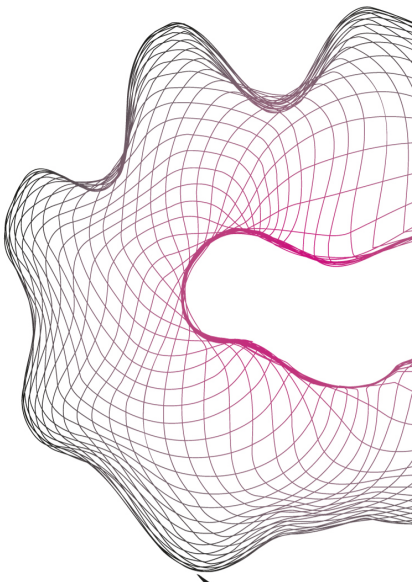
“The interaction between human crowding, colour temperature lighting and shopping motivation on consumer responses and perceptions in a retail environment”



FACULTY OF BEHAVIOURAL SCIENCE
MASTER COMMUNICATION STUDIES
SPECIALIZATION: MARKETING

Ruud van Manen

S1492381

Supervisors:

Dr. M. Galetzka

Prof. Dr. A. Pruyn

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Abstract

Little research is done on the effects of lighting on crowding perceptions in retail environments. This study proposes a theory where crowding perceptions can be reduced by using the correct colour temperature lighting while taking two shopping motivations in consideration. 204 respondents participated in this online study which let them experience a 3D virtual retail environment. The study uses a 2 x 2 x 2 between-subjects experimental design. Two levels of crowding (High vs. Low), two levels of colour temperature lighting (High vs. Low) and two shopping motivations (Fun vs. Run) were tested on the effect of multiple consumer responses and perceptions. The findings in this study revealed significant main effects of human crowding and colour temperature lighting on multiple different consumer responses and perceptions. For instance, a retail environment with low human crowding was perceived as more pleasant than a retail environment with high human crowding. To add on, an interaction effect of colour temperature lighting and shopping motivation on store attractiveness was noticed as run shoppers perceive a retail environment with low (reddish) colour temperature lighting as more attractive than fun shoppers. Concluding, these findings are discussed together with technical limitations and promising implications for retailers.

Keywords: Lighting, Crowding, shopping motivation, retail, atmospherics

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1. Introduction

In recent years, altering the atmosphere of a retail setting has become an important success factor for retailers as it is widely recognized that consumers' responses and perceptions are evidently responsive towards numerous modified atmospheric stimuli (Areni & Kim, 1994; Baum & Valins, 1977; Eroglu & Machleit, 1990; Kotler, 1973; Michon, Chebat, & Turley, 2005; Turley & Milliman, 2000; Van Rompay, Galetzka, Pruyn, & Garcia, 2008). One ambient factor that has received great research attention is social density—the number of individuals in a given setting (e.g., Dion, 2004; Eroglu & Harrell, 1986; Eroglu & Machleit, 1990; Eroglu, Machleit, & Chebat, 2005; Harrell, Hutt, & Anderson, 1980; Hui & Bateson, 1991; Machleit, Eroglu, & Mantel, 2000; Pons, Laroche & Mourali, 2006; Van Rompay, Galetzka, Pruyn, & Garcia, 2008). Social density provides retail managers an interesting dilemma. For instance, a retailer will likely desire a busy retail environment as more customers will possibly lead to higher sales. On the other hand, high social density may lead to undesirable outcomes for customers as it could lead to feelings of confinement and lack of privacy resulting in increasing perceptions of being crowded (Machleit, Eroglu, & Mantel, 2000). Crowding affects consumer responses such as time spent in store, amount purchased and satisfaction (Machleit, Kellaris, Eroglu, 1994) and consists of human and spatial crowding. This study focuses on a retail environment where human crowding is the main element. Still, this research covers some spatial crowding as the experiment takes place in narrow non-perishable aisles instead of the perishable part of a retail environment as shoppers feel less opportunity to change the environment in this area of a supermarket (Machleit, Eroglu, & Mantel, 2000).

Human crowding is an unquestionable part of retail environments and Eroglu, Machleit, and Chebat (2005) argue that it is a vital determinant of the shopping experience. Most studies show that consumers respond negatively to high density levels in retail contexts. Tension, confusion, and/or frustration are possible negative states induced by crowded or dense retail environments and thereby able to result in less favourable evaluations of the shopping experience (Eroglu & Harrell, 1986; Harrell, Hutt, & Anderson, 1980). On the contrary, several studies show that the presence of additional customers

in a retail environment can actually contribute to a more enjoyable experience (Holt, 1995; Hui & Bateson, 1991; Machleit et al., 2000). Even though there is a general agreement that density has both positive and negative effects on consumers' behaviour in retail environments, scientific understanding on this topic still remains far from complete.

Literature suggests that lighting can influence atmosphere as well as spatial impressions, although the findings have only been reported in a hand full of studies (e.g., Clusters, De Kort, IJsselstein, & De Kruiff; Flynn, 1992; Park & Farr, 2007). Park and Farr (2007) recreated a retail environment in an experimental laboratory setting demonstrating the effects of lighting on arousal, pleasure and approach/avoidance behaviour in a retail environment. Results by Park and Farr (2007) showed that an environment with low light temperature lighting is perceived as less arousing than with high light temperature lighting. Low light temperature lighting emits a warm yellowish red light and high light temperature lighting typically emits a cool white light. As this experiment has been held online, the effects of altering the light temperature in a virtual retail environment can potentially differ from the findings in a physical setting. Yet, in a digital game world, Knez and Niedental (2008) obtained data that pointed towards an identical effect of the colour of light in a non-physical world as in the real world on psychological processes of affect and cognition.

To continue, previous research has shown that emotions evoked by lighting and crowding can be influenced by shopping motivation. As concluded in previous studies, various intentions of shopping activity (i.e., Fun vs. Run shopping) are differently affected by environmental stimuli (Doucé & Janssens, 2013; Kaltcheva & Weitz, 2006; Van Rompay, Tanja-Dijkstra, Verhoeven, & van Es, 2012). For instance, shoppers with a task-oriented shopping motivation perceive an environment with high density as being more crowded to those with a non-task oriented shopping motivation (Eroglu & Machleit, 1990). To add on, studies on applying the optimum lighting in office settings have resulted in good understanding of the importance of applying the correct lighting conditions to improve performance (Rea, 1991).

The present study aims to explore the effect of two atmospheric stimuli and consumer's motivational orientation in retail environments. Specifically, this study will focus on the interaction between human crowding, colour temperature lighting and shopping motivation on consumer's responses and perceptions in a retail environment. This paper should provide new insights to support retailers in obtaining positive consumer responses. To conduct this experiment, realistic 3D visualization video simulations of a fictional supermarket were employed to resemble the scene.

The remainder of this study is structured as follows. First, the concept of retail atmospherics and its possible effects is reviewed. Following, human crowding and colour temperature lighting are addressed and possible interaction effects between these aspects are hypothesized. In the subsequent section, the moderating role of shopping motivation and potential interaction effects are discussed. Later, the methodology is explained followed by the results of the experiment. Finally, the findings are discussed and the limitations and implications are presented.

2. Theoretical Framework

2.1 Retail atmospherics

Altering a store's atmosphere to increase staff productivity and customer satisfaction is increasingly gaining more recognition by service and retailing organizations (Yalch & Spangenberg, 2000). Although the first to introduce the term 'atmospherics' was Kotler (1973), the definition of the term has later been broadened to refer to: "… the tailoring of the designed environment to enhance the likelihood of desired effects of outcomes" (Greenland & McGoldrick, 1994). Research by Bitner (1990) and Harrell, Hutt, and Anderson (1980) suggested that the customers' satisfaction with the service may also be controlled by the physical setting of a retail environment. In addition, Summers and Hebert (1999) state that the atmosphere of the retailing outlet can be of greater effect than the product itself in the purchase decision.

Turley and Milliman (2000) noted in a review of 60 experiments that manipulated fragments of a store's complicated atmosphere demonstrated a statistically significant link between shopping behaviour and atmospherics. Accordingly, Turley and Milliman (2000) conclude that the effect of the retail environment on consumer behaviour is both robust and strong, and that it can be used to raise the likelihood of evoking certain behaviours from shoppers. Individual forms and elements of atmospherics like lighting, colours, music, scents, and visual communications are able to induce shoppers' emotions and to control shopping behaviour (Machleit & Mantel, 2001; Levy & Weitz, 2004).

2.1.1 Consumer responses

To understand consumer responses, Mehrabian and Russell (1974) created an environmental psychology model which is the underlying basis of most research in consumer behaviour in retail environments of today. The Mehrabian-Russell model is based on the S-O-R (stimulus – organism – response) paradigm, which clarifies that environmental stimuli (S) induce an internal emotional response of people (O) which in turn affects consumers' behavioural response to the environment (R). The Mehrabian-Russell model is shown below in Figure 1.

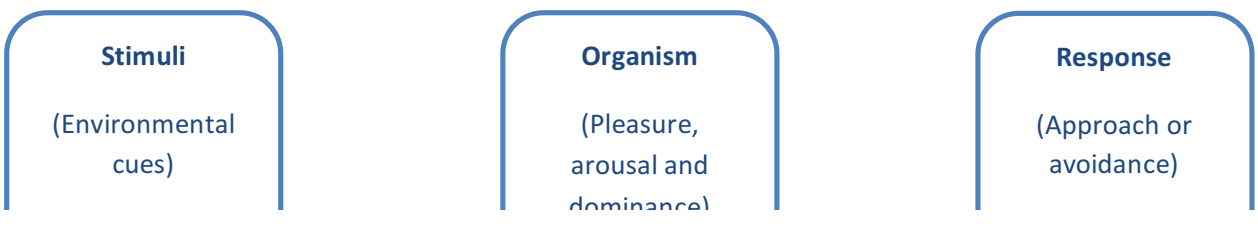

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Figure 1: *The Mehrabian-Russell model*

In the retail context, the *stimuli* paradigm consists of different individual atmospheric aspects, such as lighting, colour, store layout and music. Mehrabian and Russell (1974) stated that various atmospheric stimuli have numerous functions in impacting the subjective experience of consumers, notably their emotional states, i.e. pleasure, arousal and dominance.

The *organism* paradigm relates to the affective reactions evoked by the stimuli. Emotions experienced whilst shopping have proven to influence a mixture of reactions such as, spending levels (Donovan & Rossiter, 1982), approach behaviour (Hui, Kim, & Laroche, 1997), retail preference and choice (Dawson, Block, & Ridgway, 1990), shopping satisfaction, (Machleit & Eroglu, 2000), and willingness to buy (Baker, Levy, & Grewal, 1992). Mehrabian and Russell (1974) recognized three dimensions of affective response: pleasure, arousal, and dominance. These three dimensions provide a generally accepted explanation of emotions.

According to the Mehrabian-Russell model, the *response* paradigm is mediated by the consumers' emotional state which can be either approach or avoidance. Approach behaviour is all the positive behaviours evoked by the servicescape, such as exploring the area, willingness to return to the store, and willingness to remain in the store. Avoidance behaviour, on the other hand, is all the negative behaviours evoked by the environment, such as looking at a few number of products, desire to leave the store, and the willingness to not return to the store.

2.1.2 Consumer perceptions

Besides evoking emotional and behavioural responses, atmospheric stimuli such as lighting and density are also capable of influencing customers' evaluations (Turley & Milliman, 2000). Appropriate lighting has shown to make products more interesting and attractive (Areni & Kim, 1994), affect

customers' perception and influence spatial impressions (Custers, De Kort, IJselsteijn, & De Kruiff, 2010), and also influences room attractiveness (Park & Farr, 2007). In a similar manner, Eroglu and Machleit (1990) argue that retail density also affects consumer perceptions of the shopping experience. Therefore, it is reasonable to believe that atmospheric stimuli (i.e., density and lighting), may be able to affect consumer's perceptions.

2.2 Retail crowding

Retail crowding is a complex phenomenon where consumers react to human density which is influenced by many factors such as expectations, shopping motivation, tolerance for crowding, and personal factors (Eroglu, Machleit, & Barr, 2005). Feelings of crowding are being experienced when the surroundings are being considered as flawed dense (Eroglu & Harrell, 1986). Eroglu and Harrell (1986) created a theoretical model which proposed that higher levels of crowding will conclude in less satisfaction with the overall shopping experience. Machleit, Kellaris and Eroglu (1994) claimed that crowding can be seen as a multidimensional residing of two dimensions. The first dimension, human crowding, arises from the number of individuals and the amount of social interactions between customers in a retail setting (Byun & Mann, 2011). The second dimension presented is spatial crowding and consists on the basis of the amount of fixtures and merchandise as well as their placement within the store.

There are multiple reasons why it is meaningful to concentrate on human crowding opposed to spatial crowding. Firstly, the spatial crowding literature has already come to a general agreement that consumers encounter negative affective and behavioural responses towards spatial crowding (Eroglu, Machleit, & Chebat, 2005; Hui & Bateson. 1991; Machleit, Eroglu & Mantel, 2000; Rompay, Galetzka, Pruyn, & Garcia, 2008). However, literature regarding the impact of human crowding is more inconclusive. Most studies discuss the negative impact of human crowding on consumers. Yet, a few studies show that human crowding can have a positive effect on consumers, while other studies report no impact at all (Byun & Mann, 2011; Hui & Bateson, 1991; Machleit, Eroglu, & Mantel, 2000). Secondly, human crowding is harder to control opposed to spatial crowding as a retailer can choose to

remove spatial elements. To add on, most stores do not have the luxury to limit consumer traffic in the store opposed to high end stores without negatively influencing their sales.

Early research showed that crowding is likely to induce some psychological stress and increase arousal on shoppers who experience a restraint in freedom (Brehm, 1966) and a loss of their personal space (Stokols, 1972). Milgram's (1970) system overload theory explained the effect of perceived crowding on cognition. Customers experience an overload of stimuli under high human-density conditions. For instance, they have limited time to process atmospheric cues (Harrell, Hutt, & Anderson, 1980). Eroglu, Machleit, and Chebat (2005) argue that among numerous other elements of retail environments studied, crowding due to high density has been shown to be notably significant in influencing customer responses in both positive and negative manners.

Recent findings have substantially refined the conditions of research on the effect of density in service and retail environments (Pan & Siemens, 2011; Pons, Mourali, & Giroux, 2014; Van Rompay, Galetzka, Pruyn, & Moreno Garcia, 2008; Uhrich, 2011). These studies have displayed possible mediators (i.e., perceived control) in the density-satisfaction relationship. Considering the fact that perceived control is a part of the general environment of the store, it is a relevant element of shopping satisfaction (Eroglu & Machleit, 1990; Machleit et al., 1994). People tend to behave and feel more positively when a feeling of control is perceived (Ittelson, Proshanksy, Rivlin, & Winkel, 1974) which is in line with findings by Hui & Bateson (1991) stating that perceived crowding can induce an unpleasant feeling when it is experienced by an individual. To add on, in a bank setting, Hui & Bateson (1991) demonstrated that high human density negatively influences perceived control, thereby lowering the experienced pleasure and, in turn, approach behaviour.

Besides evoking emotional and behaviour responses Eroglu and Machleit (1990) argue that retail density may also affect consumer perceptions of the shopping experience. Consumers perceive a retail environment full with tangible elements such as racks and product displays as cluttered (van Rompay, Tanja-Dijkstra, Verhoeven, & van Es, 2012; Turley & Milliman, 2000). Research shows evidence that consumers rely on information from environmental cues to shape their perception of

service providers (Baumgarten and Hensel, 1987) and supports consumers with categorizing service firms (Ward, Bitner, & Barnes, 1992). To add on, Zeithaml (1988) argued that shopping experience costs, which involves consumers' time and effort in gathering products, along with the psychological cost of shopping (e.g., discomfort caused by crowding) have been implied as possible determinants of merchandise value.

As argued above, crowding will most likely increase arousal which in returns negatively effects consumer responses and consumer perceptions in a retail environment. To test this effect, the following hypothesis is formed:

H1: A retail setting with high human crowding conditions will lead to more (a) arousal, but less (b) pleasure, (c) perceived control, (d) approach behaviour, (e) spaciousness, (f) store attractiveness, (g) merchandise quality evaluation, and (h) merchandise value evaluation opposed to a retail setting with low human crowding conditions.

2.3 In-store lighting

The benefits and significance of lighting in retail environments has been generally accepted by researchers and lighting manufactures (e.g., Baker, Grewal, & Parasuraman, 1994; Rea, 199; Schielke, 2010). Areni and Kim (1994) and Summers and Hebert (2001) applied the M-R model to test the effects of lighting in retail settings. Both studies showed that lighting can be used as an environmental stimulus to influence consumer behaviour. Lighting has the ability to induce mood and affect emotional states of consumers (Park & Farr, 2007). Empirical evidence shows that lighting has an effect on spaciousness in a conference room (Flynn, Spencer, Martyniuk, & Hendrick, 1973). Research by Tantanatewin and Inkarojrit (2016) confirmed these findings as they found a significant effect of colour temperature lighting on space impression. Also, lighting has shown to enhance contrast, making products interesting and attractive, and affect customers' perception (Areni & Kim, 1994; Custers, De Kort, IJselsteijn, & De Kruiff, 2010).

Lamp life, colour rendition, and cost are crucial elements when selecting a retail store lighting system (Rea, 1999). Fluorescent lamps are most generally utilized in stores because of their energy efficiency and longer life (Park & Farr, 2007). Yet, with the increasing availability of LED lighting, retailers are thriving towards LED lighting in stores (Freyssinier & Rea, 2010). To evaluate the effects of lighting, one can use different measurements like lux, colour rendering index (CRI) and correlated colour temperature (CCT). Lux measures the perceived intensity of light, colour rendering index is used as a quantitative measure to report the ability of a light source to display an objects absolute colours and correlated colour temperature describes the colour appearance of a light source.

Typically, the colour a light source with low colour temperature emits is yellowish/red and is often described to as warmer colours, whereas a light source with high light temperature emits a bluish/white light and is generally referred to as cooler colours (Areni & Kim, 1994; Boray, Gifford, & Rosenblood, 1989; Park & Farr, 2007; Rea, 1999; Veitch & McColl, 2001). Research by Park & Farr (2007) showed significant effects of colour temperature on consumer responses such as arousal, pleasure, and approach behaviour. For example, in a retail environment a light source with low colour temperature will have a positive effect on pleasure opposed to a lighting source with high colour temperature.

As Mehrabian stated in 1996, lighting is a prime factor in the environment's impact on people because "brightly lit rooms are more arousing than dimly lit ones". Research by Park and Farr (2009) confirms these findings as they showed that cool lighting appeared to be more arousing than warm lighting. Van Hagen (2011), in his study on virtual train stations, found that blue lighting positively affects dominance. Appropriate lighting will produce arousal, pleasure and dominance and so contributes to consumer approach (Areni & Kim, 1994; Mehrabian, 1976; Summers & Hebert, 2001; Van Hagen, 2011).

Lighting also has the ability to influence consumer perceptions and influence spatial impressions (Clusters, De Kort, IJselsteijn, & De Kruiff, 2010). Areni & Kim (1994) argued that appropriate lighting makes products more interesting and attractive. Their research on the influence of lighting on

consumers' examination of merchandise in a wine store showed that brighter in-store lighting affected shoppers to handle and examine more products in the wine store. Contrary to these findings, Baker, Grewal, & Parasuraman, (1994) argue that a retail environment with low-level lighting may influence consumers to infer that the retailer sells high quality merchandise and thus influence their price perception. However, research by Boray, Gifford, and Rosenblood (1989), Kolanowski (1990), and Veitch and McColl (2001) showed little to no effect of colour temperature on participant mood.

Research on the effects of lighting on shoppers still remains inconclusive. A room with high colour temperature lighting will likely be perceived as more arousing opposed to a room with low colour temperature lighting (Vogels, Sekulovski, Clout, & Moors, 2009). This suggests that bluish toned lighting will be more arousing than its alternative. Yet, research also suggests that the colour red can be linked to excitement as it is perceived as an arousing colour (Belizzi et al., 1983). A scenario study by Babin, Hardesty and Suter (2003) stated that the colour of an environment also plays a vital part in determining the effect of lighting as a brightly lit room had a greater adverse effects than a softly lit blue room. An explanation for these results could be that lighting is situation-specific (Rea, 1999). Because of these diverse findings it is important to test the effect of colour temperature lighting in a retail environment. Therefore, the following hypothesis is presented:

H2: A retail setting with high colour temperature (blueish) lighting conditions will lead to more (a) arousal, (b) pleasure, (c) perceived control, (d) approach behaviour, (e) spaciousness, (f) store attractiveness, (g) merchandise quality, and (h) merchandise value opposed to a retail setting with low colour temperature (reddish) lighting conditions.

2.4 Interaction between human crowding and colour temperature lighting

As stated above, both human crowding and colour temperature lighting have the ability to influence consumers' emotional, behavioural responses and consumers' perceptions. Research by Kaltcheva and Weitz (2006) showed that pleasantness has a generally positive effect on shopping behaviour. Perceived crowding can induce an unpleasant feeling when it is experienced by an individual (Hui & Bateson, 1991). Yet, choosing the correct in-store lighting might limit the negative effects of crowding on shopper's pleasure in a retail environment as environmental cues (e.g., lighting and music) are positively connected to enthusiasm and/or motive to stay at a mall. To add on, a crowded environment can lead to a decrease of control and in turn increase a sense of stress. Thus, having a bright view is of extreme importance which in turn requires a high level of lighting (Van Bommel & Van den Beld, 2004). Park and Farr (2009) demonstrated that high colour temperature lighting positively influences visual clarity indicating that consumers in a retail environment with high levels of human crowding will prefer higher levels of colour temperature lighting opposed to low levels.

Park and Farr (2009) also demonstrated that colour temperature has an effect on room attractiveness. Participants rated an environment with a warm light source to be more attractive than an environment with a cold light source. Shoppers generally use plain, easy accessible social cues (e.g., crowding) to help them draw conclusions about possible missing information (e.g., quality, price) by using bits of information they can gather (Wakefield & Baker, 1998). To conclude, it remains uncertain how human crowding and colour temperature lighting will interact. Presumably human crowding and colour temperature lighting will strengthen or weaken each other. As discussed previously, a retailer has little to no control over human density. Therefore, it is suggested that modifying the in-store lighting will positively limit the negative consumer responses, behaviours and perceptions evoked by human crowding. To test this effect, the following hypothesis is formed:

H3a: Under conditions of low human crowding, high colour temperature (blueish) lighting will lead to less (a) arousal (b) pleasure, (c) perceived control, (d) approach behaviour,

(e) store spaciousness, (f) store attractiveness, (g) merchandise quality evaluation, and (h) merchandise value evaluation than low colour temperature (reddish) lighting.

H3b: Under conditions of high human crowding, high colour temperature (blueish) lighting will lead to less (a) arousal but more (b) pleasure, (c) perceived control, (d) approach behaviour, (e) store spaciousness, (f) store attractiveness, (g) merchandise quality evaluation, and (h) merchandise value evaluation than low colour temperature (reddish) lighting.

2.5 Shopping motivation

Early research showed a variety of shopping motives (Stone, 1954; Tauber, 1972). Two fundamental motivational orientations were recognized as most significant; task-oriented motivational orientation (in this study often referred to as run shopping) and recreational motivational orientation (in this study often referred to as fun shopping). Run shoppers have a need to obtain the needed products, services, or information with minor or no fundamental satisfaction gained from the shopping experience itself. Fun shoppers on the other hand involve consumers engaging in shopping with a need to gain satisfaction from the shopping experience itself. These findings are consistent with literature identified in psychology by Apter (1982), and Deci and Ryan (1985).

Consumers' motivational orientation controls the connection between arousal and pleasantness (Kaltcheva & Weitz, 2006). Arousal has a positive effect on pleasantness if the consumer is a fun shopper. On the other hand, a negative effect of arousal on pleasantness can be recognized for a run shopper. Because of the different orientations between shoppers it is important to find the right balance in a retail environment. A task-oriented shopper would find a high energy demand in a high-arousal environment to require too much effort and therefore find the experience unpleasant (Kaltcheva & Weitz, 2006). Run shoppers have little to no interest for meaningless tangible peripherals in a retail environment (Korgaonkar, 1981). However, a fun shopper expects a rich environment which she can engage in and enjoy the shopping experience in itself. These findings indicate that the effect of retail

atmospherics on consumer responses, behaviour and perception of shoppers will vary based on their shopping motivation. This leads to the following hypothesis:

H4: The impact of retail atmospherics on (a) arousal, (b) pleasure, (c) perceived control, (d) approach behaviour, (e) store spaciousness, (f) store attractiveness, (g) merchandise quality evaluation, and (h) merchandise value evaluation is mediated by shopping motivation.

2.6 Interaction between human crowding and shopping motivation

Motivational orientation (run versus fun) has shown to affect perceived crowding (Eroglu & Harrell, 1986). Research suggests that perceived crowding causes more negative responses in a utilitarian setting (Hui & Bateson, 1991; Noone & Mattila, 2009). Research by Baker & Wakefield (1998) and Eroglu et al., (2005) indicated that shopping motivations is one of several factors to moderate the impact of perceived density on consumers' responses. To add on, density tends to have an effect on shopping pleasure and approach behaviour but varies with shoppers' affiliation needs (Van Rompay, Krooshoop, Verhoeven & Pruyn, 2011). Negative effects were only noticeable for shoppers with a low desire for affiliation.

Shoppers with a recreational shopping motivation prefer high stimuli environments which they can engage in as it enriches the shopping experience opposed to a retail environment low on stimuli. On the contrary, shoppers with a task-oriented shopping motivation prefer retail environments low on stimuli as this hinders there shopping task completion. To test the different effects of the arousing stimuli human crowding in retail environments on both shopping motivations, the following hypotheses are formed:

H5a: With a task-oriented shopping motivation, a retail environment with high human crowding conditions will lead to more (a) arousal and less (b) pleasure, (c) perceived control, (d) approach behaviour, (e) store spaciousness, (f) store attractiveness, (g) merchandise quality evaluation, and (h) merchandise value evaluation opposed to a retail environment with low human crowding conditions.

H5b: With a recreational-oriented shopping motivation, a retail environment with high human crowding conditions will lead to more (a) arousal (b) pleasure, (c) perceived control, (d) approach behaviour, (e) store spaciousness, (f) store attractiveness, (g) merchandise quality evaluation, and (h) merchandise value evaluation opposed to a retail environment with low human crowding conditions.

2.7 Interaction between colour temperature lighting and shopping motivation

Rea (1999) suggested that pleasant lighting quality is achieved when the established mood is consistent with the function of every space, when lighting promotes productivity, and when it maintains spatial clarity. Lighting professionals and researchers recognize that various colour qualities and light patterns benefit different subjective responses and appear to influence task performance (Flynn & Spencer, 1977; Knez, 2001; Narendran, Vasconez, Boyce, & Eklund; 2000; Quellman & Boyce, 2002; Steffy, 2002). Kaltcheva and Weitz (2003) argue that a retailer might use a softer lighting in the weekdays, because the shoppers are more extrinsically motivated during these days and more intense lighting in the weekends because the shoppers are more likely to be intrinsically motivated.

Similar to the hypotheses formed for the interaction effect between shopping motivation and human crowding, research indicates that arousing stimuli (e.g., lighting) has a different effect on consumer responses and perceptions based on shopping motivations. Therefore, research suggests that lighting and motivational orientation have a interaction effect on consumer's responses and perceptions resulting in the following hypotheses:

H6a: With a task-oriented shopping motivation, a retail environment with high colour temperature (blueish) lighting will lead to more (a) arousal, (b) pleasure, (c) perceived control, (d) approach behaviour, (e) store spaciousness, (f) store attractiveness, (g) merchandise quality evaluation, and (h) merchandise value evaluation opposed to a retail environment with low colour temperature (reddish) lighting.

H6b: With a recreational shopping motivation, a retail environment with high colour temperature (blueish) lighting will lead to more (a) arousal, (b) pleasure, (c) perceived

control, (d) approach behaviour, (e) store spaciousness, (f) store attractiveness, (g) merchandise quality evaluation, and (h) merchandise value evaluation opposed to a retail environment with low colour temperature (reddish) lighting.

2.8 Interaction between human crowding, colour temperature lighting and shopping motivation

Furthermore, it remains uncertain how lighting and crowding will interact with consumer motivation in influencing consumers' responses and perceptions in a retail environment. Presumably crowding and lighting will strengthen or weaken each other. For instance, a shopper in a retail environment with high human crowding and low colour temperature lighting might perceive the shopping experience more negatively in contrary to a shopper in a retail environment with high human crowding and high colour temperature lighting. However, a different shopping motivation might be able to mediate this effect. Consequently, a research question concerning the three-way interaction is created:

RQ: *To what extent does the interaction of human crowding, colour temperature lighting and shopping motivation impact consumer's responses and perceptions in a retail environment?*

The conceptual framework of this study is as follows:

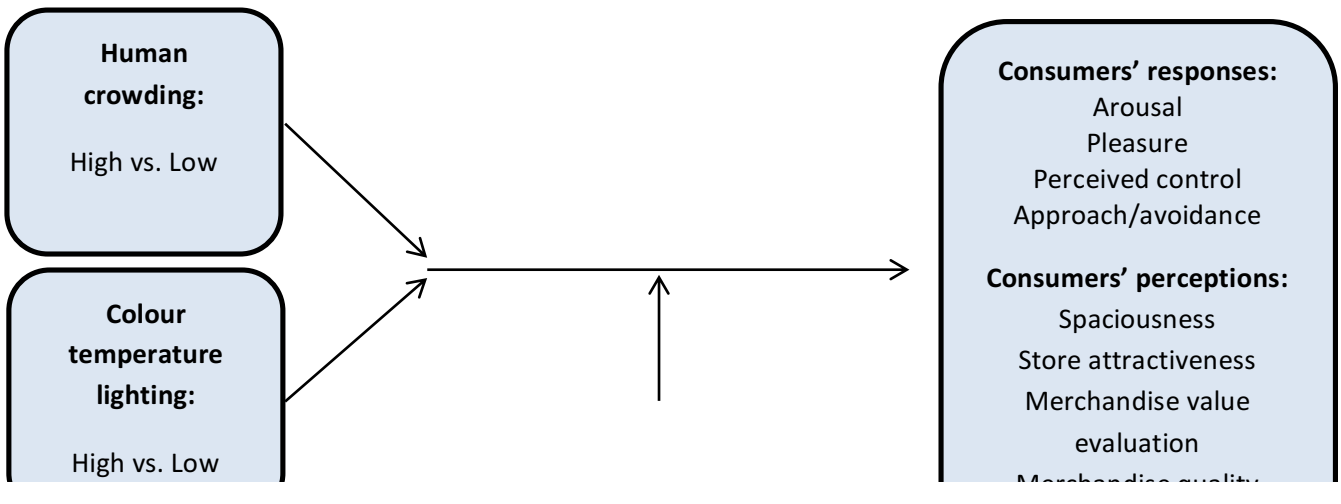

Figure 2: *Research model.*

3. Methodology

3.1 Research context

To test the hypotheses, a 2 (Colour Temperature Lighting: High vs. Low) x 2 (Human Crowding: High vs. Low) x 2 (Shopping motivation: Run vs. Fun) between-subjects experiment was conducted. Colour temperature lighting and human crowding were the independent variables. These independent variables were expected to be moderated by motivational orientation. The dependent variables in this study were *arousal, pleasure, perceived control, approach/avoidance, spaciousness, store attractiveness, merchandise value evaluation* and *merchandise quality evaluation.*

For the creation of the stimulus material, four different virtual 3D models of supermarkets were created in Google Sketch up. All models had the exact same layout, yet all of them demonstrated different conditions. The variation in conditions was created by using diverse lighting and crowding conditions. More detailed information about the different conditions can be found in paragraph 3.3**.** The distinction between shopping motivation was created by a small text which participants were asked to carefully read before starting the survey. This text was created to manipulate the participants into a recreational shopping motivation (fun-shopping) or into a task-oriented shopping motivation (run-shopping). Then, the effects of colour temperature lighting, human crowding and shopping motivation on the dependent variables were examined by means of an experiment. The first part of the experiment consisted of a tour through a virtual 3D retail environment. Bateson and Hui (1992) stated that a video protocol has ecological validity, which indicates that a video clip can resemble a real-life setting and demonstrate the real behaviour as in the field study. The last part was a questionnaire. More detailed information about the questionnaire will be discussed in paragraph 3.5.

3.2 Participants

The respondents were approached using different social media channels like WhatsApp and Facebook. A total of 204 valid online surveys were completed. 92 (45%) were male and 112 (55%) were female. Age varied between 16 and 86 years (M=32.38, SD=13.44). The diversity in age and gender of the participants is accepted because all kinds of different age groups are familiar with retail environments. The aim in this research was to collect around 200 participants. The minimum number

of responses for each condition was set at 20 participants. A total of 204 valid questionnaires were filled in.

3.3 Stimulus material

A virtual 3D model of a retail environment was created to conduct the experiment. The idea was to model a general retail environment with which the participants, like in their own environment, were familiar with. Yet, recreating a Dutch supermarket of companies like Albert Heijn or Jumbo could lead to brand bias of participants. For that reason, a foreign, and so less familiar, existing retail environment was used as an example to develop the virtual 3D model. In this case, English retail company Sainsbury's was used as an example to recreate the virtual setting. The virtual 3D model was created in Google's Sketch up software. Google Sketch up supports the creation of high quality environments, allows the virtual environment to be exported into a video, and is capable of loading in additional add-ons. This last criterion was especially helpful to load in an external lighting add-on called LightUp. LightUp has the option to alter artificial temperature lighting sources in the 3D model.

A total of four different virtual 3D models were created. Each model was modified to match the independent variables' conditions. A low level of human crowding was created by displaying only one other shopper per shopping aisle, whereas a high level of human crowding was demonstrated by having up to 8 people in a single aisle. Lighting was manipulated by exposing the participants to either a retail environment with a reddish coloured filter, resembling low colour temperature lighting or a retail environment with a blueish one, resembling high colour temperature lighting. Examples are given below in Image 1a and Image 1b.

Image 1a. High density conditions with low (left) and high (right) in-store simulated colour temperature lighting.

Image 1b. Low density conditions with high (left) and low (right) in-store colour temperature lighting.

The 3D virtual retail environment was exported into a video to present all the participants the same experience. The videos were cut into three different fragments to be able to add the different merchandise value and quality items in-between. A storyboard of a full video is shown below in Image 2. The video started with a general shot of the exterior of the Sainsbury's supermarket. The video then zooms in towards the front of the supermarket, after which the participant enters the store (still 1 to 3). The participant then virtually walks around in the store (still 4), being exposed to either a crowded or non-crowded setting, with either low colour temperature (warm) in-store lighting or high colour temperature (cold) in-store lighting. The walking stops when the participant reaches the "Werther's Original" shelf (still 5). The video then zooms in on the shelf as can be seen in still 6 (Image 2a).

Image 2a. Storyboard of the first video. This video displayed a crowded setting with warm in-store lighting

The second video continues with the participant progressing towards the second aisle. The video then rotates towards the shelves on the back wall of the virtual retail environment. The video zooms in on the "Martini Rosso" shelf (see Image 2b).

Image 2b. Storyboard of the second video. This video displays a crowded setting with warm in-store lighting.

Finally, the third video shows movement through the second aisle. The moving stops when it reaches the "Taft Gel" shelf (see Image 2c). Full story boards of all 4 videos can be found in Appendix B.

Image 2c. Storyboard of the third video. This video displays a crowded setting with warm in-store lighting.

3.3.1 Measurement pre-test

To ensure if the manipulations were successful, multiple stimuli were tested in a pre-test questionnaire. First, the simulated colour temperature lighting of the virtual 3D retail environment was tested. The participants were exposed to pictures showing the retail environment with a somewhat orange coloured filter, resembling low colour temperature lighting and pictures with a somewhat bluish tone, resembling high colour temperature lighting. A 7-point scale was used to check if the participants perceived the pictures as warm or cold. The second part of the questionnaire was to measure the perceived crowding. Here, participants were asked to look at two photos displaying either a crowded aisle or a non-crowded aisle and were asked how crowded these aisles looked, on a 7-point scale (crowded – non-crowded).

To test the motivational orientation scenario manipulation, two items from the Motivational Orientation Scale from Kaltcheva and Weitz (2006) were used. The participants were randomly assigned to either a scenario manipulation about a task-oriented (run-shopping) motivation or a scenario manipulating a recreational (fun-shopping) motivation. The run-shopping scenario was measured by the item: "This scenario indicates that I have a clear task to accomplish". And as for the fun-shopping scenario it was measured by the item: "This scenario indicates that I visit the store to look around".

3.3.2 Pre-test results

An independent-sample t-test was conducted to compare mean scores in different conditions. The results confirmed that the lighting was perceived as intended. Specifically, it showed that the retail environment with the warm lighting was perceived warmer ($M=4.00, SD=1.67$) than the retail environment with the cool lighting ($M=2.00, SD=1.23), t =2.99, p<.05$. To continue, the results also confirmed that the pictures manipulated with aisles containing human crowding were also perceived as more crowded ($M=5.53, SD=.84$) than the pictures manipulated without human crowding ($M=2.85, SD=1.46), t =-6.96, p<.001$. Finally, the participants agreed that the text resembling a recreational motivation orientation was illustrating a scenario of a fun shopper ($M=5.4, SD=1.08$) and the text they read about the task-oriented motivational orientation was indeed perceived as a scenario of a run shopper ($M=2.50, SD=.97) t =-6.33, p=<.000$.

3.4 Procedure

Participants were approached online. First people from the author's own network (about 70% of the participants) were approached. Then the survey was posted on Facebook to gain the last 30% of the responses. The participants were presented a brief introduction about the nature and purpose of the study. The brief introduction also mentioned the anonymity and voluntariness of the survey. After agreeing with the terms and conditions of the experiment, participants were randomly assigned to one of the existing eight conditions. The following page showed the respondents a small text. The meaning of this text was to either manipulate the respondents into a task-oriented motivational shopping orientation or a recreational motivational shopping orientation. Participants were then randomly assigned to one of the four different video scenarios. This was a video showing a 3D virtual supermarket with either high or low human crowding and with either low colour temperature (reddish) or high colour temperature (blueish) in-store lighting. The video was cut into three episodes because at the end of every episode a product was presented to the participants followed by a couple of questions regarding their perceived value and quality of the merchandise. To continue, the participants were then asked to fill in the rest of the questionnaire. The questionnaire continued with six more constructs that indicated their experience in the supermarket. The constructs were: perceived spaciousness, perceived store attractiveness, approach/avoidance behaviour, pleasure, arousal, and perceived control. To conclude, the participants were thanked for their participation.

3.5 Measurements

Measurement scales from existing research and literature were used to measure the constructs. Prior research has demonstrated the reliability of those scales yet all items were tested on reliability after the surveys were conducted. The results of the reliability tests of the different measurements are discussed below.

3.5.1 Consumer responses

Pleasure. Pleasure was measured by the use of the dimensions of emotions PAD-scale created by Mehrabian and Russell (1974). The scale started with the statement "In this store I feel…:" followed by 6 items on a 7-point semantic differential scale. The scale contained the items happy/unhappy, pleased/annoyed, satisfied/unsatisfied, contented/melancholic, hopeful/despairing, and relaxed/bored. Alpha reliability for this scale was $\alpha = .89$.

Arousal. Mehrabian and Russell's (1974) dimensions of emotions PAD-scale was also used to measure arousal. This scale also started with the statement "In this store I feel…:" followed by the following 6 items on a 7-point semantic differential scale: stimulated/relaxed, excited/calm, frenzied/sluggish, jittery/dull, wide awake/sleepy, and aroused/unaroused. However, because the reliability of this scale turned out fairly low ($\alpha = .62$) the decision was made to remove two items (awake/sleepy and aroused/unaroused) to increase the reliability to $\alpha = .70$.

Perceived control. Following, perceived control was measured by a scale created by van Rompay, Galetzka, Pruyn, and Moreno Garcia (2008). The three items were "In this store, I feel in control over the situation", "In this store, I can easily find what I am looking for", and "I could buy in this store what I like". The variables were measured with a 7-point scale, ranging from "strongly disagree" to "strongly agree". The reliability of the scale turned out fairly low ($\alpha = .60$), yet deleting any items would not increase the reliability of this scale.

Approach-avoidance. A 6 item scale based on Donovan and Rossiter's (1982) study was used to assess the approach-avoidance behavioural responses. These items were "I would enjoy shopping in the store," "I would stay in the store," "I would want to look around and to explore the store," "I would be willing

to buy things at the store," "I would like to return to the store sometime," and "I would be willing to recommend the store to my friends." The variables were measured with a 7-point scale, ranging from "strongly disagree" to "strongly agree". The alpha reliability for this scale was α = .91.

3.5.2 Consumer perceptions

Spaciousness. Spaciousness was measured with a 7-point scale from Okken, van Rompay and Pruyn (2013) containing 4 different items. The items used were "I had sufficient freedom of movement inside this store", "I would feel confined in this store", "I would feel constricted inside this store" and, "I would feel suffocated inside this store". The scale was reliable (α = .87). These questions were also measured on a 7-point scale ranging from "strongly disagree" to "strongly agree".

Store attractiveness. Store attractiveness was measured by 4 items. The scale started with the statement "I find this store:" followed by 4 items on a 7-point semantic differential scale. The scale contained the items very ugly/very pretty, very relaxed/very stimulating, very attractive/very unattractive, very interesting/very uninteresting. To increase the reliability on this scale the item "very relaxed/very stimulating" was removed which resulted in a reliability of α = .73.

Merchandise value. This measurement consisted out of same 3 items, each one presented after the 3 different segmented products forming an overall merchandise value construct. The items were based on the 7-point scale of Chaudhuri & Ligas (2012). The item used for the measurement of merchandise value was "This product is of good value". The answers were measured on a 7-point scale ranging from "strongly disagree" to "strongly agree". The alpha reliability measurement for this scale was α = .62.

Merchandise quality. Merchandise quality was also measured using an item from Chaudhuri & Ligas (2012). As with the measurement of merchandise value, the same 3 items were each individually presented after each of the three different products in the experiment. The item used for the measurement of merchandise quality was "This product is of good quality". The answers were measured on a 7-point scale ranging from "strongly disagree" to "strongly agree". The alpha reliability measurement for this scale was α = .64.

4. Results

To measure the effects of the independent variables *human crowding*, *colour temperature lighting* and *shopping motivation* on the dependent variables *arousal*, *pleasure*, *perceived control*, *approach/avoidance behaviour, spaciousness, store attractiveness, merchandise value evaluation* and *merchandise quality evaluation* a three-way between-subjects multivariate analysis of variance (MANOVA) was performed.

Wilks' Lambda demonstrated significant results of the independent variable *human crowding* on the dependent variables. In addition, Wilk's Lambda showed no other significant main or interaction effects on the dependent variables. Wilk's Lambda results can be found below in table 1.

Effect	**F**	**P**
Human crowding: High vs. Low	6.938	.000
Colour temperature lighting: High vs. Low	1.011	.429
Shopping motivation: Run vs. Fun	1.612	.124
Human crowding * Colour temperature lighting	.859	.552
Human crowding * Shopping motivation	1.584	.132
Colour temperature lighting * Shopping motivation	1.062	.392
Human crowding * Colour temperature lighting * Shopping motivation	.542	.824

Table 1: *Multivariate Tests (Wilks' Lambda)*

The results of the multivariate analysis of variance for the dependent variables *arousal*, *pleasure*, *perceived control*, *approach/avoidance behaviour, spaciousness, store attractiveness, merchandise value evaluation* and *merchandise quality evaluation* are presented in table 2. The means and standard deviations per condition are displayed in table 3.

Independent variables		df	F	p	η^2
Human crowding					
	Arousal	1	16.924	.000**	.080
	Pleasure	1	5.604	.019*	.028
	Perceived control	1	8.944	.003**	.044
	Approach behaviour	1	6.455	.012*	.032
	Spaciousness	1	44.750	.000**	.187
	Store attractiveness	1	2.792	.096	.014
	Merchandise quality evaluation	1	.006	.938	.000
	Merchandise value evaluation	1	1.981	.161	.010
Colour temperature lighting					
	Arousal	1	.123	.727	.001
	Pleasure	1	3.804	.050*	.019
	Perceived control	1	2.073	.152	.011
	Approach behaviour	1	5.773	.017*	.029
	Spaciousness	1	1.382	.241	.007
	Store attractiveness	1	3.248	.073	.016
	Merchandise quality evaluation	1	2.496	.116	.013
	Merchandise value evaluation	1	.373	.542	.002
Shopping motivation					
	Arousal	1	2.626	.107	.013
	Pleasure	1	.016	.899	.000
	Perceived control	1	.996	.319	.005
	Approach behaviour	1	.861	.355	.004
	Spaciousness	1	.233	.630	.001
	Store attractiveness	1	.279	.598	.001
	Merchandise quality evaluation	1	.323	.571	.002
	Merchandise value evaluation	1	2.395	.123	.012
Human crowding * Colour temperature lighting					
	Arousal	1	.091	.763	.000
	Pleasure	1	1.496	.223	.008
	Perceived control	1	.636	.426	.003
	Approach behaviour	1	1.809	.180	.009
	Spaciousness	1	.068	.795	.000
	Store attractiveness	1	6.210	.014*	.031
	Merchandise quality evaluation	1	.379	.539	.002
	Merchandise value evaluation	1	.063	.802	.000
Human crowding * Shopping motivation					
	Arousal	1	.006	.936	.000
	Pleasure	1	2.454	.119	.012
	Perceived control	1	2.689	.103	.014
	Approach behaviour	1	1.558	.214	.008
	Spaciousness	1	.695	.406	.004
	Store attractiveness	1	.265	.607	.001
	Merchandise quality evaluation	1	.396	.530	.002
	Merchandise value evaluation	1	.046	.830	.000
Colour temperature lighting * Shopping motivation					
	Arousal	1	1.532	.217	.008
	Pleasure	1	.712	.400	.004
	Perceived control	1	.401	.528	.002
	Approach behaviour	1	1.162	.282	.006
	Spaciousness	1	.197	.657	.001
	Store attractiveness	1	3.938	.049*	.020
	Merchandise quality evaluation	1	1.047	.307	.005
	Merchandise value evaluation	1	.380	.539	.002

Human Crowding * Colour temperature lighting * Shopping motivation					
	Arousal	1	1.006	.317	.005
	Pleasure	1	.534	.466	.003
	Perceived control	1	.992	.321	.005
	Approach behaviour	1	.214	.644	.001
	Spaciousness	1	.059	.808	.000
	Store attractiveness	1	.012	.912	.000
	Merchandise quality evaluation	1	1.159	.283	.006
	Merchandise value evaluation	1	.262	.610	.001

Table 2: *Effects of independent variables* ** p<.05, ** p<.005*

	Run shopper		**Fun shopper**	
	Low colour temperature lighting	**High colour temperature lighting**	**Low colour temperature lighting**	**High colour temperature lighting**
	M (SD)	*M (SD)*	*M (SD)*	*M (SD)*
Arousal				
High human crowding	4.08 (.85)	3.98 (.70)	4.22 (.96)	4.17 (.64)
Low human crowding	3.70 (.68)	3.44 (.90)	3.64 (.75)	3.88 (.70)
Pleasure				
High human crowding	3.92 (.85)	3.80 (1.25)	3.67 (1.21)	3.59 (.80)
Low human crowding	4.30 (.96)	3.64 (.86)	4.28 (1.00)	4.06 (.74)
Perceived control				
High human crowding	4.00 (1.10)	4.11 (1.27)	4.63 (1.10)	4.27 (1.06)
Low human crowding	4.96 (1.21)	4.56 (.94)	4.80 (1.34)	4.51 (.87)
Approach behaviour				
High human crowding	3.82 (1.09)	3.53 (1.24)	3.33 (1.43)	3.26 (1.32)
Low human crowding	4.36 (1.23)	3.44 (1.23)	4.15 (1.36)	3.76 (1.07)
Spaciousness				
High human crowding	3.93 (1.36)	3.63 (1.44)	4.05 (1.60)	4.00 (1.45)
Low human crowding	5.34 (1.83)	5.04 (1.11)	5.24 (1.18)	5.01 (1.27)
Store attractiveness				
High human crowding	3.67 (.82)	3.47 (1.24)	3.36 (1.25)	3.78 (1.12)
Low human crowding	4.28 (1.18)	3.23 (1.22)	4.11 (1.70)	3.75 (1.25)

	Run shopper		Fun shopper	
	Low colour temperature lighting	High colour temperature lighting	Low colour temperature lighting	High colour temperature lighting
	M (SD)	*M (SD)*	*M (SD)*	*M (SD)*
Merchandise quality evaluation				
High human crowding	4.81 (.96)	4.99 (1.06)	5.13 (1.00)	4.65 (.98)
Low human crowding	4.96 (1.19)	4.61 (1.27)	5.14 (1.09)	4.80 (1.12)
Merchandise value evaluation				
High human crowding	3.40 (1.00)	3.44 (1.00)	3.76 (1.00)	3.47 (.82)
Low human crowding	3.61 (1.08)	3.58 (1.13)	3.89 (1.06)	3.82 (1.14)

Table 3. Means and standard deviations per condition.

4.1 Main effects

Human crowding

A main effect of human crowding on *arousal* was found (F (1,201) 16.924, p<.001). A retail environment with high human crowding was rated as more arousing (M=4.11, SD=.79) opposed to a retail environment with low human crowding (M=3.66, SD=.77). Also a statistically significant main effect of human crowding on *pleasure* was found (F (1,201) =5.496, p<.05). A retail environment with low human crowding (M=4.06, SD=1.04) was perceived as more pleasant opposed to a retail environment with high human crowding (M=3.74, SD=0.92).To continue, another main effect of human crowding on the consumer response *perceived control* was found. For the dependent variable perceived control, the MANOVA showed that crowding had a significant effect on this variable (F (1,201) =8.588, p<.05). Shoppers in a retail environment with low human crowding experienced more perceived control (M=4.70, SD=1.09) than shoppers in a retail environment with high human crowding conditions (M=4.24, SD=1.14). A main effect was also found on the effect of human crowding on *approach* behaviour (F (1,201) =6.304, p<.05). Results showed that a retail environment with low human crowding (M=3.92, SD=1.23) was more likely to be approached by shoppers than a retail environment with high human crowding (M=3.48, SD=1.28). The MANOVA showed significant results for the dependent variable *spaciousness*. The level of human crowding in a retail environment has a significant

main effect on perceived spaciousness (F (1,201) =45.225, $p < .001$). Participants exposed to a retail environment with a high level of human crowding have a significantly lower score on perceived spaciousness (M=3.91, SD=1.45) opposed to the participants exposed to a retail environment with a low level of human crowding (M=5.15, SD=1.80).

No significant main effects of human crowding on *store attractiveness, merchandise quality evaluation* and *merchandise quality evaluation* were found. Yet, it might be worth mentioning that marginally trends towards effects of human crowding on *store attractiveness* (F (1,201) =2.458, p=.11) and *merchandise quality evaluation* (F (1,202) =1,936, p = .11) were found. Hypotheses 1 will partly be accepted as human crowding showed significant effects on 5 out of the 8 tested dependent variables.

Colour temperature lighting

The multivariate analysis variance (Wilks' Lambda) showed no significant results for an effect of simulated colour temperature on the dependent variables. Yet, data in table 2 indicates that colour temperature lighting has a main effect on *pleasure, approach behaviour* and possibly on *store attractiveness*. An effect of colour temperature lighting on *pleasure* was found (F (1,201) =3.804, p=.05). Contrary to hypothesis 2, a retail environment with low (warm) colour temperature lighting was rated as more pleasant (M=4.05, SD=1.03) opposed to a retail environment with high (cold) colour temperature lighting (M=3.78, SD=0.93). Further, a main effect of colour temperature lighting on *approach behaviour* was found (F (1,201) =5.773, p=.017). Also contrary to hypothesis 2, a retail setting with low (warm) colour temperature lighting was rated as more approachable (M=3.90, SD=1.33) opposed to a retail setting with high (cold) colour temperature lighting (M=3.5, SD=1.19). A trend towards a marginally significant main effect of SCT lighting on *store attractiveness* (F (1,201) =3.419, p=.06) and *overall product quality* (F (1,201) =2.654, p=.10) was noticeable. No main effects were found for the *spaciousness and overall product quality* variables. All means and standard deviations for the independent variables are presented in Table 3.

Shopping motivation

No significant main effect of shopping motivation on the dependent variables was found. Only a marginally trend towards a main effect of shopping motivation on *arousal* (F (1,201) =2.626, p=.10 and *merchandise value evaluation* (F (1,201) =2.395, p=.12 was noticed.

4.2 Interaction effects

A significant interaction effect of human crowding and colour temperature lighting on store attractiveness was found (F (1,201) =6.210, $p<.05$). Under conditions of low (warm) colour temperature lighting, a retail environment with low human crowding (M=4.20, SD=1.17) will significantly be perceived as more attractive than a retail environment with high human crowding conditions (M=3.51, SD=1.06) (Figure 3). Under conditions of high (cold) colour temperature lighting these effects were not significant. A retail environment with high human crowding (M=3.63, SD=1.17) was not significantly perceived as more attractive than a retail environment with low human crowding conditions (M=3.50, SD=1.25).

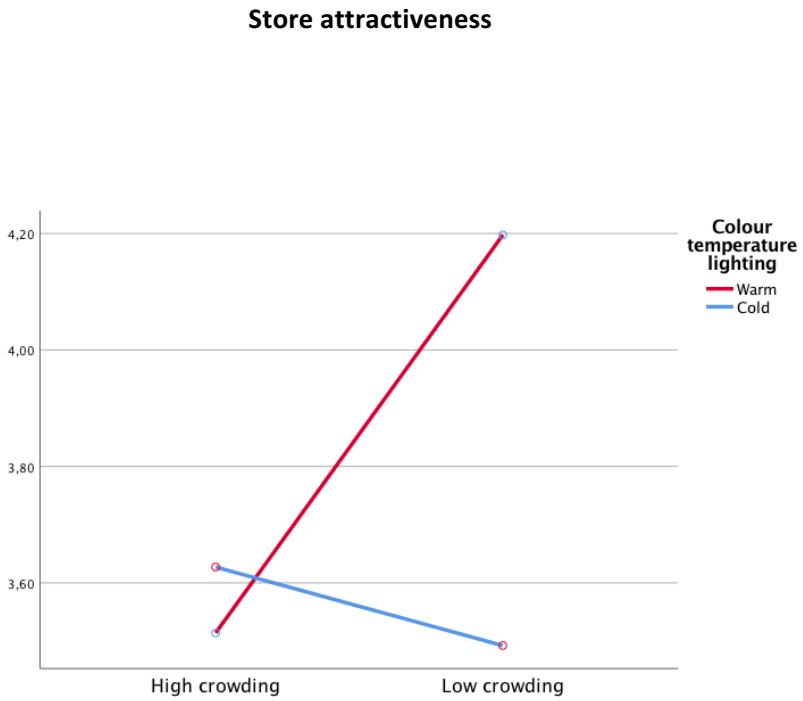

Figure 3. Interaction effect between human crowding and colour temperature lighting on store attractiveness

Another significant interaction effect on store attractiveness was found. Particularly, the MANOVA revealed an interaction effect of colour temperature lighting and shopping motivation on store attractiveness. Under conditions of low (warm) colour temperature lighting, a fun shopper will perceive the retail environment (*M*=3.74, *SD*=1.26) as less attractive than a run shopper (*M*=4.00, *SD*=1.07). On the other hand, under conditions of high (cold) colour temperature lighting, a fun shopper will perceive the retail setting (*M*=3.77, *SD*=1.18) as more attractive than a run shopper (*M*=3.35, *SD*=1.22). The results indicate that the interaction effect of colour temperature lighting on shopping motivation is most significant for run shoppers as experience a retail environment with low (warm) colour temperature lighting (*M*=4.00, *SD*=1.07) as more attractive than a retail environment with high (cold) colour temperature lighting (*M*=3.35, *SD*=1.22).

Figure 3. Interaction effect between colour temperature lighting and shopping motivation on store attractiveness

4.3 Overview of the results

The main focus of this study was to test to what extent human crowding, colour temperature lighting and shopping motivation affects the consumer responses and consumer perceptions in a retail environment. The results of this experiment showed that human crowding has effect on *arousal, pleasure, perceived control, approach/avoidance* and *perceived spaciousness* in a retail environment. To add on, the results show an effect of colour temperature lighting on *pleasure* and *approach/avoidance behaviour.* An interaction effect between human crowding and colour temperature lighting was found on store attractiveness and the results also showed an effect of shopping motivation and colour temperature lighting on store attractiveness. Though, in both cases Wilks' lambda value indicated no significant interaction effects. No other effects were present in this study. An overview of hypotheses is presented in Table 4.

H#	Hypotheses	Result
H1	A retail setting with high human crowding conditions will lead to more (a) arousal, but less (b) pleasure, (c) perceived control, (d) approach behaviour, (e) spaciousness, (f) store attractiveness, (g) merchandise quality evaluation, and (h) merchandise value evaluation opposed to a retail setting with low human crowding conditions.	**H1 (a), (b), (c), (d) and (e) are supported.** H1 (f), (g), and (h) are not supported
H2	A retail setting with high colour temperature (blueish) lighting conditions will lead to more (a) arousal, (b) pleasure, (c) perceived control, (d) approach behaviour, (e) spaciousness, (f) store attractiveness, (g) merchandise quality, and (h) merchandise value opposed to a retail setting with low colour temperature (reddish) lighting conditions.	H2 is not supported
H3a	Under conditions of low human crowding, high colour temperature (blueish) lighting will lead to less (a) arousal (b) pleasure, (c) perceived control, (d) approach behaviour, (e) store spaciousness, (f) store attractiveness, (g) merchandise quality evaluation, and (h) merchandise value evaluation than low colour temperature (reddish) lighting.	**H3a (f) is supported** H3a (a), (b), (c), (d), (g) and (h) are not supported

H3b	Under conditions of high human crowding, high colour temperature (blueish) lighting will lead to less (a) arousal but more (b) pleasure, (c) perceived control, (d) approach behaviour, (e) store spaciousness, (f) store attractiveness, (g) merchandise quality evaluation, and (h) merchandise value evaluation than low colour temperature (reddish) lighting.	H3b is not supported
H4	The impact of retail atmospherics on (a) arousal, (b) pleasure, (c) perceived control, (d) approach behaviour, (e) store spaciousness, (f) store attractiveness, (g) merchandise quality evaluation, and (h) merchandise value evaluation is mediated by shopping motivation.	**H4 (f) is supported** H4 (a), (b), (c), (d), (e), (g) and (h) are not supported
H5a	With a task-oriented shopping motivation, a retail environment with high human crowding conditions will lead to more (a) arousal and less (b) pleasure, (c) perceived control, (d) approach behaviour, (e) store spaciousness, (f) store attractiveness, (g) merchandise quality evaluation, and (h) merchandise value evaluation opposed to a retail environment with low human crowding conditions.	H5a is not supported
H5b	With a recreational-oriented shopping motivation, a retail environment with high human crowding conditions will lead to more (a) arousal (b) pleasure, (c) perceived control, (d) approach behaviour, (e) store spaciousness, (f) store attractiveness, (g) merchandise quality evaluation, and (h) merchandise value evaluation opposed to a retail environment with low human crowding conditions.	H5b is not supported
H6a	With a task-oriented shopping motivation, a retail environment with high colour temperature (blueish) lighting will lead to more (a) arousal, (b) pleasure, (c) perceived control, (d) approach behaviour, (e) store spaciousness, (f) store attractiveness, (g) merchandise quality evaluation, and (h) merchandise value evaluation opposed to a retail environment with low colour temperature (reddish) lighting.	H6a is not supported
H6b	With a recreational shopping motivation, a retail environment with high colour temperature (blueish) lighting will lead to more (a) arousal, (b) pleasure, (c) perceived control, (d) approach behaviour, (e) store spaciousness, (f) store attractiveness, (g) merchandise quality evaluation, and (h) merchandise value evaluation opposed to a retail environment with low colour temperature (reddish) lighting.	H6b is not supported

Table 4. Overview of hypotheses.

5. Discussion

This research attempts to give more insight in how human crowding and colour temperature lighting interact and whether they influence consumer's responses and perceptions in a retail environment, taking into consideration consumer's shopping motivation. The effects of these two atmospheric variables and shopping motivation on consumers' responses and perceptions have not been investigated together in a retail setting previously. Through this research some recommendations can be made concerning the use of the correct in-store colour temperature lighting in crowded versus non-crowded retail environments while taking consumer's shopping motivations into consideration.

5.1 Conclusions

Main effects

In regard to human crowding, it is not surprising that in this study consumers' responses are strongly affected by this atmospheric element since it is generally believed that crowding can result in less favourable evaluations of the shopping experience (Eroglu & Harrell, 1986; Harrell, Hutt, & Anderson, 1980). The results show that a retail environment with high level of human crowding is significantly perceived more negative opposed to a retail environment with low human crowding. Main effects of human crowding on all consumer and behavioural responses tested are found. Human crowding has an effect on pleasure, arousal, perceived control, alertness and approach/avoidance behaviour. A logical interpretation would be that higher levels of human crowding limits the consumer's freedom and therefore induces negative consumer responses. Research by Altman (1975) suggested that large spaces evoke feelings of confinement and results in beneath optimal stimulation for consumers. Research suggested that there might be an inverse U relationship between crowding and satisfaction, were crowding also can positively affect a consumer's experience in a retail environment, yet this study shows no evidence towards such theory. The findings in this study of human crowding on consumer responses are in line with earlier research and therefore once again emphasize the importance of restraining human crowding in retail environments.

To add on, human crowding also showed a main effect on a consumer perception variable. Human crowding has shown to have a significant effect on perceived spaciousness. A retail environment with low human crowding was significantly perceived as more spacious opposed to a retail environment with high human crowding. These findings are in line with research by Nasar (1984) and Machleit, Kellaris & Eroglu (1994) and show that crowding is a significant antecedent of spaciousness perceptions. To add on, Van Rompay, Tanja-Dijkstra, Verhoeven & Van Es (2011) argue that a spacious store layout is likely to reduce negative affect of task-oriented shoppers and so having a spacious retail environment is of importance in creating a positive shopping environment. Yet, this research shows no significant effect towards such theory.

In regard to colour temperature lighting, it was hypothesized that high colour temperature lighting (cold lighting) would be perceived as more pleasurable and more approachable than low correlated colour temperature (warm lighting). Yet, in this study, a retail environment with low correlated colour temperature lighting (warm lighting) is perceived as more pleasurable and more approachable. These results agree with earlier findings stating that appropriate lighting will produce arousal and pleasure and so contribute to consumer approach behaviour (Areni & Kim, 1994; Mehrabian, 1976; Summers & Hebert, 2001) but are somewhat contradictory to findings by Park and Farr (2009). Park and Farr (2009) indicate that arousal is more likely to be related to approach behaviour opposed to pleasure. Though, this study shows that low colour temperature (warm) lighting has the same positive effect on pleasure and approach behaviour and therefore indicate that pleasure contribute to consumer approach behaviour.

Furthermore, it is worth mentioning that colour temperature lighting showed no evidence towards an effect on spaciousness in a retail environment. The notion that a retail environment with high correlated colour temperature would be perceived as more spacious opposed to a retail environment with low correlated colour temperature was not supported. An explanation for these results could be the belief that lighting is situation-specific (Rea, 1999). Research by Manav (2007) showed that correlated colour temperature does have an effect on spaciousness in an office setting; perhaps this does not apply in a retail environment.

Interaction effects

Two interaction effects were found. Under conditions of low (warm) colour temperature lighting, a retail environment with low human crowding was perceived as more attractive than a retail environment with high human crowding. Shoppers generally use plain, easy accessible social cues (e.g., crowding) to help them draw conclusions about possible missing information. A crowded retail environment could indicate a popular store and thus creating an attractive store image. To add on, a room with low colour temperature lighting is perceived as more attractive opposed to a room with high colour temperature lighting (Park and Farr, 2007).

Secondly, an interaction effect of colour temperature lighting and shopping motivation on store attractiveness was found. Run shoppers perceived a retail environment with low (warm) colour temperature lighting as more attractive than a retail environment with high (cool) colour temperature lighting. An explanation for this effect could be that high (blue) colour temperature lighting is too arousing for run shoppers and therefore is a store perceived as less attractive than low (warm) colour temperature lighting, yet research showed no interaction effect of colour temperature lighting and shopping motivation on arousal. High (cool) colour temperature lighting might be too confronting for run shoppers as clear bright light might stress the obstacles a shopper must face in a store to complete its task, making it less attractive to engage in.

Unfortunately, no other interaction effects were found. Perhaps the colour temperature lighting and shopping motivation scenarios were too lightly processed. As discussed earlier in this section, crowding did seem to have a huge impact on the participants, colour temperature only showed two main effects and no main effects were found for shopping motivation. On the other hand, two interaction effects of human crowding and colour temperature lighting, and colour temperature lighting and shopping motivation on store attractiveness were found. Possibly the effects of different in-store colour temperature lighting could not be perceived as realistic in an online study.

5.2 Limitations

This research on human crowding, colour temperature lighting and shopping motivation has some limitations regarding the online survey, the stimulus material and the independent variable colour temperature. The limitations will be explained.

First, the respondents participated in an online experiment and experienced the retail environment through a video. The participants observed a motionless camera angle sliding through the retail environment with a static route. This did not allow the participants to move freely throughout the store and could not be fully representative of how they would move in a real store. For that reason, an interactive 3D setting where the participants are free to move, to look and to spend as much time in the store as they want would be a more effective method to use for future research.

Even better would be considering conducting future research in an actual physical retail environment as this study was conducted in an online virtual setting. The online virtual retail environment could be perceived as tedious and less realistic since there was no social interaction among the (few) people present in the store. Furthermore, the results of colour temperature lighting on participants in an actual physical store setting could differ in the results from this study. Using actual light sources could be more representative opposed to artificial lighting in a virtual 3D setting.

To add on, the manipulation of the motivational orientation variable could be a possible limitation in this study. As above mentioned, the survey was distributed online to the respondents and prior in engaging in the survey, the participants were asked to read a text. This text asked the participants to operate in a different mood state of which they were already in. For some participants this enacting could be quite difficult and therefore distort the results. Perhaps distributing a survey shortly after the participants did their groceries in a physical retail environment would therefore might give more accurate results.

Third, this study only focused on two types of simulated colour temperature 3,000K and 5,000K. Research by Viola, James, Schanglen and Dijk (2008) noticed a difference in alertness and sleepiness between the correlated colour temperatures of 4,000K and 17,000K. In a next research higher and lower

correlated colour temperatures could be included. Beside correlated colour temperature there are more lighting measurements to investigate. For instance, colour rendering index (CRI) showed an effect on pleasure in a retail environment (Park and Farr, 2007)

Finally, during the study some participants stated that they experienced the survey as monotonous. The first part of the survey was recognized as pleasing and fun to do by the participants. This was due to the fact that the first part of the survey existed of 3 different videos followed by a few questions. The following part was received as boring and repetitive. Perhaps limiting the measurements of the study and shortening the survey could help. Yet, this would limit the outcomes of this study.

5.3 Practical implications

The practical implications are formulated for retail managers and retail organizations. Correlated colour temperature lighting is a relatively unexplored field of research on consumer behaviour in retail environments. For that reason, there is a need for research in the area of the effect of correlated colour temperature on consumer behaviour and perceptions in a retail environment.

When creating a retail brand experience environment based on entertainment and pleasure, the use of correct correlated colour temperature can be of importance. In this study, CCT has shown to positively affect consumer's pleasure in a retail environment. Also, CCT has shown to be able to influence approach/avoidance behaviour. By choosing the correct CCT for a retail environment it can be able to pull customers towards the retail environment.

To positively affect consumer's responses it is of importance to limit crowding in a retail environment. A crowded retail environment evokes negative consumer responses. While this seems difficult to do, a retailer could use different techniques as: yield-management flows management, operational research etc. (Dion, 2004). Yet, even if these capacities are reduced, they will still remain. Retail managers should evaluate what the ideal density setting is for their retail environment so they can maximize their profits and consumer satisfaction.

Despite the few significant results this research produced, this study can contribute to marketing practices. This study once again shows the importance in limiting or battling with crowding levels and is the first study that actually combined correlated colour temperature, crowding levels and task-orientation to test the effect of consumer behaviour and consumer perceptions in a retail environment.

Reference List

1. Altman, I. (1975). The Environment and Social Behavior: Privacy, Personal Space, Territory, and Crowding.

2. Apter, M. J. (1982). *The experience of motivation: The theory of psychological reversals*. Academic Pr.

3. Areni, C. S., & Kim, D. (1994). The influence of in-store lighting on consumers' examination of merchandise in a wine store. *International Journal of Research in Marketing*, *11*(2), 117-125.

4. Babin, B. J., Hardesty, D. M., & Suter, T. A. (2003). Color and shopping intentions: The intervening effect of price fairness and perceived affect. Journal of business research, 56(7), 541-551.

5. Baker, J., Grewal, D., & Parasuraman, A. (1994). The influence of store environment on quality inferences and store image. *Journal of the Academy of Marketing Science*, *22*(4), 328-339.

6. Baker, J., Levy, M., & Grewal, D. (1992). An experimental approach to making retail store environmental decisions. *Journal of Retailing*, *68*(4), 445.

7. Bateson, J. E., & Hui, M. K. (1992). The ecological validity of photographic slides and videotapes in simulating the service setting. *Journal of Consumer Research*, *19*(2), 271-281.

8. Baum, A., & Valins, S. (1977). Architecture and social behavior: psychological study of social density.

9. Baumgarten, S. A., & Hensel, J. S. (1987). Enhancing the perceived quality of medical service delivery systems. Add Value to Your Service, Carol Surprenant, ed. Chicago: American Marketing Association, 105(10).

10. Bellizzi, J. A., Crowley, A. E., & Hasty, R. W. (1983). The effects of color in store design. Journal of retailing.

11. Bitner, M. J. (1990). Evaluating service encounters: the effects of physical surroundings and employee responses. *the Journal of Marketing*, 69-82.

12. Boray, P. F., Gifford, R., & Rosenblood, L. (1989). Effects of warm white, cool white and full-spectrum fluorescent lighting on simple cognitive performance, mood and ratings of others. *Journal of Environmental Psychology*, *9*(4), 297-307.

13. Brehm, J. W. (1966). A theory of psychological reactance.

14. Byun, S. E., & Mann, M. (2011). The influence of others: The impact of perceived human crowding on perceived competition, emotions, and hedonic shopping value. *Clothing and Textiles Research Journal*, *29*(4), 284-297.

15. Coutinho, E., & Cangelosi, A. (2011). Musical emotions: predicting second-by-second subjective feelings of emotion from low-level psychoacoustic features and physiological measurements. *Emotion*, *11*(4), 921.

16. Custers, P. J., De Kort, Y. A. W., IJsselsteijn, W. A., & De Kruiff, M. E. (2010). Lighting in retail environments: Atmosphere perception in the real world. *Lighting Research & Technology*, *42*(3), 331-343.

17. Dawson, S., Bloch, P. H., & Ridgway, N. M. (1990). Shopping motives, emotional states, and retail outcomes. *Journal of Retailing*, *66*(4), 408.

18. Deci, E. L., & Ryan, R. M. (1985). The general causality orientations scale: Self-determination in personality. *Journal of Research in Personality*, *19*(2), 109-134.

19. Donovan, R. J., & Rossiter, J. R. (1982). Store atmosphere: an environmental psychology approach. *Journal of Retailing*, *58*(1), 34-57.

20. Donovan, R. J., Rossiter, J. R., Marcoolyn, G., & Nesdale, A. (1994). Store atmosphere and purchasing behavior. *Journal of Retailing*, *70*(3), 283-294.

21. Doucé, L., & Janssens, W. (2013). The presence of a pleasant ambient scent in a fashion store: The moderating role of shopping motivation and affect intensity. *Environment and Behavior*, *45*(2), 215-238.

22. Dion, D. (2004). Personal control and coping with retail crowding. *International Journal of Service Industry Management*, *15*(3), 250-263.

23. Eroglu, S., & Harrell, G. D. (1986). Retail crowding: Theoretical and strategic implications. *Journal of Retailing*, (62), 347-363.

24. Eroglu, S. A., & Machleit, K. A. (1990). An empirical study of retail crowding: antecedents and consequences. *Journal of Retailing*, *66*(2), 201.

25. Eroglu, S. A., Machleit, K., & Barr, T. F. (2005). Perceived retail crowding and shopping satisfaction: the role of shopping values. *Journal of Business Research*, *58*(8), 1146-1153.

26. Eroglu, S. A., Machleit, K. A., & Chebat, J. C. (2005). The interaction of retail density and music tempo: Effects on shopper responses. *Psychology & Marketing*, *22*(7), 577-589.

27. Flynn, L. P., & Mouginis-Mark, P. J. (1992). Cooling rate of an active Hawaiian lava flow from nighttime spectroradiometer measurements. *Geophysical Research Letters*, *19*(17), 1783-1786.

28. Flynn, J. E., Spencer, T. J., Martyniuk, O., & Hendrick, C. (1973). Interim study of procedures for investigating the effect of light on impression and behavior. *Journal of the Illuminating Engineering Society*, *3*(1), 87-94.

29. Flynn, J. E., & Spencer, T. J. (1977). The effects of light source color on user impression and satisfaction. *Journal of the Illuminating Engineering Society*, *6*(3), 167-179.

30. Foxall, G. R., & Yani-de-Soriano, M. M. (2005). Situational influences on consumers' attitudes and behavior. *Journal of Business Research*, *58*(4), 518-525.

31. Freyssinier, J. P., & Rea, M. (2010, August). A two-metric proposal to specify the color-rendering properties of light sources for retail lighting. In Tenth International Conference on Solid State Lighting (Vol. 7784, p. 77840V). International Society for Optics and Photonics.

32. Gordon, G. (2003). Interior lighting for designers (4th ed.) New York, John Wiley & Sons.

33. Greenland, S. J., & McGoldrick, P. J. (1994). Atmospherics, attitudes and behaviour: modelling the impact of designed space. *The International Review of Retail, Distribution and Consumer Research*, *4*(1), 1-16.

34. Harrell, G. D., Hutt, M. D., & Anderson, J. C. (1980). Path analysis of buyer behavior under conditions of crowding. *Journal of Marketing Research*, 45-51.

35. Holt, D. B. (1995). How consumers consume: A typology of consumption practices. *Journal of Consumer Research*, 22(1), 1-16.

36. Hui, M. K., & Bateson, J. E. (1991). Perceived control and the effects of crowding and consumer choice on the service experience. *Journal of Consumer Research*, *18*(2), 174-184.

37. Hui, M. K., Kim, C., Laroche, M., & Joy, A. (1997). Psychometric properties of an index measure of ethnicity in a bicultural environment. *Canadian Journal of Administrative Sciences/Revue Canadienne des Sciences de l'Administration*, *14*(1), 14-27.

38. Ittelson, W. H., Proshansky, H. M., Rivlin, L. G., & Winkel, G. H. (1974). *An Introduction to Environmental Psychology*. Holt, Rinehart & Winston.

39. Kaltcheva, V., & Weitz, B. A. (2006). The moderating influence of motivational orientation on the relationship between shopping environment arousal and behavior. *Journal of Marketing*, *70*(1), 107-18.

40. Kaltcheva, V. D., & Weitz, B. A. (2006). When should a retailer create an exciting store environment?. *Journal of Marketing*, *70*(1), 107-118.

41. Knez, I. (2001). Effects of colour of light on nonvisual psychological processes. *Journal of Environmental Psychology*, *21*(2), 201-208.

42. Knez, I., & Niedenthal, S. (2008). Lighting in digital game worlds: Effects on affect and play performance. *CyberPsychology & Behavior*, 11(2), 129-137.

43. Kolanowski, A. M. (1990). Restlessness in the elderly: the effect of artificial lighting. *Nursing Research*, *39*(3), 181-183.

44. Korgaonkar, P. K. (1981). Shopping orientations, importance of store attributes, demographics and store patronage- a multivariate investigation. Akron Business and Economic Review, 12(4), 34-38.

45. Kotler, P. (1973). Atmospherics as a marketing tool. *Journal of Retailing*, *49*(4), 48-64.

46. Langer, E. J., & Saegert, S. (1977). Crowding and cognitive control. *Journal of Personality and Social Psychology*, *35*(3), 175.

47. Levy, M., & Weitz, B. A. (2004). *Retailing Management*. McGraw-Hill/Irwin.

48. Machleit, K. A., Eroglu, S. A., & Mantel, S. P. (2000). Perceived retail crowding and shopping satisfaction: what modifies this relationship?. *Journal of Consumer Psychology*, *9*(1), 29-42.

49. Machleit, K. A., Kellaris, J. J., & Eroglu, S. A. (1994). Human versus spatial dimensions of crowding perceptions in retail environments: A note on their measurement and effect on shopper satisfaction. *Marketing Letters*, *5*(2), 183-194.

50. Machleit, K. A., & Mantel, S. P. (2001). Emotional response and shopping satisfaction: Moderating effects of shopper attributions. *Journal of Business Research*, *54*(2), 97-106.

51. Manav, B. (2007). An experimental study on the appraisal of the visual environment at offices in relation to colour temperature and illuminance. *Building and Environment*, *42*(2), 979-983.

52. Manav, B. (2007). Color-emotion associations and color preferences: A case study for residences. *Color Research & Application*, *32*(2), 144-150.

53. Mari, M., & Poggesi, S. (2013). Servicescape cues and customer behavior: a systematic literature review and research agenda. *The Service Industries Journal*, *33*(2), 171-199.

54. Mattila, A. S., & Wirtz, J. (2001). Congruency of scent and music as a driver of in-store evaluations and behavior. *Journal of Retailing*, *77*(2), 273-289.

55. McColl, S. L., & Veitch, J. A. (2001). Full-spectrum fluorescent lighting: a review of its effects on physiology and health. *Psychological Medicine*, *31*(6), 949-964.

56. Mehrabian, A., & Russell, J. A. (1974). *An Approach to Environmental Psychology*. the MIT Press.

57. Michon, R., Chebat, J. C., & Turley, L. W. (2005). Mall atmospherics: the interaction effects of the mall environment on shopping behavior. *Journal of Business Research*, *58*(5), 576-583.

58. Milgram, S. (1970). The experience of living in cities. *Science*, *167*(3924), 1461-1468.

59. Narendran, N., Vasconez, S., Boyce, P., & Eklund, N. (2000). Just-perceivable color differences between similar light sources in display lighting applications. *Journal of the Illuminating Engineering Society*, *29*(2), 68-77.

60. Nasar, J. L. (1984). Modifiers of Perceived Spaciousness and Crowding among Different Cultural Groups.

61. Noone, B. M., & Mattila, A. S. (2009). Hotel revenue management and the Internet: The effect of price presentation strategies on customers' willingness to book. *International Journal of Hospitality Management*, *28*(2), 272-279.

62. Pan, Y., & Siemens, J. C. (2011). The differential effects of retail density: An investigation of goods versus service settings. *Journal of Business Research*, *64*(2), 105-112.

63. Park, N. K., & Farr, C. A. (2007). The Effects of Lighting on Consumers' Emotions and Behavioral Intentions in a Retail Environment: A Cross-Cultural Comparison. *Journal of Interior Design*, *33*(1), 17-32.

64. Pons, F., Laroche, M., & Mourali, M. (2006). Consumer reactions to crowded retail settings: Cross-cultural differences between North America and the Middle East. *Psychology & Marketing*, *23*(7), 555-572.

65. Pons, F., Mourali, M., & Giroux, M. (2014). The density–satisfaction relationship revisited: The role of scarcity and consumers affective reactions in a crowded retail situation. *Journal of Retailing and Consumer Services*, *21*(1), 54-60.

66. Quellman, E. M., & Boyce, P. R. (2002). The light source color preferences of people of different skin tones. *Journal of the Illuminating Engineering Society*, *31*(1), 109-118.

67. Rea, M. S. (Ed). (1999). Lighting handbook (9th ed.) New York: illuminating Engineering Society of North America.

68. Schielke, T. (2010). Light and corporate identity: Using lighting for corporate communication. *Lighting Research & Technology*, *42*(3), 285-295.

69. Schmidt, D. E., & Keating, J. P. (1979). Human crowding and personal control: An integration of the research. *Psychological Bulletin*, *86*(4), 680.

70. Steffy, G. (2002). *Architectural Lighting Design*. John Wiley & Sons.

71. Stokols, D. (1972). On the distinction between density and crowding: some implications for future research. *Psychological Review*, *79*(3), 275.

72. Stone, G. P. (1954). City shoppers and urban identification: observations on the social psychology of city life. *American Journal of Sociology*, *60*(1), 36-45.

73. Summers, T. A., & Hebert, P. R. (2001). Shedding some light on store atmospherics: influence of illumination on consumer behavior. *Journal of Business Research*, *54*(2), 145-150.

74. Tantanatewin, W., & Inkarojrit, V. (2016). Effects of color and lighting on retail impression and identity. Journal of Environmental Psychology, 46, 197-205.

75. Tauber, E. M. (1972). Why do people shop?. *The Journal of Marketing*, 46-49.

76. Tse, A. C. B., Sin, L., & Yim, F. H. (2002). How a crowded restaurant affects consumers' attribution behavior. *International Journal of Hospitality Management*, *21*(4), 449-454.

77. Turley, L. W., & Milliman, R. E. (2000). Atmospheric effects on shopping behavior: a review of the experimental evidence. *Journal of Business Research*, *49*(2), 193-211.

78. Uhrich, S. (2011). Explaining non-linear customer density effects on shoppers' emotions and behavioral intentions in a retail context: The mediating role of perceived control. *Journal of Retailing and Consumer Services*, *18*(5), 405-413.

79. Van Bommel, W. J. M., & Van den Beld, G. J. (2004). Lighting for work: a review of visual and biological effects. *Lighting Research & Technology*, *36*(4), 255-266.

80. Van Hagen, M. (2011). *Waiting experience at train stations*. Eburon Uitgeverij BV.

81. Van Rompay, T. J., Galetzka, M., Pruyn, A. T., & Garcia, J. M. (2008). Human and spatial dimensions of retail density: Revisiting the role of perceived control. *Psychology & Marketing*, *25*(4), 319-335.

82. Van Rompay, T. J., Krooshoop, J., Verhoeven, J. W., & Pruyn, A. T. (2012). With or without you: Interactive effects of retail density and need for affiliation on shopping pleasure and spending. *Journal of Business Research*, *65*(8), 1126-1131.

83. Van Rompay, T. J., Tanja-Dijkstra, K., Verhoeven, J. W., & van Es, A. F. (2012). On store design and consumer motivation: Spatial control and arousal in the retail context. *Environment and Behavior*, *44*(6), 800-820.

84. Veitch, J. A., & McColl, S. L. (2001). A critical examination of perceptual and cognitive effects attributed to full-spectrum fluorescent lighting. Ergonomics, 44(3), 255-279.

85. Viola, A. U., James, L. M., Schlangen, L. J., & Dijk, D. J. (2008). Blue-enriched white light in the workplace improves self-reported alertness, performance and sleep quality. Scandinavian journal of work, environment & health, 297-306.

86. Vogels, I., Sekulovski, D., Clout, R., & Moors, R. (2009). A quantitative study on the impact of light on the atmosphere of an environment. Lux Europa, 2009, 11th.

87. Wakefield, K. L., & Baker, J. (1998). Excitement at the mall: determinants and effects on shopping response. *Journal of Retailing*, *74*(4), 515-539.

88. Ward, J. C., Bitner, M. J., & Barnes, J. (1992). Measuring the prototypicality and meaning of retail environments. Journal of retailing, 68(2), 194.

89. Yalch, R. F., & Spangenberg, E. R. (2000). The effects of music in a retail setting on real and perceived shopping times. *Journal of Business Research*, *49*(2), 139-147.

90. Zeithaml, V. A. (1988). Consumer perceptions of price, quality, and value: a means-end model and synthesis of evidence. *The Journal of Marketing*, 2-22.

Appendix A. Survey

Enquête Master Thesis Ruud van Manen

Start of Block: Introduction

Geachte deelnemer, Dit onderzoek wordt uitgevoerd in het kader van een onderzoek voor de masteropleiding Communication Studies aan de Universiteit Twente. Na deze introductie krijgt u een klein stuk tekst te lezen. Lees deze tekst aandachtig en probeert u a.u.b. zo goed mogelijk te verplaatsen in de geschetste situatie. Hierna krijgt u een drie korte video's te zien. Ik vraag u vriendelijk om ook deze video's goed te bekijken. Vervolgens zullen er u een aantal vragen gesteld worden. De antwoorden kunnen worden gegeven op een 7-punten schaal.
U geeft antwoord door het bolletje aan te vinken dat het dichtst bij uw mening komt. Bijvoorbeeld, als u het participeren in een onderzoek doorgaans redelijk amuserend vindt, dan vinkt u het tweede bolletje van rechts aan. Deelname aan het onderzoek zal ongeveer 5 minuten duren. Ik ben op zoek naar uw persoonlijke mening, dus er kunnen geen goede of foute antwoorden worden gegeven. Uw gegevens zullen anoniem en vertrouwelijk behandeld worden.

Hartelijk dank voor uw medewerking!

Ruud van Manen

End of Block: Introduction

Start of Block: Toestemming

Ik stem geheel vrijwillig in met deelname aan dit onderzoek. Ik behoud me daarbij het recht voor om op elk moment, zonder opgaaf van redenen, deelname aan dit onderzoek te kunnen beëindigen.

○ Ik ga akkoord en ga verder naar de vragenlijst. (1)

End of Block: Toestemming

Start of Block: Warm-High Fun

Lees a.u.b. de volgende situatie aandachtig en probeert u zo goed mogelijk in te leven in de geschetste situatie.

Het is al weekend. Omdat u nu wat vrije tijd hebt bent u aan het nadenken over wat u zou kunnen doen met deze tijd. U kiest ervoor om rustig naar het dichtstbijzijnde winkelcentrum te gaan. Uiteindelijk loopt u even de supermarkt binnen om te kijken of zij nog wat lekkere producten hebben. Beeld nu uzelf in dat u de supermarkt binnenloopt en in de supermarkt aan het rondkijken bent.

Page Break

Bekijk a.u.b. onderstaande video

Page Break

Werther's Original's gemiddelde prijs is €1,30.

Hoeveel denkt u dat u moet betalen voor het bovenstaande product in deze winkel?

_____

Geef a.u.b. antwoord op de volgende stellingen.

	Helemaal mee oneens (1)	Mee oneens (2)	Een beetje mee oneens (3)	noch eens noch oneens (4)	Een beetje mee eens (5)	Mee eens (6)	Helemaal mee eens (7)
Dit product is van goede kwaliteit (1)	○	○	○	○	○	○	○
Dit product is voordelig (2)	○	○	○	○	○	○	○

Page Break

Ga verder met het kijken van onderstaande video

Page Break

Martini Rosso 75cl gemiddelde prijs is €5,45.

Hoeveel denkt u dat u moet betalen voor het bovenstaande product in deze winkel?

_____

Geef a.u.b. antwoord op de volgende stellingen.

	Helemaal mee oneens (1)	Mee oneens (2)	Een beetje mee oneens (3)	noch eens noch oneens (4)	Een beetje mee eens (5)	Mee eens (6)	Helemaal mee eens (7)
Dit product is van goede kwaliteit (1)	○	○	○	○	○	○	○
Dit product is voordelig (2)	○	○	○	○	○	○	○

Ga verder met het kijken van onderstaande video

Page Break

Taft Titane Power Gel's gemiddelde prijs is €5.69.

Hoeveel denkt u dat u moet betalen voor het bovenstaande product in deze winkel?

_____

Geef a.u.b. antwoord op de volgende stellingen.

	Helemaal mee oneens (1)	Mee oneens (2)	Een beetje mee oneens (3)	noch eens noch oneens (4)	Een beetje mee eens (5)	Mee eens (6)	Helemaal mee eens (7)
Dit product is van goede kwaliteit (1)	○	○	○	○	○	○	○
Dit product is voordelig (2)	○	○	○	○	○	○	○

End of Block: Warm-High Fun

Start of Block: Perceived spaciousness

Geef a.u.b. antwoord op de volgende stellingen.

	Helemaal mee oneens (1)	Mee oneens (2)	Een beetje mee oneens (3)	Noch eens noch oneens (4)	Een beetje mee eens (5)	Mee eens (6)	Helemaal mee eens (7)
Ik vond dat er genoeg vrijheid was om te bewegen in deze winkel (1)	○	○	○	○	○	○	○
Ik zou mij ingesloten voelen in deze winkel (2)	○	○	○	○	○	○	○
Ik zou mij beperkt voelen in deze winkel (3)	○	○	○	○	○	○	○
Ik zou mij benauwd voelen in deze winkel (4)	○	○	○	○	○	○	○

End of Block: Perceived spaciousness

Start of Block: Aantrekkelijk

Ik vind deze winkel:

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	
Heel lelijk	○	○	○	○	○	○	○	Heel mooi
Zeer ontspannen	○	○	○	○	○	○	○	Zeer stimulerend
Zeer aantrekkelijk	○	○	○	○	○	○	○	Zeer onaantrekkelijk
Zeer interessant	○	○	○	○	○	○	○	Zeer oninteressant

End of Block: Aantrekkelijk

Start of Block: Approach/Avoidance

Geef a.u.b. antwoord op de volgende stellingen.

	Helemaal mee oneens (1)	Mee oneens (2)	Een beetje mee oneens (3)	Noch eens noch oneens (4)	Een beetje mee eens (5)	Mee eens (6)	Helemaal mee eens (7)
Ik zou genieten van winkelen in deze winkel (1)	○	○	○	○	○	○	○
Ik zougraag blijven in deze winkel (2)	○	○	○	○	○	○	○
Ik zou rond willen kijken om deze winkel te ontdekken (3)	○	○	○	○	○	○	○
Ik zou dingen kopen in deze winkel (4)	○	○	○	○	○	○	○
Ik zou terug willen komen naar deze winkel (5)	○	○	○	○	○	○	○
Ik zou deze winkel aanbevelen aan mijn vrienden (6)	○	○	○	○	○	○	○

End of Block: Approach/Avoidance

Start of Block: PAD

In deze winkel voel ik me:

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	
Gelukkig	○	○	○	○	○	○	○	Ongelukkig
Blij	○	○	○	○	○	○	○	Geïrriteerd
Tevreden	○	○	○	○	○	○	○	Ontevreden
Voldaan	○	○	○	○	○	○	○	Melancholisch
Hoopvol	○	○	○	○	○	○	○	Wanhopig
Verveeld	○	○	○	○	○	○	○	Ontspannen

End of Block: PAD

Start of Block: Arousal

In deze winkel voel ik me:

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	
Geprikkeld	○	○	○	○	○	○	○	Lijzig
Kalm	○	○	○	○	○	○	○	Opgewonden
Opgefokt	○	○	○	○	○	○	○	Lusteloos
Gestimuleerd	○	○	○	○	○	○	○	Ontspannen
Slaperig	○	○	○	○	○	○	○	Wakker
Alert	○	○	○	○	○	○	○	Sloom

End of Block: Arousal

Start of Block: Perceived control

Geef a.u.b. antwoord op de volgende stellingen.

	Helemaal mee oneens (1)	Mee oneens (2)	Beetje mee oneens (3)	Noch eens noch oneens (4)	Beetje mee eens (5)	Mee eens (6)	Helemaal mee eens (7)
Ik zou voelen dat ik alles onder controle heb in deze winkel (1)	○	○	○	○	○	○	○
Ik zou het moeilijk vinden om mijn eigen gang te gaan in deze winkel (2)	○	○	○	○	○	○	○
Ik zou in deze winkel kunnen kopen wat ik zou willen (3)	○	○	○	○	○	○	○

End of Block: Perceived control

Start of Block: Demographics

Wat is uw geslacht?

○ Man (1)

○ Vrouw (2)

*

Wat is uw leeftijd?

_____

Wat is uw hoogst behaalde opleidingsniveau?

- ○ Basisonderwijs (1)
- ○ Middelbare school (VMBO, HAVO, VWO) (2)
- ○ Middelbaar beroepsonderwijs (MBO) (3)
- ○ Hoger beroepsonderwijs (HBO) (4)
- ○ Wetenschappelijk onderwijs (WO) (5)
- ○ Anders namelijk.... (6) _____

End of Block: Demographics

Appendix B. Video Storyboards


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