

AN ABSTRACT OF THE THESIS OF

Farida (Dida) Mouhoubi for the degree of Master of Arts in Design and Human Environment presented on March 13 2014.

Title: The Effects of Retail Store Lighting and Shelf Height on Consumer' Feeling of Safety and Behavior.

Abstract approved:

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This study aims to identify the effect of different lighting conditions and shelf height in a retail store environment on emotional states, feeling of safety and behavioral intentions. Lighting and store fixture height are two retail store components that can affect consumers' emotional states and therefore their shopping experience.

This experimental research used a mixed model repeated measures analysis of a 2x2x2 within subjects design to identify the impact of shelf height, lighting color and lighting intensity. The data collection instrument for this study consisted of an online survey. The survey included questions about eight (8) different simulated retail interiors: two different height conditions (high and low), two different color temperatures (cool and warm) and two different lighting intensities (bright and dim).

It was hypothesized that lower shelf heights, bright light intensity and cool light color would elicit more positive feelings and behaviors than high shelf height.

Pleasure and Arousal were measured with a set of items derived from the Mehrabian & Russell model (1974) and slightly adapted by Donovan and Rossiter (1982) to fit the context of shopping environment. The sample consisted of a total of sixty one (61) students. All subjects were screened for color blindness and for prior knowledge of lighting before participation in the survey.

Based on this study's findings, both lighting and shelf height influence the way people feel and behave in the retail store environment. The settings with low shelf height elicited more pleasant emotions and more approach intentions than settings with high shelf height. This contention applies to cool light and to bright intensity lighting. Cool light seems to provide more pleasantness, arousal and approachability than warm light. Bright color also has been rated more positively than dim lighting.

Overall, these findings confirmed also that retail environment cues play a role in the perceived safety. Situations with dim light were rated as less safe than well lighted ones. Higher shelf has been also rated as less safe than shorter shelves in this study.

People felt more confident in settings with low fixture height and light with higher color temperature. These situations proved to elicit among respondents more pleasing emotions, feeling of safety and more positive behaviors. Under dim light respondents did not notice a difference between the two shelf heights.

This research provides useful knowledge about the effect of two environmental cues on psychological states of customers. A well-lighted and open space, for example, influences the emotional state of customers, and induces more positive behaviors. Consequently, these customers tend to spend more time in those settings.

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The Effects of Retail Store Lighting and Shelf Height on Consumer'
Feeling of Safety and Behavior

By
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I understand that my thesis will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my thesis to any reader upon request.

Farida (Dida) Mouhoubi, Author

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CHAPTER 1: INTRODUCTION

The shopping centers literature is mainly focused on improving the in-store environment condition to stimulate consumers' purchasing action (Eppli & Benjamin, 1994; Kajalo & Lindblom, 2011, Turley & Miliman, 2000). According to previous literature, consumers' behaviors in stores are impacted by their perception of the store environment (Baker, Parsuraman, Grewal, & Voss, 2002; Grewal, Baker, & Levy, 2003; Kaltchka & Weitz, 2006; Michon, Chebat, & Turley, 2005). According to the literature both tangible and intangible factors can encourage consumers to enter, linger and purchase (Park & Farr, 2007). These factors include visual, olfactory, tactile and oral. Baker (1987) defines store atmospherics as ambient, design and social cues influencing consumer's emotional state (arousal, pleasure) and their shopping experience.

The feeling of safety is also seen as an important factor for the success of a shopping experience. In the face of so many threats, crime, shoplifting and terrorism, security in shopping centers has recently become an important issue (Colman, 2006; Hedayati et al., 2012; Overstreet & Clodfelter, 1995). The feeling of insecurity may weaken the overall reputation and the attractiveness of shopping centers to consumers (Overstreet & Clodfelter, 1995). People would not spend their time and money in unsecured places (Kajalo & Lindblom, 2011). But it is not obvious to secure store without huge investments in security devises, which could be cost effective for both retail owners and customers

Crime Prevention Through Environmental Design (CPTED) provides one of the most commonly used criminology theories by urban planners, architects and designers to solve criminality issues (Carmen & Harch, 2011; Cozens et al., 2001; 2005; Cozens, Saville & Hiller, 2005).

Consequently, by reducing crime and vandalism, crime prevention by design enhances people's overall feeling of safety. In this context, mitigating crime and fear of crime may improve the quality of life for consumers (Carmen-Girfilen, 2011; Crowe, 2000; Schneider & Kitchen, 2002), which is a basic human need (Hedayati et al., 2012).

This theory includes several strategies, the most common built environment strategies are: surveillance, territoriality, access control, maintenance of the facility and activity support. The last two strategies are treated separately because they are not physical design elements within the built environment (Jeffery, 1990). However, surveillance is seen in the literature as the key component. Formal surveillance is ensured by security guards and several surveillance systems. Informal or natural surveillance occurs by designing the place of physical features, activities in such a way to maximize visibility and foster positive social interaction (Cozens et al., 2005; Reynald & Elffers, 2009).

CPTED theory predicts that people will express a greater feeling of security from crime in specific environments which provide an open space and well lighted space (Carmen & Arch, 2011; Crowe, 2000; Fisher & Nasar, 1991). Visibility is an important factor to consider in urban and residential places (Angel, 1968; Crowe, 2000; Hassinger, 1985; Newman, 1971). In an obstacle-free and open space (for example, low-shelf height) with good lighting, participants would be predicted to have a higher level of control and a better perception of any kind of threat. It was further hypothesized that participants with a higher sense of control would report more pleasant feelings. "Perceived loss of control is usually a precursor to negative affect or even depression" (Ward & Barnes, 2001, p.139). These positive emotions in turn, are predicted to influence participants' positive behaviors, such as the shopping satisfaction, the willingness to spend more time and revisit the store.

Few studies have investigated the effects of shelf height and space (Curhan, 1972, 1974; Frank & Massey, 1970; Wilkinson, Mason & Paksoy, 1982). It was found that low-shelf height (<60”) is considered the most accommodating and attracting display height (Cardone, 2006; Carmel-Gilfilen & Arch, 2011; Dreze et al., 1994). In the merchandising literature, display merchandise on low shelves has been seen as the best way to incite people to see, touch, try and buy items in stores. Furthermore, many scholars in crime prevention literature claim that low fixture design creates a pleasant environment that may have an impact on people’s feelings of safety and well-being (Crowe, 2000). IESNA (2003) states in its guidelines for security lighting that landscape design, fences and physical configuration must be designed in a way to allow identification of unwanted persons on premises. Landscape design should not obstruct lighting from illuminating people’s surroundings (IESNA, 2003).

It is also recognized that lighting may have an impact on the occurrence of crimes. A reduction in crime and a fear of crime after improving lighting in some premises has been studied (Crowe, 2000; Cozens, 2005; IESNA, 2003). A good investment in lighting can reduce violence by two indirect ways. First, it can enhance natural surveillance of the premises by the community and the tenants. Secondly, light can affect people’s confidence and then enhance social and natural control (Brown, 1985; Crowe, 2000; IESNA, 2003; Newman, 1971). But the means to ensure a good retail illumination is not obvious. As a design factor, lighting may create a positive store experience (Rea, 2000). Lighting designers assert that lighting can change how people perceive and experience space.

Other scholars in lighting design literature found that lighting can influence human biological and psychological process (Fleischer, Krueger & Schierz, 2001; Morita & Tokura, 1998; Ruger, Gordijin, Beersma, de Vries & Daan, 2006). In the retail lighting field, Areni and Kim (1994) have investigated the effect of increasing brightness in people’s emotions. The increase of brightness

creates more pleasantness among subjects (Areni & Kim, 1994). However, for the energy efficiency requirements, studies need to be undertaken to find new ways to use lighting (IESNA, 2003; Zumtobel Research). In other words, different light intensity and color rendering temperature may be used to achieve good illumination to make certain public areas “more hospitable” to gathering for long periods (CPTED handbook, 2003, p.11).

“Lighting should be uniformly spread to reduce contrast between shadows and illuminated areas. More fixtures with lower wattage rather than fewer fixtures with higher wattage help reduce deep shadows and avoid excessive glare.” (CPTED handbook, 2003, p.12).

It is also recognized that creating a pleasant and stimulating store environment has an impact on the time and money spent in the store (Donovan, Rossiter, Marcoolyn, & Nesdale, 1994, Levy & Weitz, 2009). In addition, it also affects shopping enjoyment, enthusiasm to speak to employees, spending more money, and the possibility of repeat purchasing (Donovan and Rossiter, 1982). In other words, a pleasant environment has a huge effect on the participants’ purchase decisions (Baker, 1986). In the same way, an unpleasant environment can, for example, affect participants to the point they could shorten their stay in the store (Maxwell & Kover, 2003) or even choose another store for their purchases (Beavon, 1994).

Purpose and objectives

This study is intended to examine the influence of light intensity, color rendering, shelf height, and the combination of these factors on emotional responses, feeling of safety, and behavior as well as on the purchasing behavior of participants in retail environments. Subjects' emotional response toward simulated stores with two different lighting intensity, two different light color rendering and two different shelf heights will be compared.

The main objectives of this study are to identify the effects of lighting with different color rendering properties and intensities (bright and dim) on emotional states (pleasure and arousal) the feeling of safety, and behaviors (approach-avoid) through the use of two different retail settings, with low shelves and high shelves. The study examined and compared respondents' perceptions regarding color temperature, light intensity and shelf height preferences and feeling of safety.

Model

This exploratory study assesses the effectiveness of the use of natural surveillance to create a safe and welcoming place in retail settings from the participants' point of view. A shopping experience is a situation in which individuals are likely to have emotional responses. These responses can be either positive or negative. Negative emotions, for example, are those that arise due to shoppers' perceptions of being unsafe. To make a link between emotional states evoked in a retail environment and the statements of behavioral intention in that environment, Mehrabian and Russell (1974) proposed the model of stimulus–organism–response (S–O–R) to understand the effects of environmental stimuli on emotional responses.

This model consists of measuring the amount of arousal and pleasure which users feel in the physical environment. Donovan and Rossiter (1982) applied Mehrabian and Russell's (M-R) model to assess the effects of environmental cues on emotional states. They concluded that arousal and pleasures (but not dominance) are indeed effective measures in retail settings. Donovan, Rossiter, Marcoolyn and Nesdale (1994) extended the 1982 study using an M-R model without the dominance dimension for its lack of empirical support (Park & Farr, 2007).

These emotional states (arousal and pleasure) affect the approach-avoidance behavior in the store environment. Research has shown that shopping environments can evoke emotional responses among customers and, in turn, these emotions influence the shopping experience (Donovan &

Rossiter, 1982). Consequently, shoppers spend more time and money in stores (Donovan et al., 1994). However, studies are still searching for a coherent framework for studying retail environments (Bohl, 2012; cf. Baker, Grewal & Parasuraman, 1994; Turley & Milliman, 2000).

Hypotheses

The hypotheses are the following:

1. A retail store described as having low shelf height will be associated with more positive evaluation than a store described as having high shelf height.
2. A retail store described as having low shelf height will be associated with more feeling of safety than a store described as having high shelf height.
3. A retail store described as having low shelf height will be associated with higher behavioral intentions than a store described as having high shelf height.
4. A retail store described as having bright lighting will be associated with more positive evaluation than a store described as having dim lighting.
5. A retail store described as having bright lighting will be associated with more feeling of safety than a store described as having dim lighting.
6. A retail store described as having bright lighting will be associated with higher behavioral intentions than a store described as having dim lighting.
7. A retail store described as having cool color lighting will be associated with more positive evaluation than a store described as having warm color lighting.
8. A retail store described as having cool color lighting will be associated with more feeling of safety than a store described as having warm color lighting.
9. A retail store described as having cool color lighting will be associated with higher behavioral intentions than a store described as having warm color lighting.

Definition of terms

Environment, store environment and retail environment: These terms have been used interchangeably for the same connotation which is defined as all the physical attributes and design interior features that can be controlled by retail owners. This definition excludes all manufactured features like product packaging and urban planning issues, such as store location. (Cardone, 2006).

The rational choice theory: The Rational Choice Perspective developed by Clarke and Cornish (1985) is based on the offender's point of view rather than his psychological and social disposition. (Clarke, 1997).

CRAVED: Acronym for Concealable, Removable, Available, Valuable, Enjoyable, and Disposable. (Cardone and Hayes, 2012)

Color temperature (CT) of a light source: A manner of describing the apparent color of a light source. Commonly used to express the cool or warm color of a source that deviates from neutral. Expressed in degrees Kelvin (K). (Russell, 2008)

Light color: The light characteristic that is perceived as either warm or cool. Color temperatures over 5,000K that emit bluish or white colors are considered cool and lower color temperatures (2,700–3,000 K) that emit yellowish white through red colors are called warm (Mac Evoy, 2009)

Light intensity: Luminous intensity is perceived as either bright or dim. (Park & Farr, 2007)

Approach-avoidance behaviors: Approach behaviors characterize one's affinity with a particular place like the desire to explore, stay and affiliate (Mehrabian and Russell, 1974). Avoidance behaviors, however, represent the opposite

Pleasure-Displeasure: is an emotional reaction which entails whether individuals perceive the environment as enjoyable or not enjoyable (Mehrabian & Russell, 1974).

Arousal: is a physiological and psychological state of being awake or reactive to stimuli (Mehrabian & Rusell, 1974).

Safety feeling: is opposed to the fear of crime (Baba and Austin, 1989).

Fear of crime: negative emotional reactions generated by crime or symbols associated with crime (Baba and Austin, 1989).

CHAPTER 2

Literature Review

This chapter consists of two parts summarizing important research that pertains to this study. The first part focuses mainly on crime design literature and the second section relates to previous studies on retail atmospheric studies, particularly those related to lighting and the application of the M-R model to measure emotions.

Crime-place relationship

All retailers face the same problem regarding security, but the means for creating a safe and secure environment is less obvious. Technology enabled retailers to have access to a considerable number of means to fight against theft and shoplifting. Many retail chains have made important investments in sophisticated anti-theft procedures. Pre-employment integrity, screening measures, employee awareness programs, asset control policies, and loss prevention systems (Carmel-Gilfilen & Arch 2011). Bamfield (1994) states that in implementing preventive measures to combat retail crimes designers need a deep understanding of the problem of theft in retail context. There are different types of crimes committed against retail shops: crimes of external nature, such as customer's theft, burglary, vandalism, etc., and also crimes of an internal nature, such as employee theft (Robert S. et al.,1995).

To study security in shopping centers and retail environments, scholars have been using different methods to understand offenders' behaviors. Katz (1988) related shoplifters' behavior to psychological problems and mental pathologies (Cupchik, 1997). Scholars established a relationship between chemical deficiencies and some misbehavior. Klemke (1992) connected it to social factors,

while Abelson (1992) and O'Brien (1983) linked it to gender. Political theorists linked the criminal behaviors to oppressive capitalist governments (Crow, 2000).

Another school of thought that contradicts previous studies focused on the impact of physical environment in reducing and deterring crimes. Sociologists realized that crimes are not necessarily linked to the characteristics of neighborhood population. However, some places possess a higher risk of being victimized compared to others. Stark & al. (1987; 893) stressed that "there must be something about places as such that sustain crime."

This perspective sees crime through a different lens. The physical environment is considered the most influential factor in creating or reducing opportunities for crimes. The physical design and layout of urban living can be manipulated in a manner to create a safe and secure place. Oscar Newman's (1972) defensible space theory has been the basis for all the contemporary approaches to the crime-design relationship (Reynald & Elffers, 2009). Newman's theory (1972) asserts that poor environmental design and layout play a part in creating opportunities for crime (Newman, 1972). Newman argues that the contribution of the physical environment represents the most influential factor towards the reduction of crime.

Several researches have addressed the link between crime and place. Place-based crime prevention approach is based on the adaptation of the physical environment to prevent crime. Crime is geographically and demographically concentrated (Higgins and Millar, 2009). Residents in urban areas are exposed to more risks of crime compared to residents in rural areas (BCS, 2009). Place-based Crime Prevention suggests that some places are safer than others because of the way they are built and used by people (Mair, 2003, 211). Mair (2003) summarizes the various environmental approaches to crime prevention as follows:

- Physical design and immediate situational factors generate a sense of territoriality in legitimate users of space and incite them to act on the attachment to that space in order to prevent violence or any other illegitimate use.
- Physical design and immediate situational factors of a specific place may either encourage or discourage violence.
- An environment can be modified in order to minimize crime by making conditions more risky, more difficult, less rewarding and less excusable to offenders (Mair, 2003, 217).

In light of this consideration, Mair (2003) argues that the arrangement and design of the physical environment has an impact on people's behaviors and also on crime occurrence. Territorial reinforcement is based on the assumption that the design and arrangement of the physical environment can enhance user's property sense of ownership over a territory. Furthermore, arrangement of the physical features can also lead to crime discouragement by promoting offenders' risk perception by keeping users under observation and denying access to potential offenders (Hedayati et al., 2012).

Buttler (1994) has addressed specific store factors that attract offenders and make a space more vulnerable to crime. Buttler's (1994) survey of 15 shoplifters identified 29 factors that led to offenders' fear to commit crimes. The most deterrent ways addressed were: staff, store guards, presence of customers, alarms and CCTV. As a conclusion, Buttler stated that the human presence is an important deterrent factor to shoplifters (Butler, 1994, 62).

Carol and Weaver (1986) conducted a landmark study of how retail interiors affect shoplifters' behaviors. Using verbal protocol methodology in real-life shopping situation, Carroll and Weaver (1986) investigated expert and novice shoplifters. Their study showed that shoplifters' decision to steal is related to evidence of some security devices, the number of people present in the store and

the physical layout of the store, such as item inaccessibility, the possibility of being observed and high counters that impede observation (Carol & Weaver, 1986).

Store layout, merchandising and the increased visibility measures are also seen as being obstacles for shoplifters' intentions to steal (Tonglet, 2000). In other words, retail interiors play a significant role in preventing shoplifters from committing crime. Tonglet's study (2000) highlighted the fact that the retail interior is an important aspect in the shoplifters' decision-making process. A shoplifting decision is an impulsive act, not premeditated. Seventy four percent of interviewed offenders confirmed that their decision to steal depends on the retail environment. Tonglet's research (2000) confirmed that store interior has a considerable effect on theft decision. The follow up study by Hayes (1998) suggests in a survey that 62 people among 2000 shoplifters are influenced by the store layout and design. They decide to steal after having access to the store. Furthermore, the display of CRAVED (Concealable, Removable, Available, Valuable, Enjoyable, Disposable) items in high visibility zones does not discourage them from acting. Hayes's research emphasizes that shoplifters must see the risk once they are inside the store:

“A deterrence model could focus on altering offender's decisions by implementing and marketing cues aimed specifically at reducing theft motives and opportunities while increasing the perception of risk” (Hayes, 1998, 8).

For example, the fact of mentioning the existence of a surveillance camera in some stores may deter offenders from committing crimes.

In her exploration of the design elements that influence shoplifters, Cardone (2006) found that interior store design influences strongly the shoplifters' behaviors. A content analysis of 20 known shoplifting offenders revealed that offenders focus on target hardening, guardianship, natural surveillance and formal surveillance. Carmel-Gilfilen (2007) undertook another study which focused on the effect of environment stimuli on shoplifters. The author used a written survey and phone

interview with 20 retail companies. This study looked at the various perceptions of loss prevention and design associates for the purpose of understanding the strategies which may deter shoplifters from crime. Findings suggest that the physical factors in retail settings can motivate or discourage offenders.

Similar to Carroll and Weaver's study (1986), Carmel-Gilfilen and Arch's (2011) study method simulated real shoplifting by using potential criminals who expressed their views about the existing risks in a particular store. Participants (novice and expert shoplifters) were asked to voice record their thoughts and their perceptions of risks by thinking aloud. Research prompted with "Try to think aloud and tell me everything that passes through your mind about the retail environment" (Carmel-Gilfilen and Arch's 2011, p. 28). Verbal protocol analysis or think aloud method is a rigorous empirical method for studying cognitive process (Ericson & Simon, 1993). This method simulated shopping and shoplifting in real life. After performing the study, recorded verbalizations were transcribed, coded and analyzed. Coders identified each instance where participants express fear or related risk. Findings confirmed the potential of the physical environment in deterring shoplifters. "A well designed store cannot eliminate, but will minimize, shoplifting" (Carmel-Gilfilen & Arch, 2011). Their study came up with some suggestions on ways in which the physical environment can be designed in such a way to better deter crime and enhance security in retail environment.

- Avoid design elements such as walls and high fixtures that block the view.
- Consider using mirrors within the store to eliminate blind spots.
- Keep paths clear and open (Atlas, 2004). This strategy creates the feeling of being watched, which most offenders fear. In addition it creates a better environment for legitimate shoppers.
- Provide ample general lighting (Carmel-Gilfilen & Arch, 2011, p. 34).

Overall, the findings from all these studies support the potential of the physical environment in deterring shopliftings and creating a better environment for customers. Most offenders focus on the

physical layout of stores and security devices. The best deterrents are the combination of several strategies. Carmel-Gilfilen and Arch argue that the key to increase security in store design is integrating security planning early in the design process (Carmel-Gilfilen & Arch, 2011; Cardone, 2006; Crow, 2000). According to them, CPTED (Crime Prevention Through Environmental Design) and SCP (Situational Crime Prevention) offer a good starting point for designers to include security in the design process. “Knowledge from criminology theories such as SCP and CPTED provides an excellent starting point for the designer as is including security experts, when possible, in the design team. This strengthens and unifies the security approach.” (Carmel-Gilfilen & Arch, 2011, p. 34).

In her exploration of the design elements, Cardone (2006) found that interior store design strongly influences the shoplifters’ behaviors. A content analysis of 20 known shoplifting offenders revealed that offenders focus on target hardening, guardianship, natural surveillance and formal surveillance. In their replication and expansion of Carroll Weaver’s (1986) research, Carmel-Gilfilen & Arch, (2011) explored perceptions of 24 expert and novice shoplifters, using verbal protocol analysis. Their objectives were to investigate on shoplifters’ perception of store environment, and explore the relationship between physical design features and security techniques (Carmel-Gilfilen and Arch, 2011). Results showed that the most feared techniques are: product and employee positioning, the use of security, maintenance of the premises, and access control; all of which are components of two overlapping crime prevention theories, CPTED (Crime Prevention Through Environmental Design) and Loss Prevention theory.

However, the few researches on environmental security issues in retail design literature show the type of security developed by retail designers, retail managers and their effect on offenders. They examined a wide range of factors that contribute and motivate a potential offender in the decision to steal, but there is little insight on how legitimate customers perceive these strategies to be in relation

to their feeling of being safe and welcome. The security concern of customers is crucial knowledge for retail store managers. It is obvious that customers do not feel safe and comfortable enough to spend time browsing in stores and make purchases. It can be assumed that customers will be likely to spend more time and money in secured settings.

In this context, town planners, urban designers and city center managers have been using the theory of Crime Prevention Through Environmental Design (CPTED) to tackle crime and the fear of crime (Cozens et al., 2001; 2005). CPTED asserts that “the proper design and effective use of the built environment can lead to a reduction in the fear and incidence of crime, and an improvement in the quality of life” (Crowe, 2000, p.46).

Physical Security

Bamfield (1994) argues that turning a store into a fortress is not a good solution and that cost effectiveness is an important factor. The trade-off between the need to secure the merchandise and the desire to display it in such a way to attract customers is a big dilemma. “It is a miracle if store operations can resolve the opposing purposes of attracting buyers and thwarting the illegal removal of merchandise” (Israel, 1994, p. 97). Therefore, retail store design faces a conflict between the need to secure the merchandise from shoplifters and the need to let customers touch and try products.

The security topic also appears in the 2009 Council for Interior Design Accreditation (CIDA) standards, requiring design to “demonstrate an understanding that design solutions affect and are impacted by energy, security, and building control systems” (Council for Interior Design Accreditation, 2009, p. 19). Educating students about the importance of security issues as well as equipping them with techniques to integrate physical security into the design process is important.

Integrating physical safety in a project from the start rather than modifying it at a later stage can decrease design costs in the long-term (Crowe, 2000; Neill, Rueda & Savage, 2009).

More recent scholars on the environmental and security disconnect suggest an interdisciplinary collaboration between interior designers, security and facility managers, fire department personnel, code officials and building occupants from the inception phase (O'Shea & Awwad-Rafferty, 2009).

Crime Prevention Through Environmental Design (CPTED)

One of the few environment-design approaches that attracted designers' attention is Crime Prevention Through Environmental Design. "The concept of Crime Prevention Through Environmental Design (CPTED) is grabbing attention, especially where business people are concerned - in their wallets" (Crow, 2000; p. 22A). The crime-environment researchers focused on the impact of physical environment in deterring offenders rather than on sociological interpretations, such as social disorganization (e.g. Jacobs 1961; Jeffrey 1999; Newman 1972). Cozens (2002) argues that CPTED involves the design and management of the physical environment to reduce the opportunities of crime and is based on the assumption that the offender enters into a rational decision-making process before undertaking a criminal act (Cozens, 2002).

Techniques of environmental design center on the store itself:

“Innovative store design can increase convenience and excitement for the customer while simultaneously allowing for more staff efficiency and better product protection. Effective retail design can both enhance sales and safeguard against shrinkage” (Moussatche et al., 2004, p. 5).

Crime Prevention Through Environmental Design can be understood as a system used by both planners and designers to prevent crime and the fear of it by creating opportunities for real

customers to control and defend their space against crime. This theory also reduces the physical attributes which are conducive to crime (Newman, 1972, 1973). Clarke in his conception of crime prevention suggests a dual action. The first one is to prevent the development of all dispositions for crime and the second one is to reduce all criminal opportunities.

CPTED is a broad framework which offers security strategies based on behavioral psychology, sociology of human behavior, and design. It particularly focuses on the design of the built environment (Crowe, 2000; Jeffery, 1999). CPTED asserts that “the proper design and effective use of the built environment can lead to a reduction of fear and incidence of crime, and an improvement of the quality of life” (Crow, 2000, p.46). The goal of CPTED is to prevent crime while enhancing building functions.

Based on mid-twentieth century studies (Lynch, 1960; Jeffery, 1971; Newman, 1973; Gardiner, 1978; Clarke and Mayhew, 1980; Coleman, 1985), the first version of CPTED, called the first generation CPTED, has been as much complimented as criticized (e.g. Adams, 1973; Kaplan, 1973; Coleman, 1985). In addition to the physical design, the refined version of CPTED, called second generation CPTED, has been implemented with social factors.

The second generation CPTED responded to criticism by using risk assessments, socio-economic and demographic profiling (Saville, 1996). It also uses active community participation (Sarkissian & Perglut, 1994; Sarkissian & Walsh, 1994; Saville, 1995; Sarkissian et al., 1997). Crime Prevention Through Environmental Design has emerged as an independent theory and is now increasingly being used by urban designers and city center managers to tackle crime and the fear of crime (Cozens et al. 2001; 2005). It offers some design and layout strategies that are likely to expose offenders to more risk. The fear of crime is higher in locations that offer low escape and less refuge (Theory, Taylor & Harrell, 1996, p.9). CPTED strategies create an overall positive image by

optimizing opportunities for surveillance and by creating a sense of ownership among legitimate customers while reinforcing territoriality. Crow (2000) explains CPTED concepts below:

“Environmental design, as used in the CPTED program, is rooted in the design of the human/environment relationship. It embodies several concepts. The term environment includes the people and their physical and social surroundings.... Thus, the CPTED program seeks to prevent certain specific crimes (and the fear attendant on them) within specifically defined environment by manipulating variables that are closely related to the environment itself.” (p.35)

The focus on physical or artificial barriers (fences, locks and gates) and urban design to deny access to offenders is derived from target-hardening approach. CPTED is a comprehensive strategy; it achieves surveillance through the use of design and use of the environment. CPTED design approach involves citizen participation, law enforcement and design strategies. Environmental design has been acknowledged and is in use in many countries like the United Kingdom, United States, South Africa, Canada, and Australia.

Inspired by Newman’s defensible space theory and loss prevention theory, CPTED emphasizes three exclusive components (not always mutually). The three most important strategies of the built environment are: access control, surveillance and territorial reinforcement. In addition to the three cited procedures, maintenance and activity support are two other aspects of CPTED, not treated separately because they are physical design elements within the built environment:

- Access control: any measure denying access to crime target, including organized security (such as guards), mechanical (locks, cables, and glass cases) and natural (built and spatial barriers that define and restrict access to specific areas). Access control aims to create risk among illegitimate users (fig.1).



Fig1: Access control is a concept focused on restricting access to potential offenders. It encompasses all types of means that allow controlling and denying access to offenders.
<http://www.dezeen.com/2011/03/01/harrods-shoe-salon-by-shed/>

- Surveillance (natural and formal): It gives the users and employees the possibility to monitor and have control of the whole space. There are two different types of surveillance. The natural (informal) which includes self-surveillance opportunities such as windows, physical elements that enable casual and space users to observe and monitor a space and also on atmospheric cues such as lighting. The other type is the formal surveillance, ensured by security guards and shop keepers or CCTV. Surveillance cannot be efficient without an adequate use of the physical design. Given a potential for persecution and intervention, crimes are less likely to happen. The possibility of being observed may deter offenders from committing a crime.
- Territorial reinforcement: Territoriality strategy reinforces a sense of ownership among customers. In retail environment, this design concept can be materialized by real boundaries such as fences, jewelry display and also by more subtle space markers expressed through signage, different type of lighting, floor patterns, colors, ceiling or display (fig.3). These

design features define and distinguish between private and public space. It also creates a sphere of influence where customers feel a sense of ownership and responsibility. Moreover, it allows employees greater control of activity in the space.



Fig 2: Territoriality: a sense of territoriality is enhanced by design that allows identification of particular areas within a space, such as the use of signage, landscaping, lighting, pavement designs, etc. That creates clear distinctions between private and public spaces. <http://www.dezeen.com/2011/03/01/harrods-shoe-salon-by-shed/>

- Activity support: refers to the use of any type of signage, design and activity that encourage intended patterns of legitimate consumers. An increasing number of users may provide more eyes on the space and then offenders are likely to feel more persecuted. In other words, “safe” activities can also attract legitimate users who may discourage crimes.
- Image/maintenance: ensuring a well maintained physical environment gives customers an impression of a good maintained store and then returns a positive image of the built environment. The effect of the image returned by the environment and the repercussion on crime or fear of it has been acknowledged by several researchers (Lynch, 1960). All of the above components rely mainly on environmental design to be effective (Danielle & Henk, 2011).

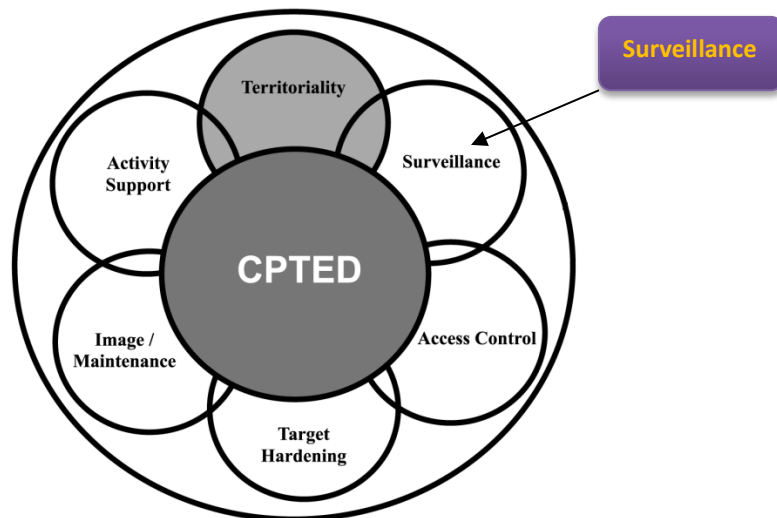


Fig 3: CPTED strategies -Adapted from Moffat (1983, p.23)

Research supporting Crime Prevention Through Environmental Design strategies:

Reynald and Elffers (2009) argue that there are conflicting empirical results about the effectiveness and validity of CPTED strategies. However, the validity of this method (CPTED) is based on the assumption that the prevention of crime can be achieved by either reducing the opportunities for crime to occur or by increasing the risk of apprehension (Cozens 2002). This assumption came from the rational choice perspective which states that offenders weigh and assess potential risks before making decisions to steal (Tonglet, 2002). Several researches using the rational choice theory highlighted the effectiveness of several CPTED strategies (Beck & Willis, 1999; Farrington et al. 1993; Carmel-Gilfilen & Arch, 2011). The basic purpose of the CPTED approach is to reduce the opportunity for crime by manipulating the built environment in order to affect users' behaviors and hence reduce crime and the fear of crime (Cozens, 2007b).

Research in commercial settings

Retail store design encourages the use of CPTED strategies. Crow (2000) argues that a good use of CPTED can enhance security in the commercial environment, “perhaps the greatest and most valuable lesson being learned is that a good store design and merchandizing are not incompatible with effective security. Both objectives may be achieved and enhanced through space planning and behavioral concepts.” (p.46)

To create a welcoming space, Crow (2000) suggests a few techniques such as enhancing visibility by lowering shelves and increasing illumination. However, there are few empirical studies which test the effectiveness of CPTED strategies in retail environment settings. Mostly focused on robberies and work place violence, few scholars revealed the importance of surveillance in deterring crime (Peek-Asa et al., 2006, Carmel-Gilfilen & Arch, 2011). Some researchers evaluated the effectiveness of CPTED in specific situations of urban planning (Casteal, 2000; Crow and Bull, 1975; Hunter, 1988; Jeffrey, Hunter & Griswold, 1987). CPTED strategies which have been tested in other public environment settings, such as banks, railway stations and parking lots, revealed a link between surveillance and incidence of crime (Barclay et al., 1996; Hannan, 1982; Laycock & Austin, 1992).

Pretious et al. (1995) revealed that formal security is perceived by retail managers as effective in reducing crime in retail environment. According to Pretious et al. (1995), uniformed guards are also perceived as deterrent to casual thieves. Lindblom and Kajalo (2011) investigated how store managers perceive formal and informal surveillance in reducing shoplifting in their stores. A survey conducted among 169 store managers revealed that store personnel play a crucial role in preventing shoplifting. Furthermore, electronic tags are found to be the most efficient among different forms of formal surveillance in preventing shoplifting (Lindblom & Kajalo, 2011). Their

study revealed also that clean and well-lighted shopping environments (natural surveillance) impact positively customers' and employees' feeling of security. However, formal surveillance such as security guards and cameras had insignificant impact on customers' or employees' feeling of security (Lindblom & Kajalo, 2011). Lindblom and Kajalo's study focuses on surveillance and its effectiveness from the retailer's point of view not from customers' point of view.

CPTED strategies have also been implemented in Portland, Oregon, ending up by a reduction in burglaries of commercial properties and improvement in neighborhood quality of life (Kushmuk & Whittermore, 1981). Furthermore, CPTED strategies have been identified as potential deterrents to crime in the interior environment, but there are not enough empirical studies on the effects of CPTED strategies on consumer's behaviors in retail stores. Little empirical studies in retail settings showed how physical, spatial and design attributes improve security from customers' point of view. These researches focused solely on the pertinence of CPTED strategies in deterring shoplifters.

Security as a key component of CPTED

The theory of Crime Prevention Through Environmental Design (CPTED) provides one theoretical approach to preventing crime and reduces the feeling of insecurity in retail stores. It has been argued that CPTED can be applied to both residential and business settings, including commercial areas, retail establishments, resorts, banks, hospitals and schools (e.g. Cozens et al., 2005). Among several CPTED strategies, surveillance is seen as a key component of the crime prevention theory (Lindblom & Kajalo, 2011). According to the literature, surveillance can be classified in two categories: formal and informal. Several scholars stated that the use of both types of security formal and informal have proven their effectiveness in reducing crime and the fear of crime

(Carmel-Gilfilen & Arch, 2011; Cozens, 2005; Crowe, 2000; Crow, 1999; Lindblom & Kajalo, 2011).

The overall goal of informal surveillance is to promote visibility and foster positive social interaction among users of space. Carmel-Gilfilen & Arch's (2011) study highlighted the effectiveness of the natural surveillance in retail environment. They came up with specific design strategies that are listed in the order of perceived importance by offenders surveyed in the study. Decentralizing cash wrap (Clarke & Eck, 2003; Crowe, 1991), such as employees' positioning, has been cited as one of the most deterrent elements, "placing employees at various store locations in a way to increase sight lines and visibility to products" (Carmel-Gilfilen & Arch, 2011, p.27). Stores with high fixtures such as high walls and shelves also represent design elements that can impede employees' and customers' view (Carmel-Gilfilen, 2011; Crowe, 1991, Carmel-Gilfilen & Arch, 2011). Fixtures allow the display of products in a way to allow customers to try and touch the product, but they can in the meantime impede the view and allow offenders to steal without being seen (Carmel-Gilfilen, 2011).

"The goal with fixture design is to create pleasing displays that effectively market the product while considering loss prevention." (Carmel-Gilfilen, 2011, p.34).

Formal surveillance

It is important to understand how design and the near environment can influence people's feelings of security. The CPTED approach is mainly based on reducing opportunities for crime to occur, by manipulating the built environment (Hedayati & al., 2012). Parnaby (2007) revealed that CPTED strategies can reduce opportunities of criminal acts, mitigate fear of crime and provide a better quality of life to improve human health. Overstreet and Clodfelter (1995) found that the customers' feeling of security can be enhanced through formal surveillance such as security guards.

More than 64% of respondents feel safer in the presence of security guards both inside and outside the malls. Their study did not strongly support the hypothesis that security concerns are higher among elderly customers. However, security has greater importance for females compared to males. It has been strongly confirmed that higher frequencies of security concerns create more precautionary actions, such as the use of only the main entrance. The data were collected only at enclosed shopping malls; no conclusion can be drawn for other types of stores, e.g., strip centers or retail stores.

Investment in formal surveillance may be efficient to fight against shoplifting, but at the same time these investments may make real customers feel less secure (Guffey, Harris & Laumer, 1979; Overstreet & Clodfelter, 1995). Lin, Hastings and Martin (1994) in their survey found that formal surveillance devices were perceived to increase customers' sense of environmental hostility within the store. To reduce shoppers' paranoia, formal surveillance must be as discreet as possible (Coleman, 2006).

This study aims to examine how the near environment can be manipulated to create a safe and welcoming place in retail environment settings, from the customers' point of view. It focuses on a particular effect of natural surveillance. In practice, informal or natural surveillance is promoted by physical, atmospheric features and activities in a manner that maximizes visibility in the space and fosters positive social interaction (Cozens et al., 2005; Farrington et al., 1993; Hays, 1999; Reynald & Elffers, 2009).

Few studies highlighted the fact that informal surveillance reduces customers' safety and security concerns. Others remained unsure about this link. Lee et al. (1999) study found that the level of criminal incidents at shopping centers did not dictate the level of private security. This

literature review shows the scarcity of research that evaluates natural surveillance in retail store from customers' perspective.

Natural surveillance

The use of low height fixtures are highly recommended in retail environment (Atlas, 2004; Crowe, 1991). It can promote people's interaction (Carmel-Gilfilen, 2011; Crowe, 1991). Successful design fixtures are the ones that allow people to feel and taste products (Carmel-Gilfilen, 2011). By lowering the overall fixtures height, retail owners will create an appealing display for customers and increase natural surveillance.

Natural surveillance occurs by designing features in such a way to increase visibility. The natural surveillance concept refers to the arrangement of physical design elements involved with the activities and the people in order to maximize opportunities for surveillance at the right moment in time and space, consequently leading to crime discouragement (Cozens, 2002; Hedayati & al., 2012). This concept underlies offenders' preference for less controlled and open places. It suggests that landscaping features can be designed to foster natural surveillance from both inside and outside the premises by passers-by (Hedayati et al., 2012). Natural surveillance can also be enhanced by the use of an adequate lighting. The appropriate lighting can enhance occupants' feeling of security and safety, because it reduces dark and hazardous areas (Crow, 2000; Carmel-Gilfilen, 2011; Kajalo & Lindblom, 2011).

The Department of Labor's Occupational Safety and Health Administration (OSHA) issued a set of recommendations for late-night retail establishment, such as the improvement of visibility (by providing adequate lighting and installing mirrors), and keeping signs and shelves low. Keeping intruders under observation will discourage or impede criminal behavior, and at the same time

encourages legitimate users to keep a watchful eye on the surroundings. Greater visibility makes honest customers feel safer. The National Community Development and Crime Prevention Institute (2009) have set few guidelines for the use of informal surveillance in retail environments:

- Use of open style designs that maximize visibility.
- Use of a good illumination in building entrances, pedestrian paths and parking areas.
- Use of internal and external windows, as well as activity areas, to increase passive surveillance
- Watch for design features and lighting conflicts.
- Visibility of restroom doors from main pedestrian areas and away from exits.

These principles were developed for the design and the construction of new buildings. They can also be applied to the existing ones. Formal surveillance can supplement natural surveillance. Formal surveillance aims to produce a deterrent threat to potential offenders' deployment of personnel whose primary responsibility is security (e.g., police, security guards) or through the introduction of some form of technology, such as CCTV, to enhance or take the place of security personnel (Clarke, 1997, p.20). Natural (informal) surveillance and formal surveillance share the same aims. However, formal surveillance can be very expensive and it can also be hypothesized that these investments may make honest customers feel a negative impact toward the store environment.

The interest in studying the effect of surveillance on participants at the store level arises from the gap in the literature. Relatively little empirical research has evaluated the effectiveness of the natural surveillance at shopping centers (Lee et al., 1995; Overstreet & Clodfelter, 1995). Furthermore, many studies have pointed out the importance of surveillance (Kajalo & Lindblom, 2011).

The present study will assess effectiveness of informal surveillance in reducing fear and enhancing the feeling of safety in retail environment. The natural surveillance focuses on the study

of the height and set up of shelves. This will also include an analysis of the type of lighting. Crow (2000) suggested that lowering the shelves and increasing visibility can create a welcoming space and foster the customers' shopping experience. A well-lighted and clear design with no obstacles and no dead angles creates an attractive store to customers and also creates less opportunity for offenders to steal (Crow, 2000). Store layout, merchandising and the increased visibility measures are also seen as being obstacles for their intentions to steal (Tonglet, 2001). In other words, the retail interiors and atmospheric (lighting) play a significant role in preventing shoplifters from committing crime.

Lighting itself cannot prevent offenders' misbehaviors. However, it represents a powerful feature that retail management can use to control and reduce the "fear" and opportunity of crime. The inability for people to see and understand the surrounding is an obstacle to the feeling of safety. A good illumination for security does not necessarily mean bright lighting. Effective security lighting must allow people to identify the face from a distance up to 10 meters for a person with normal vision (CPTED Guide book, 2003). Providing an adequate lighting in public space is an imperative consideration from CPTED perspective. Light can enhance people's feeling of safety and can promote positive behaviors (CPTED Guide book, 2003).

The impact of retail design on customers

It has been largely acknowledged that consumers do not react solely to the product or service offered when making a purchase (Bohl, 2012). One of the most influential features is the place where the service occurred or product bought. Physical setting (opposed to the social environment) is considered as a tangible variable that can stimulate or detract customers in retail setting. The physical setting or the place atmosphere can be more influential than the product (Kotler, 1974).

Kotler was “the first to define and use the term Atmospheric “as intentional control and structuring of environmental cues” (Turley & Milliman, 2000, p. 193). By atmospherics, Kotler (1974) refers to conscious design and manipulation of environmental features to make people feel a certain way or "the effort to design buying environments to produce specific emotional effects in the buyer that enhance purchase probability" (Kotler, 1973, p. 50). For instance, to create a feeling of being in Italy, the Olive Garden chain of Italian restaurants purposely uses reproduction of Italian artifacts, colors, and so on, to let its customers escape the reality for a moment. Markin et al. (1976, p. 51) propose that:

“Via design features, attitudes and images are created; that is, store personalities are created and shaped, and these personalities friendly, upper-class, aloof, high quality, low priced, convenient, warm, inviting, cool, haughty, etc. - are in turn meant to affect customer attitudes and images and hence to shape behavior these attitudes and images affect questions of store choice and store loyalty ”

Numerous studies have been made to identify specific store environmental cues (e.g., lighting, music, etc.) that need adjustments, to mold consumers’ behaviors (e.g. spend more time in store) in order to increase sales (Bohl, 2012). The prime goal of most store designs is to create an enjoyable experience among customers in order to increase sales (Bohl, 2012). The effect of design environment on staff is also important matter, because staff satisfaction with the work place affects the quality of the service delivered. Baker (1987) has divided environmental cues in the store into 3 different categories: ambient factors, design factors and social factors as shown in table1. According to Baker (1987), ambient cues cannot stimulate consumers purchase decision when they simply meet their needs. However, extreme conditions (e.g. very low or high temperature) can create negative behaviors (Bohl, 2012). Design factors are defined as being aesthetic (color, material etc.) or functional such as layout and signage (Baker, 1987; Bohl, 2012). Social factors include the service personnel present in a customer environment (Bohl, 2012).

Berman and Evans have developed a more detailed classification of atmospheric variables by adding another category (Berman & Evan, 1995). This category includes building external characteristics such as surroundings and location. Turley and Milliman (2000) have also added “Human variables” as a fifth category (Bohl, 2012; Turley & Milliman, 2000).

Table1: Components of the physical store environment*

Design factors		Aesthetic -Architecture and style -Materials, decor -Scale and shape -Textures & patterns Functional -Layout -Signale -Accessories -Comfort
Ambient factor	Non visual and background conditions of the store	-Light -Air quality -Scent -Noise
Social factors		-Service -Audience (Presence of other customers)

*adapted from Baker, 1987, p80

We can then divide the service environment in two categories: tangible elements (artifacts and buildings) and intangible (music, temperature, color, scent, etc.) and all the elements that make up the service experiment (Hoffman & Turlet, 2002). In this study, we focus on store atmosphere and design in particular lighting and shelf height that affect customers’ perception of store image and consumers’ willingness to extend time spent in those premises. The position advanced here is that the physical and atmospheric surroundings are more important in service settings because customers often experience the firm’s facility.

Retail environments

The importance of retail environments in both the industry and the academics is highly recognized and researched (Reddy, Reddy & Azeem, 2011). Scholars have emphasized that there is a significant relationship between retail environment and consumer behaviors.

The possibility for interiors and designs to mold people's feeling and behaviors in creating a particular image is important for service businesses like banks, hospitals, retail stores and so on (Baker, 1987; Bitner, 1977; Booms & Bitner, 1982; Kotler, 1973; Shostack, 1977; Upah & Fulton, 1985). Retailers create retail environments in a way to mold both people's reactions and buying processes (Levy & Weitz, 2009). However, increasing sales may be the prime goal of most retail designs as stated by Kotler (1973, p. 50):

“Buying environments [designed] to produce specific emotional effects in the buyer that enhance his purchase probability”

The influence of environmental features on people's behaviors has been widely studied in the scientific literature. Several researches about this topic suggest that customers' perceptions of the service experience are strongly influenced by the place where the service is taking place.

Physical setting (opposed to the social environment) is considered as a tangible variable that can stimulate or detract customers in retail setting, compared to other variables such as price, advertising or the firm's service (Bitner, 1992). The role of the designed environment and atmospherics are important in service sectors where the environment is one of the few tangible components.

Retail environments communicate the stores' image and purpose to customers (Bitner, 1992). They can evoke emotional reactions (Donovan & Rossiter, 1982), impact the customers' ultimate

satisfaction with the service (Bitner, 1990), and even affect the amount of money and time spent in the store (Donovan, Rossiter, Marcoolyn, & Nesdale, 1994).

A fair number of publications have discussed environmental factors influencing consumers in shopping settings. Among these factors artificial lighting, the interior climate and the acoustic qualities of the space are very effective elements in this influence (Bitner, 1990).

Lighting research

There is no doubt that lighting affects human's physiology and psychology. It has been found that light wavelengths can affect humans' chemistry (Ott Biolight Systems Inc., 1997). Several humans' functions (e.g. cardiac rhythms, endocrine system, etc.) can be influenced by different types of lights. Depending on color temperature, time of exposure and light level, light may affect humans' biological clock (Morita & Tokura, 1998; Van Bomel, 2006; Rea, Figueiro & Bullough). Light may also have influence on humans' health, performance and well-being (Van Bommel & Van den Beld, 2004). Several scholars showed that lighting can influence mood (Kuller, Ballal, Laike, Mikellides, & Tonello, 2006; McCloughan, Aspinall, & Webb, 1999) emotions (Fleischer, Krueger, & Schierz, 2001) and perceptions (Houser & Tiller, 2003; Veitch J., Newsham, Boyce, & Jones, 2008) for lighting design in buildings and in office-environments.

Baron, Rea, and Daniels (1992) indicates that the high light level elicit positive effects, improve cognitive function, and increase social behaviors. These findings supported previous studies on the positive effect of high light level on behaviors. Other researchers have also shown positive effects of a bright light on people's well-being and performance (Ruger, Gordijn, Beersma, de Vries, & Daan, 2006; Badia, Myers, Boecker, & Culpepper, 1991; Kadia, Takahashi, & Otsuka, 2007). The exposure to bright light has a significant effect on subjective sleepiness, performance and slow eye

movements (Phipps-Nelson et al. 2003). Flynn, Spencer, Martyniuk, and Hendrick (1973) used a realistic interior conference room pictures and found that lighting provide more than necessary illumination level needed but also affect subjective evaluations of the environment, perceptual clarity and spaciousness. Moreover, Gifford (1988) indicated that people tend to communicate in bright lighted environments, whereas more intimate conversation occurred in soft light.

In this context, Areni and Kim (1994) study addressed the impact of lighting on functional aspects of the purchase process (i.e. the ability to examine merchandise) and on the perception of the store image. Their study took place in a wine store under two different lighting settings (bright and soft). Customers examined and handled more items under bright lighting than soft lighting. Contrary to their hypothesis, there was little or no effect of lighting on the amount of time couples spent in the cellar, but couples spent more time in the wine cellar than other types of customers.

Fleischer et al., (2001) found that customers felt more stimulated under higher color temperature lighting compared to warm white lighting. Furthermore, customers did indicate that they experienced the warm white lighting as more pleasant. Kenz and Kers (2000) showed in a two-way interaction between type of lamp and subjects' age on negative mood that age and gender interact with luminance and the color temperature of light.

The effect of retail lighting on consumer emotions

Literature in retail field studies shows that lighting is one of the major contributing tools of retail store atmospherics (Baker, Grewal, & Prasad, 1994; Baker, Levy, & Grewal, 1992; Boyce, Lloyd, Eklund, & Brandston, 1996; Rea, 2000).

Lighting is an important factor that greatly influences customers' well-being in retail settings. Several studies have shown positive effects of a high light level on people's well-being and performance (Ruger, Gordijn, Beersma, de Vries & Daan, 2006; Badia, Myers, Boecker & Culpepper, 1991; Kadia, Takahashi & Otsuka, 2007). Brighter lighting influenced shoppers to approach and handle more merchandise. However, illumination level did not affect the time spent at the display (Areni and Kim, 1994). Boyce et al. (1996); Cuttle and Brandston (1995) show that after the renovation of lighting in furniture and grocery store, both staff and customers expressed more positive response than did the previous conditions.

Summers and Hebert (2001) undertook another study using the M-R model to examine the effect display lighting has on approach – avoidance behavior. They investigate the amount of time spent at display, the number of items touched and the number of items picked up in two different lighting conditions. Ambient lighting only in the first setting and ambient lighting with display lighting in the second setting. They installed temporary lighting over displays and alternated the lighting each day from on to off. Consumer behavior was assessed using store video in a single store with a total of 2367 participants. The display lighting treatment creates different people's behaviors depending on the store type. Their study found that lighting influenced the length and level of consumer engagement with product.

Good quality lighting is achieved when the mood created is consistent with the function of each space, when the lighting provides spatial clarity, and when it promotes productivity (Rea, 2000). Rapoport (1982) states that the quality of lighting may influence people's emotional states and reveal different behaviors depending on the cultural context. Researchers agreed that lighting quality is not related only to quantity only. Instead it has been described as a multidimensional concept that consists of esthetic, biological, and psychological characteristics (Rea, 2000; Steffy,

2002). Lighting Researches showed that different color lighting influence the perception of store image and the pricing strategy (Babin, Hardesty & Suter, 2003). Light and color appearance influences significantly task performance, the feeling of comfort, and people's well-being (Flynn & Spencer, 1997; Karlen & Benya, 2004; Knez, 2001). The color rendering and color appearance are considered important factors in retail store environment (Park & Farr, 2007).

The National Lighting Product Information Program showed in a survey of lighting designers that color appearance and color rendering properties of light sources are the most important criteria among other light properties, including the luminous efficacy of the source (Rea, Deng & Wolsey, 2004).

Park and Farr (2007) have conducted a comparison study on the effects of lighting on retail participants' emotional states and behavior between Korean and U.S. participants. Their investigation assessed the mutual effects of color temperature, color rendering, and cultural differences in a neutrally-colored experimental setting. Each subject experienced four lighting conditions and was asked to complete a questionnaire for each of the four lighting conditions both inside and outside the lighter environment. Their findings support the influence of cultural background on the perceived lighting. American respondents preferred the higher CRI condition than Koreans. Moreover, the 5000K (higher color temperature) lighting was perceived more arousing than the 3000K (lower color temperature). Also, participants assessed the lower color temperature setting as more pleasant than the higher color temperature setting. Visual clarity was also rated higher for higher color temperature levels. Color rendering was also perceived as an important indicator. The US participants rated the high color (95) rendering setting as more pleasurable than the lower color rendering (75), unlike the Koreans who preferred lighting with the lower CRI.

Reddy R., Reddy N. and Azeem B., (2011) conducted a more recent research study reflecting the influence of in-store lighting on consumer satisfaction. Their study reflects that lighting impacts “the formation of in-store satisfaction in terms of enjoyment, satisfaction and choice confirmation” (p. 6). In other words, lighting attributes which enhance the store image contribute also to the store satisfaction.

Previous studies have been done on the effect of light intensity as a lighting factor (Areni & Kim, 1994; Babin, et al., 2003; Baker et al., 1994; Baker et al., 2002). The most studied lighting factor is the light intensity where respondents rated lighting according to two adjectives: bright or dim. Less research reflected the effect of light color temperature and color rendering on emotions and behavior in retail store through cross-cultural comparison (Park & Farr, 2007).

To the researchers’ knowledge, no empirical study addressed the effect of both different color rendering and color intensity light under two different shelf height on emotional state (arousal, pleasure and dominance) and behavioral intentions (approach-avoidance) in the retailing context and the feeling of safety.

To achieve good lighting in a retail store, the Illumination Engineering Society of North America (IESNA) recommends that the light source has a CRI between 100 and 80 “CRI rating above 80 are considered to provide good color rendering and are recommended for retail applications. Sources rating below 70 are not considered suitable for merchandizing” (ASSIST, 2010, p.7).

Shelving

The physical appearance of a firm’s premises can have a positive effect on customer attribution and satisfaction (Bohl, 2012). It has been shown that shopping interior cues have a positive effect on the level of participants’ excitement and on keeping participants in a mall

(Wakefield & Baker, 1998). The role of store display factors such as shelf space, product displays and wall decoration is important in retail strategies (Berman & Evans, 1995; Bohl, 2012; Levy & Weitz, 2009).

The term shelf space has been used to refer to all studies “that examine the effects of the amount of space allocated to a product, the effect of shelf location, or the effectiveness of product display” (Turley & Milliman, 2000, p. 197). Some studies investigating the effect of product display showed that products have a higher chance to be chosen if they benefit from a prominent display on the shelf, (Curhan, 1974; Wilkinson, Mason & Pakoy, 1982; Gagnon & Osterhaus, 1985). Gagnon and Osterhaus (1985) found that the point-of-purchase display increase sales of an ointment in both supermarket and pharmacies.

However, increasing shelf space does not lead to additional benefits (Curhan, 1973). Furthermore, in most product categories (but not all) the entrance point-of-purchase shelf increases sales (Dreze, Hoch & Purk, 1994). Stern (1962) investigated on how permanent display may be set up and used to influence two types of unplanned purchases. Few researches investigated on the effects of shelf height and space (Frank & Massey, 1970; Curhan, 1972, 1974; Wilkinson, Mason & Paksoy, 1982). Sigurdsson et al. (2009) confirmed that the product placement in shelf impact consumers’ buying behavior. They measured the percentage of units (potato chips) sold in three placements: high, middle and low shelf. The placement of potato chips on the middle shelf was associated with the highest percentage of purchases.

The way the product is displayed has also been seen as an important marketing tool. The display of yogurt (product under study), by brand for example, leads to increase sales of brands than if they were displayed by flavor (Simonson & Winer, 1992). This finding is more likely to happen with products which we often purchase (Inman, Winer & Ferraro, 2009).

Studies on the effect of in-store signage stating promotional price and information have been found to influence customers (Woodside & Waddle, 1975). Patton (1981) found that the amount of information displayed in store has a considerable influence on people's choice. Consumers prefer the product that displays the most information than the one which does not for two products that have the same quality (Patton, 1981). However, the literature review shows that there is lack of empirical studies which investigate the effect of shelf height on consumers' emotional states and behaviors in retail stores. Dreze et al. (1994) study reported that the shelf located slightly below eye level is the best shelf position.

Theoretical considerations

Emotions represent a key link between environmental stimuli and consumer behaviors (Bohl, 2012). However, emotions are difficult to verbalize and to recall (Donovan & Rossiter, 1982). A well-known "PAD" model argues that all human emotions elicited by consumer environment can be captured by three dimensions: pleasure, arousal and dominance (Mehrabian & Russell, 1974). These dimensions are conceptually orthogonal. However, the model suggests that the three elements are interrelated and affect each other (Mehrabian & Russell, 1974).

Extensive literature has demonstrated the validity of this model (PAD) in capturing people's emotions. In turn, emotions cause consumers' reaction in either approaching or avoiding an environment (Aubert-Gamet, 1997; Hutton & Richardson, 1995).

The Mehrabian –Russell Model

The theoretical model developed by environmental psychologists Mehrabian and Russell (1974; Mehrabian 1980; Russell & Pratt 1980) appears to be particularly valuable in studying the effects of store atmosphere on shopping behavior.

Environmental psychologists divided people's responses toward the physical environment into two distinct and opposite forms of behaviors: approach and avoidance (Mehrabian & Russell, 1974). The seminal framework of Mehrabian and Russell suggests that the environmental stimuli have an effect on approach and avoidance behaviors of people in the environment. Approach behaviors characterize one's affinity with a particular place like the desire to explore, stay and affiliate (Mehrabian & Russell, 1974). Avoidance behaviors, however, represent the opposite. Bitner (1992), Hoffman and Turley (2002), Mahrabian, and Russell (1974), Mehrabian (1976), Rossiter, and Donovan (1982), Yalch, and Spangenberg (2000, p. 140), divided these responses as follows:

Table 2: Approach avoidance in retail environment

Approach	Avoidance
A desire to stay physically	To get out of the environment
A desire to look around and explore the environment	A tendency to stay indifferent and not interact with the environment.
Willingness to interact with people in the environment.	Don't want to communicate with others.
The degree of enhancement and satisfaction with the task.	The degree or desire to impede a task.

Mehrabian (1976) states that:

"Human emotions are amenable to precise description, quantitative measurement, and statistical analysis. Environmental psychologists working under this assumption have provided a sound descriptive framework for emotions, which forms one of the crucial elements of the system that has been developed in order to evaluate whole environments and people's reactions to them" (p.9).

The largely known seminal model (Mehrabian and Russell's model, 1974) suggests that a particular environment stimulus causes certain emotional responses in an individual, which generate an approach or avoidance response. The emotional response or mood state is seen as the key mediator influencing environment-behavior relationships. The assumption is that positive internal response leads to approach behavior; whereas a negative internal response leads to avoidance behaviors (Bitner, 1992). Environmental psychologists assume that individuals' emotions determine their behavior and they also assume that different environments elicit different feelings that cause certain behaviors which, in turn, cause the individual to approach or avoid the environment to a greater or lesser degree (Mehrabian 1976).

The purpose of this study is to adapt the Mehrabian-Russell model to the retail setting and to test predictions from this model.

Approach and avoidance response in retail environment

Many scholars (Mehrabian & Russell, 1974; Russell & Lanius, 1984; Russell & Pratt, 1980) show in abundant literature that people respond to any kind of environment, natural or human-made, with two distinct types of emotions: pleasure-displeasure and arousal that express the amount of excitement. However, Russell, and Pratt 1980 claim that the dominance dimension should be deleted from the Mehrabian-Russell model and the two dimensions of pleasure and arousal can represent all individuals' emotions. Russell argues that dominance cannot be applicable in situation calling for emotions because it requires a knowledgeable interpretation by the individual.

Donovan and Rossiter (1982) found that store atmosphere can be represented by the primary emotional states of arousal and pleasure as shown in table 2. Emotional response recalls an attitude towards the purchase behavior. The feeling of pleasure, for instance, can encourage customers to spend more time in store and explore the settings, then spend more money, whereas unpleasant places are avoided (Donovan & Rossiter, 1982). Arousing environments are positively rated unless they are coupled with unpleasantness (Mehrabian & Russell, 1974). For example, too much arousal might have a negative influence. Like high stimulation places with so much noise and confusion (Bittner, 1992). In a crowded environment, perception of guards and personnel increases people's pleasure. Furthermore, many environmental cues, such as signage, adequate space and good ventilation may play a significant role in increasing perception of personal control (Hui & Bateson, 1991). Emotional feeling toward a place can be transferred to products and people in that environment (Maslow & Mintz, 1956; Obermiller & Bittner, 1984). In other words, products are rated higher in a pleasant store environment, but the same product has been seen downgraded in an unpleasant store (Obermiller & Bittner, 1984; Kaplan, 1987).

People respond to environments emotionally, physiologically and cognitively, followed by certain types of behaviors. Studies have shown that a mix of environmental cues influence people's behaviors, especially the physical surroundings. These features can be controlled by firms to enhance customers' attraction and their willingness to stay longer. Attraction is related to the exterior cues whereas staying longer is encouraged by positive emotional responses towards the interior setting.

Table 3: Approach-avoidance in retail environment

Behavioral dimension	Approach behavior	Avoidance behavior
Physical	Patronize store	Avoid store
Exploratory	Browse through merchandise	Look at minimum number of Items
Communication	Interact with sales personnel	Avoid interaction with Personnel
Performance and satisfaction	Repeat shopping in store frequently	Do not return to store

*adapted from Donovan and Rossiter (1982).

Mehrabian and Russell Model for this study

Several researchers have validated and applied the M-R model to store environment studies (e.g., Anderson, 1986; Dawson, Bloch & Ridgway, 1990; Golden & Zimmer, 1986).

Previous researchers analyzed retail shopping behavior using this framework and found significant relationships between emotional states and factors such as time spent in the store, the propensity to make a purchase (e.g., Dawson, Bloch & Ridgway 1990; Yalch & Spangenberg, 1993) and intention to visit the store again (Spangenberg et al., 1996).

The Mehrabian-Russell (M-R) model is based on the Stimulus-Organism-Response model (S-O-R). This paradigm established a relationship between the environment stimuli (S) and the response to the environment (R), by way of individuals' emotions (O). The Stimulus-Organism-Response model assumes that the individual's feelings determine his or her intended behavior.

Conceptual framework

The conceptual framework used in this study (see figure 6) is drawn from two major theories: Crime Prevention Through Environmental Design (CPTED), one of the most important

environmental design theories, and Mehrabian and Russell's model (1974). The Mehrabian and Russell's model, based on the verbal scale of emotions, represents one of the most reliable methods to measure emotions elicited by the near environment.

The literature review suggests that reducing crime and fear of crime can improve people's feeling of safety (Crowe, 2000; Schneider & Kitchen, 2002), which is an essential factor in retail environment. It has also been shown that integrating physical safety in the conception process rather than modifying the environment later can reduce design expenses in the long-term (Crowe, 2000; Neill, Rueda, & Savage, 2009)

Therefore, CPTED strategies offer good ways to create design that better deter crime and enhances the overall retail security. The feeling of safety and security can create a sense of well-being (Crow, 2000; El Hedhli et al., 2013; Glasson & Cozens, 2010) and then encourages people to spend more time and more money.

This framework will attempt to predict the collective effect of the shelves height, as well as the lighting stimuli in a retail environment, upon different people's feelings and behavior. Several researches demonstrated the effectiveness of formal surveillance (e.g. CCTV circuit and guards) as deterrent to crime according to both retail managers and shoplifters. However, it can enhance people's feeling of paranoia (Lin, Hastings & Martin, 1994).

It should be noted that this study will focus on natural surveillance from the customers' point of view. Informal surveillance is achieved by physical environment, designed in a way to allow a maximum of visibility and foster social interaction. Formal surveillance, however, relies mainly on security hardware, such as sophisticated CCTV surveillance system and security guards.

Natural or informal surveillance encompasses several strategies (e.g. open and well-lighted shopping environment). Little empirical research has evaluated the effectiveness of surveillance at shopping centers in recent years (Overstreet & Clodfelter, 1995; Lee et al., 1995, Kajalo &

Lindblom, 2011). Previous research has focused solely on the effectiveness of surveillance in deterring and reducing crime rates.

This study seeks to evaluate the objectives and effectiveness of the natural surveillance (a key component of CPTED theory) on people's feeling of safety in retail environment. It implies that the feeling of safety does impact positively retail shopper's experience. Customers cannot experience entertainment in a climate of fear. "An unsafe mall cannot be a suitable place where community residents congregate and feel connected to one another." (El Hedhli et al., 2013). Enhancing safety features can contribute considerably to shoppers' well-being at shopping centers by offering a public place for leisure and experience a sense of community. Moreover, enhancing well-being in the consumer, social, leisure, and community life domains serves to increase overall life satisfaction (Hedhli et al., 2011).

This study puts forward two design cues as influencing participants' feeling of safety, emotional states and behavioral intentions: Shelves height, color rendering and brightness of light. It is expected that respondents will be aroused, pleased by specific lighting conditions and that shelves height will also influence emotions as well as approach behavior, such as increasing the length of stay and purchasing behaviors.

The specific objectives of this study is to explore the effect of different light intensity, color rendering factors and shelves heights on emotions and behavior that enhance consumers' purchasing behaviors and emotional states and also induce a sense of safety

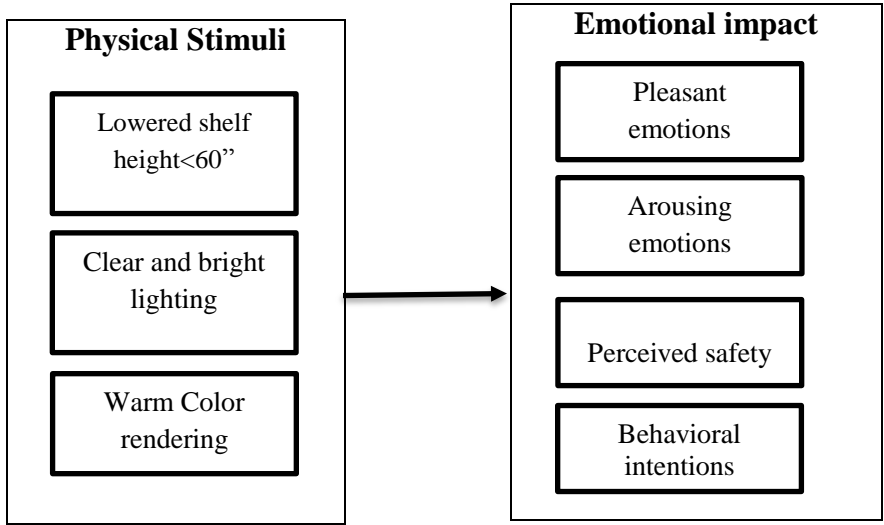


Fig.4: Conceptual framework.

CHAPTER 3: METHODS

The purpose of this study is to investigate the effect of shelf height, store lighting intensity and light color rendering on participants' emotions, feeling of safety and. It has also been hypothesized that low shelf height, bright light intensity and cool color lighting will enhance participants' approach behavior.

Model

The Mehrabian-Russell model (M-R) has been adjusted to the retail setting to test predictions from this model in relation to store setting. By applying the M-R model to the retail setting it has been predicted that participants will spend more time and perhaps make more purchases in those retail atmospheres which evoke positive emotions, such as shopping enjoyment, spending of time, exploration of the store.

The M-R model is used to examine the effects of design factors (shelf height, lighting intensity and light color rendering) on consumers' emotions and behaviors (Fig. 8). In this framework, physical stimuli refer to variables cited by CPTED as important factors to create a secure and safe environment, such as low shelves height and overall store lighting.

Selection of participants

The hypotheses were tested in a population composed of 61 undergraduate and graduate students enrolled at Oregon State University. The sample is appropriate for this study because young adults are among the primary target markets for the retail formats under consideration. An

arrangement was made with the professors from the three classes to solicit students to voluntarily participate in the study.

The aim of this study was to help designers understand users' (non-designers') emotions and preferences. Therefore, participants who might have a prior knowledge in design and lighting fields, such as architecture and design, and individuals who worked as professionals in those fields were excluded from this study because designers perceive the environment differently from non-designers (Gifford, 2002). The color perception ability is an important requirement for participants in this study. All subjects were asked if they "have any visual impairment that cannot be corrected by eyeglasses or contact lenses." The data collection started after obtaining permission from the Institutional Review Board to use human subjects (Appendix D).

Rationale for Experimental Settings

The store shopping experience was simulated using 3D-computer drafted images of an electronic store. To create a situation as realistic as possible, pictures were drafted using the modeling 3D studio 10 software, and rendered using the Photoshop software. The electronics store was used for two reasons. First, it contains valuable items which attract shoplifters. Secondly, participants expect to feel safe in an electronics store because they plan to spend a lot of time and money in those places. Created photographic slides have been seen as a valuable tool to study environment stimuli among people.

"The use of photographic simulations rather than actual environments was not only convenient but insured that subjects were responding to exactly the same stimulus. Moreover, available evidence indicates that simulations, especially if they include visual input, provide a surprisingly good approximation to actual environments." Russell & Pratt (1980, p. 320).

Furthermore, Batson and Hui (1992) demonstrated that the photos, videos and quasi-field experiments produce data that are similar in terms of quality and dynamics. Hendrick et al. (1977)

have investigated the effect of environmental lighting on people's feeling and behaviors, substituting slides of the lighting arrangements for the real lighting arrangements in demonstration rooms (Flynn et al., 1973). Using slides simulation has been seen as a valid tool to study actual environments (Hendrick et al., 1977). Chayutshakij (1998) has also used pictures of the same interior space with different lighting conditions to assess consumer retail lighting preferences based on Kaplan's environmental preference theory (1984).

In this study, eight images showing an electronic store were used as stimuli. Restriction of data collection to one retail store has been seen by Tai and Fung (1997) to increase the accuracy of results. Each picture coincided with a different condition (see table 4), and it includes a display section of electronic products such as DVDs and laptops. The pictures do not include any motions or human activity which could influence the subjects' judgments. These images were shown in a randomized succession to account for order effects.

Lighting and shelf conditions

The lighting condition used in this study was inspired by previous studies and lighting guidebooks for retail settings (IESNA, 2000; Rea & al., 2008; ASSIST, 2010). The color temperature of a lighting source commonly represents the actual color of the light that deviates from neutral. Cool color has higher color temperatures and emits bluer light, and lower color temperatures (warm) appear reddish or yellowish (The Illumination Engineering Society of North America, IESNA, 2000). For this study, the color temperature of 3,500K was selected for "warm" color temperature that emits yellowish color. Higher color temperature of 5,000K was selected for the cool color that emits bluish color. Fluorescent light is usually the most used for their energy efficiency (use rare-earth phosphors) and their good color rendering ability (Gordon, 2003).

The inclusion of shelf height in this study was inspired by recent studies in crime prevention literature which explore ways of creating and maintaining store environments that promote sales and minimize theft opportunities at the same time. Lowered shelf and fixture height, less than 60 inches tall, has been seen as a means of improving natural surveillance (Cardone, Carmel-Gilfilen, & Hayes, 2007).

Materials and furniture were used to simulate a store setting in matte finish, gray and black materials. A lightly colored wood was used as material in the shelf and floor to replicate a light instead of a dark color to avoid distracting respondents. The display is balanced in terms of color, presenting both warm and cool colors without any strong emphasis on either one (Park & Farr, 2007).

Table 4: The eight different conditions

	High shelf		Low shelf	
Intensity	Cool	Warm	Cool	Warm
Bright	<p>A</p> <ul style="list-style-type: none"> - Cool color - Bright light - High shelf 	<p>C</p> <ul style="list-style-type: none"> - Warm color - Bright light - High shelf 	<p>E</p> <ul style="list-style-type: none"> - Cool color - Bright light - Low shelf 	<p>G</p> <ul style="list-style-type: none"> - Warm color - Bright light - Low shelf
Dim	<p>B</p> <ul style="list-style-type: none"> - Cool color - Dim light - High shelf 	<p>D</p> <ul style="list-style-type: none"> - Warm color - Dim light - High shelf 	<p>F</p> <ul style="list-style-type: none"> - Cool color - Dim light - Low shelf 	<p>H</p> <ul style="list-style-type: none"> - Warm color - Dim light - Low shelf

Several resources and previous lighting researches (Flynn et al. 1973; Park & Farr, 2007) helped to realize a realistic store lighting (Karlen & Benya, 2004; Rea, 2000; Russell, 2009). Two different shelf conditions depicted their relative height: High shelf height (6 feet height) that impede

one's view and low shelf height (3 feet height) that allows the view of the retail surroundings. The 3D created retail environments are shown in 8 different slides shown below:



Slide 1: bright and cool lighting in high shelf height condition (A)



Slide 2: Dim and cool lighting in high shelf height condition (B).



Slide 3: bright and warm lighting in high shelf height condition (C).



Slide 4: Dim and warm lighting in high shelf height condition (D).



Slide 5: bright and cool lighting in low shelf low condition (E).



Slide 6: Dim and cool lighting in low shelf height condition (F).



Slide 7: Bright and warm lighting in low shelf height condition (G).



Slide 8: Dim and warm lighting in low shelf height condition (H).

Procedure

The data collection instrument for this study was an online survey (see appendix B). Invitation email including URL for the web page was sent to students enrolled at Oregon State University. A reminder was emailed seven days after the invitation during October, November and December 2013.

Prior to the start, survey participants began by having some information related to the research study and the survey in an informed document. The survey questionnaire was composed of two sections. The first part consists of completing demographic information such as age, gender and ethnicity. This section has excluded the inclusion criteria, such as visual impairment and previous lighting knowledge and also determined the relationship of the study variables and the participants' background information.

The second part of the survey presented a questionnaire which included 8 parallel slides of a simulated interior store to identify the effect of shelf height, light intensity and light color on respondents' emotional states and behaviors.

The computer-drafted stimuli had the same point of view. Each visual stimulus was placed on a different slide followed by questionnaires composed of eight questions (after each picture) to be completed by the respondents. Each subject has expressed his/her emotional reaction to each situation. The main purpose of this procedure is to determine how emotional states and environmental descriptors are correlated in identical situations.

The participants were asked to "take about a moment to get into the mood of the situation, and then respond to the same four questions about how you would feel or act as a customer in that photographed store". The first question was meant to measure subjects' emotions (pleasure and arousal), using a semantic differential scale of emotions (7 for pleasant and 1 for unpleasant). The first survey question was "Put a check mark to express which adjective describes the most your feelings."

Pleasure and Arousal were measured with a set of items derived from the Mehrabian & Russell model (1974) and slightly adapted by Donovan and Rossiter (1982) to fit the context of shopping environment. The Pleasantness was measured using four adjective pairs (Mehrabian & Russell, 1974): pleasant-unpleasant, comfortable-uncomfortable, repelling-inviting, cheerful-gloomy. Arousal was measured using the following adjective pairs: stimulated-relaxed, alert-peaceful, interesting-uninteresting, and awake-sleepy. Three items evaluated by 7-point Likert scale, measured Approach –avoidance (Donovan & Rossiter, 1982; Foxal & Greenlay, 1998; Mehrabian & Russell, 1978): 1 for "strongly disagree" and 7 for "strongly agree". The items measuring approach-

avoidance behaviors were focused on the following behaviors: revisit the store, spending more time and the shopping satisfaction. The items evaluated are the following:

- I would come back to this store whenever I need electronic equipment.
- Shopping at this store is appealing.
- I would stay longer in this store.

The item measuring respondent's feeling of safety was adapted from the retailing literature (e.g., Bellenger, Robertson & Greenberg, 1977; Chebat, Sirgy & St-James, 2006; El Hedhli & al., 2013). Safety was measured on a 7 point scale ranging from (7—Very safe; 1—Not at all safe). Respondents were asked to rate their level of safety in each retail setting created for this study as follows "I feel safe shopping in this store."

The qualitative section of the survey included an open-ended question designed to collect more information on the subjects' emotions in different settings. The question was: "Are there any other feelings that you want to describe about this retail store interior?"

A pilot study was conducted with four female students. This procedure was used to test the measuring instrument prior to conducting the survey and to estimate the time needed to complete the questionnaire.

Analysis

All data collected from the experiment settings was analyzed in three steps. The first step evaluated the semantic differential scales. Pleasantness and arousal were measured using a seven point semantic differential scale of emotions. All items were rated on a numerical scale of "1" to "7". The scores ranging between one and seven referred to the positive emotions (pleasantness and arousal) the degree of pleasantness increases as the number value increases and it increases as the

number decreases (Mehrabian & Russell, 1974). The data was analyzed using variables' mean scores and standard deviation for each variable, through the use of the "R" statistical software.

The second step measured respondents' behavioral intentions: approach-avoidance and the perceived safety (as a form of behavioral intention). For that, the average responses to Likert scale questions has determined participants' approach-avoidance for each stimulus. Means and standard deviations were obtained. For the three dependent variables including arousal, pleasure, and behavioral intentions (Approach-avoidance and perceived safety).

A 2 x 2x 2 within subjects design with repeated measures design was used to test the effect of 3 explanatory variables (shelf height, lighting intensity, lighting color) and their interactions on the 3 separate evaluation measures (arousal, pleasure, and avoidance-approach). Because multiple measures were conducted with each individual, analysis needed to account for any lack of independence introduced by repeated measures. The 2x2x2 within subjects design was used to test for main and interaction effects and to account for the autocorrelation (lack of independence) within subject. The shelf height was compared at two different levels, high and low. The light intensity variable was compared at two different levels, bright and dim. The color temperature variable was also compared at two different levels, warm and cool color temperature.

Chapter 4

Findings

This chapter presents findings for each of the variables. It starts with participants' demographic characteristics followed by findings from a mixed model repeated measures analysis of a 2x2x2 within subjects design of 3 independent variables: lighting intensity, color rendering and shelf height on each response variable. A p value of 0.05 was used to assess statistical significance.

Participants characteristics:

A total number of 115 participants, aged 18 and over, volunteered in the survey. Twenty two (22) participants were invited to exit the survey because they did not meet the requirements to participate. Nine (9) participants with visual impairment and thirteen (13) participants with prior knowledge in lighting were excluded from the survey. After leaving out the uncompleted data, responses gathered from sixty one (61) participants who met the requirements were used in this study. The average age of participants was 29.48 ranging from 18 to 67 years old, 90.32% of the sample was below the age of 30 and predominately females (72.58 %).

Table 5: Characteristics of the participants:

Age group	n (%)	Female	n (%)	Male	n (%)
18-21		15	(24.59%)	5	(8.19 %)
22-25		10	(16.39%)	6	(9.83 %)
26-30		5	(8.19 %)	1	(1.66 %)
Over 31		15	(24.59%)	3	(5.00 %)
Total	61 (100%)	45	(73.77%)	16	(26.22%)

Reliability of measures:

The Cronbach's alpha test was performed to evaluate the internal consistency of scales, measuring the variables of pleasure, arousal, behavioral intentions and the feeling of safety. Results from Cronbach's alpha test for each of the eight conditions under study are shown in table 6.

The measure of pleasantness comprised the following adjective pairs: pleasant-unpleasant, comfortable-uncomfortable, repelling-inviting, cheerful-gloomy. The scale reliability coefficient for this construct was at the acceptable value of 0.90. Similarly, arousal scale has been measured with four bipolar adjectives: stimulated-relaxed, alert-peaceful, interesting-uninteresting, awake -sleepy. The scale of reliability coefficient for this variable has an acceptable internal consistency of 0.80.

The approach-avoidance was assessed using the level of agreement with three contentions: "I would come back to this store whenever I need electronic equipment;" "Shopping at this store is appealing;" and "I would stay longer in this store." The reliability scale had a good internal consistency at the level of 0.94. For each response variable (pleasure, arousal, arousal and Safety scores) a mixed model analysis of the main effects were conducted to determine the effect of the independent variables and their interactions on the response scores. In addition to the factorial structure, an appropriate correlation structure was chosen to account for the within subject dependence.

Table 6: Reliabilities of Scales for Cronbach Alpha coefficient.

Measure	A Cool Dim Low	B Warm Dim High	C Warm Bright Low	D Warm Dim Low	E Warm Bright High	F Cool Dim High	G Cool Bright Low	H Cool Bright High	Total
Pleasure state	0.74	0.88	0.90	0.96	0.96	0.92	0.92	0.95	0.90
Arousal state	0.96	0.78	0.67	0.82	0.85	0.71	0.79	0.85	0.80
Behavioral intention	0.96	0.90	0.94	0.97	0.96	0.94	0.96	0.95	0.94

Pleasure state:

A mixed model analysis of variance revealed significant differences between mean effects of the three independent variables (Light intensity, light color rendering and shelf height) on the pleasure state. Table 7 represents the mean and standard deviation scores for each variable. Light color, light intensity and shelf height variables reached a statistical significance respectively at $F(1, 59) = 39.05, p < 0.0001$; $F(1, 59) = 125.55, p < 0.0001$ and $F(1, 59) = 51.19, p < 0.0001$.

Table 7: Mean and standard deviation for respondents' evaluations for pleasure state

Condition	A Cool Dim Low	B Warm Dim High	C Warm Bright Low	D Warm Dim Low	E Warm Bright High	F Cool Dim High	G Cool Bright Low	H Cool Bright High
Mean	14.63	9.9	19.28	13.92	14.85	13.5	21.28	18.03
SD	5.73	4.85	5.27	5.17	5.70	4.18	4.88	5.43
N	61	60	60	60	60	60	60	60

Statistical significant two-way interactions, color by height ($F=4.54, p = 0.0372 < 0.05$) and intensity by height ($F=5.76, p = 0.0196$) were obtained. As shown in table 8 below, under low shelf height participants perceived the cool light as more pleasant ($M = 21.18, SD = 4.88$) than warm light ($M= 19.28, SD = 5.27$).

Table 8: Mix model analysis of variance for the effect of light color, intensity and shelf height on pleasure emotional state.

Effect	DF	Df	F	P value
Color	1	59	39.05	<.0001*
Intense	1	59	125.55	<.0001*
color*intense	1	59	0.24	0.6282
Height	1	59	51.19	<.0001*
color*height	1	59	4.54	0.0372*
intense*height	1	59	5.76	0.0196*
color*intense*height	1	59	1.47	0.2305

*p value <0.05

Similarly, in settings with high shelf the cool light ($M= 18.03$, $SD = 5.43$) is rated as more pleasing than warm light ($M=14.85$, $SD = 5.70$). Regardless of the shelf height, the cool and bright light has been rated as the most pleasing (see figure 6).

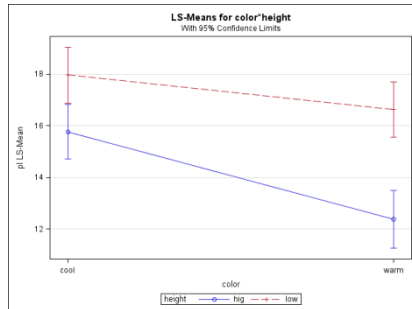


Figure 6: interaction effect of light color by shelf height on respondents' pleasure state.

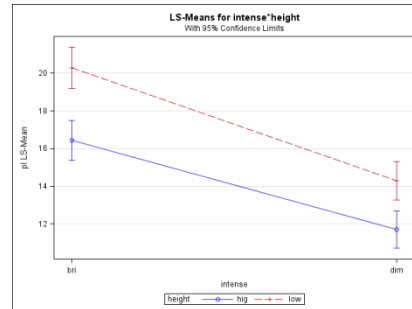


Figure 7: interaction effect of light intensity by shelf Height on respondents' pleasure state.

Arousal state:

Significant differences for the main effect of light intensity, light color rendering and shelf height have been registered. Correlated color temperature was significant statistically with $F(1, 59) = 27.71$, $p < 0.0001$. Regardless of the shelf height or light intensity, respondents rated the cool color lighting as more arousing than warm color lighting as can be seen in table 10.

Table 9: Mean and standard deviation for respondents' evaluations for arousal state.

Condition	A	B	C	D	E	F	G	H
	Cool	Warm	Warm	Warm	Warm	Cool	Cool	Cool
	Dim	Dim	Bright	Dim	Bright	Dim	Bright	Bright
	Low	High	Low	Low	High	High	Low	High
Mean	15.8	10.83	18.08	13.73	15	13.46	20.28	16.06
SD	5.19	4.54	4.56	4.94	4.67	3.87	4.73	4.38
N	61	60	60	60	60	60	60	60

The Shelf height variable reached a statistical significance at $F(1, 59) = 48.28$ and p value < 0.0001 . Under low shelf, respondents perceived the overall lighting condition as more arousing than under high shelf (see table 9).

Table 10: mix model analysis of variance for the effect of light color, intensity and shelf height on Arousal state.

effect	DF	Df	F	P value
color	1	59	27.71	$<.0001^*$
intense	1	59	93.98	$<.0001^*$
color*intense	1	59	0.75	0.3889
height	1	59	48.28	$<.0001^*$
color*height	1	59	0.15	0.7044
intense*height	1	59	4.17	0.0457*
color*intense*height	1	59	2.06	0.1562

* p value < 0.05

A two way interaction intensity by height was also significant with $F(1, 59) = 4.17$, $p < 0.045$. As shown in figure 8, participants perceived the Settings G, low shelf with cool and bright light as more arousing ($M = 20.28$) than the setting H (high shelf with cool and bright light ($M = 16.06$, $SD = 4.38$)). Similarly, this applies to the two settings with dim light. Condition A- low shelf with cool and dim light ($M = 15.8$, $SD = 5.19$), is more arousing than condition F- high shelf with cool and bright light ($M = 13.46$, $SD = 3.87$).

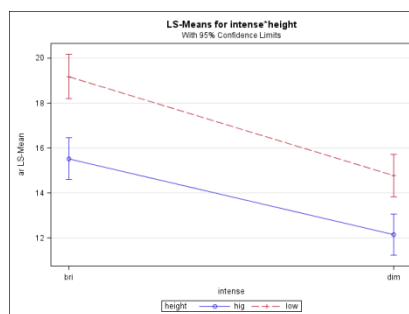


Fig 8: interaction effect of light intensity by shelf height on respondents' Arousal state.

Behavioral intentions:

Significant differences for the main effect of light intensity, light color rendering and shelf height have been registered. Shelf height variable reached a statistical significance at $F(1, 59) = 38.58$ and p value < 0.0001 . Under low shelf, respondents perceived the overall lighting condition as more approachable than under high shelf.

Table 11: Mean and standard deviation for respondents' evaluations of Approach-Avoidance state

Condition	A Cool Dim Low	B Warm Dim High	C Warm Bright Low	D Warm Dim Low	E Warm Bright High	F Cool Dim High	G Cool Bright Low	H Cool Bright High
Mean	10.6	8.03	13.63	10.03	10.78	10.51	16.01	12.98
SD	4.18	4.27	4.16	4.32	4.73	3.79	3.93	4.43
N	60	60	60	60	60	60	60	60

Correlated color temperature and light intensity were also statistically significant with respectively $F(1, 59) = 38.58$, $p < 0.0001$ and $F(1, 59) = 94.43$, $p < 0.0001$. Respondents rated the cool color temperature as more approachable than the warm light. Furthermore, the bright lighting was seen as being more approachable than the dim lighting.

Table 12: mix model analysis of variance for the effect of light color, intensity and shelf height on Behavioral intentions.

effect	DF	Df	F	P value
color	1	59	38.58	<.0001*
intense	1	59	94.43	<.0001*
color*intense	1	59	1.15	0.2879
height	1	59	31.02	<.0001*
color*height	1	59	1.22	0.2731
intense*height	1	59	17.18	0.0001*
color*intense*height	1	59	4.29	0.0427*

*p value < 0.05

Three way interaction color by intensity by shelf height (low) was obtained with $F(1, 59) = 4.29$ and $p < 0.005$. As shown in figure 7, participants rated (condition 7) the cool, bright lighting and low shelf height ($M = 16$, $SD = 3.93$) as more approachable than (condition 1) cool, dim lighting with low shelf height ($M = 10.6$, $SD = 4.18$). Bright light has also been positively rated for both color temperatures of light, unlike dim light. However, the interaction intensity by color by shelf height was not significant under high shelf height.

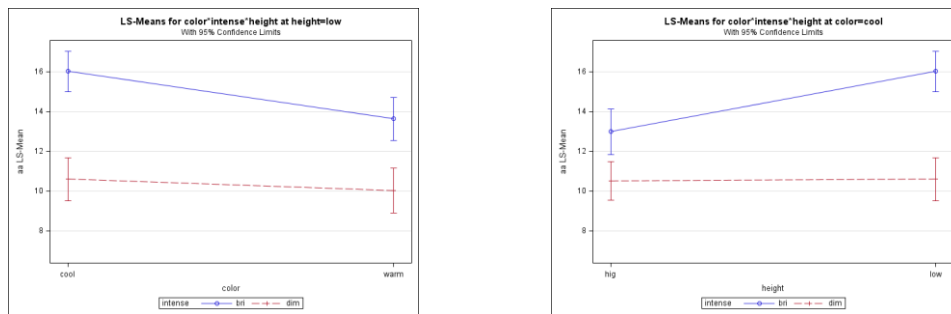


Fig 9: Interaction effect of light intensity by light color by shelf height on respondents' Behavioral intentions state.

Safety feeling:

A mix model analysis of variance was used to assess the interaction effect of shelf height, light intensity and light color rendering on subjects' feeling of safety.

Table 13: Mean and standard deviation for respondents' evaluations for Safety state

Condition	A	B	C	D	E	F	G	H
	Cool	Warm	Warm	Warm	Warm	Cool	Cool	Cool
	Dim	Dim	Bright	Dim	Bright	Dim	Bright	Bright
	Low	High	Low	Low	High	High	Low	High
Mean	3.06	2.21	4.06	2.88	3.46	3.03	4.96	3.91
SD	1.28	1.02	1.51	1.26	1.52	3.23	1.56	1.47
N	60	60	60	60	60	1.25	60	60

Table 13 represents mean and standard deviation gathered for each one of the eight pictures used as stimuli. Shelf height variable reached a statistical significance at $F(1, 59) = 21.6$ and p value < 0.0001 . Under low shelf, respondents perceived the overall retail condition as safest compared to high shelf condition.

Table 14: mix model analysis of variance for the effect of light color, intensity and shelf height on safety.

effect	DF	Df	F	P value
color	1	59	43.53	$<.0001^*$
intense	1	59	94.28	$<.0001^*$
color*intense	1	59	0.14	0.7136
height	1	59	21.6	$<.0001^*$
color*height	1	59	0.81	0.3732
intense*height	1	59	15.02	0.0003*
color*intense*height	1	59	10.56	0.0019*

* p value < 0.05

Correlated Color temperature and light intensity were also statically significant with respectively $F(1, 59) = 43.53$, $p < 0.0001$ and $F(1, 59) = 94.28$, $p < 0.0001$. Respondents rated the cool color temperature ($M = 4.96$, $SD = 1.56$) as safer than the warm light ($M = 4.06$, $SD = 1.51$).

Correlated color temperature and light intensity were also statically significant with respectively $F(1, 59) = 43.53$, $p < 0.0001$ and $F(1, 59) = 94.28$, $p < 0.0001$. Respondents rated the cool color temperature as safer than the warm light. Bright lighting was perceived safer than dim lighting.

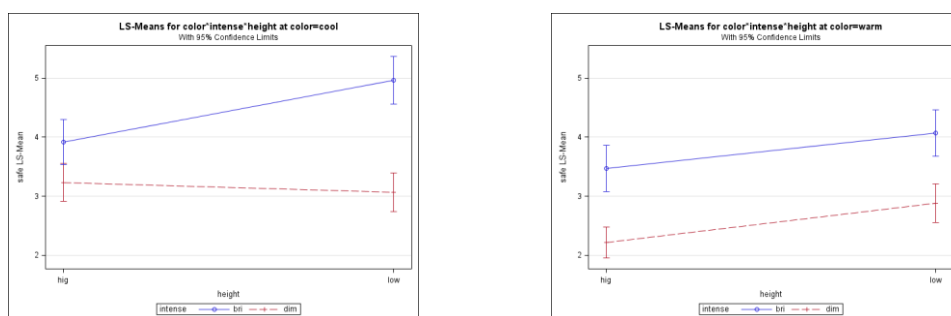


Fig 10: interaction effect of light intensity by light color by shelf height on respondents' feeling of safety.

Three-way interaction color by intensity by shelf height (low) was also significant with $F(1, 59) = 10.56, p = 0.0019 < 0.05$ (figure 10). Participants responded ($M = 4.96, SD = 1.56$) that they feel safer shopping in the store with low shelf, bright and cool color light (condition G) compared to condition H (high shelf, bright and cool lighting) ($M = 3.91, SD = 1.47$). However, under dim lighting, shelf height and light color rendering did not exhibit any significant difference along the two (2) conditions: cool/low and cool/high $F(1, 59) = 0.81, p = 0.3732$.

Taken together, the presence of the three environmental variables (cool light, bright light and low shelf height) is seen as being more pleasing and more arousing and has a positive impact on respondents' approach behaviors.

Chapter 5

Discussion and Conclusion

The purpose of this chapter is to present the summarized findings of the results for the pleasure, arousal, approach-avoidance and safety feeling variables. The results for the variables are reviewed with the research questions asked in chapter one, with previous research findings and with the research methodology developed in the third chapter. Furthermore, limitations and recommendations for future research are also presented.

State of pleasure:

Results related to respondents' pleasure state showed that the shelf height, light color temperature and color intensity had a significant effect. Respondents rated the setting with low shelf height as more pleasing compared to high shelf height. This result supported hypothesis 1. Settings with low shelf height elicited more pleasant-arousing emotions, such as feeling stimulated, awake and peaceful. Furthermore, qualitative data supported these findings.

Participants' pleasure states were also affected by the light color temperature and light intensity. Respondents rated the bright, cool lighting as the most pleasurable situation while the low intensity lighting and the warm color light as the least pleasurable. These results supported hypothesis 4 and 7. Setting with bright and cool lighting elicited more positive (pleasant-arousing) emotions compared to other settings.

These findings showed that the light color rendering, light intensity and the shelf height, as environmental stimuli, affect participants' pleasure state as suggested by the proposed model. This relation between the three (3) environmental dimensions and participants' pleasure states also

confirmed the accuracy of the Mehrabian-Russell model (Donovan & Rossiter, 1982). This model argues that the environmental settings affect the emotional states of pleasure, arousal and approach-avoidance.

Arousal State

Results showed that the shelf height, light color temperature and color intensity had a significant effect on the arousal emotional state. Participants' emotions were affected by the shelf height. Based on significant p value from a mixed model repeated measures analysis, hypothesis 1 was supported. Participants' responses for the settings with low shelf height exhibited more arousing emotions compared to the settings with high shelf height, regardless of the light color and light intensity. This conclusion also supports previous literature done on shelf height and its effect on people's emotions. Crow (2000), Carmel-Gilfilen and Arch (2011) advanced that lowering the shelf height and increasing visibility can create a welcoming space and foster customers' shopping experience.

Moreover, the manipulation of the light color temperature and its intensity yielded statistically different results. People felt more aroused in the settings with cool lighting compared to the settings with warm light. Bright lighting was also seen as more arousing than dim lighting. These results support previous scholars, who indicated that the cool and bright light is more arousing than the warm condition (Areni & kim, 1994; Baker & al. 1992; Flynn, 1977; Park & Farr, 2007, Summers & Hebert, 2001). Flynn (1997), Park and Farr (2007) studies suggested that respondents were more aroused in the cool and bright light source.

The cool and bright lighting has been rated as the most arousing condition while the warm dim lighting has been seen as the least arousing one. These results support Flynn's (1977) and Park et al. (2007) findings which show that the cool and bright lighting is the most arousing lighting condition.

Previous literature on retail store lighting indicated that the arousal state is influenced solely by the high light intensity (Areni & Kim, 1994; Baker, et al., 1994; Summers & Hebert, 2001).

These results align also with the conclusions of Donovan, et al. (1994) study, which tested the M-R model to predict the effects of the color quality of light on emotions (pleasure and arousal) in a retail store setting.

Behavioral intention:

Respondents' behavioral intentions were significantly affected by different lighting intensities, different color temperature and shelf height. Results showed that participants' approach responses were significantly affected by the light intensity. Participants perceived the bright light as more approachable than dim light. Similarly, with the light color rendering, settings with cooler color temperature were seen as more approachable than settings with warm light.

These results align with previous research on the effect of light as environmental cue on peoples' emotions and behaviors, (e.g., Areni & Kim, 1994; Donovan & al., 1992; Park & Farr, 2007). Cool light has a positive influence on consumer's behaviors (Summers & Hebert; 2001). The 5000K (cool) lighting is also perceived as being significantly better for visual clarity compared to 3000K (warm) lighting (Park & Farr, 2007).

Moreover, a lower shelf height has been rated as more approachable than a higher shelf height. Respondents answered under low shelf, bright and cool lighting that they would spend more time and would come back whenever they need an electronic item. These findings support a fair number of publications on retail store environment. Summers and Hebert (2001) found that lighting influenced the length and level of consumer engagement with product.

This connection between the environmental variables (light intensity, color rendering index and shelf height) and participants' approach behavior intention confirmed the M-R (1974) model, which suggests that the environmental stimuli have an effect on approach and avoidance behaviors of people in the environment (Donovan & Rossiter, 1982).

In sum, lighting and store fixture height can change how people perceive and experience retail environments. Shoppers tend to return to the store more frequently in the conditions underlined in this study (low shelf height, cool color light and high intensity light).

Safety feeling:

The overall findings confirm that the retail environment can enhance or detract customer's feeling of safety. Respondents rated settings with low shelf and clear space as safer than the obstructed and dark space (dim light). These interior features have been cited by previous literature as being important in deterring crimes (Carmen-Girfilen, 2011; Cozens et al., 2005; Crowe, 2000; Schneider & Kitchen, 2002; Reynald & Elffers, 2009).

As expected, visibility is an important variable; darkness represents automatically the possibility of an unsafe environment (Loewen & al., 1993). Lighting was considered as the most important safety feature. Under dim light, the two other variables become irrelevant. However, the combination of bright light, cool color temperature light and low shelf height was seen as safest. The cooler light received high ratings for visual clarity (Park & Farr, 2007).

These results agree with crime prevention literature, which indicates that the appropriate lighting can enhance occupants' feeling of security because it reduces dark and hazardous areas (Carmel-Gilfilen, 2011; Crow, 2000; Kajalo & Lindblom, 2011). An important literature has argued

that lowering the shelves and increasing visibility can create a welcoming space and foster the customers' shopping experience (Atlas, 2004; Carmel-Gilfilen, 2007; Carmel-Gilfilen & Arch, 2011; Tonglet, 2001; Cardone, 2006; Crowe, 1991). A well-lighted and clear design, with no obstacles and no dead angles, creates an attractive store to customers and also creates less opportunity for offenders to steal (Carmel-Gilfilen, 2007; Carmel-Gilfilen & Arch, 2011; Crow, 2000; Tonglet, 2001).

This study showed the importance of lighting and fixture height in perceived safety and their relative impact on subjects' behavioral intentions. Previous research also showed that design cues increase consumers' perception of favorable shopping in brick and mortar contexts (Eckman et al., 1990; Gutman & Alden, 1985; Marsh, 1999; Mazurasky & Jacoby, 1985). These results suggest that approach behavior would be related to emotional state of pleasure, arousal and feeling of safety.

Limitations:

There are few limitations that may have affected participants' responses. First of all, this study has been conducted using slides of a simulated space which may affect participants' responses. This fictitious and unnatural setting may have influenced some of the responses (Hantula et al., 2005). An actual store might produce different results and would create a more comprehensive data. Previous researchers found that shopping experience is more complex than the visual aspect, and includes other environmental stimuli, such as olfactory cues, auditory cues, social factors and other variables that influence consumers' responses (Floor, 2006). Furthermore, it was not possible to control respondents' environmental settings. Difference in light surroundings and screen characteristics might have influenced their emotional responses during the survey.

Moreover, the limitations on sample characteristics may have influenced results. The majority of subjects were females (73.77%) between the ages of 18 and 45, and they are all college students. Thus, this sample does not represent various retail customers, which limits the generalizability of the findings. In addition, women tend to express greater level of emotional responses compared to men (Youngstrom & Green, 2003). A more diverse sample would reveal a much more significant effect between lighting intensity, light color rendering, shelf height and the variables measured in this study. Future studies should include a more varied population sample. Previous literature confirmed that women tend to feel less safe than men (statistics Canada, 1985). Moreover, Youngstrom and Green (2003) argued that women express more positive emotional response than men.

Implications

This study investigated empirically how light color rendering, light intensity and shelf height affect shoppers in retail store environment. It also examined how the previously cited cues affect the shoppers' overall feeling of security, which is one of the most important issues that concern shopping environment today.

The study findings confirmed the assumption that store fixture height and lighting have significant effect on peoples' emotions and behavior within retail environments. Overall, these findings also confirmed that retail environment cues play a role in the perceived safety. The combination of cool and bright light with low shelf height was seen as the safest retail setting and the most pleasurable one compared to settings where these cues were absent. Situations with dim light and high shelf have been rated as being the least safe, least desirable and least attractive.

These findings support previous researches on light intensity and light color rendering. The blighter light intensity has been found to be more arousing than warm light (Fleischer *et al.*, 2001; Park & Farr, 2007). In a situation with bright lighting, customers seemed to be more inclined to approach and handle merchandise (Summers & Hebert, 2001). Similarly, cool lighting has been found to be more arousing compared to warm lighting in previous literature (Fleischer *et al.*, 2001; Park & Farr, 2007). This can be explained by the fact that usually shoppers also expect an entertaining and arousing experience in shopping environments (Kalcheva & Weitz, 2006).

Cool, bright light and shelf height had also a positive impact on respondents' approach behaviors. Shoppers are willing to spend more time in the store and return to it whenever they need an electronic item, compared to other settings. These results may suggest that approach behavior would be related to emotional state of pleasure, arousal and feeling of safety.

Since an interaction between store fixture height, light intensity and light color rendering constitutes a finding in this study, the effect of the shelf height can be reduced or amplified by the two light properties. Respondents experienced a high shelf as being more pleasing, more inviting and more approachable under cool and bright light. Cool and bright light seems to be a good choice for retail owners whose trade requires high shelving, such as grocery stores, bookstores, and pharmacies. This situation instills in retail store shoppers more positive behaviors.

Depending on the store activity and the retailers' wishes, retail lighting and fixtures can be arranged accordingly. The cool lighting is necessary in stores where meticulous attention is needed, such as electronic stores and bookstores. However, other retail settings might require warm color and low fixture height such as gift shops and clothing stores (Park & Farr, 2007). Moreover, lower shelves are seen as being the most effective from sales standpoint (Frank & Massy, 1970).

This study shows to what extent cool lighting is necessary to not only increase the shoppers' feeling of safety but also reduce the dominating effect that high shelves might have, particularly in stores with high shelves such as grocery stores, pharmacies, and shopping centers.

Based on the various studies on the importance of warm color in shopping environments like clothing stores, jewelry stores, and luxury items stores (Park & Farr, 2007), this present study advocates the use of white lighting which enhances the safety aspect and intensifies the warm color for a better exposure of the store items.

Future directions

Overall, these study findings confirmed that retail fixture height and light play a role in respondents' perceived safety and behavior in retail stores. In this case, this study can contribute to future analyses on the effect of light intensity, light color and shelf height on emotional states, behaviors and feeling of safety among retail shoppers. More importantly, future studies can examine the effect of these three environmental cues but with a focus on gender (man and women) and/or cultural diversity (different cultural groups).

Last but not least, this study stated that bright light attracts more attention and enhances people's wellbeing. However, because of the current concerns regarding energy efficiency future related studies may investigate alternative ways to illuminate retail space while being energy efficient.

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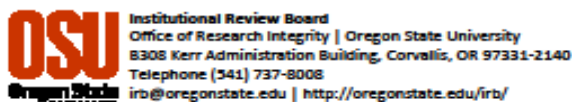
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APPENDICES

APPENDIX "A"
IRB PAPERWORK

IRB APPROVAL



STUDY ID
5941

Notification Type	EXEMPTION		
Date of Notification	10/10/2013		
Study Title	The effects of retail store lighting and shelf height on consumers' feeling of safety and behavior		
Principal Investigator	Marilyn Read		
Study Team Members	Farida Mouhoubi		
Submission Type	Initial Application		
Level	Exempt	Category(ies)	2
Number of Participants	200 <i>Do not exceed this number without prior IRB approval</i>		
Funding Source	None	Proposal #	N/A
PI on Grant or Contract	N/A		

The above referenced study was reviewed by the OSU Institutional Review Board (IRB) and determined to be exempt from full board review.

Expiration Date: 10/09/2018

The exemption is valid for 5 years from the date of approval.

Annual renewals will not be required. If the research extends beyond the expiration date, the Investigator must request a new exemption. Investigators should submit a final report to the IRB if the project is completed prior to the 5 year term.

Documents included in this review:

- | | | |
|---|--|--|
| <input checked="" type="checkbox"/> Protocol | <input checked="" type="checkbox"/> Recruiting tools | <input type="checkbox"/> External IRB approvals |
| <input checked="" type="checkbox"/> Consent forms | <input checked="" type="checkbox"/> Test instruments | <input type="checkbox"/> Translated documents |
| <input type="checkbox"/> Assent forms | <input type="checkbox"/> Attachment A: Radiation | <input type="checkbox"/> Attachment B: Human materials |
| <input type="checkbox"/> Alternative consent | <input type="checkbox"/> Alternative assent | <input type="checkbox"/> Grant/contract |
| <input type="checkbox"/> Letters of support | <input type="checkbox"/> Project revision(s) | <input type="checkbox"/> Other: |

Comments:

Principal Investigator responsibilities:

- Amendments to this study must be submitted to the IRB for review prior to initiating the change. Amendments may include, but are not limited to, changes in funding, personnel, target enrollment, study population, study instruments, consent documents, recruitment material, sites of research, etc.
- All study team members should be kept informed of the status of the research.
- Reports of unanticipated problems involving risks to participants or others must be submitted to the IRB within three calendar days.
- The Principal Investigator is required to securely store all study related documents on the OSU campus for a minimum of three years post study termination.

INFORMED CONSENT DOCUMENT



Institutional Review Board
Office of Research Integrity | Oregon State University
B308 Kerr Administration Building, Corvallis, OR 97331-2140
Telephone (541) 737-8008
irb@oregonstate.edu | <http://oregonstate.edu/irb/>

INFORMED CONSENT DOCUMENT

Project Title: The Effects of Retail Store Lighting and Shelf Height on Consumers' Feeling of Safety and Behavior

Principal Investigator: Marilyn Read
Student Researcher: Farida Mouhoubi
Version Date: October 2013
Sponsor: None

This form contains information you will need to help you decide whether to be in this study or not. Please read this consent document carefully before you decide to participate in this study. Thank you in advance for your participation.

Purpose of the study: The following survey is part of a study that seeks to determine the effects of different light colors and intensity and shelf height on consumers' emotional states and behavior in a retail store environment. The responses gathered by this survey will be used in partial fulfillment of the student researcher's Master's thesis.

Activities: You will be shown 8 computer drafted pictures of interior stores. Then you will be asked to answer four questions related to each picture. This questionnaire is expected to take no longer than 15 minutes to complete. The survey also asks for basic demographic information.

Risks: There are no expected risks associated with the study.

Benefit: There are no direct benefits to participation in this study. We hope in the future, other researchers might benefit from the results of this study, and we also hope that the results will be used to make suggestions to improve retail store design.

Confidentiality: Your participation in this study will remain confidential. You will not be asked to give your personal information; therefore, no personal identifying information will be linked to your survey. The security and confidentiality of information collected from you online cannot

Page 1 of 2

Oregon State University

IRB Study # 5941

Expiration Date 10/09/2018

SCRIPT FOR EMAIL ADVERTISEMENT

Dear Participants,

I am conducting a research study for my M.A. thesis that focuses on lighting and the retail environment. Through this research we hope to have a better understanding of the impact lighting has on the experiences of people in the retail environment. Your participation in this on-line survey would be greatly appreciated. It will take no longer than 15 minutes of your time.

If you have any questions about this research project, please contact the student researcher Farida Mouhoubi at mouhoubf@onid.oregonstate.edu or at 541-704-5426. You can also contact the principal investigator Dr. Marilyn Read at Marilyn.Read@oregonstate.edu or at 541-737-0982. .

If you have questions about your rights or welfare as a participant, please contact the Oregon State University Institutional Review Board (IRB) office at: 541-737-8008 or by email at IRB@oregonstate.edu.

I thank you very much in advance for completing the following survey:

http://oregonstate.qualtrics.com/SE/?SID=SV_8iRiu1I8tgAqCsl

Farida Mouhoubi

The study title: The Effects of Retail Store Lighting and Shelf Height on Consumer' Feeling of Safety and Behavior.

APPENDIX “B” QUESTIONNAIRE

Questionnaire as it appeared in the web:

▼ Part 1 - Tell us about YouBlock Options ▼

▼

You will start by providing some demographic information. For each question, please choose the most appropriate answer.

Female Male

▼

How old are you (in complete years)?

	19	27	35	43	51	60	68	76	84	92	100

Click to write Choice 1

1/19/2014

Qualtrics Survey Software

Do you have visual impairments (such as color blindness) that cannot be corrected by glass or contact lenses?

Yes No

If Yes is Selected, Then Skip To End of Survey

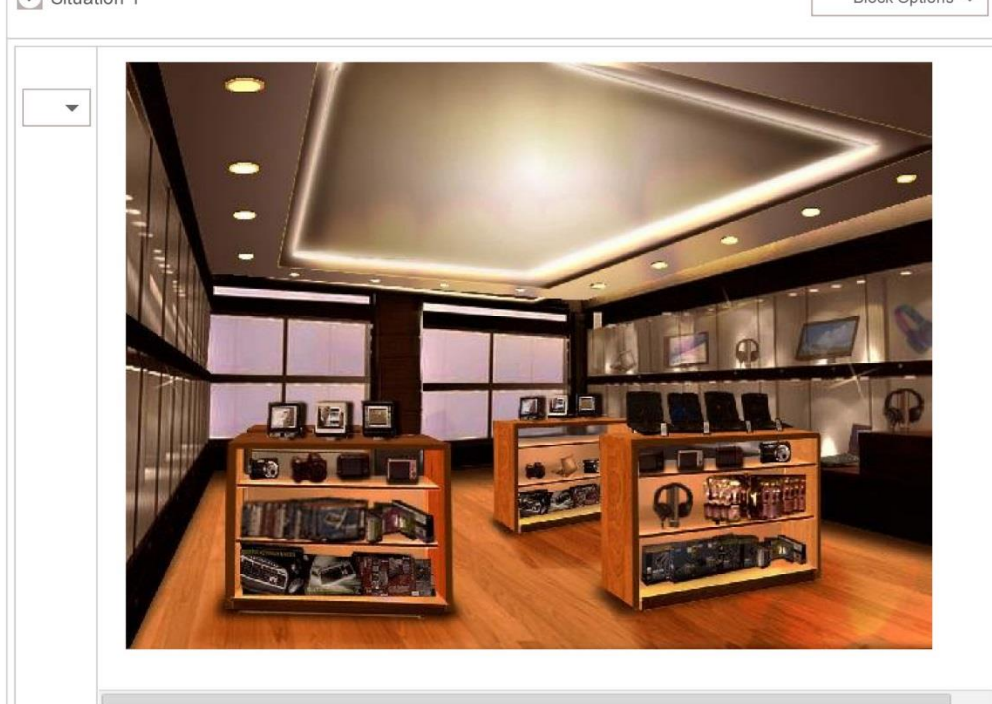
Have you taken any lighting course or worked as a professional in the lighting field?

Yes No

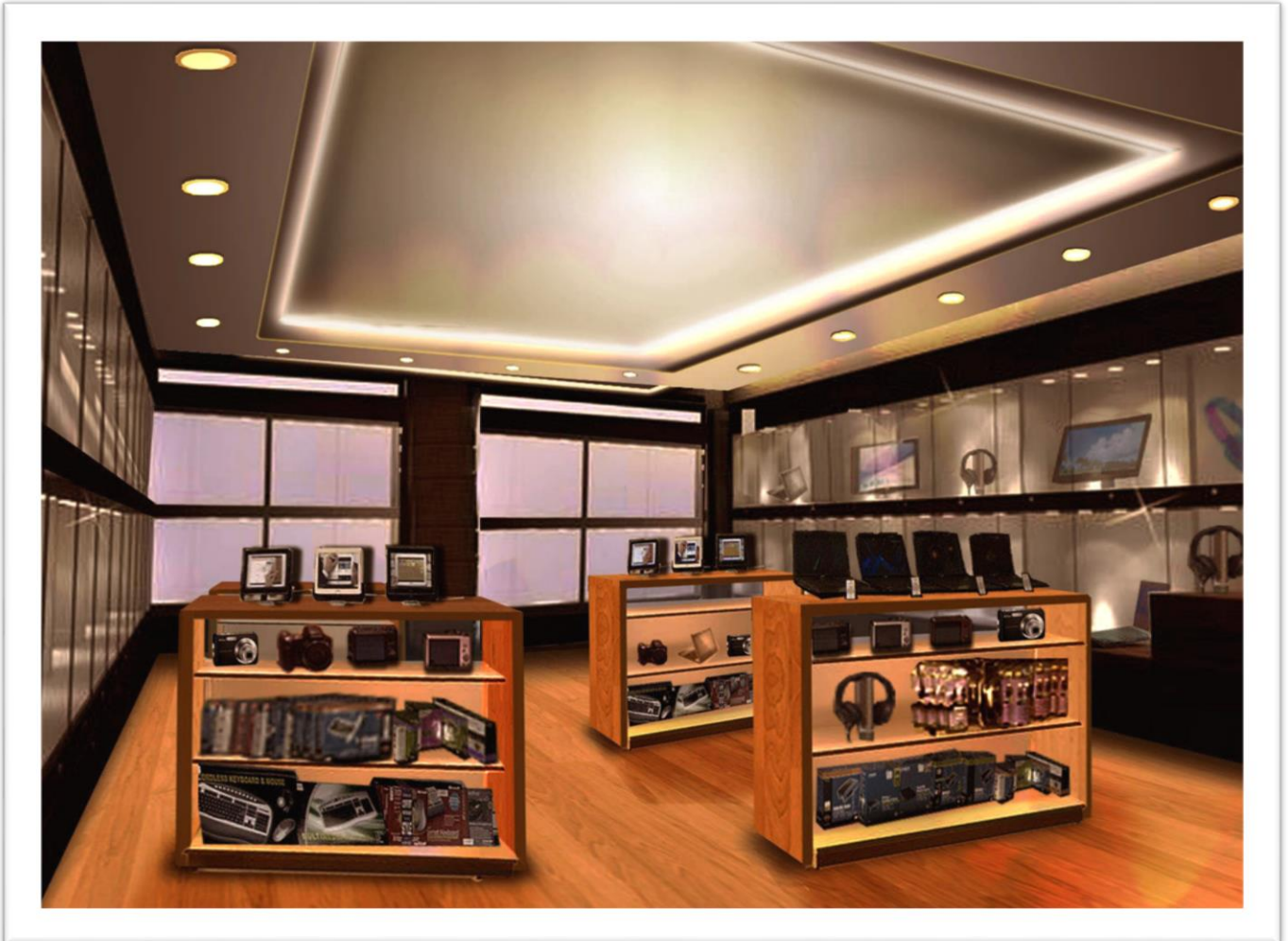
Part 2 - Survey Block Options ▾

You will see 8 different pictures with the same 4 questions each time.
For each picture, please take a moment to get into the mood of the situation, and then answer the 4 questions.

Situation 1 Block Options ▾



Slide # 1 to # 8:



1- Please mark your emotional response toward the following store interior picture.

Pleasant						Unpleasant
7	6	5	4	3	2	1

Comfortable						Uncomfortable
7	6	5	4	3	2	1

Inviting						Repelling
7	6	5	4	3	2	1

3-I feel safe shopping in this storeStrongly
agreestrongly
disagree

7 5 5 4 3 2 1

4- Are there any other feelings that you want to describe about this interior?

.....

APPENDIX “C”
VISUAL STIMULI

Slide A: cool and bright lighting condition with high shelf height. 8



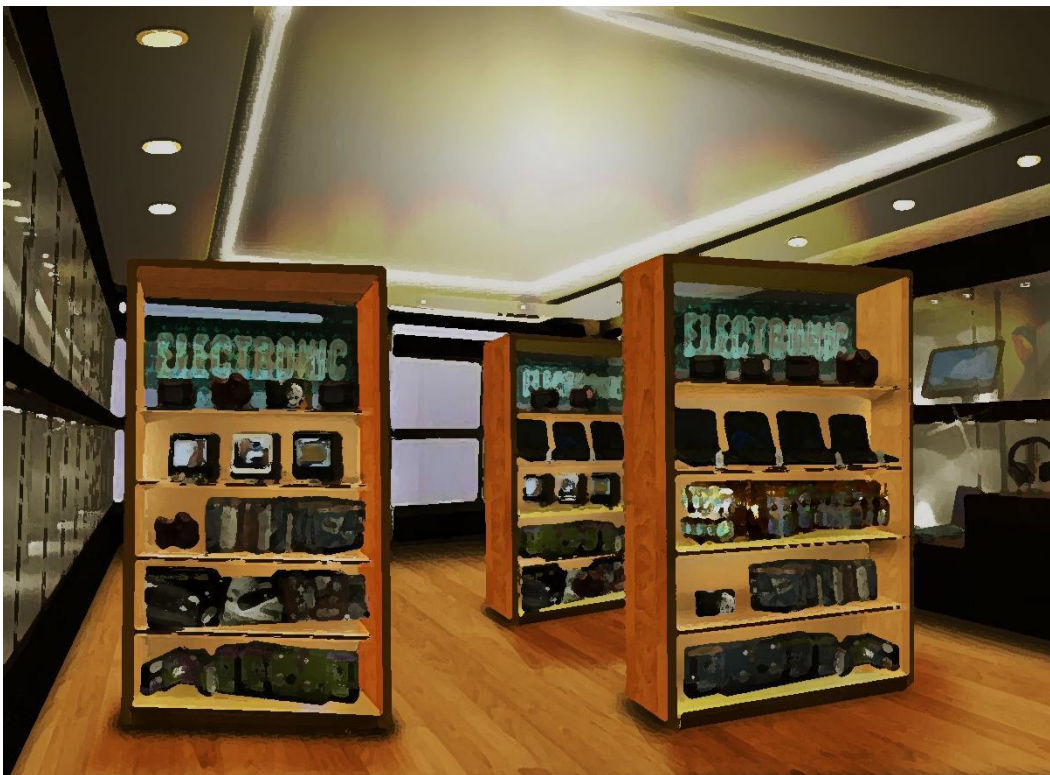
Slide B cool color dim light and high shelf height. 7



Slide C warm color bright light and high shelf height. 6



Slide D warm color dim light and high shelf height. 5



Slide D cool color bright light and low shelf height. 4



Slide E cool color dim light and low shelf height. 3



Slide F warm color bright light and low shelf height. 2



Slide G warm color dim light and low shelf height. 1

