Escaping the crowd: An experimental study on the impact of a Virtual Reality experience in a shopping mall.

Van Kerrebroeck, Helena; Brengman, Malaika; Willems, Kim

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Abstract

Crowding is largely associated with negative consumer outcomes such as shopping irritation and lower levels of shopping pleasure, less positive attitudes and less satisfaction toward the crowded store or mall. While previous research demonstrated the alleviating effect of slow music and greenery on this negative impact of high perceived crowding, this study examines the potential of a relaxing Virtual Reality (VR) experience in a shopping mall. As Virtual Reality immerses users in a computer-generated environment, and as such allows them to escape the hectic mall environment, its use is expected to result in a more positive consumer experience. In a quasi-experimental 2x2 between-subjects design, the levels of attitude toward the mall, approach behaviour, mall satisfaction, and loyalty intentions were measured as well as perceived crowding. Participants in the experimental condition were exposed to a relaxing Virtual Reality experience in the mall, whereas participants in the control condition did not get such a treatment. Overall, consumers reported more positive responses on all measured outcome variables after being exposed to the Virtual Reality experience. In addition, the effect on mall attitudes, satisfaction and loyalty is more pronounced when crowding is perceived to be high.

Keywords

Virtual Reality, Shopping mall experiences, Crowding, Escapism

1. Introduction

Over the past years, retail atmospherics research has moved from a focus on light, colour, smell, music and so forth (cf., Turley & Milliman, 2000; Vieira, 2013) to digital solutions at

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the point of sales. Overall, advanced technology has the potential to ameliorate store environments (Pantano, 2016). For instance, digital signage has been found to have a positive impact on retail atmospherics. Research demonstrated that highly sensory in-store digital displays have a positive impact on attitudes and approach behaviour (Dennis et al., 2012; Dennis et al., 2014).

In general, smart technologies can be considered as "[…] enablers of innovation and improvements in consumers' quality of life" (Pantano & Timmermans, 2014, p. 103). As such, a smart technology can enhance the quality of a shopping experience. While online shopping has gained in importance, it cannot yet match up to in-store experiences (Willems, Smolders, Brengman, Luyten, & Schöning, 2016). The current study further builds on the promising findings of smart technologies as an atmospheric cue by examining the potential impact of a Virtual Reality experience staged in a shopping mall from an environmental psychology perspective.

Virtual Reality technology provides a computer-mediated environment in which the user feels a sense of presence (Biocca, 1992) and which has the ability to engage the human senses including vision, hearing, but also kinematic and proprioceptory experiences (i.e., the ability to look around 360 degrees and the sensation of moving, falling,…) (Walsh & Pawlowski, 2002). As such, Virtual Reality users are fully immersed in the virtual environment. This feeling of being 'there' (Sheridan, 1992) results from the immersion in the virtual environment and allows users to momentarily 'escape' from the real world (Yee, 2006). It is a technology that may be used for hedonic, entertainment purposes (Verhagen, Feldberg, van den Hooff, Meents, & Merikivi, 2011) and thus can create value for consumers (Hultén, 2011).

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Virtual Reality has previously been examined and found to positively impact brand perceptions and purchase intentions via an immersive brand experience (Van Kerrebroeck, Brengman, & Willems, 2017) and virtual representations can allow consumers to better examine product items such as clothing via the technology (Verhagen & van Dolen, 2016). The innate immersive nature of Virtual Reality and consequently its ability to allow consumers to escape their real environment for a moment is cause for the focus of this study on improving the experience of shoppers in crowded shopping environments.

Atmospherics research has found that shoppers who are confronted with a large number of other shoppers in stores and shopping malls, can experience a feeling of crowding. The phenomenon of crowding negatively affects consumer evaluations, such as consumer attitudes towards the store/mall and shopping satisfaction (Eroglu & Machleit, 1990). Previous studies have found that the negative impacts of high perceived crowding can be mitigated by, for instance, slow music (Eroglu, Machleit, & Chebat, 2005), in-store vegetation (Brengman, Willems, & Joye, 2012) and employee assistance (Mattila & Wirtz, 2008). This paper resorts to the use of Virtual Reality technology to address the issue of crowding during shopping.

While retailers have recognized the practical importance of experiential retail design for some time (Pine & Gilmore, 1998), scholars only steadily moved their attention toward the topic. They find that the importance of enjoyable shopping experiences continues to grow (Bagdare & Jain, 2013; Fatma, 2014; Lemon & Verhoef, 2016; Sands, Oppewal, & Beverland, 2015; Yoon, 2013), and that "retailers might consider designing retail systems with an eye to enhancing the inherent enjoyment of the shopping experience" (Mathwick, Malhotra, & Rigdon, 2002, p. 57), as entertainment is an important dimension that must be considered with regards to mall attractiveness (El-Adly, 2007) and thus incorporated in shopping centres (Howard, 2007). Entertainment events can include holiday events, fashion shows, concerts,

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etc. (Sit & Birch, 2014). Experience oriented events can induce pleasure (Michon, Yu, Smith, & Chebat, 2007), positive attitudes and satisfaction (Leischnig, Schwertfeger, & Geigenmueller, 2011).

While most research in the past focused on the driving role of store atmospherics in generating pleasurable customer experiences (Verhoef et al., 2009; Vieira, 2013), recent studies on smart retailing technologies started to consider a variety of technological solutions to enhance shopping experiences (Pantano & Timmermans, 2014; Willems et al., 2016). According to these studies, technologies such as RFID, shopping assistant systems and smart mirrors or 3D touch kiosks show great potential for the smart retail environment as they can enrich the traditional store environment (Pantano & Migliarese, 2014; Pantano & Naccarato, 2010; Tüzün, Telli ,& Alır, 2016). While some of these technologies may already provide some entertainment value, to date however, they mainly serve a utilitarian purpose (e.g., RFID facilitating the payment process, smart mirrors aiding in the decision process, etc.; Pantano & Naccarato, 2010). Nevertheless, the use of recent technological advancements to provide hedonic value also shows great potential for retailers (Willems et al., 2016). A prospective benefit entails the application of Virtual Reality technology for entertainment purposes to remedy crowding effects in shopping malls.

The purpose of this paper is to study the impact of providing a Virtual Reality entertainment experience in a shopping mall on consumers' attitudes, approach/avoidance behavior, mall satisfaction and loyalty intentions, considering perceived crowding. Given the advanced stage of Virtual Reality in Gartner's 2016 hype cycle and its great promise for companies, this study answers to the call for research to gain a better understanding of the impact Virtual Reality may have in a business environment and how it can inspire marketing strategies (Pantano & Naccarato, 2010; Renko & Druzijanic, 2014; Walsh & Pawlowski, 2002),

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specifically with regards to crowding and the ability of Virtual Reality to alleviate the impact of crowding in shopping malls.

As such, the contribution of this study to the literature is threefold. First, we add to the literature of retail atmospherics through the use of technology. So far, for instance the atmospheric impact of digital signage has been examined (cf., Dennis et al., 2014), but this has not been done for Virtual Reality yet. Second, we enrich the consumer psychology literature on crowding, as digital and customizable solutions have not been addressed up until now. Third, this study also contributes to the HCI literature as there is still a dearth of studies examining the potential impact Virtual Reality applications, especially in the context of marketing and retailing (Renko & Druzijanic, 2014; Van Kerrebroeck et al., 2017).

In this paper, a theoretical backdrop is provided concerning the concept of crowding, its consequences and suggestions for remediation proposed in the literature. Next, Virtual Reality and its components are defined in order to explain the effect the technology can have on consumers via the construct of escapism. Then, hypotheses are formulated, the empirical methodology is outlined and the analyses and results are described. Finally, the conclusions with inherent managerial implications, limitations and suggestions for further research are presented.

2. Literature review

2.1. Crowding

The perception of crowding is a phenomenon that arises when a person feels that space is scarce, which restricts or interferes with his/her activities (Eroglu, Machleit, & Barr, 2005). Perceived crowding is generally conceived of as entailing two dimensions: human crowding perceptions (i.e., crowding perceived as a result of the number of people in a certain space)

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and spatial crowding perceptions (i.e., the store configuration and amount of objects present) (Machleit, Kellaris, & Eroglu, 1994).

The crucial aspect is the perception, as crowding may be a result of density (i.e., the number of people or objects in a certain space), while the perception relates to how crowded or dense the surroundings *feel*. This perception depends on expectations (e.g., generally one expects it to be more crowded on Saturday afternoon than on Monday morning) and experience, but also on the shopper's personality (e.g., personal tolerance for crowding or optimum stimulation level) (Michon, Chebat, & Turley, 2005). A given level of density may or may not result in a level of discomfort, and thus perceived crowding is specific to each individual (Mehta, 2013).

In the context of discount stores or hypermarkets, high human crowding has a *positive* impact on pleasure as it provides a cue of bargains that one would not want to miss out on (Li, Kim, & Lee, 2009). However, the majority of existing academic studies find that high perceived crowding results in *negative* outcomes such as decreased satisfaction as well as irritation (d'Astous, 2000; Eroglu & Machleit, 1990). When perceived crowding is high, consumers feel restricted in terms of personal space and freedom (Michon et al., 2005) and experience more negative emotions and less positive emotions such as pleasure (Hui & Bateson, 1991; Machleit, Eroglu, & Mantel, 2000). Emotions resulting from crowding perceptions can affect shopping satisfaction. In particular, crowding negatively impacts attitudes toward the shopping environment and shopping satisfaction (Eroglu, Machleit, & Barr, 2005; Eroglu & Machleit, 1990; Machleit et al., 2000). Such findings imply that higher levels of crowding will lead to decreased levels of repatronage intentions (Machleit et al., 1994). Also in terms of spatial density, the placement of a number of kiosks in a shopping mall has been found to negatively influence patronage intentions and to increase avoidance behaviour, as their presence increases consumers' crowding perceptions (Kim & Runyan, 2011).

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2.1.1. The antecedents and consequences of crowding

Crowding is a complex phenomenon (Baker & Wakefield, 2012). It is affected by density, time pressure, perceived risk, optimum stimulation level and shopping motivation (Eroglu & Machleit, 1990; Michon, Chebat, & Turley, 2005). Shoppers who are under more time pressure experience higher levels of perceived crowding. Similarly, task-oriented shoppers also experience more retail crowding than hedonic (i.e., fun) shoppers. In addition, crowding is also affected by personal factors such as optimum stimulation level (Mehta, Sharma & Swami, 2013), culture (Pons & Laroche, 2007; Pons, Laroche, & Mourali, 2006), or perceived personal control (Dion, 2004; Van Rompay, Galetzka, Pruyn, & Garcia, 2008). When comparing North American and Middle Eastern shoppers, Pons and Laroche (2006) for example found that Middle Eastern shoppers perceive lower density and respond more positively to crowding than North American consumers. Regarding the level of perceived personal control (i.e., the extent to which a person believes he/she can influence a situation), Dion (2004) finds that greater perceived personal control decreases perceived crowding, though only in the case of human crowding perceptions.

2.1.2. Solutions to overcoming the negative consequences of crowding perceptions

Past studies have manipulated atmospheric elements to reduce the perceptions of crowding and its related outcomes. Eroglu, Machleit and Chebat (2005) studied the interaction between slow/fast music and high/low crowding perceptions in a shopping mall. The results of the study established that the shopping experience was evaluated more positively for the combinations of slow music in high density, and fast music in low density mall environments. This held true both for shoppers with hedonic shopping motivations as well as for shoppers with utilitarian shopping motivations. Furthermore, experimental research conducted by Brengman et al. (2012) revealed that, in line with Kaplan's Stress Restoration Theory (1995),

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in-store greenery significantly reduces feelings of stress and evokes pleasure, especially in a spatially dense store environment. Next, besides *ambient* (cf., music) and *design* (cf., greenery) elements, the *social* atmosphere in commercial settings has also been found to play a role (Baker, 1986). Martilla and Wirtz (2008) demonstrated that assistive employees are perceived as more friendly and as such have the power to counter-balance negative effects of perceived crowding.

Current solutions to high perceived crowding are related to the field of atmospherics, which offers a range of opportunities to provide consumers with enhanced shopping experiences (Turley & Milliman, 2000). They all focus on how the *physical* store or mall environment can be manipulated to mitigate adverse effects of crowding. Retailing, however, becomes ever more digitalized (Pantano & Timmermans, 2014), and as such recent studies have started to investigate the potential impact of smart technologies on shopping experiences (Pantano & Timmermans, 2014). As such, digital infusion may serve the physical store environment (Willems et al., 2016) and open the door for retailers to deliver more enjoyable shopping experiences. Virtual Reality is one such technology that shows great promise with regards to the delivery of entertaining, enjoyable consumer experiences due to its immersive characteristics (Lee & Chung, 2008; Pantano & Naccarato, 2010; Pantano & Servidio, 2012; Garnier & Poncin, 2010; Gartner, 2016).

2.2. The impact of customer experiences

Atmospherics research has found that experiences can create value for consumers (Hultén, 2011), which can in turn positively affect satisfaction and loyalty. When specifically regarding brand experiences, positive effects with regards to attitudes (Van Kerrebroeck et al., 2017) as well as loyalty and satisfaction (Brakus, Schmitt & Zarantonello, 2009; Sands, Oppewal & Beverland, 2015) are found. Consumers can be affected by the experience either

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sensorially (i.e., the experience awakens the human senses), emotionally (i.e., the experience induces strong feelings and sentiments), behaviourally (i.e., stimulating a person to take action), or intellectually (i.e., the experience encourages a person to think and raises curiosity) (Brakus, Schmitt, & Zarantonello, 2009). Experiences can also entail in-store experiences such as fashion shows or themed events (Sands, Oppewal, & Beverland, 2009, 2015; Sit & Birch, 2014). Such events can positively impact approach behaviour (Sands, Oppewal, & Berland, 2009) and increase levels of satisfaction.

A number of studies in atmospherics research demonstrate that the following outcomes are affected by environmental stimuli, for instance: attitude (e.g., Ward, Bitner, & Barnes, 1992; Akhter, Andrews, & Durvasula, 1994); approach behaviour (e.g., Donovan & Rossiter, 1982; Hui & Bateson, 1991; Sands, Oppewal, & Beverland, 2009); satisfaction (e.g., Eroglu & Machleit, 1990; Brakus et al., 2009; Klaus & Maklan, 2012); and loyalty (e.g., Pullman & Gross, 2004; Brakus et al., 2009; Klaus & Maklan, 2012).

Shopping malls have two main goals, namely to attract and retain a high number of visitors and to generate sales for the retailers in the mall. In general, providing atmospherics and entertainment (along with price promotions) are a strong approach to succeed in meeting both objectives (Parsons, 2003). Such strategies add value by generating positive emotions which impact shoppers' approach behaviour, making them stay longer, which in turn generates more sales, leads to increased satisfaction with the shopping trip in general and the stores specifically and higher intentions to return (Sands, Oppewal, & Beverland, 2015).

2.3.Virtual Reality

2.3.1. Virtual Reality definition

Virtual Reality is a computer-based technology that allows for the simulation of a real environment in which the user can experience the feeling of being present (Serrano, Baños, &

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Botella, 2016; Serrano, Botella, Baños, & Alcañiz, 2013). Steuer (1992, pp. 76-77) defines Virtual Reality as follows: Virtual Reality is "a simulated environment in which a perceiver experiences telepresence". Telepresence is affected by both vividness and interactivity (Steuer, 1992). Vividness is "the representational richness of a mediated environment" (Steuer, 1992, p. 81) and interactivity refers to "the extent to which users can participate in modifying form and content of a mediated environment in real time" (Steuer, 1992, p. 84). It is worth noting with regard to semantics that the terms 'vividness' and 'immersion' are at times used interchangeably (Walsh & Pawlowski, 2002) (e.g., in Bhatt, 2004; Cummings, Bailenson, & Fidler, 2012; Pantano & Servidio, 2012).

Regarding the aspects of interactivity, immersion and connectivity, the most important aspect of Virtual Reality is immersion (Bhatt, 2004). Immersion can be referred to as the psychological state where one feels isolated from the real world by means of the virtual environment (Witmer & Singer, 1998) and is strongly related to the concept of flow (i.e., "an optimal state of experience in which one is so completely absorbed and engaged in an activity that nothing else seems to matter" (Nah, Eschenbrenner, & DeWester (2011, p. 734)). As such, immersion causes a feeling of actually 'being there' (Mikropoulos, 2006) which leads to presence.

2.3.2. Virtual Reality applications

To date, a wide range of applications of Virtual Reality exists (Serrano et al., 2016), for instance in the fields of education (Merchant, Goetz, Cifuentes, Keeney-Kennicutt, & Davis, 2014) and psychology and medicine (Hoffman et al., 2014; Laver, George, Thomas, Deutsch, & Crotty, 2012). Also in the field of marketing, practitioner examples start proliferating. In the travel retail sector for example, companies such as Marriott International, Thomas Cook and Ultimate Jet Vacations are using Virtual Reality to showcase destinations and hotels to

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consumers, allowing them to virtually visit a certain city or hotel before they make their purchase decision (Mandelbaum, 2015). Certain brands are also starting to experiment with Virtual Reality to allow consumers to experience the use or demonstration of the products, or to immerse them in an overall brand-themed experience in a computer-generated realistic environment (Van Kerrebroeck et al., 2017). Some examples of brands using Virtual Reality include Volvo (test-driving a specific car model), Merrell (taking a dangerous mountain hike), The North Face (providing an adventurous experience in Yosemite Park) and TopShop (enabling consumers to attend a fashion show as viewed from a front row seat) (N.a., 2016). The availability of Virtual Reality headsets that operate via a smartphone such as the Google Cardboard as well as similar alternatives on the consumer market at prices lower than 10 euros a piece contributes to the growth of Virtual Reality in business applications.

Some scant academic marketing research has been published concerning the use of Virtual Reality for product testing of, for instance, car prototypes and test drives (Papagiannidis, See-To, & Bourlakis, 2014; Söderman, 2005), and ceramic tiles (Serrano et al., 2016). Nevertheless, overall, an abundance of research questions on the use and effectiveness of Virtual Reality for marketing purposes remains to be addressed (Van Kerrebroeck et al., 2017). As such, this study contributes to building this knowledge by studying the impact of a specific consumer-computer interaction via Virtual Reality in a shopping mall environment.

2.3.3. Virtual Reality to escape crowding

Virtual Reality can be described as an affective medium, as perceived presence in a computer-generated environment allows for the transfer of emotions. Via the virtual experience, various emotions such as excitement, relaxation or anxiety, depending on the content, can be induced in users (Riva et al., 2007).

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Shopping can be stressful to consumers, especially in a crowded environment (Baker & Wakefield, 2012; Eroglu, Machleit, & Barr, 2005). Inducing positive, relaxing emotions can lower the level of perceived arousal (Donovan & Rossiter, 1982). Thus, evoking positive, relaxing emotions in a retail context can offset crowding perceptions (Machleit et al., 2000), which can in turn induce more positive consumer behaviours (Fedorikhin & Cole, 2004).

The vivid, or immersive, aspect of Virtual Reality is anticipated to be key to remediating the negative consequences of crowding. Yee (2007) describes four subcomponents of immersion: discovery, role-playing, customization and escapism. The latter, escapism, refers to the extent to which a user can temporarily forget the real world and escape from the stress and problems related to real life (Yee, 2006). Relaxation and escape have been identified as major factors to explain game playing behaviour engaged in to avoid problems and the real world (Caplan, Williams, & Yee, 2009; Hassouneh & Brengman, 2014; Kardefelt-Winther, 2014a). In their work on the growing importance of experiences to provide value to consumers, Pine and Gilmore (1998) define four experience realms along two dimensions: absorption/immersion and active/passive participation. While the combination of immersion and passive participation is referred to as an 'esthetic' experience, the combination of immersion and active participation is referred to as an 'escapist' experience.

People's need to 'escape' can be traced back to humans' instinct of the 'fight' vs. 'flight' reflex (Dennis & McCall, 2005). In a 'fight' context, shoppers could demonstrate anti-social behaviour by skipping the queue or pushing people aside. In a 'flight' context, shoppers may abandon their shopping trip altogether (Saad, 2007). In order to avoid this, retailers may look into options allowing shoppers to escape, for instance via Virtual Reality.

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While escapism has been demonstrated to be used often as a coping mechanism to deal with or rather avoid real-life problems (Caplan et al., 2009; Kardefelt-Winther, 2014b), this implies that it can effectively affect a person's psychological state, albeit temporarily. In addition, Serrano et al. (2013) found that a Virtual Reality environment can indeed induce relaxation. The concept of providing a form of escapism via Virtual Reality as such may provide a solution to crowding perceptions in the shopping mall. The Virtual Reality experience in the mall temporarily allows consumers to 'escape' from their hectic shopping mall surroundings and induces positive emotions. The busier the environment, the greater the escapism effect can be expected to be, hence resulting in more pronounced effects on consumer behaviour.

3. *Research objectives and hypotheses*

The objective of this study is to explore the impact of introducing a Virtual Reality experience in the shopping mall on consumer responses, while considering the perceived crowding of the surroundings. First, it is expected that the enjoyable and relaxing experience will result in more positive consumer responses (Sands et al., 2015; Serrano et al., 2013). This positive effect is expected for the constructs attitude toward the mall (H1a), approach/avoidance behaviour (H2a), mall satisfaction (H3a) and loyalty intentions (H4a). These key outcomes were selected for this study as they are popular metrics used to understand and evaluate customer experiences (Brakus, Schmitt & Zaratonello, 2009; Klaus & Maklan, 2012; Lee and Chung, 2008; Foster & McLelland, 2015; Hui & Bateson, 1991), also particularly with respect to shopping mall experiences (e.g., Sands et al., 2015; Sands et al., 2009; Kuruvilla & Joshi, 2010; Chebat, Hedhli & Sirgy, 2009). Moreover, these outcomes are related to performance indicators such as consumer patronage (Shim & Eastlick, 1998), profitability (Kalwani & Narayandas, 1995; Anderson et al., 1994) and market share (Anderson et al., 1994) and overall, it is found that metrics that are 'unobservable' to firms (such as satisfaction, attitudes,

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etc.) are "related to observable behaviour, which leads to financial gains" (Gupta & Zeithaml, 2006, p. 718).

Second, as the Virtual Reality experience provides relaxing, stress-alleviating benefits of escapism, it is expected that the impact of Virtual Reality will be more pronounced in case of high perceived crowding (H1b, H2b, H3b, H4b).

H1a: The Virtual Reality experience leads to more positive attitudes toward the mall.

H1b: The positive impact of Virtual Reality on attitude toward the mall is more pronounced in case of high perceived crowding.

H2a: The Virtual Reality experience leads to more positive approach/avoidance behaviour.

H2b: The positive impact of Virtual Reality on approach/avoidance behaviour is more pronounced in case of high perceived crowding.

H3a: The Virtual Reality experience leads to higher mall satisfaction.

H3b: The positive impact of Virtual Reality on mall satisfaction is more pronounced in case of high perceived crowding.

H4a: The Virtual Reality experience leads to higher loyalty intentions.

H4b: The positive impact of Virtual Reality on loyalty is more pronounced in case of high perceived crowding.

4. Research Methodology

4.1. Procedure

This study is based on a 2 x 2 quasi-experimental between-subjects design. The manipulation includes two conditions of shopping mall visitors: regular shoppers (i.e., the control group) and shoppers exposed to the Virtual Reality experience (i.e., the experimental group). The respondents are regular shoppers who were randomly intercepted in the mall via a convenience sampling approach. The data were collected at 'Les Bastions' shopping mall in Tournai, Belgium, between 21 and 24 December 2015, (i.e., the days leading up to Christmas). The shoppers who tested the Virtual Reality application were approached at the

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location in the mall where the experience was provided. The experience was offered at no cost, and was open to all shopping mall visitors. Those willing to participate in the study were asked to complete a questionnaire. The second dimension of the 2x2 quasi-experimental between-subjects design involves low vs. high perceived crowding. As natural crowding levels naturally varied over and throughout the days, perceived crowding was measured by means of self-report in the administered survey (cf., sections 4.3 and 4.4 for more details). A median split (Iacobucci et al., 2015) is subsequently performed on the self-reported crowding perceptions, creating a 'low perceived crowding' (mean = 3.17; SD = 0.56) and a 'high perceived crowding' (mean = 4.69; SD = 0.73) condition ($t(155,747) = -15.987$; $p < 0.001$).

4.2. Stimulus

A Christmas-themed Virtual Reality sleigh ride experience was offered in the shopping mall[1]. The users were pretending to be Santa Claus riding his sleigh which is pulled by reindeer. The calm sleigh ride goes up in the air through cosy snowy Nordic landscapes for a duration of approximately 3 minutes. The users could look around in the virtual environment (upwards, towards the sides, and they could even see 'their' big Santa belly when looking down). The setting around the Virtual Reality set was also Christmas-themed, a real sleigh in which the users could sit, and reindeer and other Christmas-themed ornaments were present (cf., Figure 1). The Oculus Rift DK2 was used as the Virtual Reality medium, along with headphones to provide the sound (a gentle sleigh bells sound effect). Those shoppers who chose to experience the Virtual Reality sleigh ride offered by their shopping mall are referred to in this paper as 'VR users', whereas shoppers who did not experience the Virtual Reality sleigh ride will be referred to as 'regular shoppers' or 'non-users'. While the regular shoppers did not

[1] http://www.standaard.be/cnt/dmf20161216_02629932

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experience the Virtual Reality sleigh ride, they did see the regular Christmas ornaments (including the sleigh, reindeer, etc.) present in the shopping mall (as did the VR users).

The Virtual Reality experience provided can be classified as an in-store experiential event, which can be described as an event that encompasses multiple aspects of retail atmospherics (Sands et al., 2015). Such event "differs from an atmospheric variable in terms of the way in which a consumer is immersed" (Sands, Oppewal & Beverland, 2008, p. 299).

As a result of the Virtual Reality experience, users perceived a high level of presence in their virtual environment (mean = 5.76; SD = 0.85). Pleasure evoked by the Virtual Reality experience was measured to ensure that the experience offered did in fact induce pleasure among the users. Given the mean value for pleasure of 1.72 on a semantic scale ranging from -3 to +3 (significantly different from the scale mid-point 0; $t(102) = 10.530$; $p < 0.001$), it can be concluded that the experience was pleasurable. In addition, escapism was measured to ensure that the Virtual Reality experience provides relaxation and the feeling of momentarily finding oneself in a different world (cf., section 2.3.2). Given the mean value for escapism of 5.76 on a 7-point Likert scale (from 1 = strongly disagree to 7 = strongly agree) (significantly different from the scale mid-point 4; $t(102) = 15.755$; $p < 0.001$), it can be concluded that the shoppers exposed to the Virtual Reality experience did indeed feel a high level of escapism. Lastly, the experience provided users with a sense of cosiness, as they were suddenly far removed from the noise of the shopping mall. The snowy sleigh ride elicited soft and gentle sounds, while the Christmas scenery and music in general automatically evoked a Christmas atmosphere. Our measurement regarding feelings of relaxation and calmness evoked by the VR experience resulted in a mean value of 1.96 on a semantic scale ranging from -3 (excited) to +3 (calm) (significantly different from the scale mid-point 0; $t(102) = 14.589$; $p < 0.001$).

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Figure 1. Virtual Reality set-up in the mall

4.3. Measures

The VR users completed a pre-experience questionnaire pertaining to the construct of perceived crowding (Eroglu & Machleit, 1990; 6 items, item 5 deleted; α = 0.609; e.g., 'crowded/uncrowded'), a big 5 personality scale (Rammstedt & John, 2007; 10 items; e.g., 'I am someone who is relaxed, handles stress well'), optimum stimulation level (Sharma, Sivakumaran, & Marshall, 2010; 4 items; e.g., 'I like to experience novelty and change in daily routine'; α = 0.859), and time allotted to the shopping trip (< 30 minutes; 30 minutes – 1 hour; 1 – 2 hours; 2 – 3 hours; 3 – 4 hours; > 4 hours). The post-test pertained to the constructs of escapism (Yee, 2006; 3 items; α = 0.893; e.g., 'using this experience lets me vent and relieve stress from the day'), presence (Debabbi, Daasi, & Baile, 2010; 7 items, item 5 removed; e.g., 'During the sleigh ride, my body was in the room, but my mind was inside the world created by the computer.'), relaxation (semantic scale taken from Kaltcheva & Weitz, 2006; ranging from -3 (excited) to +3 (calm)) and pleasure (Kaltcheva & Weitz, 2006; 6 items; α = 0.931; e.g., 'unhappy/happy').

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In addition, the following outcome variables were measured in the post-test: attitude toward the mall (Michon et al., 2005; 3 items; $\alpha = 0.911$; e.g., 'uninteresting/interesting'), approach/avoidance (Donovan & Rossiter, 1982; 8 items; $\alpha = 0.694$; e.g., 'I like to spend much time browsing in this mall), mall satisfaction (Song & Zinkhan, 2008; 3 items; $\alpha = 0.940$; e.g., 'I am satisfied with my experience in this shopping mall'), and loyalty intentions (Zeithaml, Berry, & Parasuraman, 1996; 5 items; $\alpha = 0.878$; e.g., I am likely to 'say positive things about this shopping mall to other people').

The questionnaire completed by regular shoppers gauged the same constructs, apart from escapism, relaxation and pleasure (as these questions pertained specifically to the Virtual Reality experience). The full list of items, measured by 7-point Likert scales or semantic differential scales (with anchor points 1 = strongly disagree and 7 = strongly agree or respectively -3 = strongly disagree and +3 = strongly agree), can be found in Appendix 1. For each of these constructs, summated scale means are calculated for further analyses. Regarding approach/avoidance, the avoidance items were reversed in order to arrive at the summated mean score for 'approach'.

Common method bias was controlled for in this study design by using both procedural and statistical methods. Common method bias is a phenomenon that occurs when items are artificially correlated with each other, with variance being attributable to the measurement method (Podsakoff et al., 2003). Regarding procedural measures taken to overcome common method bias, the anonymity of the respondents was assured, and they were asked to answer as honestly as possible, using a paper and pen questionnaire. In addition, some scale items were reverse coded (Podsakoff et al., 2003).

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Furthermore, a Harman's single-factor test is performed in order to detect potential common method bias statistically. The test reveals that no single factor accounts for more than 50% of the total variance, as this factor explains 23.58% of the total variance. The factor analysis extracted 10 factors, accounting for 74.15% of the total variance. This validates the data quality and statistically confirms that the data is sufficiently robust against common method bias.

4.4. Controlling for crowding antecedents

Crowding perceptions are affected by a number of antecedents (density, time pressure, perceived risk and shopping motivation). Given that the study was in an actual shopping mall setting, these antecedents could not be controlled directly. However, analyses with regards to the crowding dimensions demonstrate that these antecedents were nevertheless sufficiently controlled for as no differences could be revealed among VR users and regular shoppers. First, with regards to spatial density, no changes were made to the shopping mall lay-out over the course of the data collection. To ensure that both groups of respondents, VR experience users and non-users, were inquired at similar time intervals (warranting similar amounts of human density over the two conditions), we tried to make use of two researchers who worked on the data collection simultaneously as much as possible. The first day of data collection, however, only one researcher was available. Furthermore, we registered the time and date for each response. As such, we are able to assess whether there is a difference in amount of responses between the conditions over the days and within specific time frames over the course of a day, which appears not to be the case, as Pearson Chi-square tests confirm that the spread is even over the three remaining days ($\chi^2(2) = 0.055$; $p = 0.973$) as well as over the course of a day ($\chi^2(6) = 6.247$; $p = 0.377$). As such, we can presume that the amount of human density over the conditions (VR versus no VR) within each time frame of data collection was

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equal. Over the days of the data collection, we note that day 3 (23/12) was apparently more crowded than the other days as apparent from an ANOVA analysis ($F(3,176) = 4.056$; $p = 0.008$) and that day 2 (22/12) was apparently the calmest day.

At times VR users had to queue for the experience. The queues however, were never longer than maximum 10 people (i.e., waiting 5 turns as two people could use the experience simultaneously, with maximum waiting times of 15 minutes). Still, no significant difference in average perceived crowding levels as measured in the pre-test is identified between VR users and non-users ($t(181) = 0.850$; $p = 0.396$). Therefore, we can conclude by proxy that queueing did not have an imperative effect on crowding perceptions.

Second, regarding time pressure, the time allotted to the shopping trip (ordinal scale) is used as a proxy for time pressure. A cross-tabulation and Kendall's Tau (0.012; $p = 0.862$) indicate an even spread in time allotted to the shopping trip over both conditions. Third, an independent samples t-test reveals that no significant difference in optimum stimulation level can be discerned between both respondent groups ($t(181) = 0.667$; $p = 0.506$).

Fourth, we measured the shopping motivation for each of the respondents via 2 items taken from Kaltcheva & Weitz (2006). Independent samples t-tests regarding the shopping motivation (i.e., utilitarian or hedonic) indicate that no significant difference between both respondent groups exists with regards to hedonic shopping intentions ($t(189) = -1.007$; $p = 0.315$) or utilitarian intentions ($t(191) = 1.176$; $p = 0.241$). As such, we can conclude that the participants of the entertainment experience were not significantly more hedonically motivated to visit the mall than those who did not participate.

4.5. Sampling and participant information

A total number of 183 usable responses was collected, of which 103 shoppers were exposed to the Virtual Reality Christmas experience and 80 were not. The average age of the

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respondents is 34.7 (SD = 13.7; range: 14 – 74 years old). An analysis of variance (ANOVA) indicates that the respondents were evenly spread over the conditions where age is concerned ($F(3,179) = 1.170$; $p = 0.323$; cf., Table 1). Although the larger part of the respondents are female (about 70%), this was true for each of the four conditions, as confirmed by a Pearson Chi-Square test ($\chi^2(3) = 0.513$; $p = 0.916$; cf., Table 1). This can be considered representative to the overall population present in the shopping mall in the days leading up to Christmas, as it is mainly women who do the Christmas shopping (Fischer & Arnold, 1990).

	Condition 1 – Non-users/Low crowding (n = 41)		Condition 2 – Users/Low crowding (n = 57)		Condition 3 – Non-users/High crowding (n = 39)		Condition 4 – Users/High crowding (n = 46)		p-value test	Total Sample (n = 183)	
	Abs.	Rel. (%)	Abs.	Rel. (%)	Abs.	Rel. (%)	Abs.	Rel. (%)		Abs.	Rel. (%)
Gender											
Male	14	34.1	16	28.1	12	30.8	13	28.3	χ^2	55	30.1
Female	27	65.9	41	71.9	27	69.2	33	71.7	0.916	128	69.9
Age											
Min/Max	18/67		14/74		15/71		15/65		ANOVA	14/74	
Mean/ SD	35.7/13.3		36.6/15.5		31.5/12.7		34.0/12.2		0.323	34.7/13.7	

Table 1. Sociodemographic sample characteristics

In addition, we controlled for differences in personality and optimum stimulation level in order to ascertain that differences in outcomes for VR users versus non-users can be attributed to the Virtual Reality experience rather than to a difference in personality-related variables between both respondent groups. First, independent samples t-tests reveal that no significant differences with regards to personality traits could be discerned between the VR users and the non-users for each of the big five personality dimensions: extraversion ($t(181) = -0.494$; $p = 0.622$); agreeableness ($t(181) = -1.842$; $p = 0.067$; $m_{VR\ exposure} = 4.82$; $m_{no\ exposure} = 4.48$); conscientiousness ($t(181) = -0.999$; $p = 0.319$); neuroticism($t(181) = -0.417$; $p = 0.677$); and openness ($t(181) = 0.752$; $p = 0.453$). Second, optimum stimulation level is a personal characteristic strongly related to consumer innovativeness (Fiore et al., 2001; Mahatanankoon, 2007). The scale used ascertains consumers' tendency to try out something new and needing a change. An independent samples t-test reveals that no significant difference in optimum

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stimulation level can be discerned between both respondent groups ($t(181) = 0.667$; $p = 0.506$).

5. Analyses and Results

In order to test Hypotheses H1 through H4, a series of two-way analyses of variance (ANOVA) was conducted with "non-VR users vs. VR users" and "low vs. high perceived crowding" as fixed factors and respectively "attitude toward the mall", "approach" , "mall satisfaction" and "loyalty intentions" as dependent variables. Post-hoc independent sample t-tests provided insight into the secondary hypotheses regarding the expected more pronounced effect of Virtual Reality in case of high perceived crowding.

5.1. Attitude toward the mall

Regarding the impact of a Virtual Reality experience on attitude toward the mall, it was expected that being exposed to a relaxing and enjoyable Virtual Reality experience would positively impact mall visitors' attitudes (H1a), and that this effect would be more pronounced in case of high perceived crowding (H1b). An interaction effect of the impact of Virtual Reality exposure depending on the level of perceived crowding is confirmed by the study's findings ($F(1,179) = 7.97$; $p = 0.005$).

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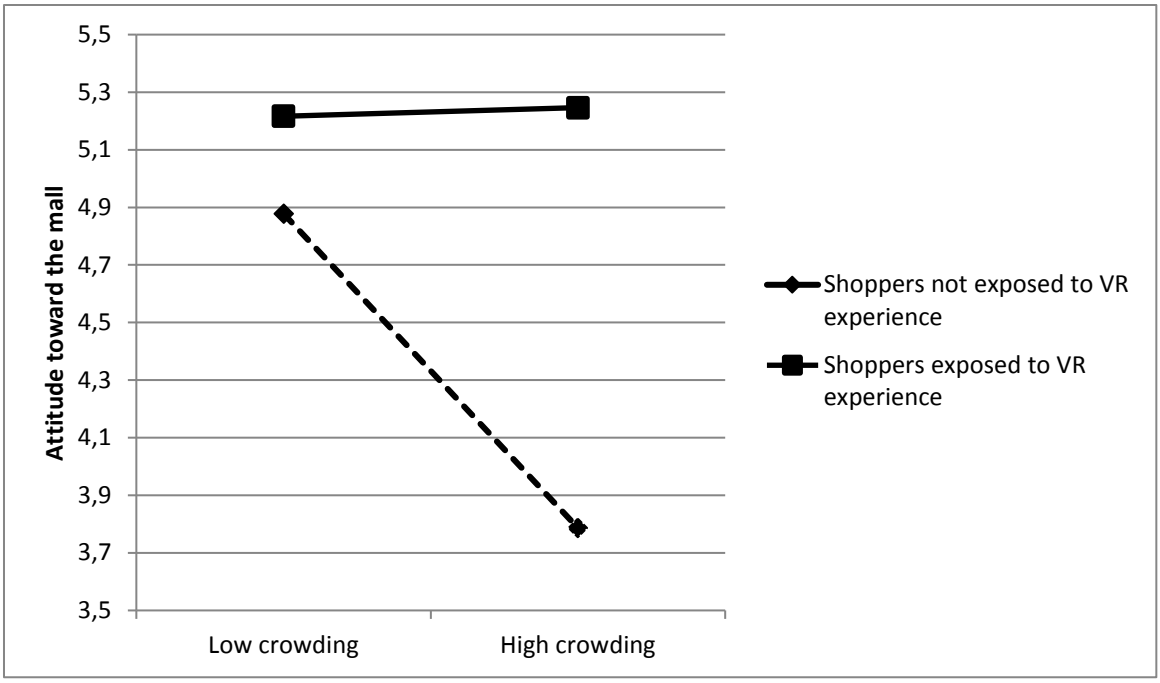

Figure 2. The impact of a Virtual Reality experience depending on the level of perceived crowding on attitude toward the mall.

As is observable from Figure 2, shoppers exposed to the Virtual Reality experience generally reported more positive attitudes toward the mall ($F(1, 179) = 20.48$; $p < 0.001$; $m_{VR\ exposure} = 5.23$; $SD = 1.38$; $m_{no\ exposure} = 4.35$; $SD = 1.36$), which is in line with hypothesis 1a.

In case consumers experience *low* levels of crowding, the exposure to the Virtual Reality experience does not seem to generate a significant effect ($t(96) = -1.19$; $p = 0.237$; $m_{VR\ exposure} = 5.22$; $SD= 1.46$; $m_{no\ exposure} = 4.88$; $SD = 1.29$). When consumers experience *high* levels of crowding, on the other hand, the positive effect of the Virtual Reality experience is clearly evident ($t(83) = -5.34$; $p < 0.001$; $m_{VR\ exposure} = 5.25$; $SD = 1.29$; $m_{no\ exposure} = 3.79$; $SD = 1.21$). This implies that hypothesis 1b is supported. Hence, providing a Virtual Reality experience has a beneficial effect on shoppers' attitudes, but only in case of high perceived crowding.

5.2. Approach behaviour

Regarding approach behaviour, it is expected that exposure to a Virtual Reality experience would positively impact approach behaviour, and that this effect would be more pronounced

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in case of high perceived crowding (H2a and H2b). The results from this study however reveal no interaction of the impact of Virtual Reality exposure depending on the level of perceived crowding ($F(1, 179) = 0.60$; $p = 0.441$).

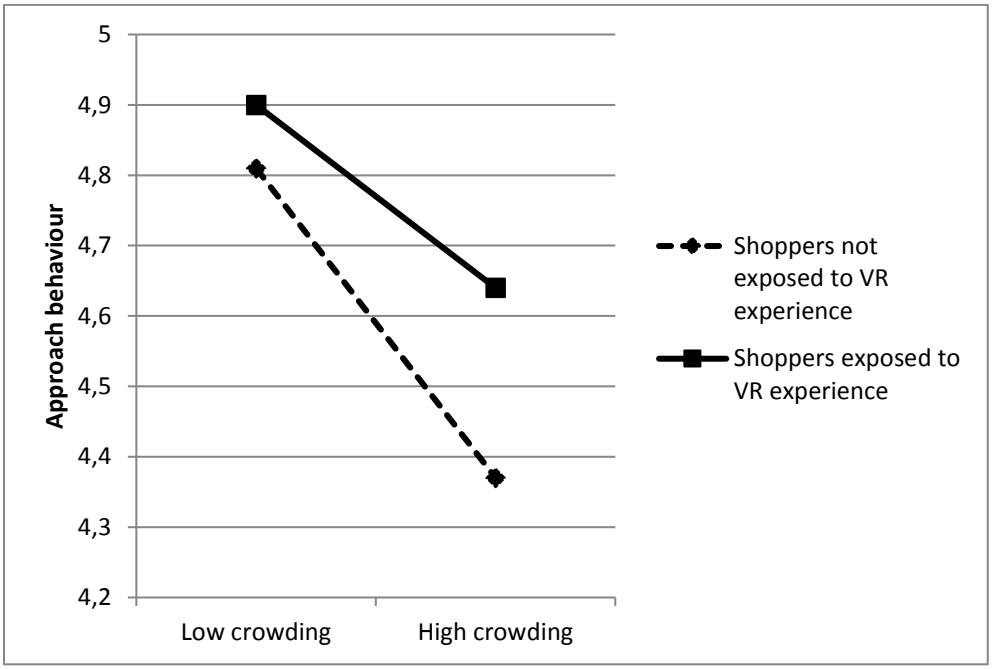

Figure 3. The impact of a Virtual Reality experience depending on the level of perceived crowding on approach behaviour.

As can be observed in Figure 3, exposure to Virtual Reality seems to elicit more positive approach behaviour. However, the difference is not found to be statistically significant ($F(1, 179) = 2.46$; $p = 0.118$; $m_{VR\ exposure} = 4.78$; $SD = 0.78$; $m_{no\ exposure} = 4.59$; $SD = 0.81$). Regarding the more pronounced effect of Virtual Reality usage in case of high perceived crowding, no statistical evidence could be found either. However, as the graphical representation illustrates, the difference in the means for Virtual Reality users vs. non-users appears to be somewhat higher in case of high perceived crowding. As such, the *direction* of the effect seems present, albeit not with statistical significance. Hence, hypotheses 2a and 2b are rejected.

5.3. Mall satisfaction

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Regarding the impact of a Virtual Reality experience on mall satisfaction, it was expected that being exposed to a relaxing and enjoyable Virtual Reality experience would positively affect satisfaction with the mall (H3a), with a more pronounced effect in case of high perceived crowding (H3b). A marginally significant interaction between the impact of Virtual Reality exposure depending on the level of perceived crowding is confirmed by this study's findings ($F(1, 179) = 3.89$; $p = 0.050$).

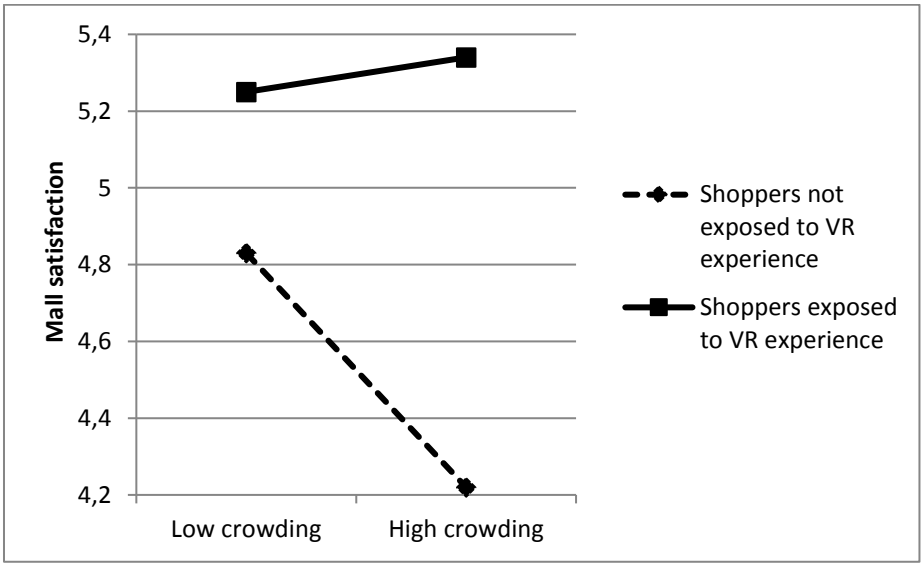

Figure 4. The impact of a Virtual Reality experience depending on the level of perceived crowding on mall satisfaction.

Overall, the findings indicate that the level of satisfaction is higher for shoppers exposed to the Virtual Reality experience than for those who were not exposed to the experience ($F(1, 179) = 12.57$; $p < 0.001$; $m_{VR\ exposure} = 5.29$; $SD = 1.35$; $m_{no\ exposure} = 4.58$; $SD = 1.39$). As such, we can confirm hypothesis 3a. Figure 4 also clearly indicates that being exposed to the Virtual Reality experience in case of high perceived crowding generates a stronger increase in mall satisfaction than when crowding is perceived to be low. Independent samples t-tests conducted to confirm hypothesis 3b reveal that this is indeed the case, as a significant effect can be found between VR users and non-users in case of high perceived crowding ($t(83) = -$

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4.38; $p < 0.001$; $m_{VR\ exposure} = 5.34$; SD = 1.15; $m_{no\ exposure} = 4.22$; SD = 1.20) as compared to the non-significant difference between VR users and non-users in case of low perceived crowding ($t(96) = -1.04$; $p = 0.301$; $m_{VR\ exposure} = 5.25$; SD = 1.50; $m_{no\ exposure} = 4.93$; SD = 1.49). Thus, the exposure of shoppers to the Virtual Reality experience positively influences shoppers' mall satisfaction, particularly in case of high perceived crowding.

5.4. Loyalty intentions

With regard to the impact of a relaxing and enjoyable Virtual Reality experience on loyalty intentions in a shopping mall, exposure to the Virtual Reality experience is expected to positively impact shoppers' loyalty intentions (H4a), and even more so in case of high perceived crowding (H4b).

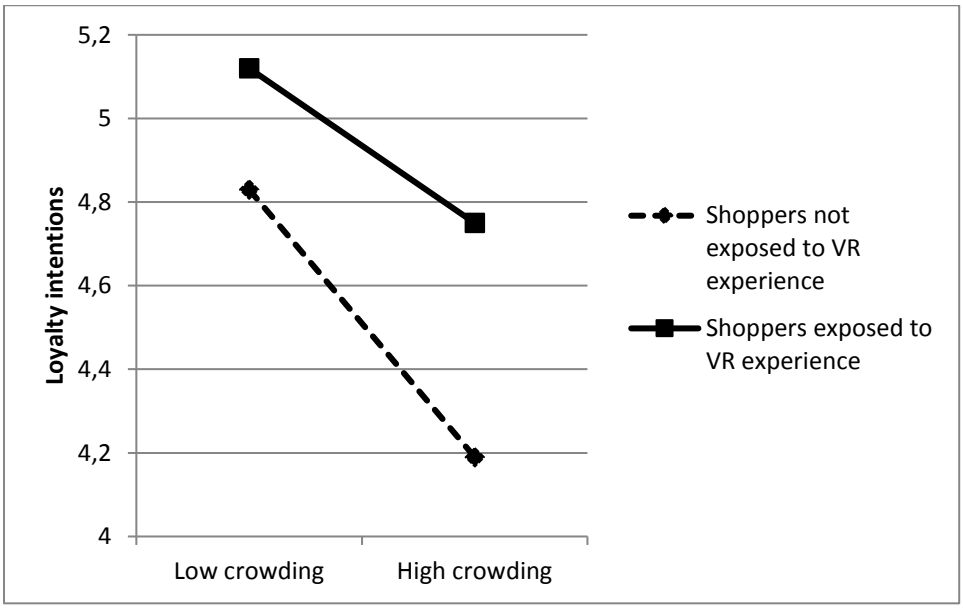

Figure 5. The impact of a Virtual Reality experience depending on the level of perceived crowding on loyalty intentions.

Our analysis of variance revealed no explicit interaction effect of the impact of Virtual Reality exposure depending on the level of perceived crowding ($F(1, 179) = 0.92$; $p = 0.339$). As is observable in Figure 5, exposure to the Virtual Reality experience does have an overall positive main effect on loyalty intentions ($F(1, 179) = 9.45$; $p = 0.002$; $m_{VR\ exposure} = 4.95$; SD

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= 0.93; $m_{no\ exposure}$ = 4.52; SD = 0.97), confirming hypothesis 4a. Still, while independent samples t-tests do corroborate a significant difference in loyalty intentions between shoppers exposed to the Virtual Reality experience and shoppers who were not exposed to the Virtual Reality experience in case of high perceived crowding ($t(83) = -2.939$; $p = 0.004$; $m_{VR\ exposure}$ = 4.75; SD = 0.80; $m_{no\ exposure}$ = 4.19; SD = 0.93), this is apparently not the case in the condition of low perceived crowding ($t(96) = -1.474$; $p = 0.144$; $m_{VR\ exposure}$ = 5.12; SD = 0.99; $m_{no\ exposure}$ = 4.83; SD = 0.92) where such a difference could not be ascertained, which does support hypothesis 4b to some extent. Hence, the findings show that, overall, exposure to Virtual Reality elicits more positive responses, and even more so in case of high perceived crowding.

6. Discussion

By means of a between-subjects experimental design, this study aimed to determine the effectiveness of the use of a Virtual Reality experience as a solution to crowding. The pleasurable Virtual Reality experience provided the users with a sensation of escapism (Yee, 2006), which cancelled out the negative effects related to perceived crowding. This is in line with Serrano et al. (2013) and Riva (2007)'s findings that Virtual Reality can induce relaxation among users. The alternate reality offered by the Virtual Reality experience allows a user to escape the hectic environment for a moment, which can help to alleviate stress in case of high perceived crowding. Based on the findings of this study, it can be concluded that introducing a relaxing and enjoyable Virtual Reality experience in a shopping mall elicits positive consumer responses. As a matter of fact, the ANOVA analyses revealed an overall positive impact of the usage of Virtual Reality on attitude toward the mall, mall satisfaction and loyalty intentions (H1a, H3a and H4a). Inherently, it can be expected that this will result into financial benefits for the shopping mall as well (Gupta & Zeithaml, 2006). While it was

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expected that a similar effect would be found for approach behaviour (H2a), the findings of this study could not confirm this.

An interaction effect of the impact of Virtual Reality exposure depending on the level of perceived crowding could be revealed for attitude toward the mall, and mall satisfaction. Independent samples t-tests confirmed the more pronounced effect of the use of exposure to a Virtual Reality experience in case of high crowding, regarding each of the variables for which a main effect was found (H1b, H3b and H4b).

The findings of this study thus confirm that providing a Virtual Reality experience in a shopping mall environment is a valid option for alleviating the negative effects of perceived crowding. Thus, VR applications can be especially valuable in commercial areas that are perceived to be crowded. It is important to note, however, that while above findings are promising, their power is still limited with regards to the potential impact on key strategic outcomes. This is in line with most atmospherics studies, where the effect sizes are often only small or medium (e.g., Vieira, 2013; Roschk, Loureiro & Breitsohl, 2017). Nevertheless, this study reveals that beside offering ambient (e.g., music; Eroglu, Machleit & Chebat, 2005), design (e.g., greenery; Brengman et al., 2012) or social (e.g., staff friendliness; Martilla & Wirtz, 2008) atmospheric cues in order to alleviate crowding effects, digital solutions may also serve the purpose of providing consumers a little something extra.

7. Conclusion

Answering the call to examine the potential of using Virtual Reality, a relatively new and promising technology, in a retail environment (Renko & Druzijanic, 2014), this research found that providing a Virtual Reality experience to shoppers in physical retail environments can be a smart retail application. Given the findings of the current study, retailers and/or shopping malls that at times suffer from high perceived crowding can provide a Virtual

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Reality experience to shoppers as a remediating option in order to alleviate the negative effects of crowding in consumers (e.g., stress; Brengman et al., 2012) and consequently diminish the negative consequences for the retailers (e.g., decreased satisfaction and avoidance behaviour; Eroglu et al., 2001).

As such, the contribution of this study to the literature was threefold. First, we added to the literature of retail atmospherics through the use of technology by demonstrating that staging an enjoyable VR experience in a shopping mall can induce favourable effects among shoppers, especially in case of crowding. Second, we enriched the consumer psychology literature on crowding, as we demonstrated the effectiveness of a digital and customizable solution to alleviate the negative consequences of crowding. Not only can the VR experience be targeted specifically to shoppers suffering from feelings of crowding, the content and length of the experience could also be adapted depending on the shoppers' state of mind. Third, this study also contributes to the HCI literature as it examined the potential of a Virtual Reality application in a commercial setting.

8. Limitations and suggestions for further research

While this study offers insights into the merits of using an entertainment-oriented Virtual Reality experience in a shopping mall, some limitations must be taken into account. A first limitation of this study is that the data collection may suffer from self-selection bias for the experimental group of respondents, as the respondents were approached for the experiment at the location where the Virtual Reality experience was offered. As such, the sample includes only shoppers who chose to take part in the Virtual Reality experience and is not representative for the entire target population (Lavrakas, 2008). The sample of VR users can most probably be described as 'experience-seekers', whereas the reactions to the Virtual

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Reality experience from non-experience-seekers could not be accounted for. Both types of customers may be differently affected by in-store entertainment. However, according to Rosenbaum, Otalora, Ramirez and Towers (2016), experience-seekers tend to respond more negatively in terms of satisfaction and repatronage intentions. Therefore we expect that non-experience-seekers may be even more positively affected by the use of a Virtual Reality experience. To explore this further, future research could examine the impact of exposure to a Virtual Reality experience via pre- and post-usage measurements of the dependent variables. In addition, the experience in this study is offered to consumers already in the mall as the in-store channel is the focus of this investigation. Consumers who may be very sensitive to crowding however may prefer to stay at home and shop online. As such, this consumer segment is not included in our study. Further research could investigate how and whether Virtual Reality technology could be used to draw in consumers who currently avoid the mall due to crowding.

Next, the exposure to the Virtual Reality experience in this study lasted only three minutes. In non-commercial settings such as in medicine/psychology exposure times are often much longer (e.g., 10 minutes; Baños, Espinoza, García-Palacios, Cervera, Esquerdo, Barrajón, & Botella (2013); 30 minutes; Soyka, Leyrer, Smallwood, Ferguson, Riecke & Mohler, 2016). However, in a commercial setting such as the one in this study, where longer periods of exposure would practically not be feasible, we even find beneficial effects after as little as three minutes of exposure. Further research could try to find out what the optimum feasible exposure time would be to reach beneficial results in commercial settings.

As Virtual Reality also shows promising results when used in a branding context (Van Kerrebroeck et al., 2016), further studies may explore replicating this set-up in a specific (brand) store. Regarding branding, further research could also examine the impact of the

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presence of Virtual Reality on certain aspects of the personality of the shopping mall or the store (e.g., innovativeness; Geuens, Weijters, & De Wulf, 2009). While a mall or store may be perceived as more innovative as a result of the Virtual Reality experience offered, a novelty effect may also exist (Jin, 2011), which could be examined via a longitudinal study. In addition, a longitudinal study may also shed light on the long-term effects on approach behaviour and loyalty.

The current study offers a specific type of experience (i.e., a relaxing, feel-good experience). Retailers could use a targeted approach in order to attract those shoppers who are in need of some relaxation to this calming Virtual Reality experience. Further research however may also examine the impact of an exciting, thrilling experience, which is expected to be more effective for experience seekers, and investigate its impact during a different time of year when it is less busy. As such, a contrast between, for instance, a thrilling experience in a calm period versus a relaxing experience in a busy time period could be investigated.

Moreover, consumers' preference for excitement (or rather relaxation) is dependent on the shopping motivation with which they enter the store (cf., Kaltcheva & Weitz, 2006). Future research could test Virtual Reality experiences in a more task-oriented shopping context (e.g., grocery shopping), where the escapist effect can engender even more fruitful outcomes for the retailer. Carrefour France for example only recently introduced a Virtual Reality experience that allows customers to travel through five sensational worlds in which they can see the products. Each world represents a specific product category (e.g., an enchanted forest for grocery and natural products) (Carrefour, 2016).

Offering shoppers a relaxing and enjoyable VR experience provides a practical alternative to other remediating measures that can be applied in case of crowding, such as the presence of plants (Brengman et al., 2012), which need a lot of maintenance, or investing in extensive

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employee training to enhance the perceived friendliness of the staff (Martilla & Wirtz, 2008). Future research could compare the relative effectiveness considering operating costs of alternative measures to remediate perceived crowding.

Finally, as the immersive nature of the Virtual Reality experience is related to escapism and thus benefits perceived crowding, it may be worth exploring whether the presence of additional sensory stimuli (e.g., scent) in a high/low crowding environment is worthwhile, as these stimuli may create an even more immersive environment, provided the stimuli are congruent (Tortell et al., 2007). Especially in a Christmas setting, the interaction of the sensory stimuli of scent and music evoke favourable consumer evaluations (Spangenberg et al., 2005).

9. Managerial implications

Besides contributing to the literature, this study also presents valuable insights for retailers. First, the study demonstrates that investing in Virtual Reality to provide cutting-edge hedonic shopping experiences, especially in potentially crowded shopping areas, may well be worthwhile for retailers. While crowding in a shopping centre leads to negative consumer behavioural outcomes (e.g., Eroglu & Machleit, 1990), its impact can be diminished by providing a relaxing and enjoyable Virtual Reality experience at the mall. The Virtual Reality experience allows shoppers to escape the reality of the (hectic) shopping environment (Yee, 2007), which is confirmed by the study's findings. As such, the technology can particularly prove to be fruitful during busy periods such as sales, holidays, Saturdays, and so forth. The exposure to the Virtual Reality experience overall leads to significantly improved behavioural responses reported by respondents who were exposed to the Virtual Reality experience as compared to regular shoppers who were not. In addition, the effect of the Virtual Reality

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experience is more strongly pronounced with regards to consumer attitudes, satisfaction and loyalty intentions when the shopping mall is perceived to be highly crowded. With regard to the impact of Virtual Reality on approach behaviour, we could however not retrieve an effect, even when crowding was high.

Second, the findings indicate that investing in VR can prove valuable to retailers, even when crowding is perceived to be low. While the VR experience appeared more effective in case of higher levels of perceived crowding, no negative effects on consumer behavioural outcomes are found when crowding is perceived to be low. As such, the VR technology can still provide enjoyment and be offered to all consumers, without that it is required to segment the store visitors based on their crowding perceptions (Sands, Oppewal, & Beverland, 2015). Besides profiting from the remediating effects with regards to crowding, presenting and advertising the presence of a new technology can also attract shoppers and thus augment market share (Pantano & Naccarato, 2010). Yet, while the implementation of other technologies or in-store events may consequently increase the risk of perceived crowding (Sands, Oppewal, & Beverland, 2015), the application of Virtual Reality can counter potential negative consequences emerging from attracting more visitors, especially if smart queueing systems or mobile queueing apps (such as Qless or Queue time) would be applied so that physical queues are avoided (cf., Guo, Zhang, & Zhang, 2016).

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Appendix

Appendix 1. Scale items

Construct	Scale type		Item	Cronbach's α/Pearson's r
Attitude toward the mall (Michon et al., 2005)	7-point Likert scale	AM1	Boring/Stimulating	0.911
		AM2	Unlively/Lively	
		AM3	Uninteresting/Interesting	
Approach/avoidance (Donovan & Rossiter, 1982)	7-point Likert scale	AA1	I like to spend much time browsing in this store	0.694
		AA2	I want to avoid looking around or explore this store (reversed)	
		AA3	This is a place where I try to avoid other people, and avoid to talk with them (reversed)	
		AA4	This is a place in which I feel friendly and talkative to store personnel who happens to be near me	
		AA5	I like this store environment	
		AA6	I enjoy shopping in this store	
		AA7	I would avoid ever having to return to this store (reversed)	
		AA8	This is the sort of place where I might end up spending more money than I originally set out to spend	
Mall satisfaction (Song & Zinkhan, 2008)	7-point Likert scale	MS1	I am satisfied with my experience in this shopping mall.	0.940
		MS2	This shopping experience is exactly what I needed.	
		MS3	This shopping experience hasn't worked out as well as I thought it would. (reversed)	
Loyalty intentions Adapted from (Zeithaml et al., 1996)	7-point Likert scale	LI1	Say positive things about this shopping mall to other people.	0.878
		LI2	Recommend this shopping mall to someone who seeks your advice.	
		LI3	Encourage friends and relatives to do their shopping in this shopping mall.	
		LI4	Consider this shopping mall your first choice.	
		LI5	Shop more often at this shopping mall in the next few years.	
Crowding (Eroglu & Machleit, 1990)	7-point Likert scale	CR1	Confined/spacious	0.609
		CR2	Too many shoppers/too few shoppers	
		CR3	Restricts movement/allows free movement	
		CR4	Crowded/uncrowded	
		CR5 (removed)	Provides an open feeling/gives a confined feeling	
		CR6	Must move at a pace set by other shoppers/can move at my own pace	
Escapism (Yee, 2006)	7-point Likert scale	E1	I like the escapism aspect of the experience.	0.893
		E2	The sleigh ride experience lets me forget some of the real-life problems I have.	
		E3	Using this experience lets me vent and relieve stress from the day.	
Pleasantness of the experience(Kaltc	Semantic scale (-3; +3)	P1	Depressed/contented	0.931
		P2	Unhappy/happy	
		P3	Unsatisfied/satisfied	
		P4	Annoyed/pleased	

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heva & Weitz, 2006)		P5	Bored/relaxed	
		P6	Despairing/hopeful	
Presence (Debbabi, Daasi and Baile, 2010)	7-point Likert scale	T1	During the sleigh ride, I felt I was in the world the computer created.	0.602
		T2	During the sleigh ride, I forgot that I was in the middle of an experiment.	
		T3	During the sleigh ride, my body was in the room, but my mind was inside the world created by the computer.	
		T4	The Christmas landscape seemed to me 'somewhere I visited' rather than 'something I saw'.	
		T5 (removed)	I felt I was more in the 'computer world' than the 'real world' around me when I was going through the winter landscape. (reversed)	
		T6	I forgot about my immediate surroundings when I was navigating through the winter landscape.	
		T7	When the sleigh ride ended, I felt like I came back to the 'real world' after a journey.	
Optimum stimulation level (Sharma, Sivakumaran, & Marshall, 2010)	7-point Likert scale	OSL1	I like to experience novelty and change in daily routine.	0.859
		OSL2	I am continually seeking new ideas and experiences.	
		OSL3	I like continually changing activities.	
		OSL4	When things get boring, I like to try something different.	
Big five personality (Rammstedt, & John, 2007)	7-point Likert scale	Extraversion	… is reserved (reversed)	0.385;
			… is outgoing, sociable	p <0.001
		Agreeableness	… is generally trusting	0.261;
			… tends to find fault with others (reversed)	p <0.001
		Conscientious-ness	… tends to be lazy (reversed)	0.274;
			… does a thorough job	p <0.001
		Neuroticism	… is relaxed, handles stress well (reversed)	0.351;
			… gets nervous easily	p <0.001
		Openness	… has few artistic interests (reversed)	0.216;
			… has an active imagination	p = 0.003

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