang et al., 2013), social engagement (Schnall, 2011), physical activity (Eves, et al., 2009), cognitive performance (Zimring & Dalton, 2003), time perception (Raghubir, Morwitz & Chakravarti, 2011), product evaluation (Berger & Fitzsimons, 2008), and aesthetic preference (Stamps, 1999; Meier et al., 2011).

However, marketing researchers have largely ignored environmental influences on consumer behavior. As Bitner (1992) stated "… in marketing there is a surprising lack of empirical research or theoretically based frameworks addressing the role of physical surroundings in consumption settings. Managers continually plan, build, and change an organization's physical surroundings in an attempt to control its influence on patrons, without really knowing the impact of a specific design or atmospheric change on its users." Only in the past few years have marketing researchers begun to explore environmental factors –more commonly labeled as "atmospherics" in marketing literature. These include factors such as color

(Mehta & Zhu, 2009), temperature (Huang et al., 2013; Hong & Sun, 2012), noise (Mehta, Zhu & Cheema, 2012), designed materials (Zhu & Meyers-Levy, 2009; Meyers-Levy, Zhu & Jiang, 2010) and ceiling heights (Meyers-Levy & Zhu, 2007). Similarly, architectural researchers have rarely shown interest in studying how designed space influences consumer choices and purchase decisions (Fisher, 2004). The importance of bringing together architectural and marketing literature becomes more evident when we consider that people spend more than 90 percent of their time indoors (EPA, 1989), essentially making the vast majority of decisions inside buildings.

Despite the crucial interaction between consumers and their environment, there is still very little research examining how architectural elements affect -and perhaps trigger- emotions, thoughts, and behaviors when it comes to making purchase decisions. Identifying such factors would be extremely important in understanding consumers' context-relevant perceptions and their subsequent behavior, judgment, and decision processes. It is clear that consumers' decisions are strongly influenced by their values, norms and habits, but at the same time is highly context-dependent. I, therefore, believe there is great potential for research that would investigate how architecture impacts consumer behavior. This dissertation is an attempt to explore this area of knowledge and bridge several gaps present in the literature.

While empirical investigation into the influences of physical environments on perception, cognition and behavior is relatively new, the philosophical debate has been going on for centuries. This has primarily been a question of whether we understand and are affected by our environment through our senses or if we have context-independent conceptual structures, "ideas" by Plato's definition that guide our interactions with the world. Clearly, we are limited to the

sensations we receive within our physical boundaries, but how does this physical restriction in perceiving the world affect how we think and behave?

Focusing more on environmental perception, a precursor to environmental influences on behavior, Hume argued that sensations spontaneously and naturally fall into an order and become perception, while Kant suggested that environmental perception is determined by the inherent structure of the mind (Durant, 1953). Beyond these philosophical arguments, current theories and techniques in environmental research, psychology and neuroscience now allow us to approach these questions empirically. This allows researchers interested in the environment-behavior link to not only uncover phenomenological aspects of this complex relationship, but also pinpoint mechanisms underlying the influence of environmental design on occupants. Accordingly, this work seeks to explore novel empirical evidence at the nexus of architectural design and consumer research, but more importantly, identify some of the underlying processes that could explain how and when these effects occur.

In the remainder of this chapter I will discuss five theoretical antecedents that tie the two essays described in chapters two and three together. At the most fundamental level, this work is based on the assumption that human perception is a key factor in studying the influence of built environments on consumer behavior. I will begin by discussing basic aspects of environmental perception and cognition. I will then delve into the unconscious effects of built environments and discuss automaticity theory and how it may enrich our understanding of the human-environment interaction. Based on current literature in this area, I suggest that these influences may occur beyond conscious awareness – which is later tested empirically. Furthermore, I argue that embodied cognition can provide a strong framework to understand these phenomena. I will highlight some of the contributions of the embodied cognition paradigm in explaining the role of

the physical environment in human behavior. This is based on an assumption of embodied cognition that environmental stimuli and mental representations and processes are inherently coupled. While embodiment theory focuses primarily on interactions between physical/bodily properties and cognition, this work posits that these effects may also shift as a function of the social environment. Within this realm, I will focus on the role of mere social presence, otherwise known as "co-presence" in human-environment interactions. I will illustrate how social influences, in combination with the physical environment, can provide a richer and more concise understanding of human-environment interactions. Finally, as a precursor to the empirical section of this work, I will introduce the Stimulus-Organism Response paradigm as it relates to studying the effects of built environments on consumer behavior and decision making. This chapter will conclude with a brief description of the methodology used in subsequent chapters and an overview of the goals and findings of the two essays that provide empirical support for this work. It is important to note that the remainder of this chapter is meant to provide a backdrop for subsequent sections of this dissertation, rather than a comprehensive literature review – which will be discussed separately in each of the following two chapters.

BUILT ENVIRONMENTS AND HUMAN PERCEPTION

First, I shall discuss the role of built environments in perception. Perception can be defined as the process that registers and interprets sensory information from the environment that guides behavior, which, in turn, shapes the nature of input to the senses (Sekuler & Blake, 2002). As a result of the limited span of human attention, it is not possible to register and process the entire multitude of sensory stimuli one receives within a built environment. Thus, in a crowded room we are not overwhelmed with other people's conversations, even though we can definitely

hear the auditory stimulus. Additionally, while input from the built environment may be the same for all occupants in a space, there may be variations in terms of what those occupants consciously or subconsciously process and build their perception of the space upon. Therefore, the effectively perceived environment may depend on a variety of factors such as gender (Lawton et al., 1996; Montello et al., 1999), personality (Rogers, 1951), culture (Whorf & Chase, 1956; Miyamoto, Nisbett, & Masuda, 2006), knowledge (Gifford et al., 2000) and familiarity with that environment. In spite of this, architects and marketers alike often make assumptions about environmental perception and cognition, and though design decisions are often made based on designers' intuition and personal experience with spaces, little systematic study has been given to the topic of perception and cognition within an architectural context until recently.

Having said this, with the rise of technological tools derived from neurosciences that were not available as recently as a decade ago; an exciting opportunity now exists to fundamentally and significantly improve our understanding of the influence of designed spaces on human perception, cognition and behavior. The first step in the path of creating the field of neuroarchitecture – the amalgamation of neuroscience and architecture - was taken in 1999, when Kanwisher and her colleagues established grounds for linking the study of the brain to architectural experiences. They identified a region of the brain called the parahippocampal place area (PPA) that responds significantly more during viewings of scenes of buildings than during viewing of faces or objects (Epstein et al., 1999). It was also shown that neural activity in the PPA was not affected by subject's familiarity with the depicted building, and it did not change as a result of movement within the space. The authors also found that activation in the PPA was more when subjects viewed complex scenes (e.g., rooms with furniture, city streets) than when they viewed building elevations or other visual stimuli. In recent years, researchers interested in

Neuroarchitecture have also investigated the role of hospital design on the cognitive development of human fetuses in Neonatal Intensive-care units (Pineda et al., 2013), the neural circuits involved in navigation, space perception and contextual association (Nasr et al., 2011) and the influence of contour on spatial perception and aesthetic judgments in architectural spaces (Vartanian et al., 2013). It is important to note that very limited research was done on this issue prior to the recent emergence of neuroimaging technologies. A noteworthy exception is Ulrich's work in the 1980's on the psychophysiological effects of natural scenes. He used electroencephalography (EEG) and electrocardiogram (EKG) measurements to show the positive effects of outdoor environments, especially views that included water, on subject's psychological state (Ulrich, 1981).

I think while findings so far have been very promising in establishing a strong relationship between environmental factors in designed spaces and human cognition and perception, it is still very early to expect the body of work in neuroarchitecture to explain how neural activity in regions of the brain that are involved in spatial perception may have downstream effects on complex behavior and decision making in consumer contexts. Therefore, in this work, I focus primarily on higher order processes - examining psychological rather than neural mechanisms involved in human-environment interactions. Next, I will discuss how perception of the environment may lead to changes in consumer behavior that are beyond conscious awareness.

AUTOMATICITY THEORY AND SUBCONSCIOUS ENVIRONMENTAL INFLUENCE

Architectural researchers have rarely explored behavioral relevance of architecture under conditions of subconscious environmental influence (Lehrer, 2011). However, much of automaticity theory investigates whether behaviors thought to be under conscious control may result from automatic interpretations of and reactions to environmental stimuli. There are two levels of involvement in regards to the influence of environment on human behavior: conscious and subconscious. The vast majority of theories focusing on the relationship between human behavior and environmental design have ignored the subconscious drivers of perception, cognition, emotion and behavior. In other words, environment behavior studies researchers have traditionally defined information processing within the environment as a deliberate and conscious process in which humans gain useful information from the environment by means of perception, which then influences their environmental cognition, preferences, affective responses and judgments, all by means of active information processing by the individual. This assumption is evident in many prominent theories such as the Reasonable Person Model (Kaplan & Kaplan, 2003), Person-Environment Compatibility Theory (Kaplan, 1983), Cognitive Representation Model (Lynch, 1950; Kearney & Kaplan, 1997), among others. This, in fact, positions most environment-behavior theories in contradiction to findings based on automaticity theory and priming effects which have shown that the unconscious effect of environments on human behavior and affective responses is, perhaps, equally as important as conscious effects. Studies based on automaticity theory have shown that the majority of information we receive through our senses are processed subconsciously (Dijksterhuis et al., 2005; Bargh, 2002; Chartrand & Bargh, 1996; Ackerman et al., 2010). For instance, IJzerman & Semin's work (2009), suggests that a room's temperature affects the perception of social relations without occupants knowledge or

attention. This phenomenon, among others, highlights the role of subtle environmental factors on human behavior, which cannot be explained using theories and approaches traditionally used by environmental researchers.

As described earlier, we know that human capacity for parallel conscious information processing coming from various sources in the environment, even a restorative environment, is quite limited. This fact may have interesting implications in the context of consumption spaces, where some environmental factors such as lighting, color or material may have been designed to take advantage of these subconscious processes to influence the decision-making process (North & Hargreaves, 1999), feel a certain emotion (Zhong & Leonardelli, 2008; IJzerman & Semin, 2010) or act or think in a certain manner (Milliman, 1982; Aarts & Dijksterhuis, 2003; Meyers-Levy & Zhu, 2007; Zhu & Argo, 2013). In this dissertation, I will build on this literature by examining effects of physical environments on consumer behavior with the following question in mind: Are consumers aware of the effect of elements in the built environment (such as illumination or elevation from street level) on their behavior and decisions? Or do these effects shape behavior beyond one's conscious awareness?

It is important to note that this question, in the context of built environments and their subconscious influence on human behavior, may raise concern for a significant theoretical pitfall. This relates to possible implications of behavioral determinism. With empirical evidence showing that the environment may affect one's mood or behavior without the person's awareness, one may argue that this approach undermines free will. Bargh (1989) however argues that the automatic effects of the environment on human behavior are limited to the initial subconscious analysis of the environment that produces the informational units that the individual then might use depending on one's purposes and goals. In other words, while the

influence of subconscious environmental effects on attitude formation and behavior may seem widespread at first, one must maintain the prevailing assumption that occupant goals are formed through conscious decision making. In other words, as Bargh argues "environmentally driven automatic processes (…) could determine the shape of inputs but not outputs in the form of memory storage, judgments, evaluations, and behavior." While not the main focus of this work, both essays take small steps towards better understanding the likelihood of subconscious processing of information related to physical environments, particularly in regards to elevation and illumination.

THEORY OF EMBODIMENT

A recent paradigm that has contributed greatly to our understanding of the effects of architectural design on human behavior and can be considered an overarching paradigm used in the present work is embodied cognition or embodiment theory. Unlike standard theories of cognition, embodied cognition, argues that that the brain does not contain amodal symbols and rather uses modal representations to create cognition. Embodied cognition also rejects the dissociation between perception and cognition. According to this framework, perception and cognition function simultaneously in the same mechanisms because they share common neural systems (Barsalou, 1999).

Some accounts of embodied cognition focus on situated action, social interaction and the environment (e.g., Barsalou, 2003; Yeh & Barsalou, 2006). According to this account, the cognitive system has evolved to support action in specific situations. These accounts stress interactions between perception, action, the body, and the physical environment and other factors, typically during goal achievement. Following Gibson (1979), theories of situated action

propose that the physical environment has a core role in shaping cognitive mechanisms (Barsalou, 2008). The central assumption in embodied cognition regarding this topic is that actions within a physical space are shaped by the body, the body's relation to the physical space, and associations between physical and psychological phenomena (Franklin & Tversky, 1990). There have been a number of studies within the domain of embodied cognition that have examined the behavioral consequences of designed spaces. For instance, one embodied link that has been demonstrated repeatedly is the association between physical and social warmth. Initial explorations of this environment-behavior link found that people judge others as socially warmer when they are exposed to warm rather than cold stimuli in their surroundings (Williams & Bargh, 2008; IJzerman & Semin, 2009). Reciprocally, people experience a room as physically colder after having been socially rejected (Zhong & Leonardelli, 2008). This and other such evidence from embodied cognition have shown that there are, indeed, strong associations between physical environments and human cognition, judgment and behavior that seem to shape human responses over time.

Furthermore, proponents of embodied cognition have found evidence that social interactions may also influence how one perceives the built environment. In a recent study, Zhang & Wang (2009) argued that there is an asymmetry between the spatial dimension and the other three dimensions of psychological distance—i.e. the temporal, social, and hypothetical dimensions. In one of their experiments, they show that a distal prime along the spatial dimension leads to greater perceived distance along the other three dimensions, but not the other way around. A reciprocal relation between spatial and social constructs, on the other hand, would be in line with results showing a relationship between affective closeness and environmental perception, specifically perception of distance between two people (Mordago et al., 2011). This

study demonstrated that people are less likely to perceive that they can pass between two people when they are not affectively close to them. These findings suggest that psychosocial factors, in fact, constrain spatial perception. Another recent study by Duguid & Goncalo (2012) found that individuals' experience of power influences their perceptions of their own height. The association between power and height, as will be discussed in depth later, is a core component of the studies reported in chapter two. While it is still too early to assess the causal roles of embodiment in the study of environmental perception and cognition, nevertheless, significant evidence from psychology and neuroscience exists already that they are not epiphenomenal (Barsalou, 2008).

So far, I illustrated the role of environmental perception, both consciously and unconsciously, on human behavior. I also described the embodied cognition account and how human behavior may be dependent on individual factors related to the bodily states and spatial characteristics. Next, I will expand the discussion on social influence on human-environment link and how this approach may help give researchers a more comprehensive understanding of the built environment's effects on consumer behavior.

INTERACTIONS BETWEEN THE PHYSICAL AND SOCIAL ENVIRONMENT

The behavioral consequences of physical and social environments have often been studied separately, primarily within the fields of environmental and social psychology, respectively. However, an integrative approach towards the socio-physical environment may help better explain how consumers' multifaceted surroundings affect their choices. In subsequent chapters I will discuss two parameters in the social environment that are quite influential in

environment-behavior effects: Mere social presence, and social reference groups. While social reference groups have been widely discussed elsewhere (see Bearden & Etzel, 1982; White & Dahl, 2006), I will focus primarily on mere social presence –which has drawn the attention of both architectural and marketing researchers. I will also discuss its significance for this work. In the book, "Space is the Machine", Bill Hillier (1996) illustrates an important aspect of the socio-physical interactions, specifically discussing what he describes as the "virtual community". In this community, which is shaped by the configuration of designed space, occupants are not socially together, but rather passively physically "co-present". These occupants may not know each other, or even acknowledge each other's existence. Yet, co-presence (as it is labeled in architectural research) or mere social presence (as it is labeled in psychological and consumer research) is illustrated as a social resource and a factor that may influence individuals. As Hillier argues, "Co-present people are not a community, but they are part of the raw material for community, which may in due course become activated, and can be activated if it becomes necessary." He states that the mere presence of individuals in a space, what he describes as "patterns of co-presence", is a psychological resource because it establishes a basic form of social awareness. Linking this phenomenon to architectural design, Hillier asserts that the patterns of co-presence and co-awareness are the distinctive product of spatial design. In this manner, he emphasized the importance of the socio-physical environment in behavioral studies.

Here, I will briefly discuss the importance of the socio-physical environment, specifically mere social presence of co-occupants in a physical environment. As I will discuss in chapter two, this is a crucial construct in explaining the mechanism through which physical environments influence how consumers think, feel and make decisions. Before delving into this topic, however, it is important to note that the effects of co-presence, or mere social presence, have

been a topic of discussion in social psychology for decades. This is one of the main components of social impact theory. The theory posits that the impact of social presence on human behavior is a function of social presence size, proximity and source strength (Latané & Wolf, 1981). In her seminal work on mere social presence, Markus (1978) used an unobtrusive experimental manipulation to demonstrate that the mere presence of others is a sufficient condition for social facilitation and social interference effects. Other psychological studies have looked at various social, cognitive and behavioral aspects of mere social presence (Cottrell et al., 1968; Robinson-Staveley & Cooper, 1990; Schmitt et al., 1986; Argo, Dahl, & Manchanda, 2005).

In respect to the role of mere social presence in marketing, however, retailers are not primarily concerned with the surroundings' ability to facilitate social interactions. Actually, fellow shoppers, unlike say co-workers, are usually not even encouraged to be any more than co-present patrons. Focusing on retailing and consumption environments, researchers have been primarily interested in identifying spatial factors that influence consumer behavior including shopper's movement and attention in non-social contexts (Garip et al., 2009; O'Neill & Jasper, 1992; Turley & Milliman, 2000; Bitner, 1992). However, interesting results may emerge from the link between spatial characteristics and co-presence in seemingly asocial public spaces such as museums or retail stores.

Several studies have looked at the role of social interactions and learning in museums. These studies have often focused on creating opportunities to enhance visitor's experience in a museum setting by encouraging social interactions and participation in the context of family groups, educational cohorts and interactive technologies (Blud, 1990; McManus, 1987; Lehn et al., 2001). However, very few studies have focused on how people who are just present at the same location at the same time can enhance engagement in public spaces. One such study used

video-recordings to examine visitor's interaction in museums (Lehn, 2006). In this paper, Lehn argues that social interaction fundamentally underpins how people experience museums. The study found that visitors' perception and experience in museums are strongly influenced by social interaction with others. More importantly, these interactions may come from companions or complete strangers. The study also found that people display and share their experience of museum exhibits with others through verbal communication, bodily action and interaction, leading to higher overall satisfaction with their experience.

Mere social presence has been examined in the retail domain as well. A recent study by Argo and colleagues examined non-interactive social situations and their role in the shopping experience. The authors conducted two field experiments in a retail setting, and demonstrated that the social size and proximity of a non-interactive social presence influence consumers' satisfaction with a shopping experience. Specifically, they show that as the size of a non-interactive social presence increases, a consumer will be more likely to experience negative feelings and manage self-presentation behaviors; but when the social presence is further away, social size will no longer matter. One limitation of this work is that it only focuses on proximity and does not discuss the potential role of other spatial parameters on consumer's behavior in co-presence situations. This is one of the goals of this work. By incorporating mere social presence – in chapter two – and social reference groups – in chapter three - this dissertation focuses on developing more comprehensive empirical evidence of the role of socio-physical environments on consumer behavior.

THE STIMULUS-ORGANISM RESPONSE PARADIGM

As discussed throughout this chapter, researchers and theorists have tackled the environment-behavior link from various angles. A dominant approach has drawn from the stimulus-organism response (S-O-R) paradigm. In this context, a physical attribute in a building or a social attribute are the stimuli (S) that affect an occupant (O) and subsequently leads to some behavioral response (R) (Mehrabian and Russell, 1974; Donovan and Rossiter, 1982). Focusing on consumer responses, the Servicescape model of Bitner (1992) and environment response model of Greenland & McGoldrick (1994) present perhaps the most comprehensive frameworks for the environmental influences on consumer behavior. Intending to identify the influences of stores on shoppers, Bitner distinguishes three types of consumer reaction in retail and service environments: cognitive, emotional, and physiological. The environment response model presents a somewhat similar categorization emphasizing the cognitive (perception), affective (feelings), and conative (attitudes/behavior) responses (see figure below).

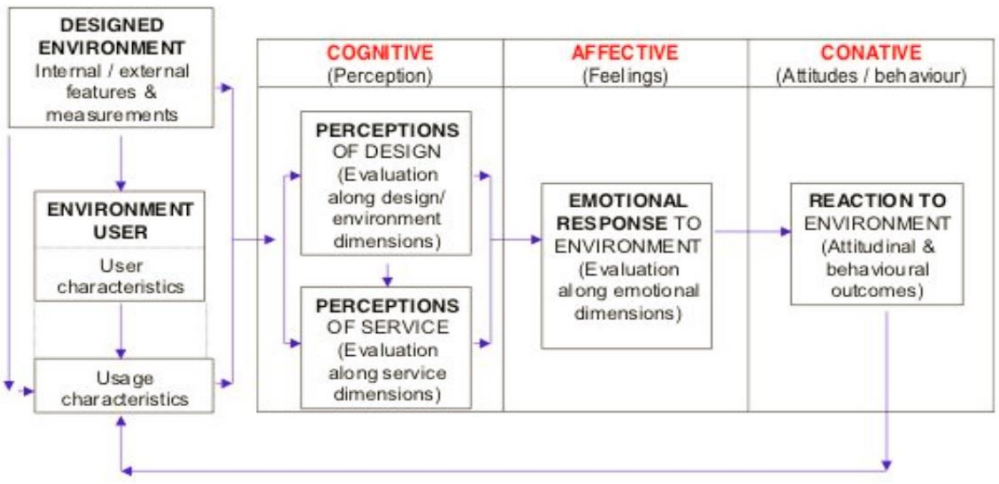


Figure 1. Environmental response model of Greenland and McGoldrick

This dissertation builds on these theoretical frameworks by incorporating elements from the social environment such as mere social presence and reference groups as forms of social stimuli. It also adds an individual's internal state and how it changes in response to the socio-physical environment such as sense of power and public self-consciousness. Based on literature in psychology, I posit that the built environment may directly affect consumers' mental state; and as a result, such states may mediate the role of designed spaces on consumer behavior. This is based on the assumption that in addition to its effects on internal responses (i.e., affective, cognitive, physiological, and conative), architectural factors influence the nature of interactive and non-interactive social relations, and as a result, consumers' social perception and status. Bennett & Bennett (1970) state that "all social interaction is affected by the physical container in which it occurs." Barker (1968) and Aarts & Dijksterhuis (2003) also argue that physical settings are highly predictive of social behavior. Embodied cognition and environmental psychology literature confirm the impact of physical settings on the nature of social interactions. Behaviors such as social bonding, aggression, and altruism have been shown to be influenced by the built environment (Holahan 1982). This work extends these findings into consumer research to suggest that architectural elements in conjunction with the social environment influence consumer behavior by means of changes in one's thoughts or feelings as a social object. Specifically, I will examine how the built environment impacts aspects of social relationships such as power and public self-consciousness, how the physical and social environment interact to affect a range of behaviors (see figure 2). In these essays I will introduce novel empirical findings on how architectural design attributes influence social constructs with downstream effects on behavior.

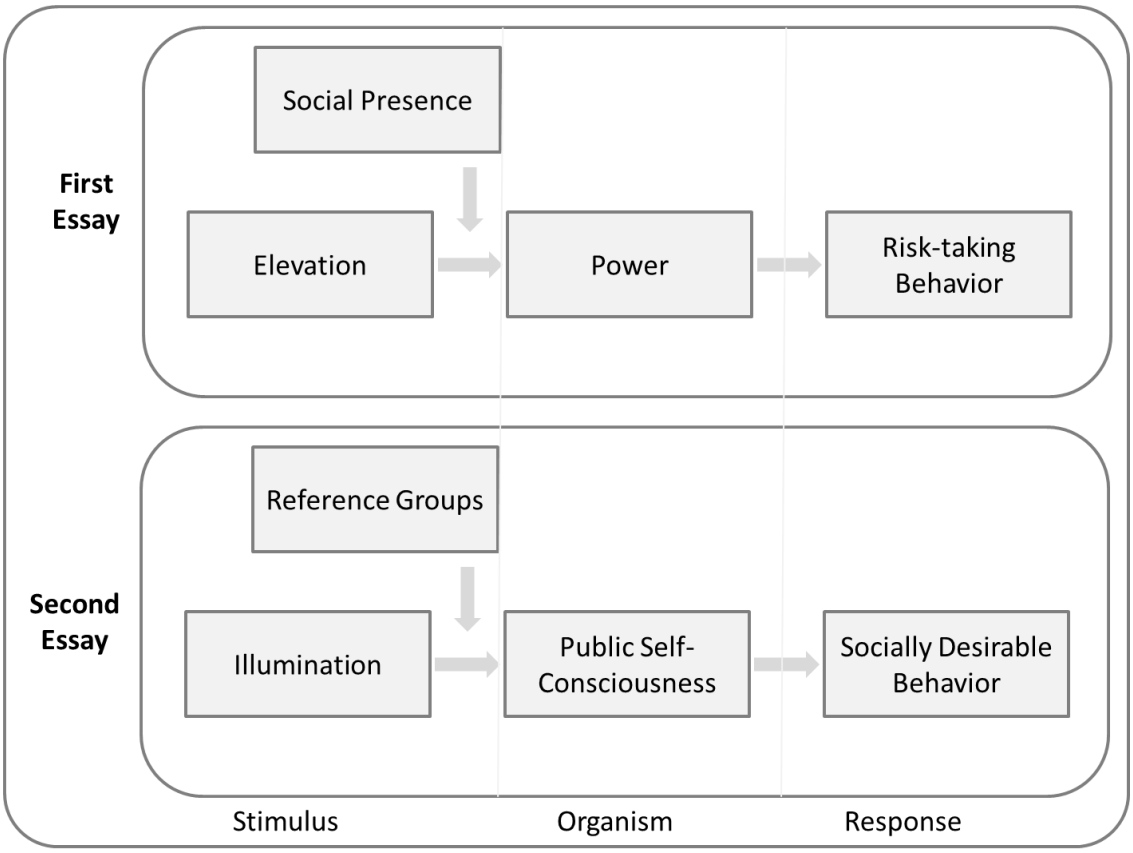


Figure 2. Diagram illustrating conceptual framework of dissertation

METHODOLOGY

Baker et al. (1992) describe several methods to examine the effects of buildings - particularly retail environments - on behavior: using a prototype store, verbal descriptions of a store, or simulating a store environment. While using actual physical environments provide the most accurate setting for such studies, this method can be costly at times. Gardner and Siomkos (1985) found that asking subjects to respond to verbal descriptions of a store systematically affect consumer perceptions of physical sensations. Baker et al. (1992) also comment that this method of inquiry does not possess external validity because verbal descriptions can be value-laden. Several studies have used images, video, or virtual reality to provide a simulated environment. Ecological validity of this simulation method is supported by De Kort et al. (2003). Qualitative methodology has also been used by researchers. For instance, McGrath (1989) interviewed shoppers about the design of a gift store. However, as described earlier, findings on automaticity theory and priming effects suggest that people do not typically allocate cognitive resources to attend to physical environments. On the contrary, we are often quite oblivious to factors in our surroundings and forcing attention towards one's surroundings – which is often necessary in qualitative studies - disrupts the realistic effects of physical environments on human behavior (Dijksterhuis et al., 2005). As a result, this method is exposed to confounding factors and is also susceptive to researcher subjectivity.

While reporting social interactions or deep affective states using questionnaires, logbooks, and daily self-assessments are common in environmental research, their questionable validity, especially under circumstances of reactive responses, has been well established in psychology and marketing. Nisbett and Wilson (1977) argue that part of the problem with self-reports is that there is little or no direct introspective access to higher order cognitive processes.

Studies in psychology and neuroscience have also shown numerous cognitive and social biases in self-reports of one's affective state, thought process, attitude, judgment, and behavior (Haselton et al., 2005; Ariely, 2008; Tversky & Kahneman, 1974; Hilbert, 2012). More relevant to the discussion of socio-spatial configurations is the issue of respondent reactions to being studied, otherwise known as the "guinea pig effect" (Selltiz et al., 1959). There are two main factors that are likely to affect self-assessment-based studies on social interaction in the context of studying spatial configurations: 1) when subjects are aware that they are being observed their behavior and interactions can be reactive and abnormal; 2) individuals may fear being evaluated (which is especially prevalent in workspaces). Rosenberg (1965) and others have demonstrated the "evaluation apprehension" effect. This occurs when people perceive that they are being evaluated, and thus exhibit unusual behavior because of their concern with not appearing abnormal.

Not all studies of spatial configurations and social interactions are prone to this weakness though. For instance, a study of spatial and social networks in organizational innovation (Wineman et al., 2009, 2014) was not based on self-reports, but rather measured cases of collaboration and co-authorship among individuals. This study showed that spatial configuration shaped the formation of co-authorship networks within a university department. Additionally, people in more integrated office locations tended to co-author more intensively than those in less integrated offices. Even though the results from the study may be limited since the closeness between collaborators may be an artefact of locational strategies of the department (placing faculty with similar interests in next door offices), the study highlights important links between spatial structure and the concept of co-presence. A core goal of this work is to unobtrusively experiment with social and physical parameters to better understand how they affect the decision

making process. Therefore, in addition to conducting studies using a between-subject design with no potential for subjects' interpretation of the manipulated variables, I also utilize implicit measures for several observed variables described in chapter two and three, for instance using a word fragment completion task used to measure sense of power.

In terms of setting, previous research on the effects of architectural space on human behavior has been done in both laboratories and the field. For studies using laboratory settings, many researchers have relied on random assignment of subjects to different treatment conditions. Field studies, on the other hand, are more exposed to unaccounted factors in the real world, although they may have higher external validity. The correlation between explanatory variables and the unbalanced design commonly found in field studies reduce the power of hypothesis testing and hence the statistical validity of the findings. I believe using quasi-experiments may provide a fruitful balance between laboratory and field studies. This approach is utilized in the second essay to study how consumers' naturalistic positioning in different levels of buildings may affect their risk taking behavior in a product evaluation task.

Based on this assessment, the data for this dissertation were obtained using two primary research methods: 1) Controlled lab experiments manipulating actual physical attributes with random assignment. To test hypotheses in these experiments, I relied primarily on behavioral, affective and cognitive measurements derived from literature in psychology. 2) Quasi-experiments using Amazon MTurk. This has the added benefit of tapping into a diverse subject pool and increase external validity in a more realistic setting.

In essay one, physical elevation and in essay two, illumination were the main architectural factors manipulated in the lab experiments. The perceptual manipulation involved

either directly using spatial change in elevation/illumination level in the experimental setting or using non-spatial methods such as changes in screen brightness. Another aspect of manipulating design attributes involved investigating static vs. dynamic physical attributes, for instance, change of elevation on an elevator. Next, I will briefly describe the goals and findings of the following essays reported in chapter two and three.

OVERVIEW OF ESSAYS

First essay: The influence of physical elevation in buildings on risk preferences

Figurative language and our sensorimotor experiences frequently associate power with physical height (Schubert, 2005; Zanolie et al., 2012; Gagnon et al., 2011; Giessner & Schubert, 2007; Meier et al., 2007; Lakens, Semin & Foroni, 2011). In addition, increased power has been shown to influence risk-taking behavior (Anderson & Galinsky, 2006; Fast et al., 2012; Galinsky et al., 2003). In a series of three experiments, this essay examines the influence of physical elevation in built environments on risk-taking behavior. Results from experiment one demonstrates that individuals who are on an elevator going up take more risks than those going down. Experiment two looks at the influence of elevation on risk-taking behavior and the mediating role of power. A moderated mediation is suggested involving power - in which elevation influences risk-taking behavior by means of increasing sense of power, especially in the presence of others. This study also investigates the influence of elevation on affective state as an alternative explanation. Experiment three involves a quasi-experiment using MTurk that replicates results from previous studies in a consumer context. It also examines whether the effect of elevation is constrained to having an elevated view, or if merely positioning people on a higher level of a building will influence risk-taking. In this experiment it is shown that

consumers at higher levels of buildings who are cued with their vertical position are more likely to take risks, as measured by their willingness to test and pay for a beverage that poses sensory risk. These findings show that a subtle environmental parameter – physical elevation – can influence human psychological states and consequently affect decisions.

Second Essay: The influence of illumination on socially conscious behaviors

Illumination has been used extensively by writers and poets to signify awareness, intelligence, and morality. Mehrabian (1976) argued that illumination is a chief factor in the environment's impact on individuals because it is often beyond conscious awareness and people typically cannot block out, control, or avoid it. However, the role of lighting on human behavior is not clear and mixed results exist in the literature. This essay brings together theory and research methods from architectural research, environmental, cognitive and social psychology, consumer research and behavioral economics to shed light on the influence of illumination on human behavior, specifically socially conscious behavior. This is done based on postulates of Embodied Cognition (Barsalou, 2008; Lakoff & Johnson, 1999), Construal-level Theory of psychological distance (Trope & Liberman, 2003) and by incorporating an identity-signaling perspective (Berger & Heath, 2007, 2008). It is posited that visual restraints caused by dimness result in a sense of concealment and environmental ambiguity, leading people to feel psychologically distant from their surroundings, thus facilitating internally-motivated and context-independent behavior. On the other hand, brightness enhances the quality of visual information received, leading people to feel more observed and more connected to their physical and social environment. This promotes behavior that is more socially driven. In other words, it is suggested that illumination increases physical visibility and bolsters social visibility, thus boosting socially desirable behavior.

Four experiments investigate this prediction. In experiment 1, participants in a bright room (vs. dimmed room) are shown to conform more to others' opinions in a beverage test (S1a), show more empathy towards others in a charity campaign (S1b), and become more sensitive to fairness in an ultimatum game (S1c). In Experiment 2, I focus on the underlying process by demonstrating that illumination increases participants' attention to their surroundings. Public self-consciousness is shown to mediate the relationship between illumination and socially conscious behaviors, in this case, perspective-taking. Also, it is shown that reference groups determine the direction of the effect (i.e., the effect reverses with out-groups vs. in-groups). This experiment addresses and reconciles a discrepancy in the literature regarding the social effects of illumination. In Experiment 3, participants in a bright (vs. dimmed) room are shown to be more likely to consume a healthy snack. Here, I argue that participants in brightly lit rooms are more concerned with displaying socially desirable behavior in the form of healthy eating. This study also rules out several alternative explanations (e.g., perceived power, perceived morality). For instance, it is argued that individuals do not become less socially driven under dim lighting because dimness metaphorically facilitates a sense of power (see Banerjee et al., 2012). It is also argued that the effect is not due to an increased sense of morality under bright lighting. In other words, individuals will not be more empathetic and prosocial in bright light because light is metaphorically associated with a sense of morality.

This essay develops a unified explanation for the psychological consequences of a ubiquitous, yet subtle environmental factor - illumination. Results from this study help mitigate inconsistencies in the literature and inform consumer researchers as well as design researchers regarding the effect of illumination on a broad range of consumer judgments and decisions. People are generally quite oblivious to how buildings affect their behavior. Thus, findings from

this study may be used to create consumer welfare guidelines to control the subconscious effects of environments on unhealthy or anti-social behavior and encourage pro-social and healthy behavior.

In the following two chapters I will report the empirical portion of this dissertation in greater depth. The last chapter will wrap up the discussion from findings of each study and how this work contributes to our understanding of the environment-behavior interaction, specifically in regards to consumer decisions.

CHAPTER TWO:

THE INFLUENCE OF PHYSICAL ELEVATION IN BUILDINGS ON RISK PREFERENCES:

EVIDENCE FROM THREE FIELD STUDIES

ABSTRACT

Little empirical research has been reported on the role of urbanization, particularly vertical expansion on consumer behavior. Based on embodied cognition literature, we propose that elevation from street level influences risk preferences. In a series of three field studies, involving financial and sensory decisions with both hypothetical and real payoffs, we find that high physical elevation increases risk-seeking tendencies. Further, this effect is mediated by sense of social power and moderated by social presence. Finally, we establish a boundary condition for the impact of elevation on risk preferences by demonstrating that the effect attenuates when an elevated view is not prompted. These findings show that a subtle environmental parameter – physical elevation – can influence human psychological states and consequently affect decisions.

INTRODUCTION

Americans spend more than 93 percent of their time indoors (Klepeis et al. 2001). Yet, we know very little about how built environments affect everyday choices. Recent studies in psychology, architecture, and marketing have indicated that factors in the physical environment have a subtle yet strong influence on consumers' perceptions, attitudes and behaviors (e.g., Dijksterhaus, Smith, Van Baaren, & Wigboldus, 2005; Levav & Zhu, 2009; Mehta, Zhu & Cheema, 2012; Zhu & Argo, 2013; Zhu & Meyers-Levy, 2009; Meyers-Levy & Zhu, 2007; Berger & Fitzsimons, 2008; Goldstein, Cialdini & Griskevicius, 2008). This research identifies a broad array of factors that characterize the influence of buildings on consumers. One of the ubiquitous environmental factors rarely discussed is consumers' vertical spatial location in a building.

The importance of investigating the behavioral consequences of physical elevation becomes evident when considering the ongoing migration of people to cities. Over three million people move to cities each week (International Organization for Migration, 2015). Over 87% of the US population now resides in cities and by 2050, it is predicted that 64% and 86% of the developing and developed world, respectively, will be urbanized (United Nations, 2013). Urbanization occurs primarily through either horizontal or vertical expansion. The latter strategy has resulted in nearly half of China's population now living in what is known as the "great housing wall" – high-rise residential buildings. McKinsey reports that by 2025, 50,000 new skyscrapers will be built in Chinese cities, the equivalent to constructing ten New York cities (Woetzel et al., 2009). Making the case for studying the effects of vertical expansion on decision-making is the fact that with rapid urbanization, a growing number of everyday decisions will be made in multi-story buildings (e.g., offices, banks, hospitals, hotels, restaurants, shopping

centers, residential apartments, airports, etc.). Despite rapid vertical expansion, little is known about how elevation within buildings affects consumer behavior, particularly risk taking behavior.

Consumers routinely deal with situations in which they must decide between options with varying degrees of risk. Consumer risk taking involves a process that is strongly influenced by individuals' habits, dispositions, motives and the utility of risks. However, contextual factors such as the framing of risks or the social environment have also been shown to influence risk tendencies (Kahneman & Tversky, 1979; Martin & Leary, 1999). Yet, little research has been done on the role of spatial factors in risk preferences. As decisions occur in a variety of physical settings, it is crucial to understand if and how purchase environments impact decisions under uncertainty. In the present research, we take a step towards better understanding spatial influences on consumer behavior by examining how verticality affects choices under uncertainty, and importantly, pinpointing some of the underlying psychological processes involved.

THEORETICAL BACKGROUND

Since the 1970's, researchers have proposed that the physical environment may have a notable influence on consumer decision-making. Kotler (1973), Belk (1975) and Bitner (1992) suggest that atmospheric and spatial factors such as sounds, scents, décor, lighting and geographical location influence consumer perceptions and decisions. However, few studies to date have investigated how consumer choices and decisions may be affected by the physical elevation of consumers within buildings. In this section, we will briefly review theories and

findings on the psychological effects of physical elevation. Next, we will build our conceptual framework and discuss possible explanations for the effect of elevation on risk preferences.

Psychological Effects of Elevation

Physical elevation (or verticality) is one of the most widely studied spatial dimensions in the psychology literature. Lakoff and Johnson (1980) suggested that being physically high or low is used metaphorically to represent abstract concepts. For instance, divinity, power, happiness and health are associated with verticality. The authors argue that elevation-related metaphors provide a grounding of abstract concepts in sensorimotor experiences of spatial vertical positioning. A large body of empirical evidence has confirmed this relationship (e.g., Meier, Hauser, Robinson, Kelland Friesen, & Schjeldahl, 2007; Schubert, 2005; Gagnon, Brunye, Robin, Mahoney, & Taylor, 2011). For instance, studies have shown that positive (vs. negative) words are categorized more quickly when shown in the upper (vs. lower) part of a screen, demonstrating associations between affect and the vertical dimension (Meier & Robinson, 2004; see also Meier & Robinson, 2006). Studies have also found that mental simulation of vertical movements affects motivation and performance. Ostinelli, Luna and Ringberg (2014) demonstrated that imagining upward movements makes people feel more self-worth, which undermines their motivation and worsens performance on a subsequent task. Another line of research has shown that physical elevation is associated with abstract versus concrete processing (Aggarwal & Zhao, 2015; Slepian, Masicampo & Ambady, 2015). Slepian and colleagues (2015) found that people in high (vs. low) elevations think more abstractly (vs. concretely).

A review of the literature suggests that elevation has been defined and studied on various scales ranging from massive to minuscule. For instance, researchers have studied elevation using photos of a mountain, aircraft or spaceship (Gagnon et al. 2011; Ostinelli, Luna, & Ringberg,

2014). On the other end of the spectrum, some studies have involved height variations in cars, furniture, or people. For example, findings have shown that taller referees in sporting events show more authority (Stulp, Buunk, Verhulst, & Pollet, 2012). Also, taller employees have higher social esteem and display more leadership skills (Judge & Cable, 2004).

It is important to note that the vast majority of these studies interchangeably operationalize height, elevation, and verticality using one of four representations: 1) the top or bottom of a page on paper-based tests - which are often presented on the horizontal axis and are not necessarily aligned with physical elevation (e.g., Meier et al. 2007); 2) top or bottom of a monitor on computer-based tests (e.g., Zanolie et al. 2012); 3) mental imagery (e.g., Ostinelli, Luna & Ringberg, 2014) or; 4) elevation-related pictures (e.g., Gagnon et al. 2011). Despite this, elevation-related associations are more likely to have been shaped based on spatial experiences rather than two-dimensional observations commonly used in marketing or psychological studies. Thus, we examine elevation using field studies involving actual physical elevation, which should corroborate previous findings and allow for a better understanding of the impact of real world experiences on human behavior.

Elevation and Risk Preferences

Despite the fact that consumers routinely make decisions that involve varying degrees of risk and these decisions are increasingly likely to occur in elevated environments, research on the impact of vertical positioning on risky decisions is scant. Limited findings on this topic have shown that taller people are chronically more risk tolerant (Dohmen et al., 2011). Additionally, researchers have anecdotally described an association between physical elevation and risk. Being exposed to verticality itself is commonly regarded as a risk and thus becomes part of various risk-seeking activities (Celsi, Rose, & Leigh, 1993; Ewert, 1994). Many of today's extreme

sports that take place in high elevations essentially weigh the risk of physical injury or death against the adrenaline rush. The elevation-risk association may, however, be explained as risk-takers being more likely to gravitate towards higher elevations to pursue exhilarating physical risks. But would occupying a high vertical position reciprocally make individuals more risk tolerant than they would be on ground level?

No studies to date have examined the elevation-risk association empirically. Specifically, how being situationally positioned on higher elevations affects risk tendencies. Our research addresses this oversight by investigating the effects of physical elevation in buildings on consumers' risk preferences. Previous research on power shapes our prediction regarding this understudied relationship.

Previous social psychological research has established a relationship between physical elevation and social power (Schubert, 2005; Zanolie et al., 2012; Gagnon et al., 2011; Giessner & Schubert, 2007; Meier et al., 2007), suggesting that "Up = Powerful, Down = Powerless". The link between power and elevation is deeply rooted in language and culture; expressed, for instance, as "upper" vs "lower" classes or "high" vs. low" status. Gagnon and colleagues (2011) demonstrated how verticality is metaphorically associated with power in social hierarchies and corporate structures. Further evidence from architecture and urban planning reinforces this link through the elevated placement of high-status edifices (e.g., executive offices) and prominent places (e.g., The Acropolis, U.S. Capitol on Capitol Hill, Beverly Hills). Additionally, studies have shown that a sense of powerfulness can increase optimism in perceiving risks and result in risky behavior (Fast, Sivanathan, Mayer, & Galinsky, 2012; Anderson & Galinsky, 2006; Galinsky, Gruenfeld, & Magee, 2003). Merging these findings, we argue that physical elevation can influence perceptions of powerfulness, which in turn affects risk preferences.

Furthermore, there is reason to believe that the social environment may influence elevation's psychological consequences, specifically with regard to the elevation-power association. Previous studies suggest that non-interactive social presence can impact decision making (Argo, Dahl & Manchanda, 2005). Additionally, studies suggest that the elevation-power association is shaped in social situations (Schubert, 2005; Giessner & Schubert, 2007). The power-elevation association has exclusively been described in terms of social power, as opposed to, say physical power. In other words, people on high physical positions are perceived as being more powerful socially, but not physically. Therefore, we argue that if the power-elevation association develops in social contexts and is most salient in such contexts, the proposed mechanism may be strongest in social situations. In other words, people may feel more powerful in high elevations when they can observe their elevated positioning relative to others and interpret it as social superiority. Therefore, we predict that high elevation, especially, in the presence of others, will heighten one's sense of power and as a result, increase risky behaviors.

In sum, this essay examines how vertical positioning in buildings affects risk preferences. We argue that risky behavior is indirectly facilitated by the social comparison that results from physical elevation. Therefore, we hypothesize that the presence (vs. absence) of others will lead individuals to feel more powerful as their physical elevation increases, thereby increasing their tendencies to favor risky alternatives. We conduct three field experiments to test these hypotheses.

STUDY ONE: THE ELEVATOR PITCH

Study 1 investigates the effect of dynamic elevation on financial risk preferences. We hypothesize that increasing (vs. decreasing) elevation would lead individuals to invest more (vs. less) in a risky bet. This study comprised of two parts: one using a between subjects design and the other using a repeated measures design. This was done to explore how elevation effects risk tendencies when comparing subjects' risk tendencies as they are exposed to opposite vertical movement, as well as to explore whether the effect is robust enough to influence the same individual's risk preferences as a function of their upward vs. downward movement.

Study 1a

Our first study sought to establish that changes in physical elevation from street level leads to differences in risk preferences between participants.

Method

One hundred sixteen individuals (85 males, 31 females) participated in this study. Participants were approached as they were going up or down on an elevator at the Renaissance Center in Detroit, MI. The elevator in question traveled between the mezzanine level and the seventy second floor in approximately ninety seconds. Elevator rides were on the Panoramic Otis Traction elevator with views of the Detroit River and Windsor, Ontario. Midway in the elevator ride, subjects were asked to make a financial decision by choosing between a low risk lottery (which offered 50% probabilities of winning $50 or $100) and a high risk lottery (with 50% probabilities of winning $20 or $130).

Results and Discussion

Results show that participants who were going up were more likely to choose the high risk option compared to participants going down, $\chi^2(1, N = 116) = 3.85$ $p < .05$. While only 19% of participants opted for the high risk option in the downward condition, 38% of their counterparts in the upward condition chose this option.

These results provide initial evidence for the influence of physical elevation on risk preferences. However, it is important to note that there may be a range of confounding factors involved in this study. For instance, since this study was conducted in the field, participants were not randomly assigned to each condition. As a result, it may be that participants going up, say to meet a colleague, have lunch, or get to work, were in a very different psychological state than those going down. Such differences may have subsequently affected risk tendencies. In the next section of this study, we explore this effect using a repeated-measures design to eliminate such possibilities.

Study 1b

Our next study is designed to test whether the effect found in Study 1a is robust enough to be captured using a repeated-measures design.

Method

Thirty-eight individuals (15 males, 23 females) participated in this study in exchange for $6. Participants were randomly assigned to one of two conditions in a repeated-measures design that involved meeting the experimenter either on the mezzanine floor or the 72nd floor of the same skyscraper described earlier. After a brief introduction, and signing a consent form, under the guise of having forgotten part of the experiment material, each participant was asked to accompany the experimenter on the elevator to get the material from a colleague and then return

to the initial meeting location. Therefore, participants who were assigned to the 72nd floor first took the elevator down and then back up; while participants in the other condition first took the elevator up and then back down. Each ride took approximately 90 seconds. Midway on the elevator ride, the experimenter told participants that for the sake of time, he recommends beginning the task. None of the participants objected; therefore, risk preferences were assessed on the elevator for all subjects. To measure risk preferences we used the Gneezy and Potter (1997) elicitation method. Participants were asked to imagine that they had received a certain amount of money and could invest all or part of the money and keep the remainder. Participants were told they have a chance of 2/3 (67%) to lose the amount invested and a chance of 1/3 (33%) to win 2.5 times the amount invested. They were then asked to allocate the amount they would keep and invest. On the first ride (i.e., going up for participants on the mezzanine level, or going down for participants on the 72th level) participants were asked to allocate $70. On the second ride (i.e., going back to initial meeting location), the task involved an endowment of $170. The share invested from the total amount in each scenario was used as the measure of risk taking. Upon returning to the initial meeting location, participants were debriefed and dismissed.

Results and Discussion

The percentage of money each participant invested was highly correlated in the upward versus downward conditions, $R = .80$, $p < 0.001$, showing that attitudes towards risk did not change drastically as a result of the spatial manipulation. However, a paired-samples *t*-test revealed that participants took more risk when their physical elevation was increasing. Participants allocated a larger share of the money to the risky investment when they were going up (M =50.89%, SD = 25.18) compared to when they were going down (M = 44.79%, SD = 23.05); $t(37) = 2.48$, $p < .05$.

Results from this field experiment demonstrate a link between physical elevation and financial risk-taking. We found that, on average, participants allocated approximately 6% more towards the risky investment when they were ascending (vs. descending). Still, it is unclear how elevation influenced risk-taking behavior. Also, in this study increasing the vertical distance from street level was shown to affect risk preferences, but how would elevation influence individuals who are statically positioned on a certain level of a building? While movement and elevation are confounded in both parts of this field experiment, in the next studies, we examine physical elevation in static, rather than dynamic settings to tease these two explanations apart.

STUDY TWO: ELEVATION AND POWER

In Study 2, we examine the underlying processes that lead individuals to take more risks with higher elevation. Specifically, we examine the mediating role of power and the moderating role of social presence. We also consider an alternative explanation that mood changes resulting from an elevated view may account for the effect of elevation on risk-taking. Previous studies identified an association between affect and vertical position (Meier & Robinson, 2004, 2006). Therefore, one may argue that participants at a high elevation would feel more positively, hence be more optimistic about the outcome of risks, and as a result take more risks compared to their low elevation counterparts.

Method

Design and Procedure. Study 2 used a 2 (elevation: high vs. low) x 2 (social presence: high vs. low) between subjects design. One hundred forty-four individuals (43% female, average age = 33.87, age range 18-73) participated in this field experiment in exchange for a chance to win an

Apple iPod and a small cash prize. Subjects were randomly assigned to meet the experimenter in one of two identical spaces, either on the ground floor of a building or on the third floor. Both spaces had views of the same forty-foot high atrium (see Appendix A). Therefore, the orientation, horizontal positioning and viewable surrounding of the spaces were identical, varying only in their elevation. An interior vertical space (as opposed to looking out of a window) was chosen as the venue for this study to eliminate any visual confounding factors that may influence behavior. To control for familiarity biases, we only recruited individuals who had never been in that space prior to the study. To manipulate social presence, subjects were randomly assigned to participate in the study either on a busy weekday or during the weekend. In this way, the number of people visible from the location in which the tasks were performed was manipulated. During the weekday sessions, on average 67 people were seen in the atrium, while during the weekend sessions, on average 4 people were visible. Elevation and social presence were both pretested with a separate group of twenty participants. All sessions were held between 9:00 am and 2:00 pm. Upon arriving at the designated spot, participants were greeted by the experimenter and asked to complete several tasks for a study on cognitive abilities and decision-making. After subjects signed a consent form, in the guise of assessing their verbal abilities, participants were asked to eloquently describe their view. This was done to cue elevation. Next, they completed three tasks to measure power-related and affect-laden thoughts, construal level, and risk preferences. The order in which the tasks were completed was counterbalanced across participants to control for potential order effects. At the end of the study, participants were debriefed and dismissed.

Measures.

Risk Preferences. Participants' risk preferences were assessed using the multiple price list method (MPL; Holt & Laury, 2002, see table below). This method has been shown to be effective in capturing risk preferences and identifying treatment effects (Charness, Gneezy & Imas, 2013). In this task, participants are given a list of 10 decisions between paired gambles with risk-averse (Option A) and risk-seeking (Option B) choices – see table below for details. In the first decision row, participants are presented with a 1/10 chance of getting the high payoff for either option, and the expected payoff of Option A is only $1.17 greater than of Option B. Hence, only a very risk-seeking individual would choose Option B in this row. Moving down the rows, the probability of the high payoff increases and by the last decision, the choice is between $2.00 and $3.85 with certainty. If the individual understands the instructions correctly, he/she should choose Option B for the last decision. For all but the most risk-seeking, this implies a pattern where individuals start by choosing Option A for the first decision and switch over to Option B at some point before the last decision row. We used this switching point (indicating the number of risk-averse options chosen) to measure individuals' risk preference. To make the risk preferences incentive-compatible, participants were informed that after all decisions are made, one decision will be selected at random and the chosen gamble will be played for real (see Andersen, Harrison, Lau, & Rutstrom, 2006).

Option A	Option B
1/10 of $2.00, 9/10 of $1.60	1/10 of $3.85, 9/10 of $0.10
2/10 of $2.00, 8/10 of $1.60	2/10 of $3.85, 8/10 of $0.10
3/10 of $2.00, 7/10 of $1.60	3/10 of $3.85, 7/10 of $0.10
4/10 of $2.00, 6/10 of $1.60	4/10 of $3.85, 6/10 of $0.10
5/10 of $2.00, 5/10 of $1.60	5/10 of $3.85, 5/10 of $0.10
6/10 of $2.00, 4/10 of $1.60	6/10 of $3.85, 4/10 of $0.10
7/10 of $2.00, 3/10 of $1.60	7/10 of $3.85, 3/10 of $0.10
8/10 of $2.00, 2/10 of $1.60	8/10 of $3.85, 2/10 of $0.10
9/10 of $2.00, 1/10 of $1.60	9/10 of $3.85, 1/10 of $0.10
10/10 of $2.00, 0/10 of $1.60	10/10 of $3.85, 0/10 of $0.10

Table 1. Multiple Price List (Holt & Laury, 2002)

***Power and Mood*.** To assess sense of power, participants completed a word fragment completion task derived from Bargh and colleagues (1995). Participant's affective state was measured by incorporating affect-related words in the task. Previous studies, including DeWall and Baumeister (2007), used this task to assess mood implicitly. The task included 10 power-related words, 10 non-power-related positive words and 10 non-power-related negative words (total of 30 words). For example, the target power-related words included "B_S_", which could be completed either as "BASE", or "BOSS", "C_NTR_L" as "CENTRAL" or "CONTROL" and "KIN_" as "KIND" or "KING". The number of words completed as power-related was used to measure power. The affect-laden words included incomplete target words such as "JO_" or "ANG__" that could be completed to form positive or negative emotional words, such as "JOY"

or “ANGER”, or unemotional words, such as “JOB” or “ANGLE”. The total number of affect-laden words that were formed was used to measure mood.

Results

Risk Preferences. All participants seemed to have understood the instructions for the MPL task correctly and all participants switched from Option A to Option B only once over the ten decision rows. An ANOVA with risk preferences on the MPL task (i.e., the total number of risk-averse choices) as the dependent variable and elevation and social presence as predictors revealed a main effect of elevation. Participants were more risk-seeking in high elevation compared to low elevation (M_{high} = 5.79, SD = 1.94 vs. M_{low} = 4.88, SD = 1.66; $F(1, 142)$ = 9.13 , $p < .01$). These findings replicated results from Study 1 using a static vertical position. Social presence and its interaction with elevation did not affect risk taking ($ps > .1$).

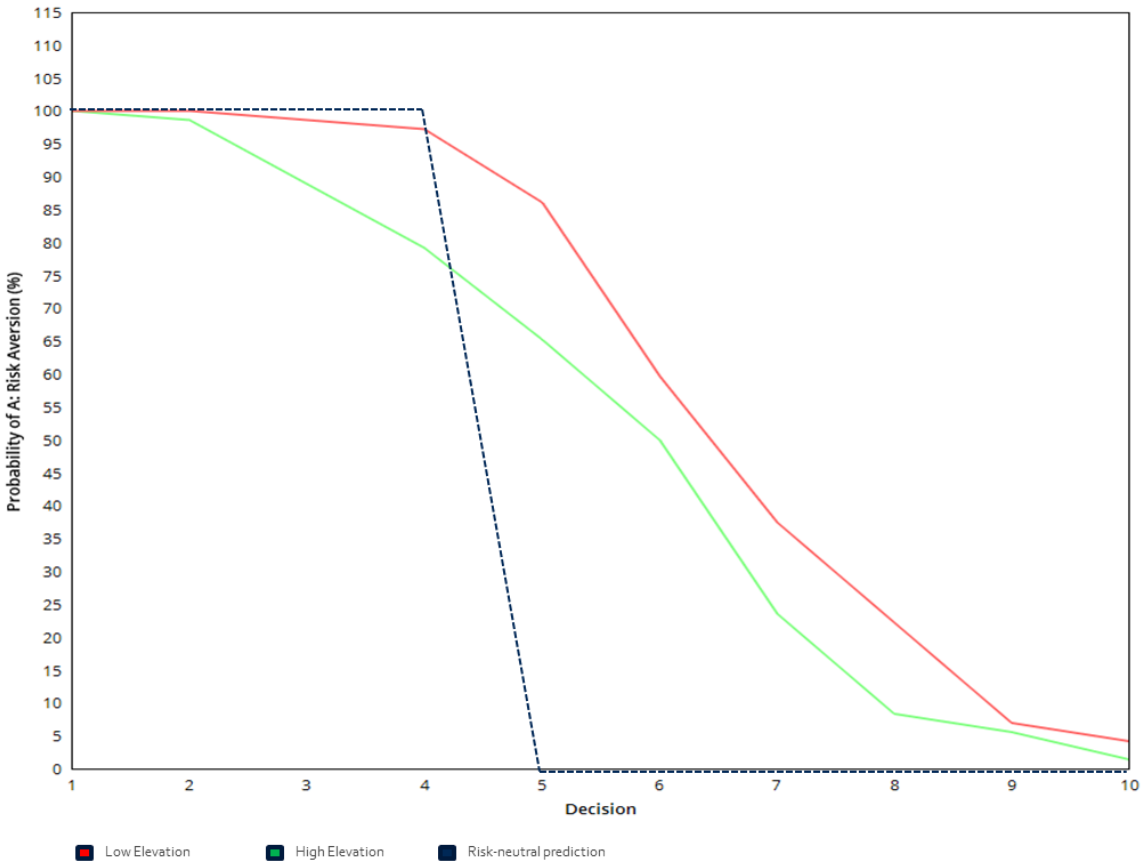


Figure 3. Probability of risk-averse choices in each decision

Process Analyses. First, moderation was assessed by conducting an ANOVA with power as the dependent measure and elevation and social presence as predictors. There was a significant main effect of elevation, with participants in the high (vs. low) elevation condition being more likely to complete target words as power-related (M_{high} = 3.53 vs. M_{low} = 2.40; $F(1, 140) = 35.92$, $p < .001$). The main effect of social presence was not significant ($p > .1$). This was qualified by the hypothesized two-way interaction of elevation and social presence on power, $F(1, 140) = 6.70$, $p = .011$. Simple effects tests provided support for our hypotheses. When participants were in a high (vs. low) elevation in the presence of others, they were more likely to complete words as

power-related (M_{high} = 3.86 vs. M_{low} = 2.25; t (70) = -5.86, p < .001). However, when others were not present the effect of elevation on power weakened (M_{high} = 3.19 vs. M_{low} = 2.56; t (70) = -2.49, p < .05).

Next, the mediating role of power in physical elevation's effect on risk taking behavior was assessed. To do so, we coded the low and high elevation conditions as 0 and 1, respectively. The effect of elevation was reduced to non-significant (from β = .24, p < .05, to β = -0.02, p > .5) when we added power as a covariate, and power was a significant predictor of risk taking (β = .51, p < .001). Next, we examined the indirect effects of elevation on risk preference at values of social presence with low and high social presence coded as 0 and 1, respectively. A bootstrap analysis showed that the 95% bias-corrected confidence interval for the size of the indirect effect excluded zero in both social presence conditions, albeit to a stronger degree in high social presence, b = -.82, ([-1.28, -0.48]) compared to low social presence, b = -.32, ([-0.67, -0.06]) suggesting a significant indirect effect.

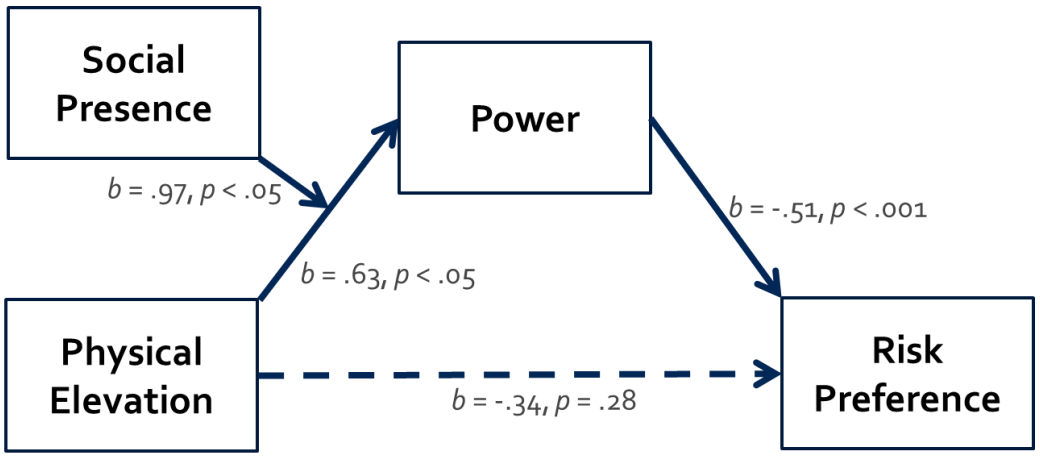


Figure 4. Power mediates and social presence moderates the effect of elevation on risk taking behavior

Alternative Explanation: Mood. Results from a *t*-test showed that words completed as affect-laden were not significantly different between the high and low elevation conditions ($M_{high} = 9.7$ vs. $M_{low} = 9.4$, $t(142) = .37$, $p > .1$).

Discussion

The results of this study extend those of Study 1 in several ways. First, we showed that being positioned statically on a high (versus low) elevation leads to riskier behavior. Second, we demonstrated a moderated mediation, identifying the mediating role of power and the moderating role of social presence. Specifically, high elevation facilitates more risky behavior by inducing a sense of power - especially when others are present. Interestingly, power mediated the effect of verticality on risk preferences regardless of others' presence; albeit to a weaker degree in the low social presence condition. This may have occurred because the setting chosen for this study is frequently used as a social gathering place. Participants may have felt an imagined social presence even if there were no people in that environment. Moreover, the low social presence condition was not completely void of other people; therefore, it may be that the presence of even a few people was sufficient to activate the elevation-power association. These results demonstrate that the strength of this association is dependent on the social context, specifically mere social presence. Finally, this study rules out the explanation that positive moods drive risky behavior in high elevations. It is worth noting that the operationalization of social presence (i.e., weekdays vs. weekends) while successful, could potentially confound these results. In the next study, we explore this effect in a consumer scenario involving new product choices.

STUDY THREE: ELEVATION AND SENSORY RISK

In this study, we examine the role of physical elevation on risk taking behavior in a consumer context. Additionally, study 3 seeks to supplement our previous findings in two important ways. First, it examines the effects of verticality in consumers' natural habitat: their residence or workplace. Second, it explores conditions in which elevation does not lead to more risky behavior. Specifically, we investigate the effects of elevation on risk preferences when elevation is not cued. Studies have demonstrated that certain aspects of an individual's view through a window may affect their behavior (e.g., Ulrich, 1984). In this study, we hypothesize that an elevated view is a crucial component in the effect of elevation on risk taking. In other words, perhaps an "elevated view" rather than "elevation, per se" is what triggers an increase in risk taking behavior.

We examined financial risk using a lottery task and the Gneezy and Potter (1997) elicitation method in study 1, and the multiple price list method (Holt & Laury, 2002) in study 2. These methods evaluate individuals' risk preferences in scenarios involving maximizing monetary gains and minimizing losses. In this study, we use consumers' willingness-to-pay to assess financial risk preferences. Additionally, we introduce and examine a rarely studied form of risk: sensory risk. This type of risk can be defined as the tendency to maximize pleasant sensory experiences and minimize unpleasant ones under uncertain circumstances, for instance, trying a new food or drink (i.e., gustatory risk), touching an unknown material (i.e., haptic risk) or smelling an exotic odor (i.e., olfactory risk). In all of these situations, consumers who take risk and experience a particular sensation probabilistically may incur great utility (such as enjoying the taste or smell of exotic delicacies, or the pleasant surprise of touching an unfamiliar clothing fabric). On the other hand, encounters with novel sensory stimuli could also lead to unsavory,

regretful or even painful experiences. We posit that risk-seeking individuals would be more willing to experience novel sensory stimuli with uncertain outcomes. Conversely, risk-averse individuals would avoid such sensations, forgoing the possible utility of novel sensory inputs. Sensory risk preferences have occasionally been discussed in psychology literature within the framework of sensation seeking behavior (e.g., Zuckerman, 2007). However, to our knowledge, this is the first study to formally operationalize it as a distinctive form of consumer risk taking.

We predict that participants primed with an elevated view would take more risks by displaying higher willingness to pay (WTP) and willingness to try (WTT) an unfamiliar drink with uncertain sensory outcomes. We expect no differences for a familiar drink because it presents a predictable taste and poses minimal sensory risk.

Method

Pretest: Elevation. Study 3 was conducted using Amazon's Mechanical Turk (MTurk) platform. One important feature of MTurk is that it allowed us to conduct a quasi-experiment; hence, we did not control, manipulate or assign participants to a particular physical elevation. Instead, we categorized participants' real world elevation following a pretest. We pretested judgment of physical elevation with a sample of forty participants who were asked to categorize images of views as either "low elevation" or "high elevation". Each subject saw seventy images comprised of ten images from each level of various buildings (i.e., ten images from the first floor, ten images from the second floor, all the way to seventh floor). These images were taken from residential and commercial buildings in urban and suburban settings. The majority of participants judged the photos taken from the first (97%) and second level (87%) as "low elevation". On the other hand, the majority of participants categorized the view from the sixth (75%) and seventh floor (87%) as high elevation. Analysis revealed notable disparity in evaluations of elevation on

the third, fourth and fifth floor, all in the range of 40-60%, χ^2s < 1, *p*s > .1. To clearly differentiate elevation, potential participants in levels that resulted in an unclear judgment of elevation (i.e., third through the fifth floor) were not included in the study. Based on this pretest, participants on the first and second levels were included in the "low elevation" condition, and those on the sixth and higher levels were included in the "high elevation" condition. It is important to note that elevation perception is often relative in nature. Therefore, a comparison between the third level that was used for "high elevation" in Study 2 (where participants were looking at an interior space) and that discussed here (where participants were viewing an outward facing window) is not entirely valid.

Participants and Procedure. One hundred sixteen individuals (65% female, average age = 35.21) who satisfied the elevation criteria were recruited through Amazon MTurk and participated in this study in exchange for $2. The study employed a 2 (elevation: high vs. low) × 2 (view: prompted vs. not prompted) × 2 (sensory risk: high vs. low) mixed design with elevation and view as between-subjects factors and sensory risk as a repeated factor. We asked participants to evaluate two new products and upload a photograph of the view from the closest window in their vicinity. They were also asked to describe their view in one paragraph and attach the description to the photo. The photo and description served two purposes: 1) to verify participants' reported physical elevation and 2) to cue elevation. Participants were randomly assigned to complete this task either before or after the product evaluation task – serving as the manipulation of view. Participants were given the following instructions: "A food and beverage company has recently created a new line of natural fruit beverages which is being tested for a nationwide launch. We would like to get your feedback regarding two of the beverages being launched." Then, participants saw pictures of a familiar fruit beverage: Strawberry smoothie and

an unfamiliar fruit beverage: barberry smoothie. Next, they were asked to state how familiar they are with the taste of each fruit (serving as our manipulation check), and whether they are willing to try a sample and provide feedback for each of the beverages. These items were answered on a scale of 1 (not at all) to 7 (very much). We also asked participants to state how much they are willing to pay for a 15-ounce bottle of each of these beverages (from $0 to $10, in $0.50 increments). Willingness to pay and willingness to test the unfamiliar beverage was used as the measure of sensory risk preferences.

Results

As expected, participants were much more familiar with the taste of strawberry than barberry ($M_{strawberry}$ = 5.85 vs. $M_{barberry}$ = 2.05; $t(115) = 24.08$, $p < .001$).

Willingness-to-pay. An ANOVA using WTP as the dependent variable and elevation, view and sensory risk as predictors produced a marginal 3-way interaction, F(1, 112) = 3.33, p = .071. Planned contrasts revealed that, as hypothesized, participants at higher elevations who were prompted with their view were willing to pay more for the unfamiliar drink (M = $2.65, SD = 2.16) than their counterparts whose elevated views were not prompted (M = $1.63, SD = 1.75; $t(56) = 1.96$, $p = .055$) or their counterparts who were prompted with views of low elevations (M = $1.67, SD = 1.35, $t(56) = 2.06$, $p < .05$). WTP for the strawberry smoothie was higher than barberry, $M_{strawberry}$ = $2.66, SD = 2.00 vs. $M_{barberry}$ = $1.94, SD = 1.80; $t(115) = 4.03$, $p < .001$ and as expected, elevation and view did not affect the WTP for the strawberry smoothie ($p > .5$). An ANOVA using WTP for the barberry drink as the dependent variable produced a marginally significant interaction, $F(1, 112) = 3.07$, $p = .082$. Furthermore, planned contrasts revealed that, as hypothesized, when participants were in higher levels of a building and were cued with their view they were willing to pay more for the unfamiliar drink (M = $2.65, SD = 2.16) than their

counterparts who were also on higher levels of a building but not cued with their view (M = \$1.63, SD = 1.75; $t(56) = 1.96$, $p = .055$) or their counterparts who were on lower levels and cued with their view (M = \$1.67, SD = 1.35, $t(56) = 2.06$, $p < .05$). In general, WTP for the strawberry drink was much higher than barberry, $M_{strawberry}$ = \$2.66, SD = 2.00 vs. $M_{barberry}$ = \$1.94, SD = 1.80; $t(115) = 4.03$, $p < .001$ and as expected, elevation and view did not affect the WTP for strawberry smoothie ($p > .5$).

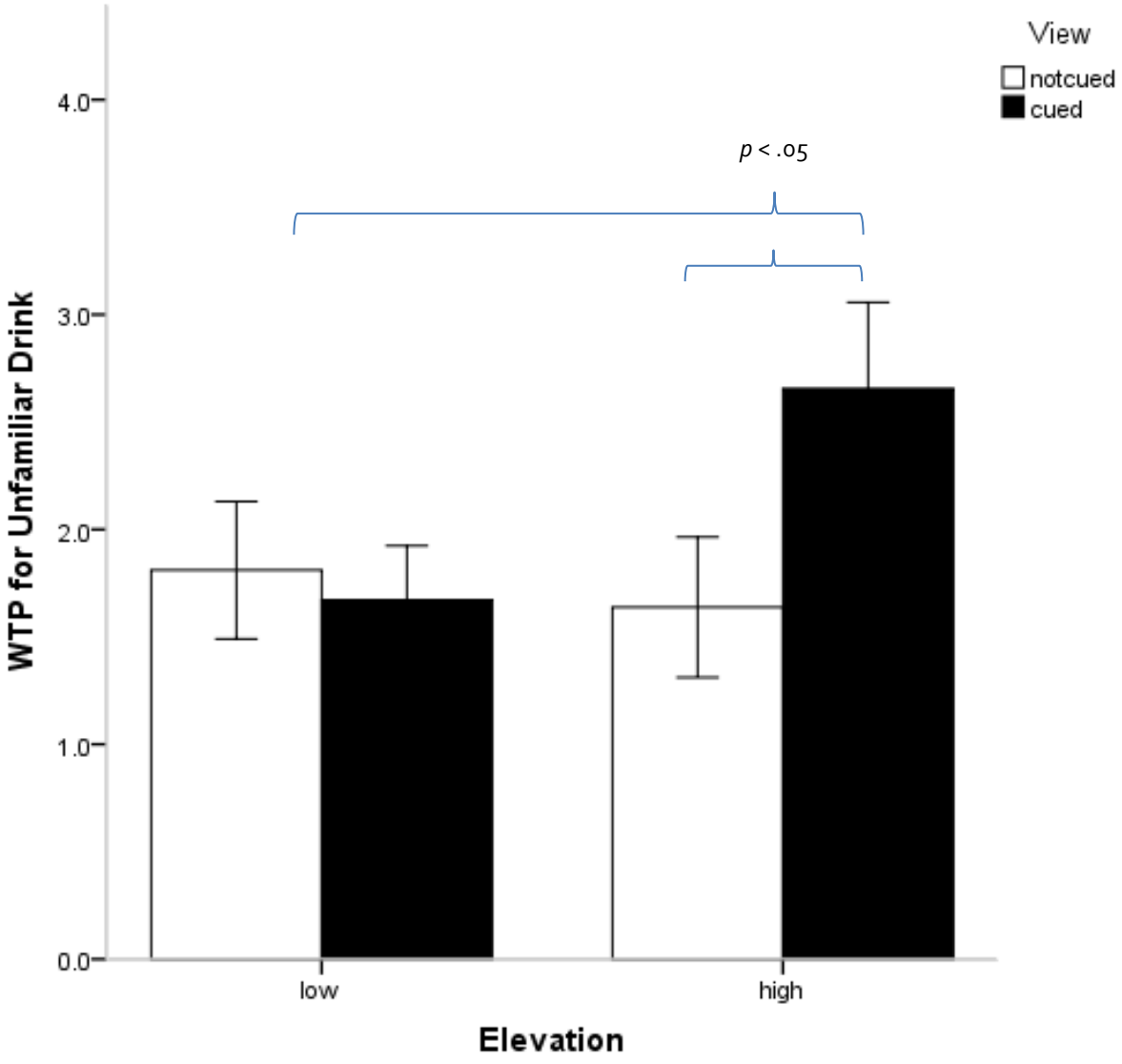


Figure 5: Willingness to pay for unfamiliar drink vary by elevation and view

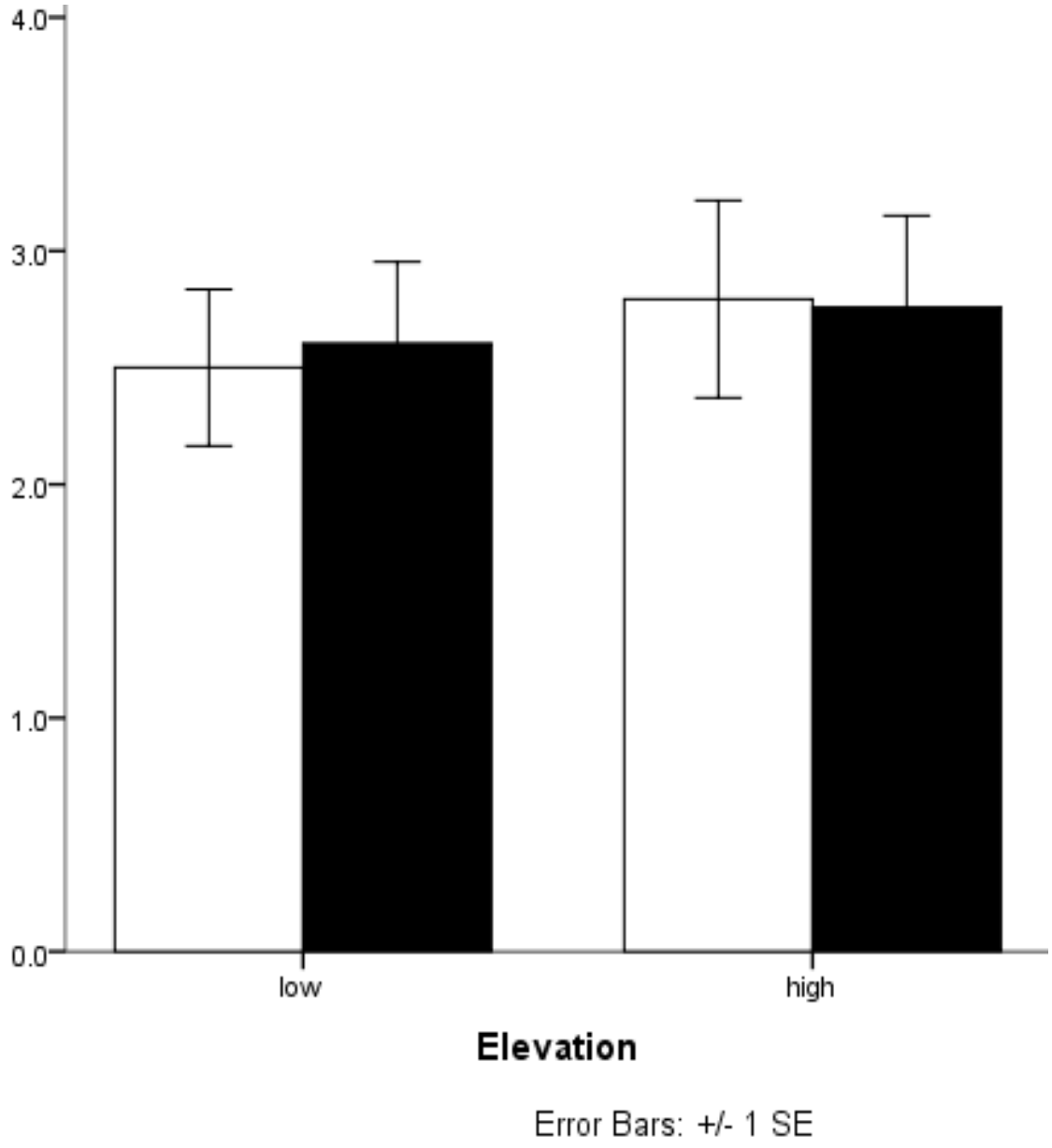


Figure 6: Willingness to pay for familiar drink vary by elevation and view

Willingness to try. An ANOVA using WTT as the dependent variable and elevation, view and sensory risk as predictors results revealed a marginal main effect of elevation, such that WTT a beverage was slightly higher in high elevation (M_{high} = 4.13 vs. M_{low} = 3.66; $F(1, 112) = 3.15$, $p = .078$). These results were qualified by a 3-way interaction, $F(1, 112) = 4.41$, $p < .05$.

Participants on higher levels who were prompted with their elevation displayed higher WTT for the unfamiliar drink (M = 4.34, SD = 1.91) than their counterparts who were on higher levels but not prompted with their view (M = 3.14, SD = 1.82; $t(56) = 2.45$, $p < .05$) or their counterparts who were cued with views of lower elevations (M = 2.90, SD = 1.95; $t(56) = 2.85$, $p < .01$). We also found that WTT the familiar beverage was higher than the unfamiliar one, $M_{strawberry}$ = 4.36, vs. $M_{barberry}$ = 3.44; $t(115) = 3.99$, $p < .001$. As predicted, elevation and view did not affect WTT the strawberry smoothie ($p > .5$).

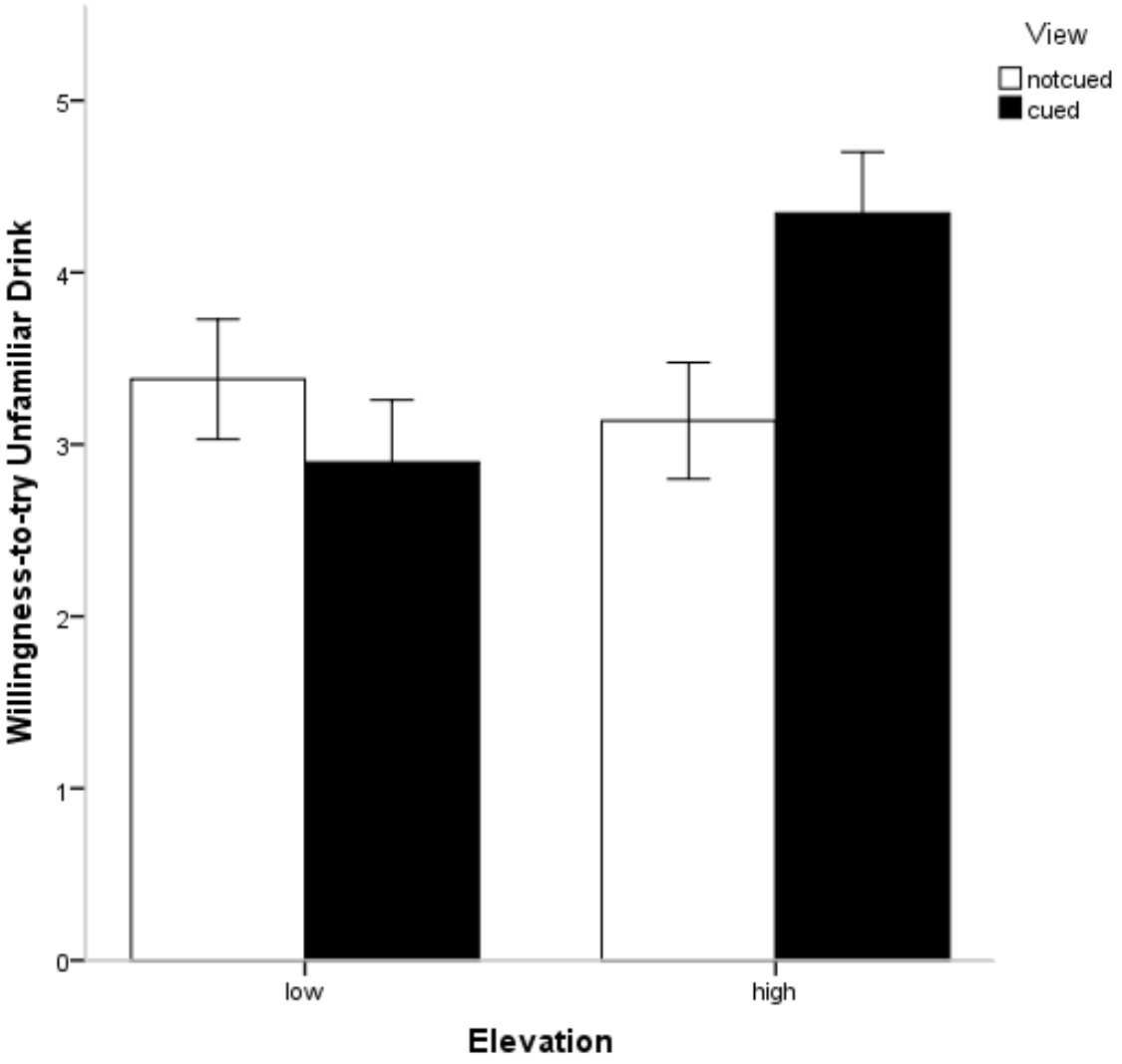


Figure 7: Willingness to try unfamiliar drink vary by elevation and view

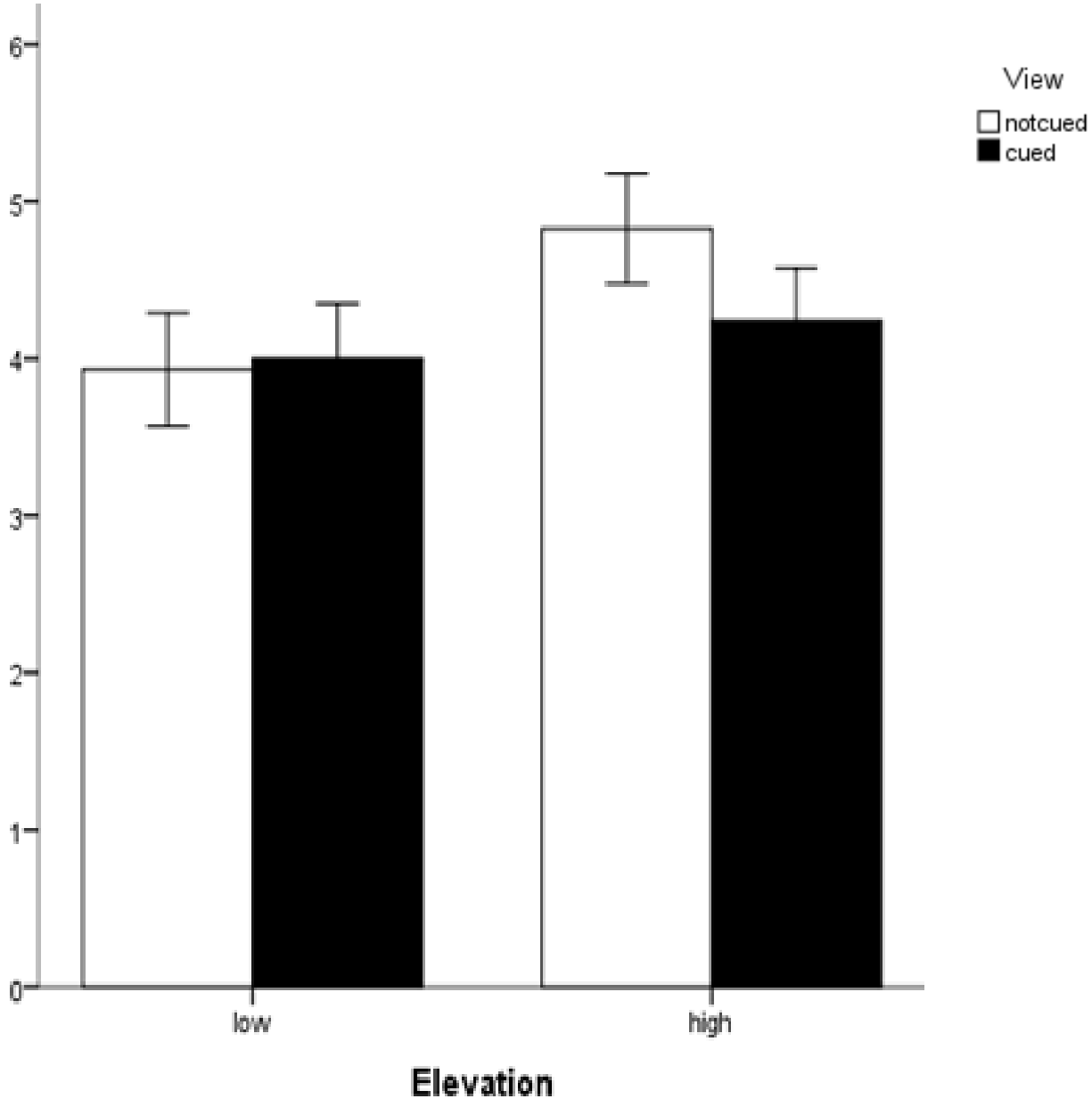


Figure 8: Willingness to try familiar drink vary by elevation and view

Discussion

The results of study 3 add further support to our hypotheses. These results extend our earlier findings to the domain of sensory risk, showing that elevation led to more risk taking in a consumer situation that involved evaluating a new product. We demonstrated that participants in high elevations of buildings who were cued with their view were more willing to pay for an unfamiliar drink – hence, risk losing the money paid in return for minimal utility if they didn't like the beverage. They were also more willing to experience the taste of an unfamiliar drink - hence risk having an unpleasant gustatory experience. As expected, the effect of elevation and view on risk preferences completely diminished when the drink was familiar and hence, didn't pose notable financial or sensory risk. Admittedly, while results on WTT were robust, we did observe weaker results on WTP, which seems plausible since participants are likely to display higher sensitivity towards financial (vs. sensory) loss. In other words, being exposed to an elevated view seems to have increased risk tolerance; however this had a weaker effect when the stakes were financial (i.e., risking the cost for an undesirable beverage) as opposed to sensory (i.e., risking the negative experience of tasting an undesirable beverage).

Importantly, we find evidence of the hypothesized effect with a quasi-experimental design involving consumers in everyday environments. Lastly, this study establishes an elevated view as a boundary condition for the effect of elevation on risk-taking, showing that higher elevation leads to more risk taking only if participants have been primed with their elevation first.

GENERAL DISCUSSION

Summary and Contributions

This essay demonstrates the effects of verticality on risk preferences. Across three field studies we examined whether, when and how physical elevation affects individuals' psychological states and subsequent behaviors. The first study investigated the effect of dynamic elevation on risk preferences and found that individuals took more risks when they were ascending than when they were descending. The second study examined how elevation affects risk tendencies. We developed and tested a mediation model showing that high elevation led to riskier behavior by increasing one's sense of power, especially when many others were present. The third study involved a quasi-experimental design involving sensory risk. This study also examined whether elevation's effect is constrained to having an elevated view, or if mere positioning of people in higher stories influences risk-taking. We found that consumers at higher elevations responded more favorably to riskier options, but only if they had been prompted with their elevated positions.

Our work contributes to the consumer psychological literature on how spatial and atmospheric factors affect consumer choices. Previous research on verticality has rarely examined actual physical elevation. We argue that elevation-related effects are likely to have been shaped based on spatial experiences, and found evidence, through a series of field studies, for elevation's impact on risk taking behavior mediated through the effects of 'power'. We also extend literature on the power-elevation association by showing that the strength of this link can shift as a function of mere social presence. Additionally, our work contributes to research on sensory marketing (Krishna, 2012) and consumer risk-taking. By introducing and utilizing sensory risk preferences, we explore an intriguing and rarely-studied form of risk.

By establishing that verticality influences psychological states and subsequent choices, we probe a phenomenon that goes far beyond the scope of this essay. Academic research takes place in various elevations at universities across the world, ranging from basements to high-rises. The results from this study have substantial implication for research that is not concerned with spatial parameters such as elevation, but may be inadvertently affected by such factors. With the heightened focus on replicability in behavioral studies (Yong, 2012; Francis, 2012), our findings suggest that even the most rigorously controlled lab environments may be prone to spatial effects that may influence subjects' psychological states and behavior.

Practical Implications

Based on our findings, particularly from study 3, we believe the natural vertical positioning of consumers and the effect it may have on their behavior can lead to interesting applications for hyper-contextual targeting for mobile ads (Andrews, Luo, Fang, & Ghose, 2015). As mobile advertising evolves, marketers are using information related to consumers' physical location to optimize targeted advertising (Marshall, 2014). In light of these results, companies may, for instance, promote new brands or products to consumers in high elevations - identifiable using cellphone barometer sensors, location-based apps, or social media posts.

Identifying spatial effects, such as those demonstrated here, would be crucially important in understanding individuals' context-relevant risk perceptions as well as their subsequent behavior and decision-making processes. Such processes can prove vital in a number of physical settings. Various building types such as hospitals, banks, clinics, courthouses, workplaces, and retail settings may be continuously and subtly affecting risky choices that are made within them. In addition to the practical implications of this study in designing buildings that, for instance, help inhibit risky behavior, the findings can be used in advertising to influence consumer

behavior. Ad campaigns guided by these findings could incorporate elevation cues to encourage risk-seeking behavior. The opposite effect could be useful, particularly in health communication or consumer welfare campaigns, where priming non-elevated positioning may help reduce the desire for risk taking behavior such as smoking or gambling.

Limitations and Future Research Directions

In our studies, we examined financial and sensory risk. We suspect that other forms of risk, particularly social and legal risks may not yield the same results. Additional studies are required to examine how elevation may affect risk tendencies that involve public repercussions. Our findings suggest that at higher elevations, individuals take more risks. However, if the risk involves social/legal consequences, it is plausible that increased elevation would actually lead individuals to feel more exposed to the eyes of society and law, thus decreasing the odds of engaging in risky behaviors.

Another shortcoming of this essay relates to our focus on positive elevations from street level. Research on the role of subterranean environments on consumer behavior is non-existent. Future research may examine the effects of negative elevations on risk taking behavior. For example, do people in a basement or subway train feel less power than those on the surface? And does a negative elevation from a common reference point (perhaps street level) make individuals more risk-averse than usual? In addition to subterranean conditions, we believe that the issue of physical elevation on scales smaller than the one we studied may also be a fruitful area of research. Future work is needed to explore if small scale changes in elevation induce risky behavior. For instance, do individuals take more risks when wearing high heels? Do drivers of SUVs, as anecdotally believed (Wheldon, 2007), take more risks compared to drivers of Sedan

vehicles? Are people sitting on high chairs more risk-seeking than those sitting on low chairs - for example while gambling?

In this research, we measured power using an implicit task; therefore, we were only able to show that elevation makes power-related concepts more accessible. We did not explore whether participants explicitly felt more powerful in high elevation. Having said this, we were able to show that even using an indirect elicitation, power strongly mediated the effect of elevation on risk preferences.

An exciting area for future research could involve studying the neurophysiological impact of verticality on human behavior. We found that the effect of elevation on risk preferences is mediated by power, which is linked to the hormone testosterone. Studies have found that individuals with power (versus without power) often show higher baseline testosterone levels and testosterone increases as individuals gain power or adopt power-inducing postures (Schultheiss, Wirth, & Stanton, 2004; Bendahan, Zehnder, Pralong, & Antonakis, 2015; Carney, Cuddy, & Yap, 2010; Dabbs & Dabbs, 2000). Testosterone has also been shown to influence financial risk taking (Stanton, Liening, & Schultheiss, 2011; Apicella, Dreber, & Mollerstrom, 2014; Ronay, & Von Hippel, 2010). In a recent study, Cueva and Colleagues (2015) show that increased testosterone levels shift financial investment towards riskier options. They found that testosterone affects risk tendencies by boosting optimism towards risky decisions. Future studies should examine how physical elevation affects risk taking as a result of changes in neuroendocrine profiles, particularly testosterone levels. Based on our findings, we posit that exposure to physical elevation leads to an increase in testosterone levels, which subsequently leads to more risk taking.

Lastly, future studies are needed to examine if the relationship between elevation and risk is bidirectional. In other words, would engaging in risky behaviors induce higher vertical spatial perception? A bidirectional relation between verticality and risk taking would be comparable to Schnall's findings on the influence of social relations on spatial judgment (Schnall, 2011; Schnall, Zadra & Proffitt, 2010; Schnall, Harber, Stefanucci, & Proffitt, 2008). For example, Schnall and colleagues (2010) demonstrated that a psychosocial resource, such as social support, can affect the visual perception of inclines. Participants who were with friends estimated a hill to be less steep when compared to participants who were alone. Another recent study by Duguid and Goncalo (2012) found that individuals' experience of power influences perceptions of their own height. Along the same lines, it may be that individuals who engage in risky behavior also judge their physical elevation as being higher than it actually is. Such studies would be conceptually interesting and have practical implications, especially for marketers, real estate agents, and architects. The present research is a first step to better understand consumers' behaviors in various vertical positions. Our findings suggest that physical elevation is an important, omnipresent, yet underexplored factor within consumer behavior. We hope that this work will spur further exploration of this topic.

CHAPTER THREE:

ILLUMINATING ILLUMINATION: UNDERSTANDING THE INFLUENCE OF LIGHTING ON SOCIALLY CONSCIOUS BEHAVIORS

ABSTRACT

Illumination has been used by writers and poets to signify awareness, truth, intelligence, and morality. A growing body of literature shows that illumination can affect human behavior. Some research suggests that exposure to bright (versus dim) light facilitates socially conscious behaviors; other studies record the opposite. With the current work, we explore how and when illumination, specifically the intensity of light, affects such behaviors. Using both room lighting and screen brightness, we demonstrate that illumination generally increases socially conscious behaviors such as conformity, helpfulness, fairness and perspective-taking. In other words, participants exposed to bright lighting are more likely to act upon others' opinions, needs, rights, and views. We also provide process evidence suggesting that public self-consciousness mediates the effect of illumination on such behaviors. We find that the effect reverses in social contexts involving dissociative reference groups. Further, we extend these results to the food consumption domain and show that lighting also influences eating motivation and behavior. Supported by our

findings, we developed a unified explanation for the psychological consequences of a ubiquitous, yet often subtle environmental factor - illumination.

INTRODUCTION

Light predates humanity's existence by billions of years. Our early ancestors were at the mercy of Mother Nature and the daily cycle of light and dark. Over the course of millennia, we learned to harness light and use it to our advantage. Now, we live in an era in which illumination engulfs us day and night and we take it for granted. Still, we know very little about its impact on our choices and behaviors. Recent studies suggest that illumination, like many other environmental factors, may have a subtle yet significant impact on consumers' judgments and decisions because it is often beyond conscious awareness (Dijksterhuis et al. 2005; Turley & Milliman, 2000; Wansink & Chandon, 2014). Even when they do notice it, people typically cannot block out, control, or avoid lighting conditions in their surroundings. Mehrabian (1976) argued that lighting is a chief factor in the environment's impact on human behavior. Furthermore, researchers in marketing, psychology, and architecture have described lighting as one of the main atmospheric factors influencing consumer experiences (Bitner, 1992; Belk, 1975; Kotler, 1973; Quartier, Christiaans, & Van Cleempoel, 2009; Greenland & McGoldrick, 1994; O'Neill & Jasper, 1992; Spence et al. 2014; Turley & Milliman, 2000). Today hundreds of companies and consultants across the world provide lighting guidelines and fixtures to retailers to improve product and brand perception and increase consumer engagement and satisfaction (Schielke, 2015).

Despite the common belief that lighting conditions in consumption environments matter, illumination's effect on consumer behavior is not clear and there is contradicting evidence in the

literature regarding its influence on choices and actions in social settings. The connection between lighting and social awareness is deeply ingrained in figurative language. Expressions such as “putting a spotlight on somebody”, “being in the limelight” or “stealing the spotlight” are often used to metaphorically describe the extent to which people attend to or are attended by others. This suggests that social visibility may be enhanced as a result of better physical visibility in bright lighting conditions, which raises the question: Are people more considerate of the social consequences of their actions and behavior under bright lighting?

Thus far, lighting’s effects on behaviors in social situations has not been examined as a single phenomenon and no studies to date have demonstrated a unifying theory that explains the role of lighting in such behaviors. In this essay, we reconcile previous findings and explore the psychological and behavioral consequences of lighting, specifically focusing on its effects on socially conscious behaviors, which we define as actions occurring in social contexts that are primarily driven by social cues rather than internal beliefs, dispositions and motives. From a marketing perspective, these are particularly important behavioral outcomes because they are grounded in the assumption that the consumer is a social object whose decisions within a wide range of domains can be influenced by others. Therefore, explaining such influences with an overarching principle can further enrich our understanding of the multifaceted mechanisms driving social behaviors, and lead to notable implications for marketers as well. Building on this premise, we test how lighting affects consumers’ perception of themselves in relation to others and how this focus on self (versus others) affects a range of seemingly unrelated actions that can all be categorized as socially conscious behaviors (such as evaluating a beverage, making a donation, literally taking someone’s perspective, or eating a snack). The potential impact of lighting on behavior in social contexts raises many questions. For instance, could subtle changes

in lighting levels in a room or on a computer screen alter consumers' social awareness? Could bright lighting conditions literally and figuratively put people under the spotlight and cause them to act in more socially conscious ways? If so, how and when? Finally, are people aware of such influences on their psychological state and actions?

We answer these questions in this chapter. We show that bright (vs. dim) lighting encourages social consciousness in a variety of behaviors. Delving deeper into the process, we show that brightness induces such behaviors via increasing a sense of public self-consciousness. Furthermore, the behavioral effect of lighting depends on the social context. We also show that the effect occurs unconsciously. In the remainder of this chapter, we build our conceptual framework and hypotheses, describe the experiments, and finally present conclusions and ideas for future studies.

THEORETICAL BACKGROUND AND HYPOTHESES

The majority of studies on the psychological effects of illumination have focused on either food consumption or emotional states. For instance, several studies have found that lighting influences food-related factors such as: the appearance of food (Barbut, 2001; Wada et al. 2010), food acceptance (Imram, 1999; Wansink et al. 2012), food choice (Sester et al. 2013), taste evaluations (Oberfeld et al. 2009; Velasco et al. 2013; Wilson & Gregson, 1967), and food intake (Barkeling et al. 2003; Linne et al. 2002). Also, several studies have investigated how lighting affects mood. For instance, it has been demonstrated that low lighting can contribute to positive affect and comfort (Baron, 1990; Baron, Rea, & Daniels, 1992; Baker & Cameron, 1996). Lighting that supplements ambient lighting (e.g., spotlights) has been shown to increase shopper satisfaction in retail environments (Areni & Kim, 1994; Golden and Zimmerman, 1986;

Hoyer, 1984; Summers and Hebert, 2001). More recently, Xu and Labroo (2014) showed both positive and negative affect are felt more intensely under bright light.

However, the role of lighting on several aspects of consumer behavior is not clear, and the literature contains mixed results. It has been widely reported that bright illumination increases consumers' estimation of waiting time (Baker & Cameron, 1996; Goldstone, Lhamon, & Sechzer, 1978), decreases how long people stay in a restaurant, and reduces alcohol consumption, whereas dim lighting generally causes people to linger and eat more (Areni & Kim, 1994; Summers & Hebert, 2001; Lyman, 1989). Dim lighting has been shown to promote disinhibited eating in restrained eaters (Stroebele & De Castro, 2004), and promote antisocial behavior (Zhong, Bohns, & Gino, 2010). Zimbardo (1969) argued that dimly lit environments may induce a state of deindividuation. Page and Moss (1976) suggested that lighting may have important consequences for social behaviors and proposed that dim lighting acts as a social disinhibitor. Dim lighting has been shown to reduce inhibition by increasing anonymity, leading to increased self-interested behavior and aggression (Hirsh, Galinsky, & Zhong, 2011; Prentice-Dunn & Rogers, 1980). It has also been suggested that exposure to dimmer lighting in the evening/night promotes general behavioral disinhibition (Kasof, 2002).

Contrary to these findings, several studies suggest opposite effects of lighting on eating and social behavior. For instance, it has been suggested that people actually eat more when food is located on a table that is brightly illuminated (Ross, 1974). Wansink and Van Ittersum (2012), in contrast to the predominant literature, showed that dim lighting led people to eat less. These results are aligned with the argument that bright illumination in fast-food restaurants and cafeterias may be promoting rapid food consumption, whereas eating at home in dimmer lighting may promote longer time at the table, but less total energy intake (McCrory et al. 1999). Several

studies suggest that dim lighting actually promotes prosocial rather than antisocial behavior (e.g., Steidle, Werth, & Hanke, 2011; Steidle, Hanke, & Werth, 2013; Bohns, Gino, & Zhong, 2010). Steidle and colleagues (2013) argued that dimness increases social distance, and this leads to compensatory reactions by individuals to reduce the distance by engaging in collaboration and helping others.

We propose three possible sources of discrepancy in the literature: 1) A difference between ambient illumination and targeted illumination. In this essay we focus on ambient illumination, which is lighting that is evenly dispersed in a space; 2) A difference between illumination and lighting color (dim vs. warm lighting, bright vs. cool lighting) which has often been used interchangeably in the literature. To deal with this, we focus solely on the intensity of light - measured in lux; 3) Unidentified moderators of the psychological effects of illumination, for instance, social context. We argue that brighter lighting emphasizes the social context, and that this context drives behavior.

Emphasizing the third point, we hypothesize that illumination increases physical visibility and bolsters social visibility, which leads to higher public self-consciousness, and as a result, behaving in a more socially conscious manner. This, in effect, juxtaposes findings from Zhong, Bohns, & Gino, 2010 with Steidle and colleagues (2011, 2013), and proposes that bright lighting may lead to more pro-social (as suggested by Zhong, Bohns, & Gino, 2011) or more anti-social behavior (as suggested by Steidle and colleagues) - depending on the social context, for instance whether one is surrounded by friends, strangers or adversaries. In other words, in this study we qualify two opposing streams of research on the social influence of lighting on human behavior, and present a framework that is compatible with the previous findings. Based on our framework, we expect that the social context would result in differences in individuals'

preferences, leading them to be more self-focused or more other-focused. We discuss the social context in terms of associations versus dissociations with social reference groups (White & Dahl, 2007). In an associative reference group context, increased focus on one's social surroundings may lead to acting upon social (versus self-centered) motives; while in a dissociative group situation the opposite may occur. This may help explain the seeming inconsistency in prior findings regarding lighting's influence on social behavior. Extending our framework to food consumption, we posit that illumination influences eating habits by focusing attention on the social context. We argue that healthy eating is generally considered a socially desirable behavior that should increase when people are more conscious of their social context. While illumination may have little effect on internal motivations for healthy eating, people's attention to their social context may have an impact on external motivations to eat healthy. Therefore, we hypothesize that individuals are more likely to eat healthy food in a bright (versus dim) environment, if they are mindful of and sensitive to the social context. We test the following hypotheses using an array of behaviors (conformity, fairness, helpfulness, perspective-taking, dieting motivation and eating behavior) to ensure the robustness of our findings: First, we propose that individuals display more socially conscious behavior under bright lighting. Furthermore, we posit that public self-consciousness mediates the effect of illumination on socially conscious behavior. Finally, we hypothesize that individuals interacting with dissociative (versus associative) reference groups under bright illumination are more likely to display self-regarding (vs. other-regarding) preferences.

OVERVIEW OF STUDIES

Four studies provide empirical evidence for the role of illumination on socially conscious behaviors. In the first study, we demonstrate that lighting can affect a range of behaviors with social consequences. More specifically, we show that participants in a brightly-lit room (vs. dimly-lit room) conform more to others' opinions in a beverage test, donate more to a charity campaign and are more sensitive to fairness in an ultimatum game. It is important to note that the dependent variables investigated in this experiment are different in more than one way. However, the objective of this study and the next ones is to examine the robustness of the proposed effect across a wide range of behaviors that fit our definition of socially conscious behaviors, even though they may be disconnected in other aspects. In the second study, we show that public self-consciousness mediates the relationship between illumination and socially conscious behavior, in this case, perspective-taking. In the third study, we show that lighting's effect reverses in the presence of dissociative reference groups, where heightened social consciousness no longer necessitates social desirability, but rather fosters self-centered behavior. In the final study, we argue that the same framework applies to food consumption in a social context; we show that illumination increases participants' external motivation to make healthy food choices. We also find that bright lighting results in increased healthy eating among motivated participants.

STUDY ONE: FOR ME IN THE SHADE, FOR OTHERS IN THE LIGHT

Does illumination affect choice dilemmas in social situations? We theorize that individuals in a brightly lit (versus dimly lit) setting would be more socially conscious; hence, more likely to make decisions based on others' opinions, rights, and needs. We study three

corresponding behaviors with crucial implications for consumer psychology: conformity, fairness, and helpfulness. Regarding conformity, we argue that people in a bright environment should be more likely to choose a product based on reviews by others as opposed to their personal sensory experience. This should lead participants in a brightly lit room to be more likely to choose a highly-rated yet unsavory drink over a tasty yet unpopular drink and be willing to pay more for it compared to participants in a dimly lit room. Regarding fairness, we hypothesize that under bright (versus dim) lighting conditions individuals should be fairer and more sensitive towards fairness. Hence, participants playing the ultimatum game in a brightly lit room would offer a fairer share of cash to others. On the other hand, under bright (versus dim) illumination, players would also feel more socially conscious, thus, more sensitive towards being treated fairly by others, and as a result more likely to reject unfair offers they receive. Therefore, we expect to observe more rejections in the bright environment controlling for the amount offered by proposers. Lastly, regarding helpfulness, we hypothesize that participants in a brightly lit room should be more considerate of others' needs; therefore, they would donate more money for charitable purposes than participants in a dimly lit room.

Method

One hundred-two students with no reported food allergies (45 females and 57 males) at University of Michigan participated in this study for a maximum payment of $22. Participants received $2 for showing up, $10 for completing several tasks, and an opportunity to earn up to $10 extra by playing the ultimatum game. Participants were randomly assigned to complete three tasks in a bright, average, or dim auditorium, with illumination set at 900, 500 or 100 lux, respectively. These illumination levels were set according to the recommended illuminance levels for performance of visual tasks involving high, medium and low dexterity, respectively

(GSA, 2003). Despite this, a manipulation check was performed on the lighting conditions. A university auditorium was chosen as the venue for this experiment as students are accustomed to experiencing a wide range of lighting levels in such spaces and would not be suspicious of any irregular lighting conditions. Participants were not informed that the experimenters were studying illumination and were told instead that they would be completing various unrelated consumer decision tasks. We used two realistic consumer scenarios involving a product prelaunch testing and a charity campaign to measure subjects' conformity and helpfulness, respectively. We used the ultimatum game (Guth, Schmittberger, & Schwarze, 1982) to evaluate subjects' fairness towards others and their sensitivity to being treated fairly by others.

Measures

Conformity. We tested conformity using a beverage taste test. Participants were asked to taste two new beverages being launched, choose the one they preferred, and indicate how much they were willing to pay for a 10-ounce bottle of it. The options included a tasty drink with bad reviews and an unsavory drink with good reviews. The tasty drink was a 3-ounce cup of organic apple juice fictitiously described as having received an average rating of 2 out of 5 stars by other participants. The unpleasant drink was a similar cup of apple juice mixed with half a teaspoon of salt, labeled with an average rating of 4 out of 5 stars. Both drinks were pretested for pleasantness. A separate sample of 31 participants rated the two drinks for their tastiness on a 1-7 point scale. This pretest indicated that the organic apple juice was judged as being tastier (M = 4.74, SD = 2.12) than the slightly salty drink (M = 3.61, SD = 1.60; $t(30) = 2.91$, $p < .01$). We used product preference and willingness to pay to measure conformity.

Fairness. In the second part of the experiment, we used the ultimatum game to study fairness. In this often used game two players interact to decide how to divide a sum of money. The first

player (proposing player) proposes how to divide the sum between the two players, and the second player (recipient player) can either accept or reject this proposal. If the recipient rejects, neither player receives anything. If the recipient accepts, the money is split according to the proposal. The game is played only once between a pair of players so that reciprocation is not an issue. In the current study, the proposing player was given $10 in cash, to divide between the players. We randomly assigned and matched proposing and recipient players for the first round and subsequently switched roles and matched players once more so that all participants were given a chance to act as both proposer and recipient. We used the amount offered (US dollars) by proposing players as a measure of fairness towards others and rejection of offers by recipient players as a measure of sensitivity towards fairness.

Helpfulness. In the third part of the experiment we used monetary donations as a measure of helpfulness (e.g., Vohs, Mead, & Goode, 2006; Twenge et al. 2007). Upon arrival to the auditorium, to make sure participants had cash, they were given $2 in quarters in exchange for their participation. After they completed all other parts of the study participants were told that the experiment was complete and were given a false debriefing and dismissed. With this step, we ensured that participants did not connect the donation opportunity to the experiment. As the experimenter exited the room, he mentioned that the lab was taking donations for the Pediatric Cancer Foundation and that there was a box by the door if the participant wished to donate. The amount of money donated (US dollars) was used as a measure of helpfulness.

Results and Discussion

Conformity. A chi-square test showed a significant effect of lighting on conformity, with bright lighting leading to more conformity than less intense lighting conditions (29% in bright condition vs. 9% in average light condition; 12% in dim condition), χ^2 (2, N = 102) = 6.071, $p <$

.05. Participants in a bright room were almost three times as likely to choose a more highly-rated, yet less tasty drink compared to those in other conditions. Another chi-square test was conducted to compare conformity in bright versus dim conditions in particular, χ^2 (1, N = 68) = 3.238, p = .071. Participants in a bright room were more likely to conform (i.e., choose the drink based on reviews) compared to those in a dim room. These results are in line with those of Steidle and Werth (2013) suggesting that dim lighting facilitates non-conforming ways of thinking. Lighting did not have an effect on willingness to pay for the drink (F<1).

Fairness. With an ANCOVA using the amount of money offered in the ultimatum game as a covariate, we found support for the hypothesized effect of illumination on sensitivity towards fairness. Participants in a bright environment were more likely to reject unfair offers compared to participants in other conditions (35% in bright condition vs. 17% in averagely lit condition and 14% in dim condition) when controlling for the amount offered, $F(2, 101) = 5.413$, $p < .01$. However, unsupportive of our hypothesis regarding being fairer, lighting did not affect the amount offered by proposing players, M_{bright} = \$3.50 vs. $M_{average}$ = \$3.29, and M_{dim} = \$3.05, $F(2,101) = 1.397$, $p > .2$. In other words, illumination influenced participants' sensitivity towards being treated fairly, resulting in higher rejection of unfair offers, but not necessarily their own fairness towards others.

Helpfulness. A one-way ANOVA showed that the results for helpfulness followed a similar pattern to conformity and fairness. We found a significant main effect of bright lighting leading to more charitable donations, $F(2, 101) = 4.921$, $p < .01$. As predicted, participants in a bright room donated more compared to participants in the other conditions (M_{bright} = \$1.39 vs. $M_{average}$ = \$0.85, and M_{dim} = \$0.72). An independent-samples t-test was conducted to compare helpfulness in bright versus dim conditions. There was a significant difference in donations

between these two conditions, with participants in the bright condition donating more than their counterparts in the dim condition, $t(66) = 2.836$, $p < .01$. Taken together, study 1 supports the thesis that illumination can affect a range of behaviors in a similar way. We demonstrate that when exposed to bright lighting, individuals are more likely to act in a socially conscious manner. We found that participants in bright lighting conditions were more likely to make decisions that were counter to their own sensory experience, and their financial interests. Specifically, they were more likely to take others' opinions (beverage test), fairness (ultimatum game) and needs (donation) into account when making a decision. Interestingly, these findings suggest that the social influence of lighting on behavior is driven primarily by the presence of light rather than its absence. In other words, while being in a brightly lit room (compared to an averagely lit room) resulted in significantly more socially conscious behavior, being in a dimly lit room did not differ significantly from being in an averagely lit room. The non-linear pattern emerging from the results suggest that being under a spotlight (visually and socially) facilitates socially conscious decision making more than being shaded can disinhibit such behaviors. Study 2 replicates these results with a different social dilemma involving perspective-taking. We also dig deeper into illumination's role to explain why this effect occurs.

STUDY TWO: SHEDDING LIGHT ON SELF-CONSCIOUSNESS

Study 1 confirmed that lighting influences socially conscious behaviors in a consistent manner. However, it is still unclear why this phenomenon occurs. In this experiment, we look at the influence of lighting on a different behavior: perspective-taking. We predict that participants in a bright (vs. dim) environment, would be more socially conscious, thus more likely to spontaneously adopt another person's perspective (Underwood & Moore, 1982). We also test our

assumption that people pay more attention to their surroundings as a result of increased visual saliency under bright lighting conditions. To do this, we investigate the effect of illumination on spatial recall. We hypothesize that subjects in a bright (vs. dim) room are more aware of their environment; therefore they would demonstrate better spatial recall. In this study, we also examine the mediating role of public self-consciousness, which is defined as the tendency to be aware of oneself as part of a social context (Fenigstein, Scheier, & Buss, 1975). Other researchers have hinted at the role of self-awareness on human behavior in bright environments. For instance, Kasof (2002) investigated the interaction of illumination and dieting and proposed that heightened self-awareness may mediate the effect of lighting on eating behavior but did not test this hypothesis. We argue that the underlying mechanism driving the behavioral effect of lighting is as follows: Bright light increases public self-consciousness. This, in turn, promotes socially conscious behaviors, in this case, perspective-taking.

Alternatively, one may argue that individuals become less concerned with the social consequences of their actions under dim lighting because darkness may metaphorically induce a sense of possessing power (see Banerjee et al. 2012). Another line of reasoning may suggest that this effect is due to increased motivation to act ethically under bright lighting (see Zhong, Bohns, & Gino, 2010). In other words, individuals may be more socially conscious in bright light because brightness is metaphorically associated with being ethical. In this study we examine these alternative explanations. Finally, we address possible naïve theories. Do people anticipate an association between lighting and their behavior? If not, then illumination's effect is at least partially activated unconsciously.

Method

Sixty-four students at the University of Michigan (43 females and 21 males) were paid $15 to participate in the study. Participants were randomly assigned to complete several tasks in a brightly lit (800 lux) or dimly lit (200 lux) room. Participants were told that the experimenters were interested in studying cognitive performance and physical dexterity (i.e., performing various manual tasks). Participants' age, gender, and handedness were recorded at this point. To assess perspective-taking we used a procedure created by Hass (1984, also see Galinsky, Magee, Inesi, & Gruenfeld, 2006) in which participants were asked to draw an E on their foreheads. One way to complete this task is to draw an "E" as though one is reading it oneself, which leads to a backward "E" from the perspective of another person. This indicates a self-oriented approach. The other way to respond to the task is to draw the "E" as though another person is reading it, which leads to the production of an "E" that is backward to oneself. This indicates an others-oriented or socially conscious approach. Upon completion of the perspective-taking task, participants completed the Self-consciousness Scale (Scheier & Carver, 1985), which include the public self-consciousness subscale in addition to the private self-consciousness and social anxiety subscales, a word fragment completion task assessing sense of power (Bargh et al. 1995), and the ethics position questionnaire (Forsyth, 1980). Next, participants were accompanied to another room where they were asked to recall the items they saw in the lab environment. These included ordinary objects that one may encounter in a lab environment such as whiteboards, computers, lighting fixtures, chairs, tables, books, cabinets, decorations, plants, projectors, and speakers). The total number of correctly recalled items was used as a measure of spatial recall. Lastly, subjects were given a funnel debriefing and dismissed.

Results and Discussion

With a chi-square test, we replicated the effect found in study 1. Bright lighting increased the likelihood of taking others' perspective (88% in bright condition versus 63% in dim condition), χ^2 (1, N = 64) = 5.333, $p < .05$. Hence, participants displayed more socially conscious behavior in the bright (vs. dim) condition. Our framework was based on the assumption that bright illumination increases the saliency of the environment. We confirm this assumption by finding that participants in the bright condition recalled more items from their environment than those in the dim condition ($M_{bright} = 5.16$, vs. $M_{dim} = 4.09$; $t(62) = 3.17$, $p = .002$). Spatial recall did not predict perspective-taking ($p > .2$), and was ruled out as a potential mediator in the relationship between illumination and socially-conscious behaviors. We hypothesized that public self-consciousness (PSC) would mediate the effect of illumination on perspective-taking (hypothesis 2). Participants in the bright condition displayed higher PSC compared to those in the dim condition ($M_{bright} = 16.94$, SD = 2.80, vs. $M_{dim} = 12.91$, SD = 3.62; $t(62) = 4.978$, $p < .001$). Lighting did not significantly affect the other two subscales of private self-consciousness or social anxiety. We examined whether PSC mediated the effects of illumination on perspective-taking. The effect of illumination was reduced to non-significant (from $\beta = -0.31$, $p < .01$, $prep > .95$, to $\beta = -0.07$, $p = .33$, $prep = .62$) when we added PSC as a covariate, and PSC was a significant predictor of perspective-taking ($\beta = -0.71$, $p < .001$, $prep > .99$). A bootstrap analysis showed that the 99% bias-corrected confidence interval for the size of the indirect effect excluded zero ([−0.77, −0.69]), suggesting a significant indirect effect. These results show that PSC mediated the effect of illumination on perspective-taking. Addressing alternative explanations, we found that power was highly correlated with perspective-taking, $R^2 = 0.044$, $p < .05$. However, lighting did not influence power or ethical position and these factors did not mediate the effect of lighting on perspective-taking (ps>.2).

Addressing naïve theories, none of the participants reported any suspicion that the experiment involved manipulating lighting levels or other environmental parameters. Also, no one reported any suspicion regarding lighting conditions having affected their behavior. When asked how they thought illumination could affect their behavior in general, six participants pointed out that they would be more careful of their actions under bright lighting as they would "feel more watched". None of the participants were able to identify the link between lighting conditions and the perspective-taking task. This confirms our theory that people are generally unaware of the ways in which lighting affects their behavior and that the effect is primarily non-conscious. However when pointed out, some do anticipate that they would be more conscious of their social environment under bright light, which is in line with our reasoning and findings.

In study 2, we replicated results from study 1 and obtained support for hypothesis 2. We found that illumination fosters socially conscious behavior and that public self-consciousness mediates this effect. We also confirmed our assumption that people are more mindful of their surroundings in bright settings. Study 3 extends these results by testing conditions under which lighting affects behavior in seemingly contradicting ways. We address the discrepancy in the literature regarding the social consequences of lighting by examining the interaction between physical (i.e., illumination) and social (i.e., reference groups) environments.

STUDY THREE: SHINING FRIENDS OR BLAZING FOES

The findings from study 2 are consistent with our theoretical framework that lighting effects are driven by an increase in awareness of one's environment. We anticipate that the introduction of an undesirable reference group would reverse the behavioral outcome, leading to more, rather than less, egocentric actions in bright settings (hypothesis 3). This may seem at odds

with results from study 1 and 2, and previous research showing that brightness promotes socially conscious and prosocial behavior (e.g., Zhong, Bohns, & Gino, 2010). On the other hand, it confirms other findings demonstrating that people are more socially-oriented in dim, rather than bright environments. For example, Bohns and colleagues (2010) argue that brightness decreases helping behavior towards strangers and can, for instance, discourage individuals from pointing out embarrassing situations exhibited by a stranger. Our theory predicts that individuals in a bright environment become more publically self-conscious; therefore if the social interaction involves an associative reference group member, motivation to act in favor of others should increase (as shown in studies 1-2). However, if the context is comprised of members of dissociative reference groups, heightened social consciousness - induced by illumination - would lead to less socially-oriented behavior. In the first two studies, we found that bright lighting increases actions that are considerate of others in a collegiate social setting (i.e., university auditorium and labs). Here, we manipulate reference groups by incorporating a dissociative group member in the experiment design (see Bearden & Etzel, 1982; White & Dahl, 2006, 2007). We argue that in such conditions bright lighting would lead to more egocentric actions, rather than acting with others in mind.

In this study, we use a non-spatial manipulation of illumination. Zhong and colleagues (2010) showed that darkness can facilitate unethical behavior regardless of actual anonymity. They tested their hypotheses by demonstrating that participants wearing sunglasses are more likely to commit moral transgressions. They suggest that darkness may induce an illusionary sense of anonymity that is not necessarily proportionate to actual anonymity in a given situation. Extending this reasoning, we argue that the behavioral effects of lighting may occur even if actual physical visibility (and hence judgment) of one's behavior is not affected. We test this by

incorporating a two-dimensional (i.e., screen-related), rather than three-dimensional (i.e., spatial) manipulation of lighting.

Method

Study 3 used a 2 (reference group: associative vs. dissociative) x 2 (illumination: bright vs. dim) between-subjects design. One hundred twenty students (45 males, 75 females) participated in this study in exchange for $10. The procedure was similar to study 2 with a few modifications. First, to test the role of reference groups we subtly manipulated the relationship between the experimenter and participants. While the experimenter in study 2 was dressed neutrally (i.e., wearing a gray shirt), in this study we had the experimenter dress in a way that conspicuously signaled his affiliation with a certain group. In the associative reference group condition, the experimenter wore a gray shirt with the logo of the host university on it. In the dissociative group condition, the same experimenter wore a similar shirt with a rival university's logo on it. We pretested the logos from ten different schools with a separate group of twenty students at the host school where we asked participants to indicate how much they associated with each school on a 10-point item scale (1 = not at all, 10 = very much). The host school and the rival school were chosen as the most and least associated school ($M_{\text{host}} = 9.6$, $M_{\text{rival}} = 2.6$). Second, as described earlier, we changed the way illumination was manipulated. Instead of manipulating room lighting levels, we manipulated brightness by setting a 21-inch monitor's brightness to either maximum (i.e., bright condition) or minimum (i.e., dim condition). The experiment was run online using Skype with experimenter and subjects being able to communicate and see each other in real-time. After completing the perspective-taking task participants were debriefed and dismissed.

Results and Discussion

An ANOVA showed that the main effect of illumination was not significant ($p > .1$). However, there was a main effect of reference group on perspective-taking; with more socially conscious perspective-taking (i.e., outward-facing "E") in the associative reference group condition (61%) than the dissociative group condition (40%). This was qualified by the hypothesized two-way interaction of lighting and reference group on perspective-taking, $F(1, 119) = 17.17$, $p < .001$. Simple effect tests provided support for our hypothesis. When interacting with an associative group member (i.e., host school experimenter) participants were more likely to take others' perspective in the bright condition (77%) versus the dim condition (47%), χ^2 (1, N = 60) = 5.711, $p < .05$ - replicating study 2. As predicted, a reversal was observed in the dissociative group condition (i.e., interaction with rival school experimenter), where participants were more likely to take others' perspective if they were interacting via a dim (60%) versus bright screen (20%), χ^2 (1, N = 60) = 10.0, $p < .005$.

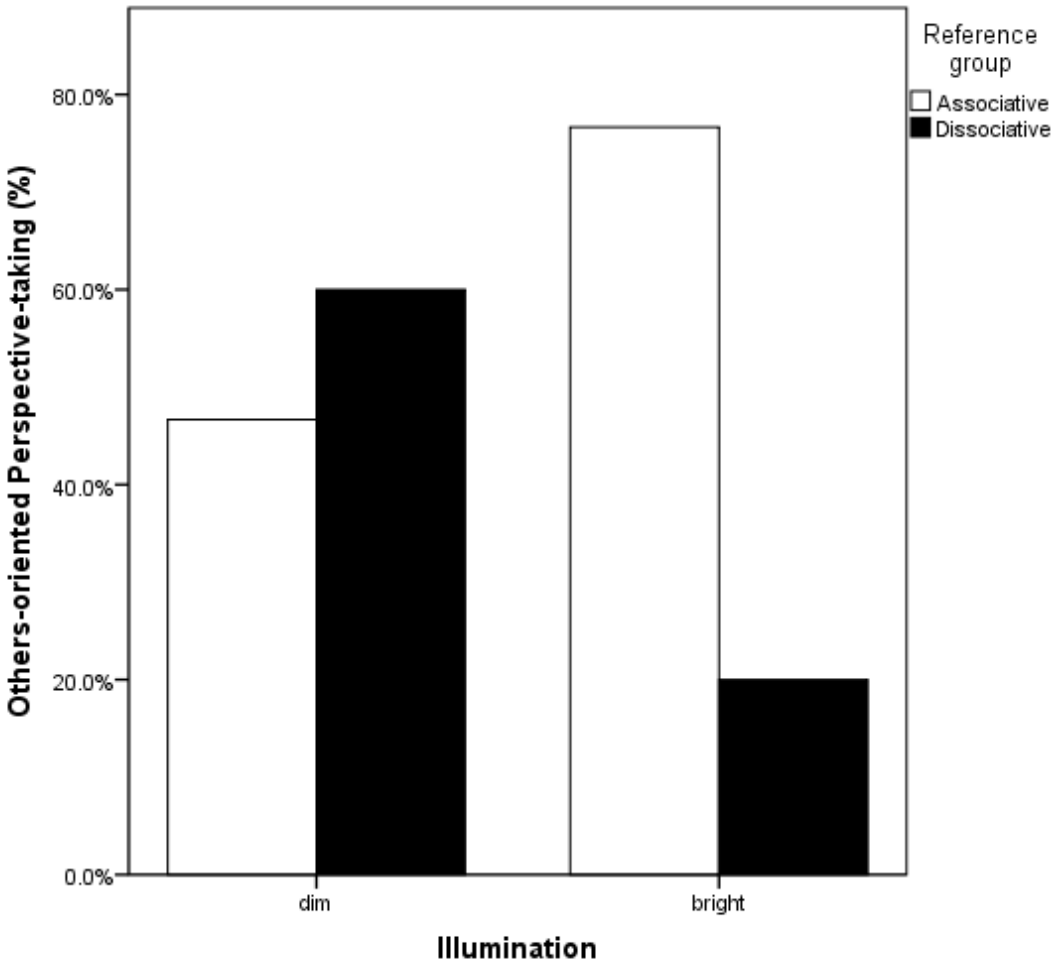


Figure 9: perspective-taking is affected by illumination conditions and reference groups

In this study, we demonstrated that the identity of social groups alters the way in which illumination influences behavior. Particularly, while participants in the bright condition were more likely to take others' view in an associative reference group setting, they were actually less likely to do so when interacting with a dissociative group member. Study 3 provides support for our theory on the interaction of social and physical environments and its role on behavior. In light of these results, it seems reasonable that bright lighting would lead to more prosocial behavior among associative reference group members and more antisocial behavior among

dissociative group members. Thus, our findings reconcile the literature on illumination and help explain reported discrepancies discussed earlier.

So far, we have established that illumination can influence behaviors with social consequences in a consistent manner. We have found robust evidence for this phenomenon across a range of behaviors involving choice dilemmas where one must decide whether to act egocentrically or with others in mind. We have shown that public self-consciousness mediates the effect and the presence of dissociative reference groups reverses it. We have also found evidence suggesting that individuals are generally not aware of lighting's effects on their behavior and that the effect occurs non-consciously. We have demonstrated these effects using both spatial and screen-related manipulations of illumination. In the next study, we expand our findings into the realm of food consumption. We argue that eating healthy food is considered by most consumers as a socially desirable behavior, and based on our findings so far, should increase if people are more socially conscious under bright lighting. In study four we test this by examining the role of illumination on motivations and actions involving healthy and unhealthy food choices.

STUDY FOUR: HEALTHY EATING UNDER THE SPOTLIGHT

Eating can create a social dilemma when individuals face the decision to either consume food that is enjoyed personally but may lead to social repercussions (e.g., eating unhealthy food that may lead to negative impressions), or forgo the pleasure gained from consuming something unhealthy and choose a healthy alternative that is considered socially desirable. In effect, this dilemma entails an egocentric option: to reward oneself without regard for negative social consequences; or socially conscious option: to forgo what one enjoys more, opting instead to

display healthy behavior that may result in higher social approval and reward (Bennett & Gurin, 1982; Povey et al. 2000;Tilgner, Wertheim, & Paxton, 2004). We found that bright light - by means of enhancing visual awareness - facilitates social awareness and socially conscious behaviors. Therefore, we propose that under bright light, individuals should be more motivated to choose healthy snacks, displaying healthy behavior in the presence of others.

Schachter and Gross (1968) demonstrated that obese people are more likely to be influenced by external (versus internal) cues (see also Wansink, Payne, & Chandon, 2007). Based on our theory and findings so far, we are particularly interested in investigating the effect of illumination – as an external cue - on the external regulation of eating behavior. Pelletier and colleagues (2004) define this in the Regulation for Eating Behaviors Scale (REBS) as a measure for regulating eating behaviors that are governed by social sources of control such as a dieter's partner or a health professional. Furthermore, they describe this type of motivation as being driven by external rewards (e.g., recognition from a physician) or to avoid negative consequences (e.g., criticisms from partner). In this context, we predict that illumination should only affect external regulation and should not have an impact on other forms of motivation (i.e., the other five subscales of REBS, including intrinsic and integrated motivation) that are irrelevant from a social or atmospheric standpoint.

In addition to the effect of illumination on eating behavior, we argue that the effect is moderated by individuals' general inclination to eat healthy. We assume that individuals who are not very motivated to keep a healthy diet and don't do so regularly would be less likely to be concerned with the social repercussions of unhealthy eating or the social reward of healthy eating. Thus, their eating behavior is unlikely to be influenced by illumination.

In this study, we also examine two alternative explanations: mood valence and fatigue. As described earlier, it has been suggested that low lighting can contribute to positive affect (Baron, 1990; Baron, Rea, & Daniels, 1992; Baker & Cameron, 1996). An explanation for the effect of illumination on eating behavior may be that low lighting facilitates positive emotions and this subsequently leads to less concern for negative social judgment, therefore increasing unhealthy eating behavior. A similar reasoning may apply to fatigue. It may be argued that individuals would feel more tired in a dim environment (as suggested by Xu & Labroo, 2014). Thus, they may compensate for their fatigue by increasing energy consumption (i.e., eating unhealthy high-calorie snacks). We examine these alternative explanations in this study. We also explore the external validity of our findings in this experiment. Studies 1-3 relied on university students; in this study, we extend our results to the general public.

Method

Fifty-two members of the community (32 females and 20 males; average age = 30.86 years, age range 18-62) participated in groups with a maximum size of 12, in exchange for a chance to win a $100 gift card. Each participant was randomly assigned to one of two lighting conditions (i.e., bright: 800 lux or dim: 200 lux). The experiment setting was a conference room with participants sitting around a large table facing each other. In order to measure eating behavior, each participant was given a plate of snacks while completing filler tasks that included the short-format of the PANAS (see Thompson, 2007) to assess mood and the Samn-Perelli Seven-point Fatigue Scale (Samn & Perelli, 1982) to assess fatigue. To choose appropriate snacks, a pretest was conducted in which a separate sample of twenty-two participants rated various snacks for their healthiness on a 1-7 point scale. This pretest indicated that raisins were viewed as significantly healthier (M = 5.90, SD = 1.13) than M&M's (M = 1.81, SD = .49; t(21)

= 24.77, $p < .01$). Each plate carried approximately 40 grams of each of these two snacks. Participants were told that the snacks were a token of appreciation for their participation and that they were welcome to eat the snacks while completing the tasks. The amount of M&M's and raisins consumed from each plate, weighed on a kitchen scale (in grams), were used as measures of unhealthy and healthy eating behavior, respectively. To measure the motivation to eat healthy food we used the Regulation for Eating Behaviors Scale (Pelletier et al. 2004, also see Kato et al. 2013). This scale includes 24 items and six subscales: Intrinsic motivation, integrated regulation, identified regulation, introjected regulation, external regulation, and amotivation. This scale was administered at the end of the experiment. After completing the tasks participants were debriefed and dismissed.

Results and Discussion

An ANOVA showed that lighting did not have an effect on the total REBS score. However, further analysis identified a significant main effect of lighting on external regulation, with bright lighting (versus dim lighting) leading to higher external motivation to eat healthy (M_{bright} = 3.31, SD = 1.17, vs. M_{dim} = 2.36, SD = 1.03), $F(1, 51) = 9.415$, $p < .005$. Supporting our hypothesis, external motivation was the only subscale affected by lighting and the other five subscales were not influenced by illumination (ps > .2). Also, external motivation alone did not predict healthy eating ($p > .4$).

A multiple linear regression was performed on healthy eating behavior (i.e., amount of raisins consumed) with independent variables (i) motivation for healthy eating, (ii) illumination (contrast coded for bright versus dim), and (iii) their interaction. Six participants who reported food allergies or other dietary restrictions and did not eat any snacks during the experiment were excluded from further analyses, leaving 92 data points from 46 participants who displayed some

form of food consumption (i.e., healthy, unhealthy or both). Results revealed that healthy eating behavior was positively associated with motivation for healthy eating (β = .334, t(45) = 2.491, p < .05). Healthy eating behavior was also positively associated with illumination (β = .251, t(45) = 1.877, p = .068). Participants ate more healthy snacks in the bright condition than the dim condition (M_{bright} = 10.04, SD = 16.01, vs. M_{dim} = 5.12, SD = 7.06). These results were qualified by a significant two-way interaction between motivation and illumination (β = .315, t(45) = 2.365, p < .05). To explore the interaction, we examined the slopes of motivation at each level of illumination. The slope of motivation was significant and positive in the bright light condition, R^2 = 0.274, p = .01; while the slope of motivation was nonsignificant in the dim light condition, R^2 = 0.008, p > .8 (see Figure 10). In addition, a spotlight analysis at one standard deviation above the mean of motivation for healthy eating showed a significant difference such that highly motivated consumers ate more healthy snacks when lighting was bright versus dim (M_{bright} = 19.38, M_{dim} = 5.32), F(1, 42) = 8.751, p = .005. A similar spotlight analysis at one standard deviation below the mean of motivation showed no significant difference such that consumers with low motivation were not affected by illumination (M_{bright} = 3.07, M_{dim} = 4.89), F(1, 42) = .156, p > .5. Together these results find support for our hypothesis regarding lighting's effect on eating behavior. Individuals in brightly lit rooms were more motivated to choose healthy snacks, displaying healthy behavior in the presence of others.

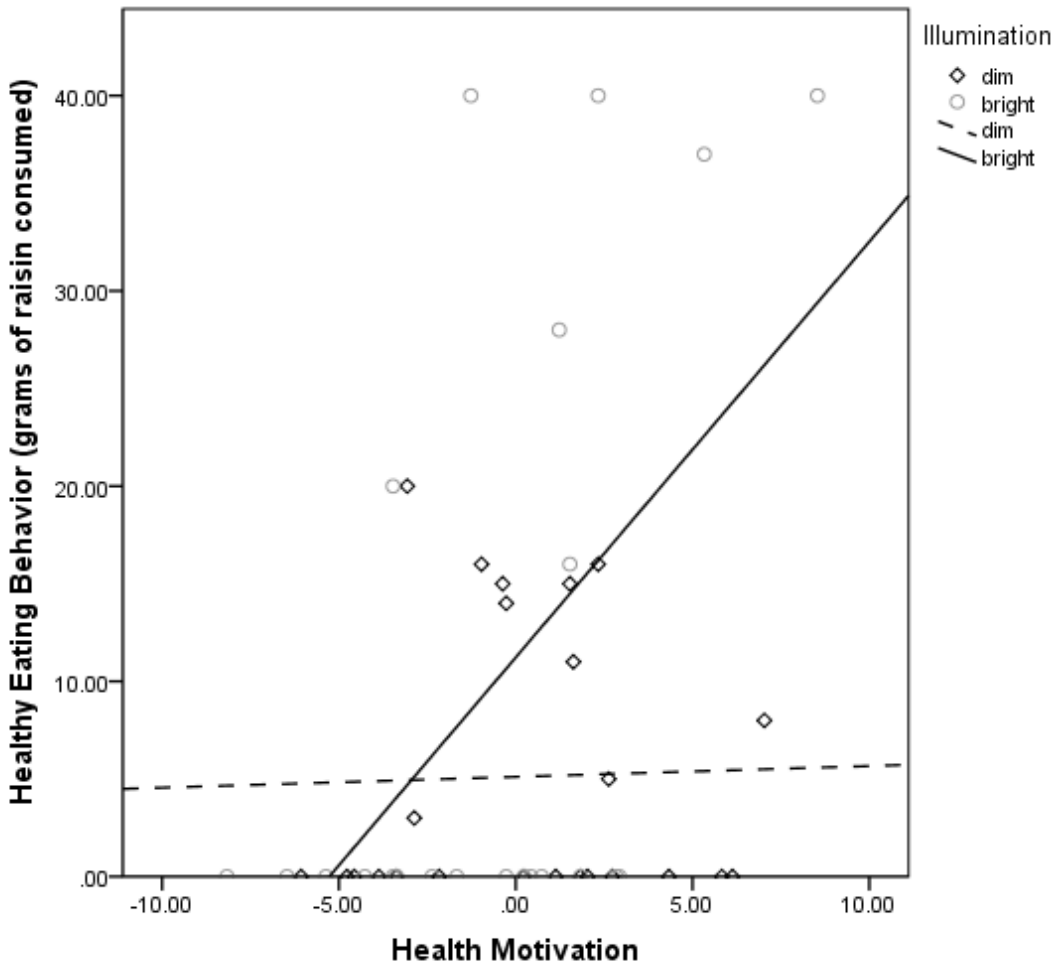


Figure 10. Healthy eating behavior as a function of illumination and motivation

A similar multiple linear regression was performed on unhealthy eating behavior (i.e., amount of M&M's consumed). Results revealed that motivation for healthy eating was negatively associated with unhealthy eating behavior, β = -.316, $t(45)$ = -2.179, $p < .05$. In other words, motivated participants ate fewer M&M's. The slope of motivation was significant and negative in the bright light condition, R^2 = 0.239, $p < .05$; while the slope of motivation was nonsignificant in the dim light condition, R^2 = 0.023, $p > .4$, (see Figure 3). Even so, the illumination condition and its interaction with motivation did not predict unhealthy eating

behavior (*p*s > .1). Addressing alternative explanations, an ANOVA showed that lighting did not have an effect on mood or fatigue (*Fs*<1).

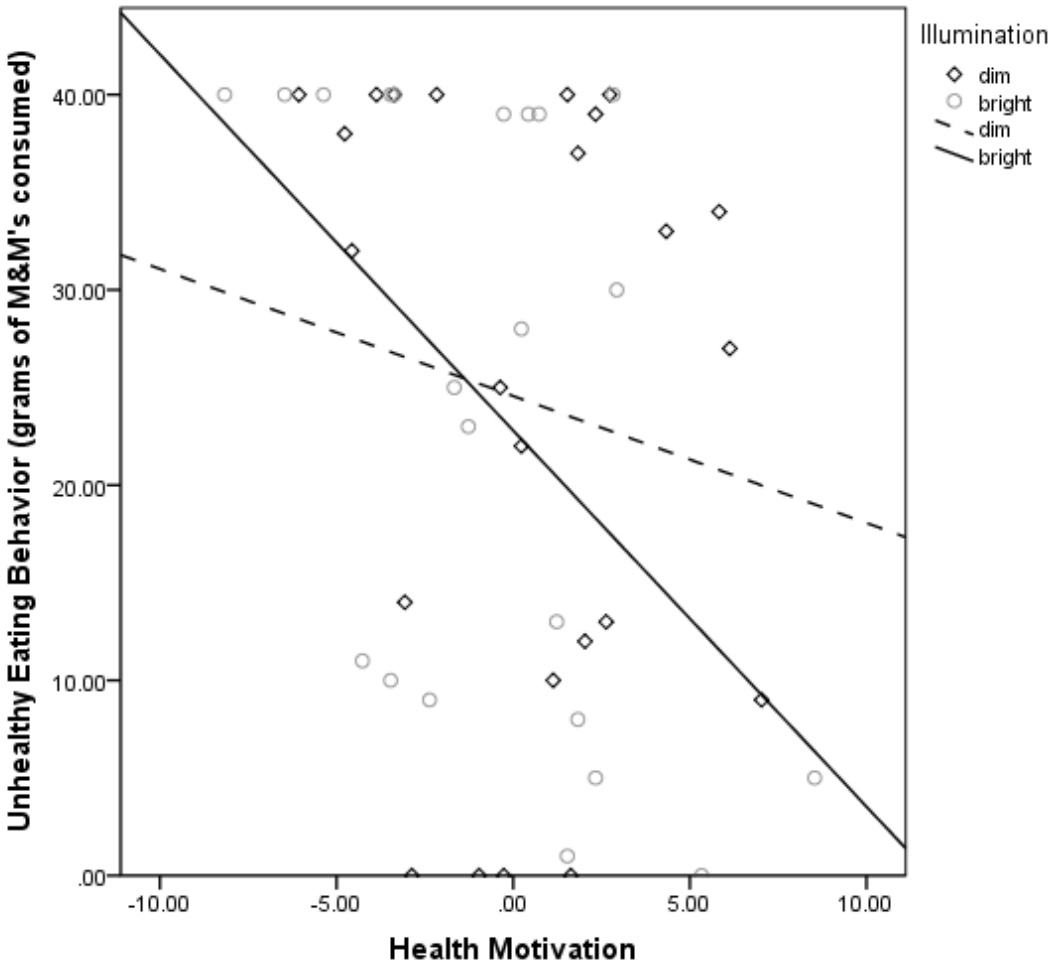


Figure 11. Unhealthy eating behavior as a function of illumination and motivation

The results of study 4 add further support to our theory. When participants were in a brightly lit environment they had more external motivation to regulate their eating behavior. Additionally, if they were generally motivated to eat healthy they were more likely to consume healthy snacks as a way to signal healthy eating behavior. Lighting did not impact unhealthy

eating though. These results suggest that illumination facilitates healthy behavior in a social context, but doesn't necessarily inhibit unhealthy behavior. Put differently, lighting seems to foster actions motivated by social rewards, but not social backlash. Our findings qualify those of Wansink and Van Ittersum (2012) who demonstrated that dim lighting led people to eat less. We show that dim lighting can facilitate eating less, but only if the food in question is considered healthy. On the other hand, unhealthy food consumption was not affected by lighting. This experiment also demonstrates that mood and fatigue do not affect the process in which illumination influences eating behavior and that the results we found among university students generalize to the general public. This experiment further demonstrates the widespread impact of illumination on human behavior and contributes theoretically by showing that the effect includes behaviors - such as eating - that may seem less likely to be driven by illumination's impact on social awareness.

GENERAL DISCUSSION

Illumination impacts behavior, but findings to date have been inconclusive. We combine evidence from numerous domains to shed light on the influence of illumination on consumer behavior, specifically choices and actions with social implications. We ran four studies supporting our hypotheses. We found that illumination increases physical visibility and social awareness, thus boosting socially conscious behavior. In study 1, participants in a room with bright (vs. dim) lighting conformed more to others, donated more, and were more sensitive to fairness. In study 2, we showed that bright lighting makes the environment more salient and public self-consciousness mediates the relationship between illumination and perspective-taking. We also found that lighting's effect on behavior is largely non-conscious. In study 3, we found

that due to its dependence on social awareness, the behavioral effect of lighting reverses in the presence of dissociative reference groups. Finally, in study 4, we demonstrated that illumination influences healthy food consumption. Participants in a bright (vs. dim) environment were more motivated to eat healthy. In addition, they were more likely to eat healthy snacks, but only if they were health-conscious. In these studies, we demonstrated the effect of lighting on behavior using both spatial and screen-related illumination. Furthermore, on an empirical basis, we dismissed several alternative explanations, particularly in regards to power, ethics, fatigue, and mood.

Our research contributes to the consumer behavior, social psychology and environment-behavior literature. Our main contribution to consumer research is an explication and consolidation of the effects of illumination on actions with social consequences around one overarching theory. We demonstrate that illumination can have a significant impact on choices in a variety of consumer situations. We also contribute theoretically by pinpointing processes involved in this effect. Our work adds to the growing literature in consumer research showing that atmospheric aspects of consumption environments have a subtle, yet strong impact on consumers. Finally, we make an attempt to bridge the gap between marketing and architectural research, two fields that have been largely disparate. Over the past few decades, each of these disciplines has developed an understanding of how factors in the physical environment, such as lighting, affect consumer behavior. However, each field has evolved around its own set of theoretical frameworks and terminology and so far findings have rarely been shared or compared across the two disciplines. Marketers and architects, as key stakeholders in many designed environments may have a significant impact on consumer decisions. Therefore, by understanding the psychological impact of design attributes such as lighting, consumption environments can be designed to facilitate better choices.

Discussing the use of neuroimaging in marketing, Ariely and Berns (2010) argue that architectural design presents a promising potential application. We believe that an exciting area for future research could involve studying the neurophysiological impact of lighting on human behavior. Higher levels of illumination are associated with increased cortisol levels (Kuller & Wetterberg, 1993) and arousal (e.g., Van Hagen, 2011). In addition, Privitera, Diaz, and Haas (2014) argue that arousal leads to more conscious decision-making. A neurophysiological explanation for our findings could be that bright light increases arousal, which in turn increases conscious decision-making that is more likely to be influenced by higher-level executive functions in the prefrontal cortex (PFC), including social decisions. Neuroimaging documentation of the effects of lighting on behavior can provide a rich and untapped area for researchers interested in studying the role of atmospheric factors on consumer behavior.

In the present research, we focused on the influence of illumination (i.e., brightness versus dimness) on consumers' behavior. However, it seems reasonable to expect that other lighting properties such as lighting color may also influence behavior. For instance, recent research on embodied cognition has shown that feelings of social warmth or coldness can be induced by experiences of physical warmth or coldness, and vice versa (Bargh & Shalev, 2011, IJzerman & Semin, 2009, 2010). Other studies have demonstrated that experiencing physical warmth may create an ontological scaffold for the development of social conceptual and metaphorical knowledge (IJzerman & Koole, 2011; Williams, Huang, & Bargh, 2009). Additionally, there have been a number of studies looking at methods of manipulating perceived temperature in a room without changing the physical temperature (Berry, 1961; Kwallek & Lewis, 1990; Hygge & Knez, 2001). Future studies may move beyond conventional methods of

manipulating physical warmth. Specifically, we suggest manipulating perceived physical warmth using lighting color and examining its effects on socially conscious behaviors.

The impact of illumination on human behavior in real world situations warrants further attention and provides an exciting arena for future research. The vast majority of studies on psychological effects of lighting, including this one, have been performed in controlled lab environments (Gardner & Siomkos, 1986; Baker, Levy, & Grewal, 1992). A literature review revealed only two studies that have been conducted in real world settings (see Cuttle & Brandston, 1995; Areni & Kim, 1994). In one of these studies, consumers were recorded in stores. They were found to examine and handle significantly more items under bright lighting conditions than under soft lighting conditions (Areni & Kim, 1994). Future studies should pursue opportunities to explore the psychological consequences of illumination in real world settings such as retail stores, restaurants, hotels, banks, hospitals, and urban settings.

Our research has practical implications for managers who often rely on rules of thumb regarding lighting, rather than rigorous scientific knowledge. Illumination guidelines based on our findings can easily be applied to visual merchandising, retail and website design strategies, and creative marketing ad campaigns. For instance, such guidelines may be used to design fundraising stages or charity websites that facilitate philanthropy, renovate restaurant interiors to encourage healthy choices or develop e-commerce websites and advertising messages that increase consumers' reliance on product reviews.

Evidently, lighting profoundly influences human behavior. As the 19th century author Sebastian Kneipp mentioned in his book "Thus Shalt Thou Live": "Now, if light exercises such a power over other created beings, why should it not also have a distinct influence on the human body and mind?... It may rightly be asserted that a clear atmosphere and light are most powerful

in producing a genial disposition in man and therefore have a vital influence on mind and body." Confirming this century-old notion, our work explains how awareness of lighting's impact can help understand consumers' minds and shape their choices.

CHAPTER FOUR:

CONCLUSION

The physical features and geography of our everyday environments are powerful. They influence our thoughts (Eberhard, 2009; Williams & Bargh, 2008; Meyers-Levy & Zhu, 2007; Zimring & Dalton, 2003), our workplace productivity (Wineman, 1986), our social networks (Wineman, Kabo & Davis, 2009), our health (McCormick & Shepley, 2003; Kaplan & Kaplan, 2009; Leonard, 2012) and even how we vote (Berger, Meredith & Wheeler, 2008). More importantly, when it comes to buildings, these factors have usually been deliberately planned and designed in one way or the other. Thus, by investigating the influence of built environments on consumer behavior we will be able to use environmental design as a strategic tool to nudge human behavior. Over the past millennia human beings have created millions of buildings, houses, roads, cities - entire worlds. Yet the core process of architectural design is still often one of an intuitive and artistic nature, surprisingly oblivious to the downstream effects of architects' decisions on consumers' thoughts and actions throughout a building's lifespan.

The main intention of this dissertation is to demonstrate that consumer behavior is more tightly connected to our physical surrounding than current literature in design studies, consumer behavior and psychology suggest. The outcome of this research provides a stepping stone for other work that brings together theories from these, often disparate, disciplines to address complex, integrated factors influencing human behavior and decision making.

Emphasizing the interaction between architectural and social attributes in this dissertation also provides insight into the interactive mechanisms that affect such behavior. An architect, through design of the physical environment, has significant control over the nature of critical social interactions. By understanding these mechanisms, spaces may be designed favorably to alter the sensory input and create more effective environments for various purposes. From a marketing perspective, these studies help establish a basis to evaluate an environment's effectiveness in providing for the critical and often overlooked architectural elements that influence consumers' purchase decisions and behavior. In the following pages, I will summarize the key goals, findings and implications of this dissertation and discuss directions for future work.

Based on a review of the literature on human-environment interactions (discussed in chapter one) and current psychological literature on risk taking and socially conscious behaviors in particular (discussed in chapters two and three respectively) this dissertation suggests that consumer behavior research would benefit from considering the consumer as part of the socio-physical environment. Given the clear gap in the literature, spatial and atmospheric factors such as elevation and illumination may be more influential in consumer behavior than current work has demonstrated. To better understand how such underexplored factors may affect consumer behavior, I introduce a general framework based on the Stimulus Organism Response Paradigm to structure different types of spatial and social influence and their behavioral consequences.

Specifically, in Chapter two, I highlight how consumers' physical elevation in buildings, in combination with their social context (i.e., mere social presence of others) can affect risk tendencies. Beyond an association between high physical elevations and heightened risk preferences, especially in the presence of others, I suggest that sense of power may have a crucial

role in this effect. Lastly, being visually cued with high physical elevation (as opposed to mere knowledge of being in a high physical elevation) was shown to be a necessary part of this effect. Taken together, I argue that existing research has not focused on the role of physical parameters on risk taking, or the underlying mechanisms that may be involved in such influences. Importantly, findings from this chapter pave the way for other research that explores how risk preferences may be shaped by decision makers' physical location. It also presents interesting insights for research methodology in regards to behavioral experimentation settings, as well as substantive implications especially for marketers and policy makers who may be able to leverage these findings to encourage or discourage risk taking behaviors. It is critical for future work to gain a better understanding of where and when consumers are most vulnerable towards influences by their physical environment and which spatial factors – other than verticality – are effective.

In the third chapter of this dissertation, I target another understudied factor in the built environment that had the potential to greatly impact consumers' internal state in relation to others, thus affecting their behavior in social contexts. Specifically, results presented in Chapter 3 reveal that when people are in brightly lit rooms, they are more inclined to act in a socially conscious manner. I define this category of behaviors as the tendency to act more in accordance with others views, rights and needs. Interestingly, the effect reverses in dissociative (vs. associative) social contexts, when being in brightly lit rooms seems to increase people's awareness of others, thus leading to more egocentric (vs. others-oriented) behaviors. I argue that this effect expands beyond what is typically defined as social behavior by showing that eating behavior can also be influenced by lighting levels. The results of this study indicate that people are more likely to eat healthy food in the presence of others – perhaps as a way to signal a

socially desirable behavior: being healthy. Lighting, however, does not affect eating unhealthy food. In terms of theoretical insights, these findings expand our understanding of the psychological and behavioral consequences of illumination. Furthermore, it consolidates previous findings on lighting's effect on social behavior by introducing social context as an important moderating factor that may determine how lighting affects social behavior. While previous findings attests that bright lighting conditions lead to more antisocial behavior (e.g., Steidle, Werth, & Hanke, 2011; Steidle, Hanke, & Werth, 2013), the results across the present studies strongly suggest that consumers' surrounding illumination levels can affect social behavior in opposing ways, and that illumination levels should be considered in combination with what illumination draws attention to: the social context. This means that under bright lighting conditions, people are more socially-oriented when interacting with an associative group member; while under dim lighting conditions they are more socially-oriented when interacting with a dissociative group member. Critically, several alternative explanations such as morality and power are ruled out.

Practically, the insights gained in chapter three also point to interventions to nudge consumers towards more pro-social and healthy choices. Specifically, the findings suggest that, assuming a friendly social environment, placing people in brightly lit spaces can lead to more focus on others' needs, rights and views. Practically speaking, this may be a useful tool in negotiation tactics, as well as fundraising events. Future research should examine underlying physiological mechanisms by which illumination affects consumer behavior and choices and explore how other aspects of lighting, such as lighting color may affect social behaviors.

Linking research in architecture, consumer research, and psychology using multiple methods of knowledge acquisition – including those utilized here- will bring about a fresh

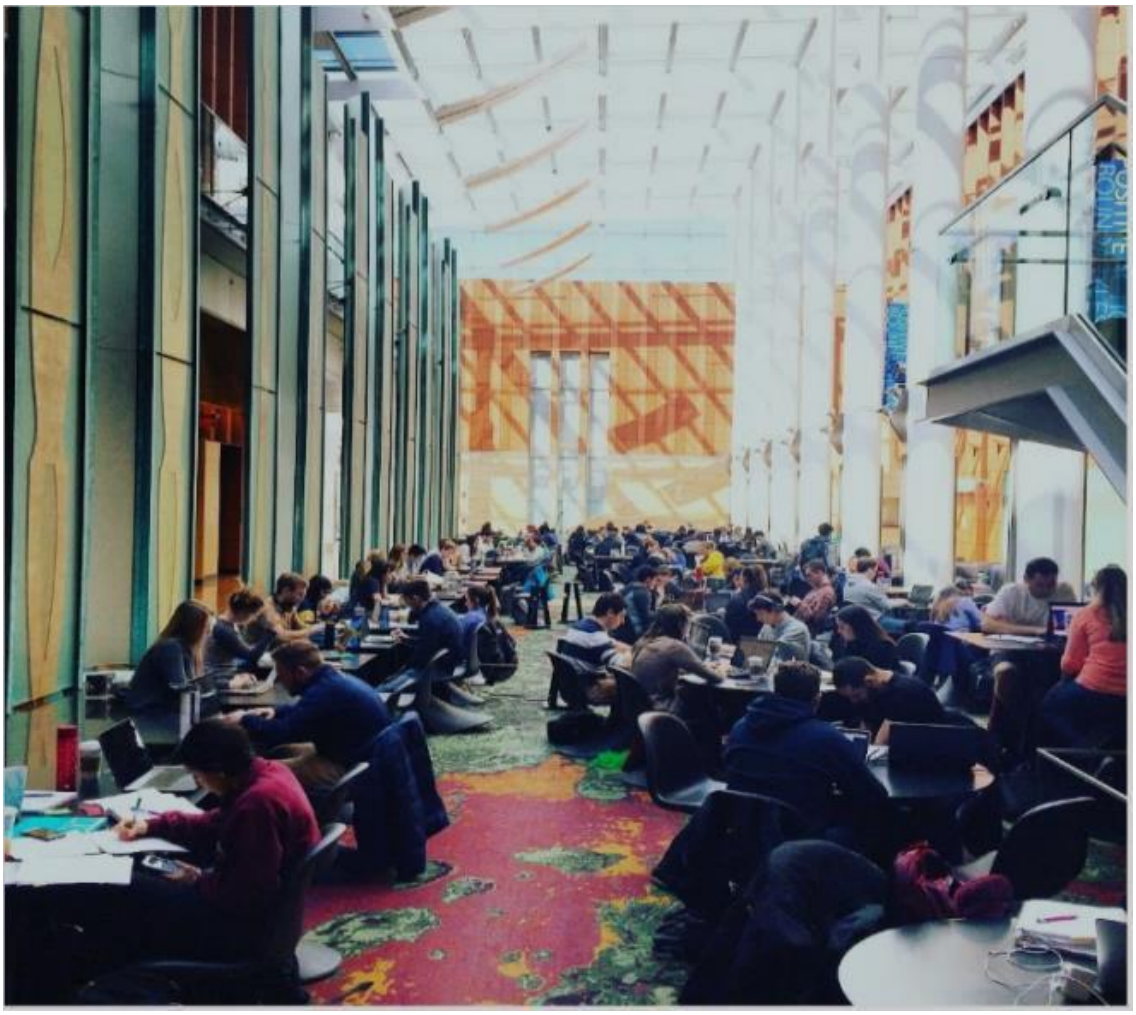
perspective on our understanding of the influence of built environments on human behavior. Today, more than ever, researchers are crossing traditional boundaries between academic disciplines to investigate the complex structure of problems in society. Persisting with such research is critical and, for example, can lead to the development of more effective public policies promoting pro-social behavior, tackling the obesity epidemic, decreasing risky behavior among vulnerable populations, improving consumer welfare guidelines, and providing crucial recommendations for buildings and product design.

APPENDICES

APPENDIX A: STUDY 2 MANIPULATION OF ELEVATION AND SOCIAL PRESENCE

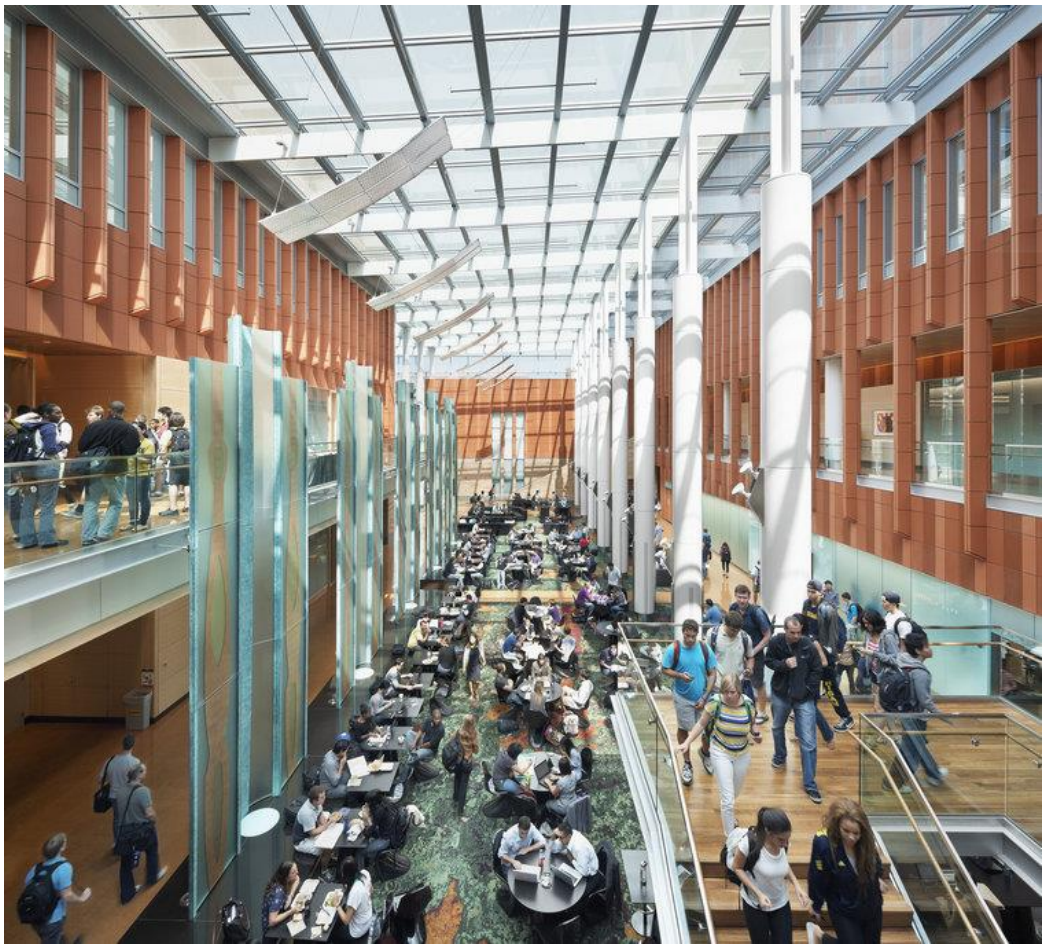
A.1. Low Elevation, Low Social Presence Condition

A.2. Low Elevation, High Social Presence Condition



A.3. High Elevation, Low Social Presence Condition

A.4. High Elevation, High Social Presence Condition



APPENDIX B: STUDY 4 EXAMPLES OF PHOTOS TAKEN BY PARTICIPANTS

B.1. High Elevation Condition Example

B.2. Low Elevation Condition Example

APPENDIX C: STUDY 3 STIMULI

C.1. Low sensory risk, familiar product: Strawberry drink

C.2. High sensory risk, unfamiliar product: Barberry drink

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