How does virtual reality shopping experiences influence consumer perceptions of product and how do demographic factors (e.g., age, gender, income) moderate the impact of virtual reality on consumer decision making and behaviour in supermarkets?

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Virtual Reality:
A Comparative Experimental Study of High vs. Low vs. No Exposure to Virtual Reality on Purchase Intention

Jury

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Master thesis by

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Zaid Jamhour

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Abstract

This thesis examines the impact of Virtual Reality exposure (high vs. low vs. no exposure to the Virtual Reality) on purchase intention among consumers, with telepresence serving as a mediator and familiarity with VR, age, and gender serving as possible moderators. An experimental methodology collected data from 108 Liège participants, and statistical analyses evaluated how immersive experiences affect consumer behaviour. The findings indicate that VR exposure significantly strengthens telepresence and purchase intention relative to control website imagery, but longer exposure does not always enhance such effects. Moderate exposure served as the most effective persuader, and it appears that the efficacy and design of VR interaction—more than exposure duration—are the decisive drivers of engagement. Telepresence served as an underlying mechanism between VR and purchase intention through “vividness” and “interactivity”, same as “self-location” and “possible actions”. Moderating roles of familiarity, age, and gender, however, were insignificant, and they suggest that VR efficacy may be widely generalizable across different types of consumers. In general, the findings highlight VR’s promise as a marketing device to strengthen purchase intention where experiences are thoughtfully crafted toward maximizing decision-relevant immersion.

Keywords : Virtual Reality, Immersion, Presence, Virtual Environment, Purchase Intention, Familiarity.

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Chapter I

Introduction

This chapter provides an introduction to the subject, beginning with a contextualization and broad statement as a way to guide the reader and ensure paper accessibility to all. Then, the problem statement, followed by research motivations and the contribution of this thesis in terms of scientific knowledge, and concluding with the approach through which the research is being conducted

Introduction

i. Contextualization & Broad statement

In today's world, the quick development of technology and its intelligent application—particularly by marketers as we are in a marketing context—are changing the way people buy things, and this is happening all over the world (Raza et al., 2024). In fact, the idea of traditional and digital marketing is evolving as we rapidly transition to a "*post-digital*" environment in recent decades. Experts and scholars have seen multiple changes and transformations in the marketing sector (Nelson et al., 2017). This growth in new technologies, as I make reference to the paper of Dwivedi et al. (2020), includes the Augmented Reality (AR), which is a real-time direct or indirect view of a physical real-world environment or items, that are enhanced, improved, "*augmented*" by introducing virtual computer-generated information (Carmigniani et al., 2010) and the Virtual Reality (VR), which is defined as a real-time simulation of one or more of the user's five senses, that is achieved by allowing the user to navigate and potentially interact with a computer-generated 3D environment, called the Virtual Environment (VE) (Guttentag, 2009). In the context of VR, "*navigation*" implies the capacity to move around and investigate a 3D VE, while the capacity to choose and work with objects in the scene, for example, "picking up an item from the ground" is defined as an "*interaction*" (Gutiérrez et al., 2008).

To better understand the difference between VR & AR, Milgram et al. (1994) introduced the Reality Virtuality Continuum, where they considered both concepts "VR" &"AR" to be related to one commonly held view of VE which is one. Yet, viewing them on a continuum where both concepts are lying on opposite ends of it is more convenient. (*Figure 1.)*

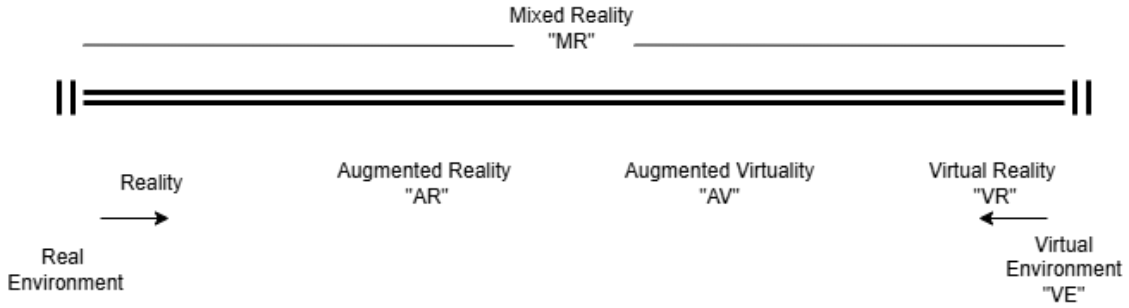

Figure 1. Reality Virtuality Continuum. Adapted from (Milgram et al., 1994)

VR technology is now widely used for commercial applications due to recent improvements (Berg & Vance, 2016), and the global virtual reality market was valued at 59.96 B$ in 2022, and is predicted to increase at CAGR (Compound Annual Growth Rate) of 27.5% between 2023 and 2030 *(Figures 2.)* (Grand view research, 2022).
Pacific Asia has the most revenue share within the virtual reality market, up to 39% is registered in 2022 *(Figure 3.)* (Grand view research, 2022). Economies like China's, Taiwan, South Korea, key producers and suppliers of VR-related hardware, are driving the regional market expansion. Besides, the Pacific Asian region is known by hosting several enterprises and factories that use virtual reality in a variety of their operations and processes, as part of the automation trend. In addition, the increasing prevalence of handheld devices with Virtual Reality compatibility in Asia Pacific is likely to lead the market growth in the region (Grand view research, 2022).
From the first steps to this thesis, we see that this rapid-evolving and emerging technology is crucial to Europe too just like other countries, so that it can go hand in hand with the latest trends in the high-tech sector.

ii. Problem statement

The rapidly evolving digital perspective, advancements in technology and innovations are redefining, affecting, and shifting consumer behavior, as well as modifying how consumers make purchasing decisions (Hussain et al., 2025). Europe is predicted to reach 40.97 B$ by 2030 and to grow at a CAGR of 28.2% over the period of prediction 2024-2030 (Grand View Research, 2024). This is thanks to the wide adoption of VR technology in a variety of applications across multiple sectors, most notably in the gaming and automobile industries. Europe has an important gaming population, which encourages the use of modern VR headsets in the region (Hussain et al., 2025). The regional market has grown more quickly because of the quick development and distribution of strong VR technology targeted at the gaming community in Europe (Grand view research, 2022). Many industry experts predict that all virtual technologies, including the AR and VR, will for sure, play a crucial role, as a key, in the retail business, due to its ability to offer personalized and highly interactive experiences (Taylor, 2020), and due to the ability to place "... *consumers in quasi-physical store conditions*" (Donaldson, 2020).

While traditional online shopping depends significantly on images (sometimes a 3D 360° imagery technique), product descriptions, and customer reviews, VR provides an immersive dimension by allowing customers to interact with products in a VE before making a purchase. Even though VR has been widely adopted in areas such as gaming, entertainment, and certain industries like cosmetics (Dhianita & Rufaidah, 2024), there remains a gap in understanding how different levels of exposure to VR influence consumer behavior in comparison to traditional website formats.

This study investigates the impact of high versus low exposure to VR experiences, relative to conventional website-based product imagery, on purchase intention. Examining how varying degrees of immersive engagement and levels of familiarity with technology (some can be less familiar than others) affect consumer decision-making, this research addresses an underexplored area in literature and aims to contribute meaningful insights to both academic theory and practical application in digital retail.

In this regard, the main problem question to be considered is the following:

"What is the impact of high and low exposure to virtual reality compared to traditional website images on consumers' purchase intention, and how are this relationship and its effects influenced by familiarity with VR?"

The comprehension of these elements is very important for organizations and marketers seeking to optimize VR applications in digital commerce. The aim of this study is to look into the impact of virtual reality on customer behavior, namely the purchase intention.

iii. Research motivations

The motivations behind this research, first and foremost, arise from my personal experience with Head Mounted Displays. Serving in several today's world sectors *(Table 1.)*, all that is related to HMDs is relevant to know, especially when it comes to new technologies that can foster competitive advantage, provide a better positioning in the market for different players, but also to all different stakeholders who can benefit from it, in addition to the fact that, today, these technologies are evolving very fast. Moreover, in the paper of Gong and Ribiere (2021) they argue that digital transformation has become an imperative for most organizations, driven by constant technological advancements and dynamic market demands, meaning not only a transformation into digital, but also a transformation within the digital world.
And since marketing by definition, is the activity, institutions, processes for creating, communicating, delivering and exchanging offerings that have value for all stakeholders, while managing customer relationships in a manner that benefit the organization and its stakeholders (American Marketing

Association, 2017), this research is driven by the need to understand how VR can afford an optimized customer journey.
In conclusion, this paper seeks to fill this gap in information, especially the correlations that can exist between different variables through a quantitative data analysis.

iv. Contribution

This thesis is expected to provide significant value to various stakeholders, beginning from whom is a normal reader seeking knowledge, to whom utilize it as a credible research reference for academic or organizational purposes.

The insights of this thesis could be important for managers and marketing professionals, since it is introducing a comparative study between high and low exposure to VR, compared to traditional e-commerce imagery, to best optimize its usage for marketing purposes.

Additionally, this thesis is focused on a quantitative data analysis, with a keen overview on the qualitative study led simultaneously by other colleagues, since it is part of a big research project conducted by the SIG AR/VR Lab[*], at HEC – University of Liège.

v. Approach

This thesis consists of six chapters, starting from the first chapter, which is an introduction, including a contextualization of the topic, the problem statement, personal and academic motivations behind the research, and last but not least my contribution to this study.

Besides, the second chapter is oriented towards highlighting previous findings in literature, the theoretical framework, research questions, hypothesis elaboration, and the graphical model of the research. The third chapter is allocated to the research design to be followed, while the fourth chapter covers the data analysis part and its results. The fifth chapter is allocated to interpret the findings of the study, with a discussion part, where statistical results are drawn and highlighted in a way making it simple for every reader.

Finally, the last chapter demonstrates a conclusion to this thesis, including theoretical contributions, managerial implications, limitations and recommendations for both, organizations and future research.

[*] Service d'Informatique de Gestion - Augmented and Virtual Reality Laboratory

Chapter II

Research Approach

This chapter provides a detailed review of the current state of knowledge and scientific research concerning the application of virtual reality in different application areas, with a scoop on marketing. First, the relevant concepts of virtual reality are explained, after that, a presentation of the theoretical framework which is the basis of the research methodology, and finally, an overview of the different hypotheses this thesis is responding to

Research approach

i. Literature review

a. Virtual Reality

"Virtual Reality", as an official neologism, was first used in the 1960s; even so, its etymon stem from the 19th century when the first 360° artworks emerged in the form of panoramic murals (Lum et al., 2020). Later on, a mechanical device was introduced, the *Sensorama Simulator* (Heilig, 1962) has engaged multiple senses to provide the highest level of immersion possible within VR; the device included a 3D-colored film, joined to sounds, smells, the feeling of motion and the wind sensation (*Figure 4.*).

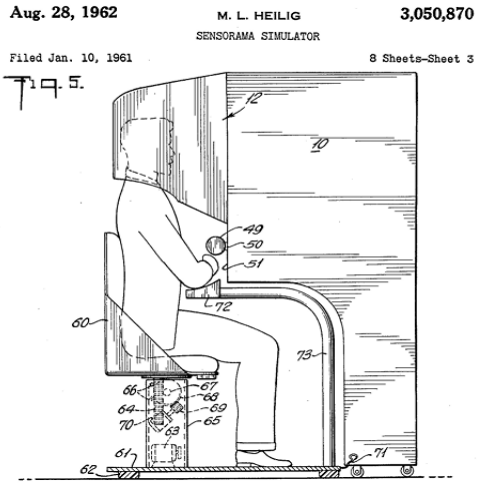

Figure 4. patent for immersive VR system by Heilig, 1962

VR is a totally simulated, immersive digital environment where users interflow with virtual components (Milgram et al., 1994). It has been a subject of several scholars and academics, and seems to be defined in different ways, depending on the level of its application and context. For example, Biocca (1992) has defined VR as a computer-generated environment or by the mean of other medias, where the participant feels present. Similarly, the definition by Pan & Hamilton (2018) of virtual reality, and Slater (2018), is "*a computer-generated world*", but virtual reality system too, which is surrounding, and "*where perception is at least a function of head-tracking*"-this it to say-head movement.

Burdea & Coiffet (2003) has defined the virtual reality as "*a high-end user interface that involves real-time simulation and interaction through multiple sensorial channels*". Evenly, Lee & Wong (2014) perceive virtual reality as a way of simulating or replicating an environment where a person can explore it and interact with.

Virtual Reality is likely to be a problem-solving device, which transforms enormous quantities of mind-breaking data into comprehensible illusions (Brooks, 1988). Moreover, Slater (2018) has evoked the fundamental elements of any virtual reality system. This matter is supposed to include a computer-generated world, which perceptually surrounds the participant, and where perception is a function at least of head tracking. This means that, at least being able to turn your head into the virtual environment, that is virtual reality.

b. Virtual Reality applications

As illustrated in (*Table 1.*), virtual reality is widely used in different ways, and applied to several sectors (Serrano et al., 2016), for instance, in all related to medicine (Laver et al., 2011), psychology (Hoffman et al., 2014) (*Figure 5.*) , and education (Merchant et al., 2013).

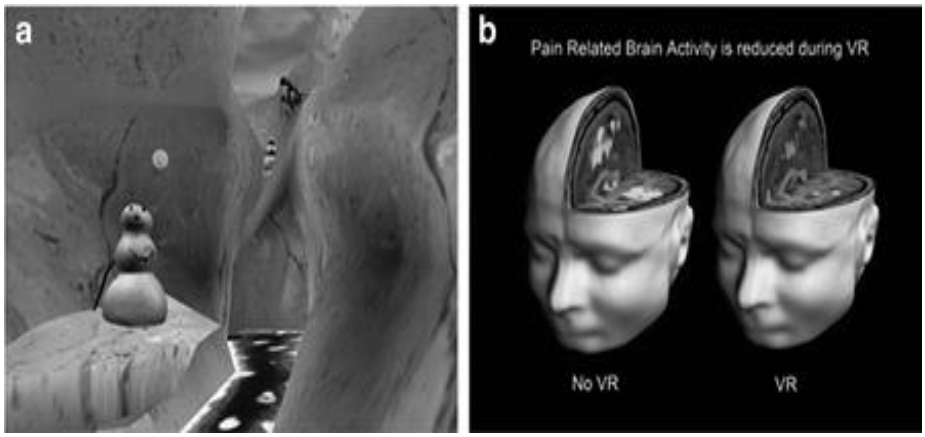

Figure 5. (a) SnowWorld, a VE designed for distracting patients from procedural pain; (b) Functional magnetic resonance imaging (fMRI) brain scan

The field of marketing is not an exception, i.e. Marriott International, Inc. introduced in September 2015 the "*First Ever In-Room Virtual Reality Travel Experience*" to showcase their rooms to potential comers before ordering, called "*VRoom Service*", and it was the first-of-its-kind guest service that time (Marriott International, 2015); Additionally, virtual reality experiences are considered as an important technological tool in the tourist industry, and the application of it is growing rapidly (Baiwir, 2020).

Several brands are starting to implement computer-generated realistic environments, in order to allow customers to see from a close distance the product, or to engage them in a brand-themed VE, as a form of increasing brand awareness (Van Kerrebroeck et al., 2017).

Some examples of brands using VR include, Happy Goggles by McDonald's (a VR viewer made from an ordinary happy meal box) (James, 2016); Sleighride for marketing campaigns by Coca-Cola (Coca-Cola's Christmas Village) (RawMarketing.ie), Volvo VR trainings by Oculus HMDs (retail personnel are trained to manage electromobility and liquified natural gas) (volvogroup.com), Bears Ears by Patagonia (a multimedia experience optimized for sound and VR) (patagonia.com). One other element that enhances the use of VR in business applications, is indeed the availability of headsets that work via smartphones, such as Google cardboards, at a low price ≈15 Dollars (Patel et al., 2019).

Only a few instances of the potential effects of new VR technologies on customers have been discussed (Javornik, 2016; Huang, 2012). Most of conducted studies on VR have been technique-driven, with a strong focus on technical features, even if the conceptual and practical aspects of adopting virtual reality for business development have been significantly advancing, i.e. (Smolentsev et al. 2017; Satam et al. 2011), yet, there are still unresolved issues regarding the efficacy and application of virtual reality in marketing (VanKerrebroecket al., 2017) that still need to be addressed, as such, this thesis aims to contribute into forging the body of knowledge by examining the effect of consumer-VR interaction using VR in an Ikea showroom environment.

c. Immersive versus non-immersive Virtual Reality :

On the basis of visualization and interaction devices, VR applications can be segmented into two broad categories, as per Vergara et al. (2017):

immersive	non-immersive
completely introduces the user into a virtual world, generally, by using glasses with two small screens placed in front of the user's eyes	where the user's vision to the world is by means of the flat screen of a computer acting as a "window"
also subdivided into two	

HMD	CAVE[†]
which is composed of active glasses with a small screen display positioned appropriately in front of each eye (Dickey et al., 2013; Hilfert & König, 2016)	where a variety of stereoscopic projectors project the virtual world on the walls, roof, and floor of a room. Here, users are invited to wear passive stereo glasses in order to achieve a 3D vision of the VE (DeFanti et al., 2008; Kuchera-Morin et al., 2014). (*Figure 6. & 7.*)

Table 2. immersive VS non-immersive VR, elaborated based on own research

N.b. : In general, the HMD with screen display in front of each eye is indeed the special technology utilized in immersive systems, to the point that, users can see it as a believable space they are engaged in, if the VE is well organized, established and appropriately displayed (Violante et al., 2019).

Moreover, immersion (i.e. almost like living another life), presence and telepresence (i.e. is the sensation of being present at a place other than the actual true location), and interactivity (i.e. the continuous live information exchange and communication within the VE) are crucial tools of VR (Radianti et al., 2019).

d. The three I's & five classic components of Virtual Reality

It is understandable from the previous definitions that virtual reality is immersive and interactive same time. Burdea & Coiffet (2003) have developed a third stimuli, which refers to *Imagination*. Human imagination is very important in shaping the performance of the simulation, that is, the extent to which an application is capable of solving problems, since imagination refers to mind's capacity to perceive virtual items, nonexistent things.

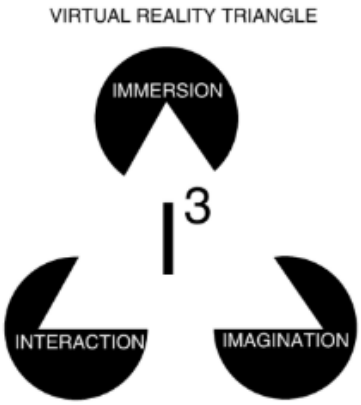

Figure 8. virtual reality three I's (Burdea & Coiffet, 2003)

They also defined the five components of system architecture, which are the virtual reality engine and its software and data base, the input/output devices, the user and the given task. Input device refers to devices consisting of user input, such as gloves, controller, etc.., and output device refers to devices consisting of output displayed to the user.

[†] Cave Automatic Virtual Environment

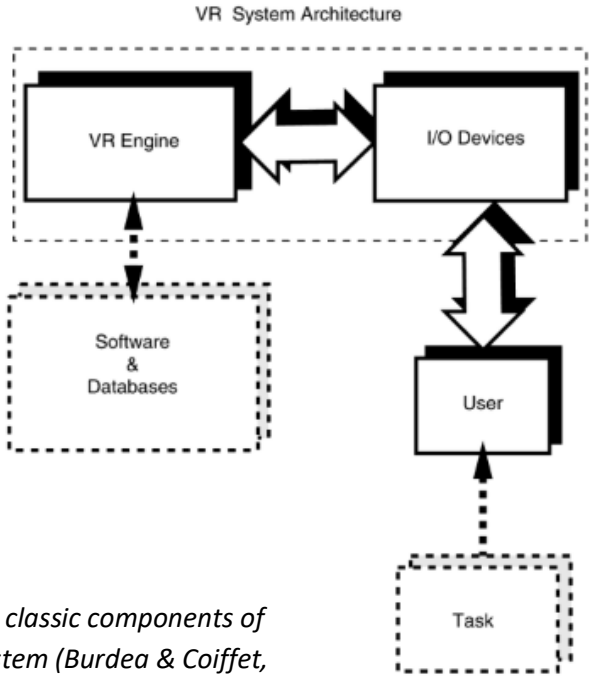

Figure 9. the five classic components of virtual reality system (Burdea & Coiffet, 2003)

e. Immersion

Immersion into the VE is the first characteristic distinguishing VEs from other means of displaying information, and it is achievable by freezing all real-world related sensations as possible, and changing them into virtual-environment related sensations; thus, immersion is driven thanks to the resemblance between humans characteristics with VR devices (including the field of view, 3D animated sound, and the stereoscopic aspects of simulation), which means that the more the technology provides displays through all senses and try as much to keep the original feeling, the more immersion is enhanced (Mestre et al., 2006).

The sense of immersion in virtual environments is reduced by the moderating role of extraneous variables such as extraneous distraction, otherwise increases when direct interactions with the virtual environment occur, but also the performance of the task activity within the virtual environment (Witmer et al., 2005).

This next table assembles different definitions of immersion:

Authors	Year	Definition
Shu et al.	2019	*The result of a good gaming experience that includes disconnection from the real world and real time, and involvement in the task environment.*
Kisker et al./Slater & Wilbur	*2019/ 1997*	*The degree to which a technical system generates an inclusive, extensive, surrounding, and vivid illusion of reality.*
Slater	*2018*	*Objective property of the system, either it is higher or lower immersion as the extent to which a VR system can support natural sensorimotor contingencies for perception including the response to a perceptual action.*
Makransky et Lilleholt	*2018*	*An objective measure of the extent to which the VR system presents a vivid VE while shutting out physical reality.*
Jennett et al.	*2008*	*An experience descried by people as being in the game. It is the outcome of a good gaming experience, even if all the definitions provide a*

		broad understanding of the term, it is still not clear what exactly is meant by immersion and what is causing it.
Bowman & McMahan	*2007*	*Immersion refers to the objective level of sensory fidelity a VR system provides.*
Witmer et al.	*2005*	*Immersion is a psychological state characterized by perceiving oneself to be enveloped by, included in, and interacting with an environment that provides a continuous stream of stimuli and experiences.*
Arsenault	*2005*	*A sensation provided by multisensory virtual reality environments.*
Slater	*2003*	*It is mainly what the whole technology delivers. The more the displays are capable of delivering high fidelity and tracking, the more level of immersion is high.*
Witmer & Singer	*1998*	*A psychological state where oneself perceives to be enveloped by, included in, and interacting with the VE.*
Slater & Wilbur	*1997*	*Immersion is a description of a technology, and describes the extent to which the computer displays are capable of delivering an inclusive, extensive, surrounding, and vivid illusion of reality to the senses of a human participant.*
Slater et al.	*1996*	*A quantifiable description of technology, which includes the extent to which the computer displays are extensive, surrounding, inclusive, vivid, and matching.*

Table 3. definitions of immersion based on own research

Various researchers have technically and psychologically defined immersion. Older research such as Slater & Wilbur (1997) and Slater et al. (1996) define immersion as something to be measured and describe how technology functions, for instance, how inclusive, extensive, and vivid the displays are. Likewise, Bowman & McMahan (2007) and Slater (2003, 2018) define immersion in terms of how VR systems function and how they provide support for our physical actions. In contrast, Witmer & Singer (1998), Witmer et al. (2005), and Jennett et al. (2008) view immersion as a state of mind in which individuals perceive that they are surrounded by and part of the virtual world.

Other authors, such as Shu et al. (2019) and Makransky & Lilleholt (2018), relate immersion to disconnection from the real world or to how well VR presents a vivid scene and prevents the physical world from being seen. The word cloud indicates that system, reality, extent, vivid, surrounding, inclusive, and experience are terms that are frequently cited, indicating both system-centered and experience-centered perspectives coexist. Generally, although definitions vary, they all point out that immersion entails both what VR systems do and how individuals feel being surrounded by virtual reality.

See *Table 4.* & *Figure 10.* in the appendices section.

It is important to distinguish between immersion and presence. These two terms are related to one another but roughly different. Immersion is likely to be a description of a technology, which provides an idea about the extent to which a computer-generated display is set−in an inclusive, surrounding, extensive, and vivid−illusion of the reality to the user (Slater & Wilbur, 1997).

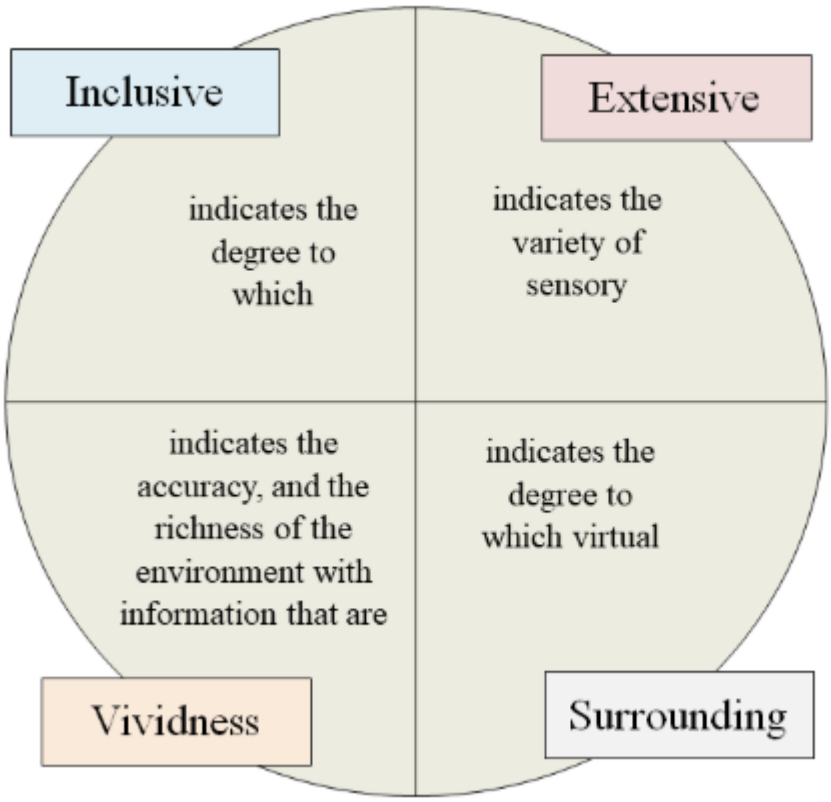

Figure 11. Immersion by (Slater & Wilbur, 1997)

Immersion can be an objective and quantifiable description of what any particular system does provide (Slater & Wilbur, 1997), and each of the four dimensions of immersion, is indeed working as a scale marking the degree to which they are realized. For example, if we are talking about HMD, surrounding dimension can be delivered by optimizing the Field of view (FOV). Same time for inclusive-dimension, which can be optimized for example by lowering the weight of the device, which can lead to a feeling of telepresence (*see next title*), otherwise, for the vividness dimension, which is about the richness, resolution and the quality of displays (Steuer, 1992), which can be achieved by developing the device itself.

Another two factors should be added. As in the paper of Slater & Usoh (1994), the first one is the Body Centred Interaction, which refers to the interaction techniques that should be built in order to meet and match the sensory raw data and cognitive level (what the body support while immersed in the VE), with the proprioceptive feedback—which provides the concerned person with information about the body's mechanical state (Dean, 2013), this is to say (what the body feels while immersed in the VE).

Based on the same paper of Slater & Usoh (1994), Body Centred Interaction (BCI) involves three components:

Inference about the state of the body from limited information	**Body centred feedback**	**Magical and Mundane Interaction**

<table>
<tr><td rowspan="2">The BCI approach seeks to establish a device-agnostic control system that converts physical tracking information into virtual body dynamics. In the absence of sufficient tracking data, an inferential model is required for determining the complete virtual body's position and orientation</td><td rowspan="2">Interaction necessitates feedback regarding the state of the virtual body and its connection with the environment, including the generation of real-time shadows that include the virtual body too</td><td colspan="2">This is to say, the extent to which the participant can move, navigate and manipulate the VE</td></tr>
<tr><td>it is Mundane</td><td>it is Magical</td></tr>
<tr><td></td><td></td><td>if the interaction is reproduced in one's real life. For example, flipping a light switch to turn on virtual light, or pouring a drink from a virtual bottle into a virtual glass</td><td>if the interaction never can be possible in a real-life context. For example, tele-portation from different locations instantaneously, time manipulation or even summoning objects—creating items out of thin air</td></tr>
</table>

Table 5. BCI components by Slater & Usoh (1994)

The second one is the plot; which represents the degree to which the virtual environment can isolate the participant from ordinary world and create an independent universe with its own story, and of course, supporting participant's engagement (Slater & Wilbur, 1997).

It is important to think about immersion first, since it is the first occurring, and has several benefits, we cite:

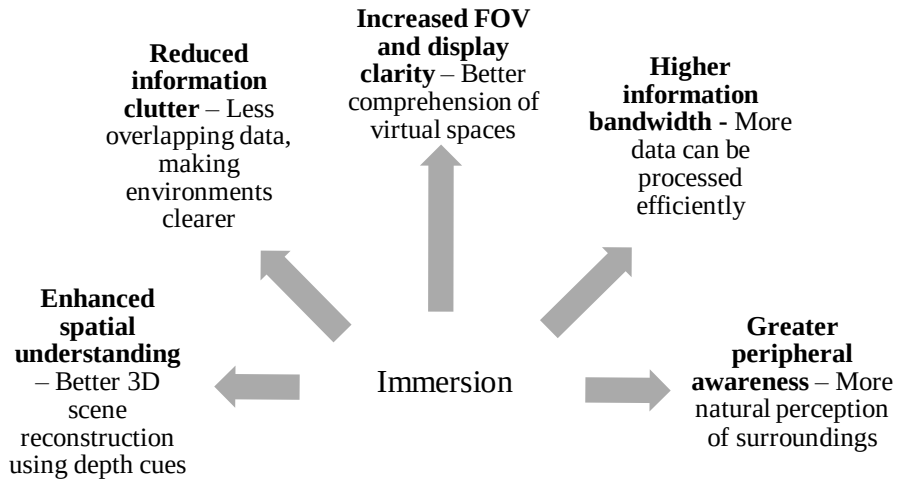

Figure 12. immersion benefits (Bowman & McMahan, 2007)

And since high levels of immersion can lead to an increased sense of presence (Bowman & McMahan, 2007), and assuming that both are different, it is important to examine presence apart.

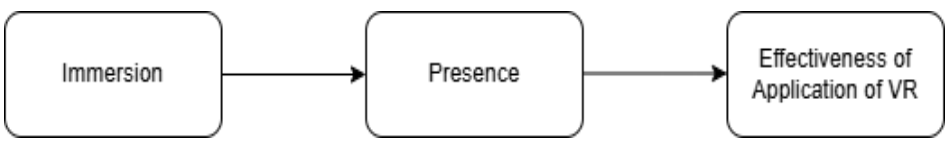

Figure 13. benefits of immersion from a Traditional thinking strategy contrast (Bowman & McMahan, 2007)

f. Presence

Presence is centric in all forms of immersive virtual experiences (Brade et al., 2017). Steuer (1992) has conceptualized presence as the degree to which one feels present in the mediated world rather than in the immediate physical environment, besides, as a psychological state in which the virtuality of the experience is not felt (Lee, 2004). This means, that the person experiencing the VE, perceives the existence of the medium, which is the technological system that delivers the virtual experience, in his communication mechanism, yet still responds as if the medium is totally nonexistent, thanks to the level of immersion within the mediated environment (Lombard & Snyder-Duch, 2001), consequently, a medium is considered more transparent, clear and engaging, if affording more presence to the users (Grigorovici & Constantin, 2004).

Nevertheless, Slater (2003) has defined presence as the response to a certain level of immersion, and being present is manifested into behaviors that are all but identical to real-situation behaviors, by creating the match between the sensory raw data and cognitive level with the proprioceptive feedback (Slater & Usoh, 1994).

This next table assembles different definitions of presence:

Authors	Year	Definition
Kisker et al.	*2019*	*Refers to the subjective feeling of being there, in a virtual environment, while the awareness of the physical environment and technical equipment diminishes.*
Wilkinson et al.	*2019*	*It is psychological state of 'being there' mediated by an environment that engages our senses, captures our attention, and fosters active involvement.*
Roettl & Terlutter	*2018*	*Sense of being in a virtually mediated location instead of being in a real location.*
Pan & De C Hamilton	*2018*	*Participant's perceptual illusion, where they feel their heart beating on a virtual environment despite knowing they are in the laboratory.*
Slater	*2018*	*Presence is the illusion of being there, notwithstanding that you know for sure that you are not. It is a perceptual but not a cognitive illusion, where the perceptual system believes but not your cognition.*
Makransky & Lilleholt	*2018*	*A psychological state in which the virtuality of the experience goes unnoticed.*
Cooper et al.	*2018*	*A subjective feeling of being present in the virtual environment, rather than the real space.*
Triberti & Riva	*2016*	*As a cognitive process, presence aims to locate the self in a physical space or situation, based on the perceived possibility to act in it.*
Diemer et al.	*2015*	*Presence is a dimensional construct and describes the extent to which a user feels present in a virtual reality environment.*
Bowman & McMahan	*2007*	*Presence refers to a user's subjective psychological response to a VR system.*

Witmer et al.	*2005*	*Presence is a psychological state of "being there" mediated by an environment that engages our senses, captures our attention, and fosters our active involvement.*
Slater	*2003*	*Presence is a response to a system of a certain level of immersion. It is indeed a human reaction to immersion. It is about form, the extent to which the unification of simulated sensory data and perceptual processing produces a coherent 'place' that you are 'in' and in which there may be the potential for you to act.*
Witmer & Singer	*1998*	*Presence is defined as the subjective experience of being in one place or environment, even when one is physically situated in another. It refers to experiencing the computer-generated environment rather than the actual physical locale.*
Zahorik & Jenison	*1998*	*Presence is tied to one's successfully supported action in the environment, either virtual or real.*
Lombard & Ditton	*1997*	*Perception of an illusion that a mediated experience is not mediated.*
Slater et al.	*1996*	*Presence is a state of consciousness, the (psychological) sense of being in the virtual environment, and corresponding modes of behavior.*

Table 6. definitions of presence based on own research

The definition of presence is invariably the subjective experience of "being there" in the virtual world, even though one is physically somewhere else. Several authors (e.g., Kisker et al., 2019; Cooper et al., 2018; Witmer & Singer, 1998) characterize presence as a subjective experience or psychological state, involving a perceptual illusion where users experience themselves as being in the virtual instead of the physical environment.

Other definitions emphasize the perceptual versus cognitive difference: Slater (2018) mentions that presence is a perceptual illusion—where the senses perceive the virtual as real—although cognition understands it as artificial. In the same vein, Pan & De C Hamilton (2018) depict presence as a perceptual illusion, where physiological reactions take place in VR in spite of knowledge of the laboratory environment.

Though most emphasize presence as a feeling or state of consciousness of being in the VE (Slater et al., 1996; Lombard & Ditton, 1997; Witmer et al., 2005), some cast it in dimensional or cognitive terms. Diemer et al. (2015), for instance, view it as a dimension of the extent to which users feel present, while Triberti & Riva (2016) focus on its function as a cognitive process of self-location in a space in which action can be taken.

Zahorik & Jenison (1998) also relate presence to the effective facilitation of action within virtual or real environments. Slater (2003) explicitly links presence to immersion, characterizing the former as a human response to immersive system characteristics. Collectively, the definitions point to a conflict between presence as a subjective psychological illusion and presence as a cognitive or action-based concept. Although emphases differ, the common denominator among definitions is the illusion or feeling of being physically present in the virtual world, with perceptual, cognitive, and behavioral factors providing support.

See *Table 7.* & *Figure 14.* in the appendices section.

Steuer (1992), considered some technological aspects leading to telepresence, we cite: Vividness & Interactivity

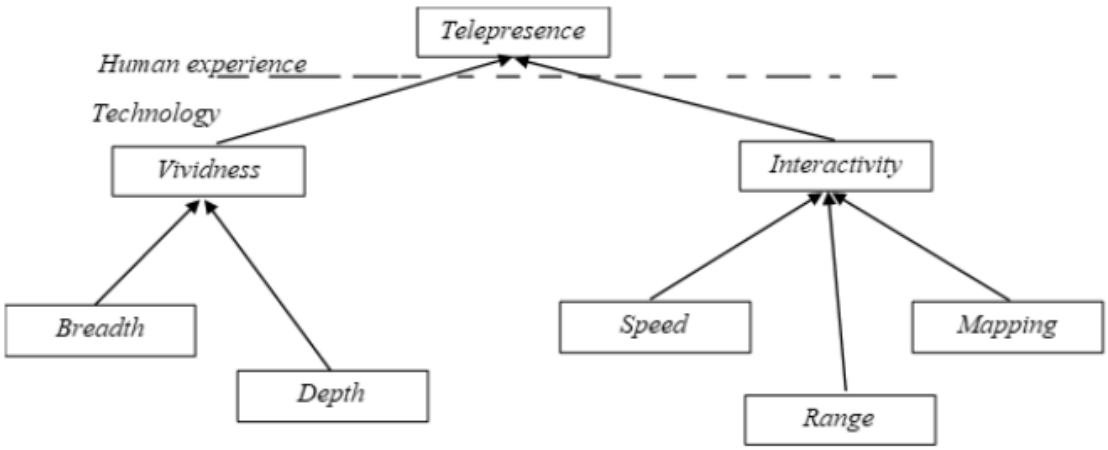

Figure 15. Conceptual model (Steuer, 1992)

Sensory breadth and sensory depth are two variables influencing vividness. While breadth is the number of sensory dimensions simultaneously provided, depth is the resolution of each of these iterations. Moreover, speed refers to the rapidity of inputs to be translated into actions in the VE. Range is the extent to which multiple tasks can be operated at the same time, and mapping is the ability to translate the commands into actions in the VE.

It is very important to make people feel present in a VE for many reasons, we highlight two of them in following table:

<table>
<tr><td colspan="2">engagement (O'Brien & Toms, 2008)</td><td>behavior (Slater et al., 1996)</td></tr>
<tr><td colspan="2">Increasing consumer's engagement</td><td rowspan="4">More realistic behaviors in the virtual space just like a real situation</td></tr>
<tr><td colspan="2">which has been associated with</td></tr>
<tr><td>Memory Awareness</td><td>Recall</td></tr>
<tr><td>Increased memory awareness of the virtual space (Mania & Chalmers, 2001).</td><td>Increased recall of the virtual experience, meaning that users are more likely to remember specific details of the VE (Bailey et al., 2012).</td></tr>
</table>

Table 8. presence benefits, elaborated based on own research

In fact, multisensory signals are crucial to achieving a high level of presence in VEs, since humans, and in order to perceive their surrounding environment, use all five senses together (Sight, Sound, Smell, Taste, and Touch). Improving the variety of sensory input forms in a virtual world can improve memory for items in the environment as well as the sense of presence within the VE. As often as not, VEs use visual and hearing stimuli a priori, besides touch, taste and smell oftentimes referred to as the lower senses - coming in second (Spence, 2011).

In this study, the focus is placed exclusively on the measurement of telepresence, rather than immersion. The construct of immersion primarily refers to the technical and environmental features of a virtual system and is therefore difficult to assess through participant self-reports. In contrast, presence, defined as the user's subjective psychological response to a virtual environment, is more suitable for measurement in user studies.

Although some distinctions exist between presence and telepresence, the two terms are used interchangeably in literature. Specifically, telepresence is often preferred when referring to virtual reality environments.

g. Purchase Intention

Enyejo et al. (2024) affirms that VR provides people with immersive experiences in which they can test products in virtual locations, which results in greater interaction with the products and encountering that enhances the desir to purchase. Through virtual trials and interactive demonstrations, VR enhances shopping. In the same view, Dave et al. (2025) demonstrate that virtual reality shopping has a significant influence on the behavior of individuals and purchase intentions by developing experiential and interactive shopping experiences.

In the paper of Mkedder et al. (2024), authors state that consumers prefer to experience VR. stores through which individuals can purchase products online . An example of an online store is a VR store. a platform where users can browse, engage, interact, and purchase products nearly, which assists shops to transform their method of selling. It assists individuals to discover goods and services and purchase them straight away.

Purchase intention, according to Shah et al. (2012), is a type of decision-making that outlines the reasons why a consumer selects a particular brand for purchase. Purchase intention illustrates the process where consumers make the decision to buy a given product under specified circumstances, and is usually determined by various factors including product quality, brand name, price, advertisement, and packaging (Akbariyeh et al., 2015). Purchase behavior, in this context, becomes a significant process whereby consumers compare and screen alternatives, making purchase intention an essential predictor of the buying process. Intention, however, is hardly ever fixed since it could be influenced by perceptions of price, quality, and general value (Akbariyeh et al., 2015).

As noted by Akbariyeh et al. (2015), consumers typically go through six phases prior to making a purchase decision: awareness, knowledge, interest, preference, persuasion, and purchase. As this process indicates, decision-making is complex and emphasizes how attitudes and perceptions of consumers change over various stages. Notably, consumers tend to view purchases with low prices, basic packaging, or less-known brands as high-risk, which indicates product quality concerns. In this context, VR's potential to offer vivid, interactive experiences appears as an effective mechanism for mitigating perceived risk, enhancing engagement, and consolidating purchase intention during the decision process.

ii. Theoretical Framework

To better understand how immersive technologies such as VR influence consumer purchase intentions and behaviors, it is important to adopt a theoretical framework that explains the relationship between external stimuli and individual responses.

A strong foundation for investigating how external stimuli affect interior mental processes and, eventually, behavior is offered by the S-O-R model. The S-O-R model by A. Mehrabian and J. Russell in 1974, which refers to (stimulus-organism-response), is an extension of the S-R framework discussed by Woodworth in 1954 (Buxbaum, 2016). It recognizes that the individual's internal world is essential to comprehending behavior, in contrast to its predecessor, the S-R model, which views behavior as a straightforward output of environmental cues. The S-O-R model is a suitable theoretical framework for this study, since it is suitable for basic psychological and psychiatric concepts.

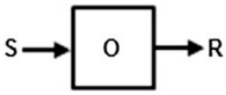

Figure 16. The general S-O-R-model (Stimulation-Organism-Response) (Buxbaum, 2016)

The S-O-R framework is linking stimulation and human behaviours with organismic component. In this regard, the S-O-R framework is applicable to the conceptual model of this thesis, as the following:

Stimuli	Organism	Response
Independent variables	Internal cognitive/mediating variable	The behaviour/ Dependant variable
Level of Exposure to VR Traditional e-commerce imagery	Tele-presence	Purchase intention

Table 9. SOR framework applied to our approach, own elaboration

The process toward the response (behaviour), is mainly impacted by existing stimulation; this is to say, behaviours are conducted by stimulus, through the organism which is in this regard cognitive (tele-presence & "immersion").

In addition to the traditional thinking strategy (Bowman & McMahan, 2007), where the first occurring is the immersion then presence then the effectiveness of the application of VR, we see that both theoretical backgrounds are important for the case of this study.

In the case of immersion, it is difficile to interpret it in terms of measurements, since it is more related to the characteristics of the VE and not the user's perception. As Slater & Wilbur in 1997 have evoked that immersion is likely to be a description of a technology, which provides an idea about the extent to which a computer generated display is set−in an inclusive, surrounding, extensive, and vivid−illusion of the reality to the user.

As a result, the proposed research conceptual framework is the following:

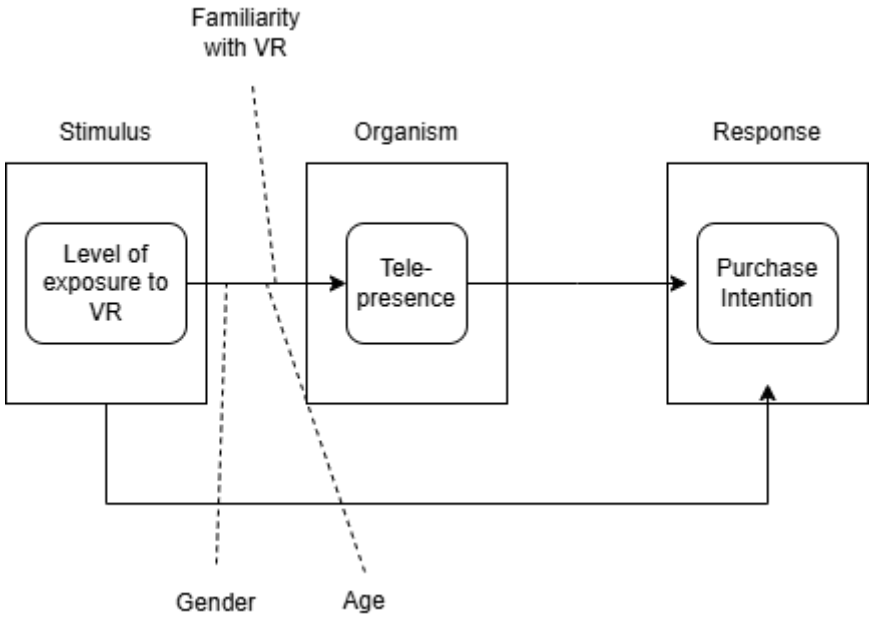

Figure 17. Research conceptual framework by the author

iii. Research Questions

- How does exposure to virtual reality compared to traditional website images on consumers' purchase intention?

- How does the level of exposure to VR (low vs. high) influence consumers' willingness to purchase a product?
- To what extent does familiarity with VR, age and gender moderate the relationship between the level of exposure to VR and the consumer's purchase intention?
- How does perceived presence within the virtual environment influence consumers' purchase intention?

iv. Hypotheses

Based on the reviewed literature, this section presents the hypothesized relationships between exposure to VR, telepresence, purchase intention, and the moderating role of familiarity with VR, age and gender.

The level of exposure to virtual reality is expected to significantly affect the degree of telepresence, which refers to the psychological state in which users feel present in the virtual environment rather than in their physical surroundings (Steuer, 1992). According to previous research, telepresence is improved by prolonged or more intense exposure to immersive content, which strengthens the virtual experience's realism and interactivity (Cummings & Bailenson, 2016; Tussyadiah et al., 2018). Therefore, it is possible that people who have been exposed for longer periods of time will report stronger telepresence than people who have been exposed for shorter periods of time or not at all.

H1: High exposure to VR (vs. low vs. non) has a positive impact on telepresence.

Consumer decision-making, especially purchase intention, may be influenced by exposure to immersive virtual environments. Compared to static website visuals, virtual reality (VR) can more precisely imitate product experiences, which may result in stronger behavioural reactions (Pizzi et al., 2019; Beck & Crié, 2018). Increased exposure might improve product appraisal and emotional engagement, which would raise likelihood of purchase.

H2: High exposure to VR (vs. low vs. non) leads to greater purchase intention.

The sense of telepresence may serve as a mediator between exposure and purchase behavior. Users are more likely to develop positive attitudes and greater intentions towards a product or brand when they feel psychologically present in a virtual setting (Tussyadiah et al., 2018; Kim & Biocca, 1997). Thus, telepresence may be the underlying mechanism explaining the effect of VR exposure on purchasing behavior.

H3: Telepresence positively influences purchase intention and mediates to role between VR and Purchase Intention

Familiarity with VR technology is expected to moderate the relationship between exposure and telepresence. An enhanced sensation of telepresence can result from users with prior experience interpreting virtual cues, navigating interfaces, and immersing themselves in the environment more readily (Cummings & Bailenson, 2016). This suggests a moderation effect where the influence of exposure depends on past familiarity.

H4: Familiarity with VR moderates the effect of VR exposure on telepresence; the effect is stronger among users with higher familiarity.

Individual traits like age and gender are also likely to moderate the VR exposure-purchase intention relationship, Younger consumers tend to be more open to tech innovations and might easily interact with immersive environments, resulting in higher purchase intentions than older consumers, who might be less experienced or comfortable with VR. By the same logic, gender can has a moderating role too, since the exposure might not affect all consumer equally. Age and gender are in general, metrics that are taken into consideration in every study, thus, it is very important to check the

influence that these variables might have on the relationship between the independent variable and the dependent variable.

H5: Age moderates the relationship between VR exposure and purchase intention; the effect is stronger among younger consumers.

H6: Gender moderates the relationship between VR exposure and purchase intention; the effect differs between male and female consumers.

The hypothesized conceptual framework followed in this research is the following:

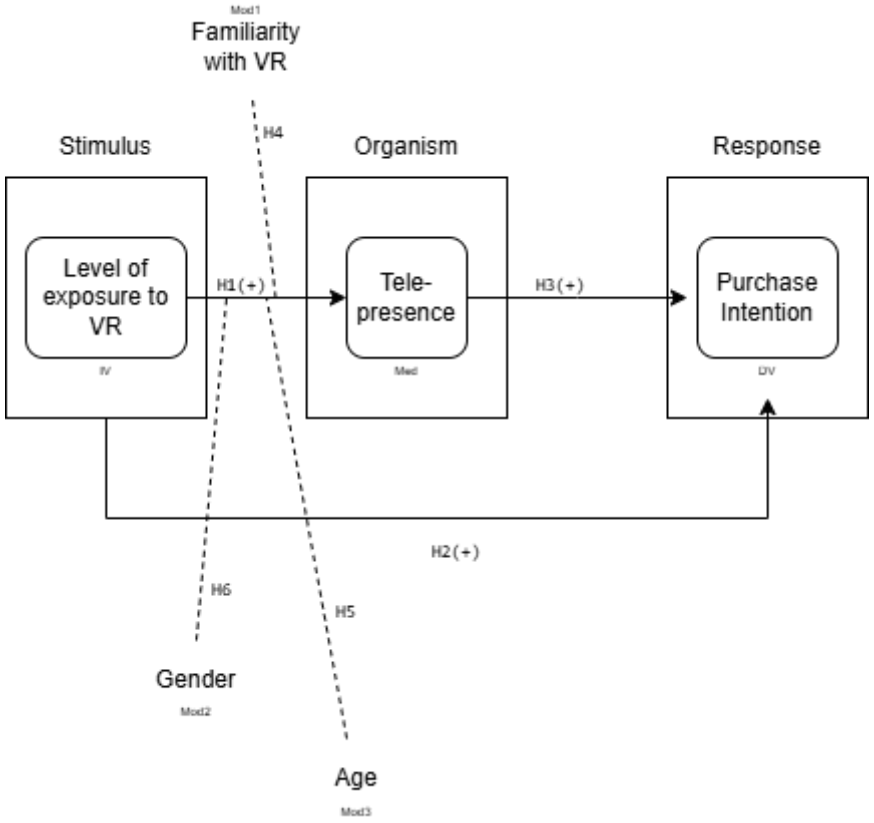

Figure 18. Hypothesized Research conceptual framework by the author

Chapter III

Research Design

This chapter provides a comprehensive summary of the research design to be followed in this thesis. Both sampling procedures and mode of administration of questionnaire, in addition to scales and measurements are evoked in this chapter

Context of the Study

This research examines the effect of varying levels of exposure to VR (high, low, and none) on consumer purchase intentions, with telepresence as a possible mediating variable. Virtual Reality allows consumers to interact with products in virtual spaces, inducing immersive and interactive experiences that could increase emotional attachment and decision-making. While greater exposure to VR is anticipated to increase telepresence and purchase intention, these influences could differ based on individual differences.

The study seeks to examine the direct impact of VR exposure on telepresence and purchase intention. We hypothesize that the greater the level of Virtual Reality exposure, the stronger the telepresence and the higher the purchase intentions compared to lower exposure or no exposure. In addition, telepresence will mediate the link between VR exposure and purchase intention.

Moreover, the research investigates if familiarity with VR, gender, and age moderate these relationships. People with greater familiarity levels might decode virtual cues better and feel more telepresence. Likewise, differences in purchase intention could arise between age groups and genders due to differences in the processing of immersive experiences.

A quantitative approach will be adopted, using an experimental design to gather data from the participants. The study will manipulate the levels of virtual reality exposure (high, low, or none) and measure participants' perceived time, their opinion wether they spent enough time, perceived telepresence, buying intentions, familiarity with VR technology, and demographic factors. Statistical tests will be conducted to test the hypothesized relationships, mediation, and moderation effects.

The subsequent sections will discuss in detail the process of data collection, including the survey instrument, sampling frame, and data collection methods. Also, the statistical tests intended to be used in analyzing the data and testing the hypotheses will be discussed in detail. Lastly, possible limitations of the adopted methodology and how they can be overcome will be explored.

Research Design

About

This research used a quantitative, between-subjects experimental research design with three groups to examine the effect of varying degrees of virtual reality exposure on telepresence and purchase intention, in contrast to a website-based experience. A between-subjects design with three groups is achieved by dividing or splitting participants into three distinct groups, with each group experiencing a different condition of the independent variable.

i. Data Collection

Data for the current research were collected through two structured online survey questionnaires, which were implemented immediately after participants completed their assigned experiences. The questionnaires were created and distributed using LimeSurvey, thus facilitating efficient administration and standardized data collection.

Participants in the VR condition went through the experience with a Meta Quest 3 headset made available by the Digital Lab of HEC. Having been explained the virtual setting, participants had liberty to interact with the VR scene for different time lengths: some for about 2–3 minutes (low exposure) and others for 5–6 minutes (high exposure). Notably, participants had liberty to take off the headset at any point, so as not to artificially restrict and bias their experience.

The virtual reality setting consisted of an interactive bedroom showroom from IKEA, where participants could explore two different design layouts: a classic room and a Scandinavian-style room. An interactive table allowed the choosing of favorite alternatives, with the possibility of personalizing several elements in the room. When an item was chosen, related product information was displayed, and participants could move freely in the environment, with the possibility of observing the bedroom from three angles. In addition to a background music and voice off explaining the concept of the room. This setup was conceived to simulate an actual product exploration, successfully combining interactivity with informational cues.

Those assigned to the website condition were sent a link to the web survey via email or instant message. They were instructed to look over a web-based site showing the same products and information as in the VR condition, but in the format of standard website images and text descriptions. Both surveys used identical variables and measures. They included items assessing telepresence, purchase intention, and demographic information, thus allowing comparability between conditions. The only distinction between the two groups was the presentation format of products (virtual reality headset vs. website platform), which served as the experimental manipulation.

See more in Figures 19. 20. 21. 22. 23. 24. 25. 26. 27.

ii. Sampling

The best choice of sampling technique in the case of this study is the convinience sampling technique. Rahi (2017) affirms that convenience sampling is a process of collecting data from a research population that is easily available to the researcher. Comparing the probability sampling and non-probability sampling, MacNealy (1999) describes a convenience sample as a method where researchers go to public and ask people to participate in the experience. This was used due to its ease and effectiveness in obtaining data within the resources and time availability (Galloway, 2005). Participants were invited using social media and personal network, which allowed access to a range

of people with different levels of exposure to VR. Although convenience sampling does not provide a completely representative sample of the general population, it provided a sufficient foundation upon which to examine consumer reactions to VR exposure for the purpose of this study.

iii. Survey Structure

The questionnaire was developed to analyze the effect of virtual reality exposure on telepresence and purchase intention. It was clarified that there were no correct or incorrect answers, that the questionnaire would require about 5–7 minutes, and that all answers would be totally anonymous and confidential.

For the first questionnaire, it commenced with a brief introduction that set out the research background. In this section, the objective of the research was stated, the contribution of VR towards delivering immersive shopping experiences was emphasized, and the scope of the study was explicitly stated. The introduction also guaranteed total anonymity and confidentiality to motivate the participants to respond truthfully. The survey included multiple structured sections aimed at assessing the study variables.

The experience evaluation section measured participants' attitudes toward the length and adequacy of their VR experience for making a purchase decision using a 5-point Likert Scale “Not at all – Completely". They could also share the perceived time that they spent in the experience; two options were displayed: 2/3min & 5/6min. This is to see weather perceived spent time is different from the real time that has been recorded using a chronometer, once the participant enters to the Virtual Environment. Later, the respondent to the survey is asked to introduce a precise number in one of the questions (1 for high exposure & 2 for low exposure), which is given by the author, and represents a number allocated to one of the two groups (2/3min & 5/6min).

The familiarity with VR section gauged participants' self-reported awareness, level of information, and overall familiarity with VR technology. The telepresence section comprised items measuring the degree to which participants felt present in the virtual world, such as perceiving themselves as being physically present within VR, or being able to move about freely in the virtual space and interact with virtual objects, as I make reference to “vividness” and “interactivity” variables by Steuer (1992). The purchase intention section assessed participants' intentions to buy a bedroom from IKEA, with both direct and reverse-coded items.

Finally, the survey concluded with a demographic section where respondents were asked; their gender, age, level of education, and employment situation. It allows for a better understanding of the collected data and a full view over respondents’ profiles, but also to explore possible extraneous variables which could influence indirectly the study. The last part of the survey included an optional open-ended question that allowed respondents to provide any additional comments or insights about their experience.

Same way, the second questionnaire commenced with a brief introduction and welcoming to participants to the study, explained the activities they were required to do on the IKEA website, and gave explicit usage guidelines. Participants were invited to browse the given webpage freely, look at the pictures, click on interactive areas, and read product details as though they were navigating on their own, with blurred pictures explanations to avoid personal bias.

Prior to proceeding to the main questions, a control question was inserted to verify that respondents actually visited the website as requested. This allowed data quality to be protected.

The telepresence section followed, consisting of items adapted from VR-oriented measures but rephrased in the context of a website environment. Although telepresence may not carry the same immersive meaning in a two-dimensional web interface as in virtual reality, the items were retained in order to enable a comparative analysis across all three experimental conditions. These items assessed whether participants felt engaged with the website environment, experienced a sense of being situated within the digital content, and perceived an ability to interact meaningfully with the material presented.

In the end, the purchase intention segment was presented with the same set of items as seen under the VR condition. Then, the survey closed with demographic inquiries requesting the respondents to report their gender, age, level of education, and work status, and the final part of the survey contained a voluntary open-ended question asking the participants to provide any further remarks or thoughts regarding their experience.

Both surveys can be found in the appendices under surveys section.

iv. Sample

The aim in this study is to achieve a broad and diverse sample of people who differed in terms of age, sex, educational level and status. 108 participants are recorded in the whole study. All of whom provided valid responses were included in the analysis. 42 entries were deleted after data cleaning. Participants were distributed across experimental conditions: some experienced a Virtual Reality showroom using the Meta Quest 3 headset provided by the HEC Digital Lab, while others were exposed to a web-based showroom presenting the same products in a standard online setting. 73 participants took part in the VR experience and 35 participants who took part in the web-based control group.

The process of data collection took over 30 days and was organized in various places in Liège in order to have a diversified sample. The VR sessions were organized in the homes of participants, at the Campus Génération student residence, at the author's home, at the University of Liège (city center campus), and at the B3 institute. This range of places gave a diversity of participants with varying backgrounds and offered accessibility. Besides, participants were isolated as hard as possible to reduce the influence of other extraneous variables.

And for the web-based condition, the survey was sent online through email and instant messaging, allowing participants to take it from a distance under similar instructions.

108 usable responses were gathered in total, offer a quite strong foundation for analysis. The demographic information of these respondents was analyzed to offer a summary of the composition of the sample in relation to age, gender, education and status.

The demographics of the respondents are as below, and on the "JASP Tables" section in the appendices:

Age
Mean: 30.5 years
Max: 65 years

Min: 17 years

See Tab1 in the appendices

Gender
Male:47 respondents (43.5%)
Female: 61 respondents (56.5%)
Mean age Male: 34.43 years
Mean age Female: 27.48 years
Max/min Male: 65/18 years
Max/min Female: 63/17 years

See Tab2

Education Level
Bachelor's Degree: 30 respondents (27.8%)
Doctoral Degree: 3 respondents (2.8%)
High School diploma or equivalent: 10 respondents (9.3%)
Less than high school: 4 respondents (3.7%)
Master's degree: 42 respondents (38.9%)
Some college: 19 respondents (17.6%)

See Tab3

Status
Employed full-time: 28 respondents (25.9%)
Employed part-time: 6 respondents (5.6%)
Retired: 5 respondents (4.6%)
Self-Employed: 8 respondents (7.4%)
Student: 56 respondents (51.9%)
Unemployed: 5 respondents (4.6%)

See Tab4

These demographics represent the diversity of the participants and form a quite good basis for analyzing how different manipulated groups react to VR and website exposure in the context of telepresence and purchase intention.

v. Scales and Measurements

The variables considered in this research are familiarity with VR, telepresence, and purchase intention. Each of the variables was measured with previously validated measures and formatted as 5-point Likert scales (Ranging from Strongly Disagree 1 to Strongly Agree 5), or semantic differential items to enable consistent quantification of the subject perceptions and reliable cross-comparison of answers.

The first moderator variable, familiarity with VR, was measured with the three-item semantic differential scale originally created by Oliver and Bearden (1985) and subsequently used by Moore et al. (2005). The measure gauges respondents' self-reported awareness, knowledge, and level of information about VR technology. The scale gives a strong indication of the degree to which participants are familiar with the technology, which is important in determining its moderating effect. Respondents rated themselves on scales ranging from "familiar/unfamiliar," "informed/uninformed," to "knowledgeable/unknowledgeable."

The mediating variable, telepresence, was assessed with items adapted from Tussyadiah et al. (2018), founded on Steuer's (1992) concept of telepresence as a combination of vividness and interactivity. Telepresence was operationalized in two components in this research: self-location and possible

actions. The self-location component consisted of items such as "I felt like I was actually there in the VR environment" and "It was as though my true location had shifted into the VR environment." The possible actions component captured the sense of interactivity participants had, with items such as "The objects in VR gave me the feeling that I could do things with them" and "It seemed to me that I could do whatever I wanted in the VR environment." These assessments determine how immersed participants were.

The dependent variable, purchase intention, was assessed with a three-item scale by Maxham et al. (2002). The scale examines a person's likelihood to make a future purchase from a company. The items consisted of statements such as "If I needed a new home in the future, I would purchase that new home from this company" and "If I were going to purchase a new home in the near future, I would not have this company as my provider" (the third item is reverse-coded). The scale is frequently utilized in consumer studies to grasp individuals' intentions as they relate to their experiences with companies.

For the VR survey, all three scales: purchase intention, telepresence, and familiarity with VR were presented. For the website-based survey, the format was the same, with the exception that the familiarity scale was not included, as it was irrelevant to the setting. Moreover, the telepresence items, which were initially created for VR, were modified to suit the website experience, keeping their emphasis on self-location and potential actions but reformulating them to express engagement with a web-based imagery.

Contrust	Author	Code	Adapted Items
Familiarity with VR	Adapted from: Oliver and Bearden (1985); Moore et al. (2005)	Mod_Fam1	In general, would you consider yourself familiar or unfamiliar with Virtual Reality?
		Mod_Fam2	Would you consider yourself informed or uninformed about Virtual Reality?
		Mod_Fam3	Would you consider yourself knowledgeable about Virtual Reality?
Telepresence for the VR experience	Adapted from: Tussyadiah et al. (2018)	SL1	I felt like I was actually there in the Virtual Reality Environment
		SL2	It seemed as though I actually took part in the action of the Virtual Reality
		SL3	It was as though my true location had shifted into the Virtual Reality Environment
		SL4	I felt as though I was physically present in the Virtual Reality Environment
		PA1	The objects in Virtual Reality gave me the feeling that I could do things with them
		PA2	I had the impression that I could be active in the Virtual Reality Environment
		PA3	I felt like I could move around among the objects in Virtual Reality
		PA4	

			It seemed to me that I could do whatever I wanted in the Virtual Reality Environment
Telepresence for the web-based experience	Adapted from: Tussyadiah et al. (2018)	SL1	I felt like I was actually there in the place shown in the pictures
		SL2	It seemed as though I was actively involved in what was happening in the pictures
		SL3	It was as though my true location had shifted into the scene shown in the pictures.
		SL4	I felt as though I was mentally present in the place shown in the pictures
		PA1	The pictures and other content on the website gave me the feeling that I could interact with them
		PA2	I had the impression that I could be active while exploring the pictures and content on the website
		PA3	I felt like I could move around and navigate freely through the pictures and sections of the website
		PA4	It seemed to me that I could explore the pictures and website content however I wanted
Purchase Intention	Adapted from: Maxham el al. (2002)	PI1	If I needed a new bedroom in the future, I would purchase that new bedroom from IKEA
		PI2	If you were in the market for an additional bedroom, how likely would you be to purchase it from IKEA
		PI3*	If I were to purchase a new bedroom in the near future, I would NOT use IKEA as my provider*

Table 10. Research constructs and items

* Reverse Coded

Chapter IV

Data Analysis

This chapter provides a data analysis for the experiment using JASP software. In addition to the results of it, and hypotheses tests, besides evoking limitations and conclusions to the whole data analysis matter.

Data Analysis

Preliminary analysis, Descriptive and inferential statistics

1. *Binomial test and general overview of the dataset*

Prior to conducting further statistical analyses, preliminary checks were carried out to ensure the data's suitability for the intended procedures. Beginning with binomial test which gives an overview of the sample. This section is already presented. See sample section and more in Tab5.

Moreover, the mean, max/min possibles values of age, familiarity with the virtual reality, telepresence and purchase intention are shown in Tab6. The mean age of the sample is 30.5 years, yet 2.845, 3.611 and 3.666 are the means of the familiarity with VR, purchase intention and presence respectively. See Tab6.

2. *Normality check*

One essential step is to assess the normality of the data. For this purpose, the Shapiro-Wilk test was employed, which evaluates the null hypothesis that the sample originates from a normal distribution.

Descriptive Statistics

	Mod_FAM	Med_PR	DV_PI	Age	Groupe_1high_2low	Perceived Time
Valid	73	108	108	108	73	73
Missing	35	0	0	0	35	35
Mean	2.845	3.666	3.611	30.50	1.493	1.521
Std. Deviation	1.054	0.694	0.724	13.21	0.503	0.503
Skewness	0.079	0.038	−0.445	1.426	0.028	−0.084
Std. Error of Skewness	0.281	0.233	0.233	0.233	0.281	0.281
Kurtosis	−0.905	−0.659	−0.137	0.807	−2.056	−2.050
Std. Error of Kurtosis	0.555	0.461	0.461	0.461	0.555	0.555
Shapiro-Wilk	0.966	0.980	0.959	0.774	0.636	0.636
P-value of Shapiro-Wilk	.044	.107	.002	< .001	< .001	< .001
Minimum	1.000	2.125	1.667	17.00	1.000	1.000
Maximum	5.000	5.000	5.000	65.00	2.000	2.000

Descriptive statistics, Shapiro-Wilk test & Kurtosis

After conducting it, familiarity with virtual reality showed a p value of 0.044, which is less than 0.05 making it significant. It shows on the plot a slight skewness to the left but still normally distributed considering other factors such as skewness and kurtosis values. See Plot1 in the appendices under plots section.

Same way, presence shows a p value of 0.107, which is far from being significant, yet a skewness of 0.038 is very acceptable. The plot shows a normally distributed sample in terms of presence variable. See Plot2.

Besides, for the purchase intention, it has shown a p value of 0.002, making it less than 0.05 so significant. It is on the plot representation quite normally distributed, but with slight skewness to the right. See Plot3. Finally for the age, it shows a p value less than 0.001 making it very significant, but the plot shows a rough skewness to the left. See Plot 4

In our case, the Shapiro-Wilk test produced statistical values for most items that were close to 1, indicating that the data approximates a normal distribution. However, in line with best practices, the p-values were also considered.

While some items yielded p-values lower than 0.05, suggesting deviations from perfect normality, such results are common in sample sizes and do not necessarily invalidate the assumption of

normality. To complement this, skewness and kurtosis values were examined. All values fell within the recommended range of -2.5 and 2.5 (George, 2010), confirming that the data did not exhibit extreme deviations from normality in terms of asymmetry.

3. Reliability check through Cronbach's alpha

After the check and confirming the nearly normal distributed data, the reliability and internal consistency of the measurement scales should be examined. Although the scales used in this study have been validated in previous research, it is essential to re-evaluate their performance in the context of this specific sample. Cronbach's alpha was employed to assess reliability, with values greater than 0.70 are considered acceptable (Nunnally & Bernstein, 1994).

Frequentist Scale Reliability Statistics

			95% CI	
Coefficient	Estimate	Std. Error	Lower	Upper
Coefficient α	0.891	0.015	0.862	0.921

Frequentist Individual Item Reliability Statistics

	Coefficient α (if item dropped)		
Item	Estimate	Lower 95% CI	Upper 95% CI
SL1	0.878	0.846	0.910
SL4	0.883	0.851	0.915
SL3	0.885	0.855	0.915
SL2	0.882	0.848	0.915
PA1	0.882	0.849	0.915
PA2	0.882	0.850	0.914
PA3	0.888	0.857	0.918
PA4	0.882	0.849	0.915
PRM	0.871	0.835	0.907
PI1	0.884	0.852	0.915
PI2	0.884	0.853	0.914
PI3	0.901	0.873	0.929
PIM	0.881	0.849	0.913

Reliability, alpha coefficient for telepresence and purchase intention items

The results of the reliability analysis for the main constructs were as follows:

For the construct Telepresence: Cronbach's alpha = 0.871, suggesting at 95% confidence level reliability across the self-location and possible actions dimensions. None of the items were removed from the dataset.

For the construct Purchase Intention: Cronbach's alpha = 0.881, which falls within the range, (greater than 0.70) confirming a good consistency of the items. None of the items were removed from the dataset.

Where necessary, item-total statistics were consulted to check whether removing certain items would improve the reliability of the constructs. However, all scales were retained in their original form, as they demonstrated sufficient coherence and were supported by their strong theoretical foundation in prior research.

4. Perceived spent time vs Real spent time in the VE

The VE has provided participants with mostly enough time to make a purchase after spending 5/6min within it, with a mean of 4.162. In the other hand, participants had moderately enough time to make a purchase decision after spending 2/3min, with a mean of 3.861. This is to say, that the more exposure to VR is high, the more enough time you spend to make a purchase.

Descriptive Statistics

		Valid	Missing	Mean	Std. Deviation	Minimum	Maximum
Enough_T	2	36	0	3.861	0.931	2.000	5.000
Enough_T	1	37	0	4.162	0.928	2.000	5.000

Note. Excluded 35 rows from the analysis that correspond to the missing values of the split-by variable Groupe_1high_2low

Descriptive statistics, enough time vs high or low exposure

Participants have shown a good level of awareness, since the participants tend to stay aware of the time spent as shown in the next tab. This assumption is arbitrary and based on next data.

Descriptive Statistics

		Valid	Missing	Mean	Std. Deviation	Minimum	Maximum
Perceived Time	2	36	0	1.694	0.467	1.000	2.000
Perceived Time	1	37	0	1.351	0.484	1.000	2.000

Note. Excluded 35 rows from the analysis that correspond to the missing values of the split-by variable Groupe_1high_2low

Descriptive statistics, perceived spent time vs real spent time

While 1 indicates high exposure and 2 for low exposure to virtual reality, we see that people who affirmed passing 2/3min within the VE, which is the group 2, the mean 1.694 tends to approach the number two, since there's only two possible cases (1&2). In the other hand, participants who affirm passing 5/6min which is group number 1, the mean 1.351 tends to approach the number one.

5. Correlation test

Pearson's correlation coefficient was utilized for investigating relationships among variables. There was a positive and significant (p value < 0.001) correlation of r=0.461 between purchase intention and telepresence, indicating that people with higher scores in telepresence also have a more favorable purchase decision.

On the contrary, there was a negative correlation of r=-0.074 between telepresence and familiarity with VR. This finding would suggest that users with greater previous familiarity with VR do not have telepresence and have low telepresence levels. However, this is somewhat away from significance as p value is 0.534.

Lastly, a positive relationship of r=0.111 is observed between familiarity with VR and purchase intention. This indicates that the more individuals are familiar with VR the more they will be willing to purchase using the VR, it does not indicate a high significance level, remaining at a p value of 0.349.

Pearson's Correlations

Variable		Mod_FAM	Med_PR	DV_PI
1. Mod_FAM	Pearson's r	—		
	p-value	—		
2. Med_PR	Pearson's r	−0.074	—	
	p-value	.534	—	
3. DV_PI	Pearson's r	0.111	0.461	—
	p-value	.349	< .001	—

Correlations matrix, JASP Output

6. Hypothesis testing

After the comprehension of all the elements cited and discussed before this paragraph, it is crucial to lead statistical test to further reject or approve hypotheses. Statistic tests are used in different ways depending on factors, such as the type of research design and variables type.

- H1 (+): High exposure to VR (vs. low vs. non) has a positive impact on telepresence.

Descriptive Statistics

		Valid	Missing	Mean	Std. Deviation	Minimum	Maximum
Med_PR	1	37	0	3.784	0.679	2.500	5.000
Med_PR	2	36	0	3.684	0.587	2.125	5.000
Med_PR	3	35	0	3.521	0.796	2.375	5.000

Descriptive statistics, Different situations of the experience on telepresence. 1high exposure; 2low exposure; 3no exposure to VR

The means comparison shows minimal differences between the three groups. Highly exposed participants (5–6 minutes) perceived the most telepresence with a mean of 3.784, followed by participants exposed for 2–3 minutes with a mean of 3.684, while participants with zero exposure to VR had the lowest mean of 3.521. To test these differences statistically, a one-way ANOVA was used. This is suitable in light of the research scenario, which includes independent groups in a between-subjects design with participant groups exceeding two.

Additionally, the independent variable (exposure condition), coded as 1, 2, and 3 in JASP, is a nominal variable, while the dependent variable (telepresence) is scaled on a ratio scale. Hence, ANOVA is a strong test for determining if the observed differences in the mean telepresence between exposure levels are statistically significant.

ANOVA - Med_PR

Cases	Sum of Squares	df	Mean Square	F	p
Groupe_1high_2low_3noexposure	1.257	2	0.628	1.314	.273
Residuals	50.207	105	0.478		

Note. Type III Sum of Squares

Anova test fo H1(+)

The Anova test shows a p value of 0.273, which is very higher than the significant level of p value (0.05). This indicates a lack of statistical significance and therefore the first hypothesis is rejected.

H1 (+) is Rejected

- H2(+): High exposure to VR (vs. low vs. non) leads to greater purchase intention.

Descriptive Statistics

		Valid	Missing	Mean	Std. Deviation	Minimum	Maximum
DV_PI	1	37	0	3.667	0.671	2.000	5.000
DV_PI	2	36	0	3.787	0.677	1.667	5.000
DV_PI	3	35	0	3.371	0.779	2.000	5.000

Descriptive statistics, Different situations of the experience on purchase intention. 1high exposure; 2low exposure; 3no exposure to VR

The comparison of means reveals minimal differences between the three groups. Respondents exposed to VR for 2–3 minutes perceived the greatest level of telepresence (M = 3.787), followed by respondents exposed for 5–6 minutes (M = 3.667). Conversely, respondents who were exposed to web-based imagery only (no VR) had the lowest mean (M = 3.371).

This implies that respondents exposed to 2–3 minutes of VR were the most inclined to demonstrate purchase intentions for IKEA, followed by longer exposure (5–6 minutes), and lastly those not exposed to VR. The pattern reveals that moderate VR exposure might be the most effective in stimulating engagement and purchase intentions, while minimal (no VR) and extended exposure are relatively less effective.

An Anova was conducted and shows the following:

ANOVA - DV_PI

Cases	Sum of Squares	df	Mean Square	F	p
Groupe_1high_2low_3noexposure	3.239	2	1.620	3.216	.044
Residuals	52.872	105	0.504		

Note. Type III Sum of Squares

Anova test for H2(+)

The Anova test shows a p value equal to 0.044, which is less than 0.05. This indicates statistical significance and therefore the second hypothesis is supported.

H2 (+) is Supported

- H3 (+): Telepresence positively influences purchase intention and mediates to role between VR and Purchase Intention

Descriptive Statistics

		Valid	Missing	Mean	Std. Deviation	Minimum	Maximum
DV_PI	1	37	0	3.667	0.671	2.000	5.000
DV_PI	2	36	0	3.787	0.677	1.667	5.000
DV_PI	3	35	0	3.371	0.779	2.000	5.000
Med_PR	1	37	0	3.784	0.679	2.500	5.000
Med_PR	2	36	0	3.684	0.587	2.125	5.000
Med_PR	3	35	0	3.521	0.796	2.375	5.000

Descriptive statistics, Different situations of the experience. The impact of telepresence on purchase intention. 1high exposure; 2low exposure; 3no exposure to VR

We see that participants with high exposure to VR indicated a mean telepresence of 3.784, which corresponded to lower purchase intention (M = 3.667).

In contrast, participants exposed to VR for 2–3 minutes indicated a mean telepresence of 3.684, which corresponded to 3.787 for purchase intention. For the web-based group, a mean telepresence of 3.521 was indicated, which corresponded to the lowest purchase intention (M = 3.371).

To examine this hypothesis, simple linear regression was carried out where telepresence was entered as a covariate in JASP. Since both telepresence and purchase intention are ratio variables measured, regression analysis is the best statistical approach to assess the significance of the relationship between them.

Model Summary - DV_PI

Model	R	R^2	Adjusted R^2	RMSE
M_0	0.000	0.000	0.000	0.724
M_1	0.461	0.213	0.205	0.646

Note. M_1 includes Med_PR

ANOVA

Model		Sum of Squares	df	Mean Square	F	p
M_1	Regression	11.94	1	11.936	28.64	< .001
	Residual	44.17	106	0.417		
	Total	56.11	107			

Note. M_1 includes Med_PR
Note. The intercept model is omitted, as no meaningful information can be shown.

Coefficients

Model		Unstandardized	Standard Error	Standardized	t	p
M_0	(Intercept)	3.611	0.070		51.823	< .001
M_1	(Intercept)	1.846	0.336		5.499	< .001
	Med_PR	0.482	0.090	0.461	5.352	< .001

Simple Linear Regression for H3 (+)

A positive correlation 0.461 implies that the variables are positively related to one another. An R^2 of 0.213 implies that when the telepresence changes, it is responsible of 21,3% of the change in purchase intention. Moreover, the Anova shows a p value < 0.001 which is highly significant, so that the model gives a statistically significant estimation of the purchase intentions.

Besides, the b0 intercept shows a value of 1.846, and 0.482 for the slope b1. This is to mean, if the telepresence increases by 1 unit, the purchase intention increases by 0.482 units. Therefore, the equation 1.846+0.482*Med_PR significantly predicts the DV_PI.

In order to measure the mediation role of telepresence, a mediation analysis were conducted, showing a p value highly significant p < 0.001 in total effects. Direct effect has shown a significance but not the same for the indirect effect with p value equal 0.506 which is far from being significant.

Direct effects

			Estimate	Std. error	z-value	p	95% Confidence Interval Lower	Upper
Groupe_1high_2low_3noexposure	→	DV_PI	0.158	0.146	1.082	< .001	−0.128	0.444

Note. Estimator is ML.

Indirect effects

					Estimate	Std. error	z-value	p	95% Confidence Interval Lower	Upper
Groupe_1high_2low_3noexposure	→	Med_PR	→	DV_PI	−0.038	0.056	−0.666	.506	−0.148	0.073

Note. Estimator is ML.

Total effects

			Estimate	Std. error	z-value	p	95% Confidence Interval Lower	Upper
Groupe_1high_2low_3noexposure	→	DV_PI	0.120	0.156	0.774	< .001	−0.185	0.425

Note. Estimator is ML.

Path coefficients

			Estimate	Std. error	z-value	p	95% Confidence Interval Lower	Upper
Med_PR	→	DV_PI	0.376	0.116	3.242	< .001	0.149	0.604
Groupe_1high_2low_3noexposure	→	DV_PI	0.158	0.146	1.082	.279	−0.128	0.444
Groupe_1high_2low_3noexposure	→	Med_PR	−0.100	0.147	−0.680	.496	−0.387	0.188

Mediation Analysis for H3 (+)

Consequently, the third hypothesis is supported.

H3 (+) is Supported

- H4: Familiarity with VR moderates the effect of VR exposure on telepresence; the effect is stronger among users with higher familiarity.

Descriptive Statistics

		Valid	Missing	Mean	Std. Deviation	Minimum	Maximum
Mod_FAM	1	37	0	2.793	1.123	1.000	5.000
Mod_FAM	2	36	0	2.898	0.991	1.000	5.000
Mod_FAM	3	0	35	NaN		∞[a]	-∞[a]
Med_PR	1	37	0	3.784	0.679	2.500	5.000
Med_PR	2	36	0	3.684	0.587	2.125	5.000
Med_PR	3	35	0	3.521	0.796	2.375	5.000

[a] Infimum (minimum) of an empty set is ∞, supremum (maximum) of an empty set is -∞.

Descriptive statistics, familiarity and telepresence

We see that the mean of familiarity with the VR groups 2 & 1 are respectively 2.898 and 2.793. And for telepresence, respectively 3.684 and 3.784. But as mentioned in the previous section, there was a negative correlation of r=-0.074 between telepresence and familiarity with VR.

A simple linear regression test was conducted to further see the possible moderation role of it.

Model Summary - Med_PR

Model	R	R^2	Adjusted R^2	RMSE
M_0	0.079	0.006	−0.008	0.635
M_1	0.106	0.011	−0.017	0.638

Note. M_0 includes Groupe_1high_2low_3noexposure

Note. M_1 includes Groupe_1high_2low_3noexposure, Mod_FAM

ANOVA

Model		Sum of Squares	df	Mean Square	F	p
M_0	Regression	0.182	1	0.182	0.450	.505
	Residual	28.660	71	0.404		
	Total	28.842	72			
M_1	Regression	0.323	2	0.161	0.396	.674
	Residual	28.519	70	0.407		
	Total	28.842	72			

Note. M_0 includes Groupe_1high_2low_3noexposure

Note. M_1 includes Groupe_1high_2low_3noexposure, Mod_FAM

Coefficients

Model		Unstandardized	Standard Error	Standardized[a]	t	p
M_0	(Intercept)	3.784	0.104		36.226	< .001
	Groupe_1high_2low_3noexposure (2)	−0.100	0.149		−0.671	.505
M_1	(Intercept)	3.901	0.225		17.305	< .001
	Groupe_1high_2low_3noexposure (2)	−0.095	0.150		−0.637	.526
	Mod_FAM	−0.042	0.071	−0.070	−0.589	.558

[a] Standardized coefficients can only be computed for continuous predictors.

Simple Linear Regression for H4

To examine H4, which stated that familiarity with VR moderates the influence of VR exposure on telepresence, a moderation regression analysis was performed. The overall model accounted for merely 1.4% of the variance in telepresence (R^2 = 0.014), and this was not statistically significant, F(3, 69) = 0.322, p = 0.810.

The main effect of familiarity with VR was also not significant (b = -0.015, p = 0.872), indicating that familiarity does not predict telepresence. Similarly, the interaction terms between familiarity and VR exposure were not significant: for Exposure(2) × Familiarity (b = -0.015, p = 0.872) and Exposure(3) × Familiarity (b = -0.062, p = 0.671). These findings show that the degree of familiarity with VR does not significantly enhance or diminish the impact of exposure on telepresence. Put differently, both highly familiar and less familiar participants reported similar levels of telepresence across conditions. Thus, H4 is rejected.

H4 is Rejected

- H5: Age moderates the relationship between VR exposure and purchase intention; the effect is stronger among younger consumers.

To evaluate this hypothesis, a moderation model was estimated with age serving as the moderator. The analysis looked for evidence that the effect of VR exposure on purchase intention varied by age group, with stronger effects anticipated for younger respondents.

Model Summary - DV_PI

Model	R	R^2	Adjusted R^2	RMSE
M_0	0.293	0.086	0.041	0.709
M_1	0.293	0.086	0.041	0.709

Note. M_0 includes Age, Groupe_1high_2low_3noexposure, Age:Groupe_1high_2low_3noexposure

Note. M_1 includes Groupe_1high_2low_3noexposure, Age, Age:Groupe_1high_2low_3noexposure

ANOVA

Model		Sum of Squares	df	Mean Square	F	p
M_0	Regression	4.833	5	0.967	1.923	.097
	Residual	51.278	102	0.503		
	Total	56.111	107			
M_1	Regression	4.833	5	0.967	1.923	.097
	Residual	51.278	102	0.503		
	Total	56.111	107			

Note. M_0 includes Age, Groupe_1high_2low_3noexposure, Age:Groupe_1high_2low_3noexposure

Note. M_1 includes Groupe_1high_2low_3noexposure, Age, Age:Groupe_1high_2low_3noexposure

Coefficients

Model		Unstandardized	Standard Error	Standardized[a]	t	p
M_0	(Intercept)	3.610	0.306		11.809	< .001
	Age	0.002	0.009	0.033	0.200	.842
	Groupe_1high_2low_3noexposure (2)	0.489	0.439		1.114	.268
	Groupe_1high_2low_3noexposure (3)	0.142	0.425		0.334	.739
	Age ✻ Groupe_1high_2low_3noexposure (2)	−0.013	0.014		−0.942	.348
	Age ✻ Groupe_1high_2low_3noexposure (3)	−0.013	0.012		−1.087	.280
M_1	(Intercept)	3.610	0.306		11.809	< .001
	Groupe_1high_2low_3noexposure (2)	0.489	0.439		1.114	.268
	Groupe_1high_2low_3noexposure (3)	0.142	0.425		0.334	.739
	Age	0.002	0.009	0.033	0.200	.842
	Groupe_1high_2low_3noexposure (2) ✻ Age	−0.013	0.014		−0.942	.348
	Groupe_1high_2low_3noexposure (3) ✻ Age	−0.013	0.012		−1.087	.280

[a] Standardized coefficients can only be computed for continuous predictors.

Simple Linear Regression, for the age moderation role

To examine H5, which suggests that age moderates the effect of VR exposure on purchase intention, a moderation analysis was performed with a regression model incorporating interaction terms between age and exposure groups. The overall model accounted for 8.6% of the variance in purchase intention ($R^2 = 0.086$), but this was not statistically significant, $F(5, 102) = 1.923$, $p = 0.097$.

A look at the coefficients revealed that neither age ($b = 0.002$, $p = 0.842$) nor the exposure groups themselves were significant predictors. Most critically, the interaction terms capturing the moderation effect of age were also non-significant: Age × Exposure(2) ($b = -0.013$, $p = 0.348$) and Age × Exposure(3) ($b = -0.013$, $p = 0.280$). These findings suggest that the effect of VR exposure on purchase intention does not significantly differ based on participants' age. That is, younger and older consumers in the sample responded similarly to the VR exposure conditions in terms of purchase intentions. Thus, H5 is rejected.

H5 is Rejected

- H6: Gender moderates the relationship between VR exposure and purchase intention; the effect differs between male and female consumers

Model Summary - Med_PR

Model	R	R^2	Adjusted R^2	RMSE
M_0	0.330	0.109	0.065	0.671
M_1	0.330	0.109	0.065	0.671

Note. M_0 includes Groupe_1high_2low_3noexposure, Gender_1W_0M, Gender_1W_0M:Groupe_1high_2low_3noexposure

Note. M_1 includes Groupe_1high_2low_3noexposure, Gender_1W_0M, Gender_1W_0M:Groupe_1high_2low_3noexposure

ANOVA

Model		Sum of Squares	df	Mean Square	F	p
M_0	Regression	5.604	5	1.121	2.493	.036
	Residual	45.860	102	0.450		
	Total	51.463	107			
M_1	Regression	5.604	5	1.121	2.493	.036
	Residual	45.860	102	0.450		
	Total	51.463	107			

Note. M_0 includes Groupe_1high_2low_3noexposure, Gender_1W_0M, Gender_1W_0M:Groupe_1high_2low_3noexposure

Note. M_1 includes Groupe_1high_2low_3noexposure, Gender_1W_0M, Gender_1W_0M:Groupe_1high_2low_3noexposure

Coefficients

Model		Unstandardized	Standard Error	Standardized[a]	t	p
M_0	(Intercept)	3.694	0.150		24.636	< .001
	Groupe_1high_2low_3noexposure (2)	−0.180	0.218		−0.826	.411
	Groupe_1high_2low_3noexposure (3)	−0.666	0.269		−2.474	.015
	Gender_1W_0M	0.196	0.221	0.141	0.886	.378
	Groupe_1high_2low_3noexposure (2) ✻ Gender_1W_0M	0.144	0.314		0.459	.647
	Groupe_1high_2low_3noexposure (3) ✻ Gender_1W_0M	0.469	0.341		1.375	.172
M_1	(Intercept)	3.694	0.150		24.636	< .001
	Groupe_1high_2low_3noexposure (2)	−0.180	0.218		−0.826	.411
	Groupe_1high_2low_3noexposure (3)	−0.666	0.269		−2.474	.015
	Gender_1W_0M	0.196	0.221	0.141	0.886	.378
	Groupe_1high_2low_3noexposure (2) ✻ Gender_1W_0M	0.144	0.314		0.459	.647
	Groupe_1high_2low_3noexposure (3) ✻ Gender_1W_0M	0.469	0.341		1.375	.172

[a] Standardized coefficients can only be computed for continuous predictors.

Simple Linear regression for the gender moderation

To examine H6, which suggested that gender moderates the effect of VR exposure on purchase intention, a moderation regression analysis was conducted. The overall model explained 10.9% of the variance in purchase intention (R^2 = 0.109), which was statistically significant, F(5, 102) = 2.493, p = 0.036. However, upon examination of the coefficients, the interaction terms between VR exposure and gender were not statistically significant: Exposure (2) × Gender (b = 0.144, p = 0.647) and Exposure (3) × Gender (b = 0.469, p = 0.172).

This indicates that gender does not have a significant change on the effect of VR exposure on purchase intention. Interestingly, a direct main effect was found for one exposure group (Exposure 3 vs. reference), which had a significant negative effect (b = -0.666, p = .015), indicating less purchase intention under that condition regardless of gender. In all, the hypothesized moderation effect of gender was not supported, and H6 is rejected.

H6 is Rejected

Chapter V

Results

This chapter provides the results of the whole paper, with a discussion part.

Discussions

The present section is designed to discuss the findings of this study, compared to existing papers and research, but also an exploration of their significance in the context of Virtual Reality.

- ❖ Impact of VR Exposure and no Exposure on Telepresence

Hypothesis H1 predicted that increased exposure to VR would increase telepresence. Although VR exposure evidently created a more vivid sense of "being there" than a standard website, merely increasing the length of the session did not produce a consistently stronger telepresence effect. That is, the medium change (web → VR) made a difference, but additional minutes did not necessarily equal additional presence.

This pattern indicates that telepresence relies on how clear things are and what you are able to do, and not on how long it has been going on (Steuer, 1992; Slater & Wilbur, 1997; Witmer & Singer, 1998). When a person is actually concentrated, the additional time may not be that significant because they become accustomed to it, newness wears off, or they get fatigued (Cummings & Bailenson, 2016). When things matter in an environment, most individuals are probably aware of the primary indicators that build presence first; additional time enables exploration without enhancing physical experiences.

Two design implications follow. First, improve the beginning of VR with good looks, quick movement, and useful actions that can capture people's attention within a short time. Second, prioritize valuable interactions rather than simply lengthening experiences: useful actions, intelligent utilization of objects, and object handling well interest people more than simply spending more time.

Overall, the results indicate that H1 is not supported: VR itself increases telepresence compared to web imagery, but increasing exposure time does not consistently enhance that effect. Future research should manipulate interaction richness and system fidelity in addition to time, and examine task structure and user training as levers to increase telepresence without lengthening sessions.

- ❖ Impact of VR Exposure and no Exposure on Purchase Intention

The finding that VR outperforms a standard website on purchase intention, with moderate exposure proving most persuasive, is consistent with evidence that immersive try-outs increase choice confidence and buying intention relative to non-immersive displays (Beck & Crié, 2018; Pizzi et al., 2019). In line with S-O-R thinking, VR's sensory-motor cues act as the stimulus that heightens organismic states such as telepresence and affect, which then shape response (attitudes/intentions) (Tussyadiah et al., 2018; Ye et al., 2019).

The superiority of short, focused exposure can be understood through diagnosticity and processing fluency: early VR moments deliver vivid, interactive cues that are highly diagnostic for evaluation and are processed fluently, which fosters positive judgments and readiness to act; as exposure lengthens, cognitive load and option proliferation can reduce fluency and dampen momentum (Reber et al., 2004).

Recent quantitative reviews in retailing further indicate that VR experience quality is a key driver of purchase intentions more so than sheer exposure time underscoring the value of tight, well-orchestrated sessions over longer, unguided ones (Mishra et al., 2024). Practically, this implies optimizing the first 2–3 minutes to concentrate a "wow" interaction, progressive disclosure of product information, and a clear decision path (e.g., save configuration, add to cart), rather than simply extending time in the environment.

❖ Impact of Telepresence on Purchase Intention

Hypothesis H3 predicted that telepresence has a positive effect on purchase intention and serves as the psychological bridge “organism” between VR exposure and buying decision. The findings accord with this explanation: when users feel "there," attitudes change and intention grows stronger as presence enhances attention, emotion, and perceived realism (Tussyadiah et al., 2018).

Telepresence also encourages mental simulation—fantasizing about fit and use in one's own life—and enhances perceived control over the experience, both of which are associated with stronger intentions to buy (Ye et al., 2020). In immersive retail environments, presence has also been found to increase brand ratings and downstream choice inclinations, highlighting its role as the conversion process (Cowan et al., 2021).

- VE design implications

The one should prioritize early, decision-relevant presence: front-load vivid, responsive cues to engage "being there" early (Steuer, 1992). Interactions should be joined closely to purchase criteria for instance, quick layout changes and seamless object manipulation that make comparison easy and effortless (Ye et al., 2020). Capture intent at presence peaks with prominent commitment options (save/compare/request quote/add to cart), translating felt control into doable action (Cowan et al., 2021).

❖ Familiarity with VR × Exposure impact on Telepresence

- Explanation of the null moderation

The examination reveals that awareness of VR did not moderate the relationship between exposure and telepresence. It indicates that, in this instance, the sense of "being there" was more reliant on the experience's quality (such as how real it was, how well everything came together, and how interactive it was) than on users' experience. These are parameters which could not be measured through the survey. Indeed, immersion is related more to technical options offered by the HMD or by the VE. That’s why presence were measured instead of immersion or them both. Telepresence is more related to a self cognitive and psychological state of mind.

This supports the research of Hameed et al. (2024) which states that perceived authenticity and quality of experience are both significant elements for presence in VR.

- Novelty vs. Fluency, does it really matters?

Two opposing mechanisms might have neutralized one another. Novices might receive a novelty-driven boost in presence initially, while experienced users might gain from more fluid interface fluency. When both novelty and fluency enhance presence through alternate routes, the overall impact of familiarity can even out across exposure conditions, yielding no systematic moderation.

In the regard of this study, being novice or fluent with VR technology doesn’t influence any of this subject variables.

- Power and design sensitivity

A primordial reason is limited sensitivity to interaction effects. Moderation demands more statistical power than main effects, and small cross-group differences can be obscured by measurement noise in telepresence or heterogeneity in user aim and objectives.

❖ The moderator role of Age on the relation between the IV and the DV

- Interpretation of the null effect

Not being age-bound makes VR shopping rely more on emotions and experiences rather than the age of the person. In VR shopping, whether or not the experience makes individuals feel like they are actually there and in control from the beginning appears to be what makes customers more willing to purchase (Jin et al., 2021).

- Category and context matter

The product environment, such as a bedroom or show room, matters at various points in life. The situation provides information on the space, including its layout, fittings, which makes individuals feel more assured. When telepresence presents clear and helpful information, individuals feel more confident to act, regardless of group age. This concept also holds in VR advertising, with improved telepresence causing individuals to return (Ying et al., 2021).

Also, from another point of view, age is not the ideal basis for comparing what influences the extent to which people intend to purchase, such as what they know about products, what they like about shopping or what they know about technology.

Current retail research on virtual reality indicates that what people know about products and what they like about shopping is more significant to consumers than age regarding the advantages of VR, as I make reference to the paper of Zhang et al., (2024). This is why, for their research, age did not influence the connection between exposure and intention.

❖ The moderator role of Gender on the relationship between the IV and the DV

- Gender as a non-differentiating factor.

In different conditions/situations of the experience, gender did not moderate the IV DV link. In those instances, the way people are affected appears to rely on individual experience, such as feeling present, in control, and fully engaged, which helps both men and women. Looking at the product environment (such as choosing “opened drawers”) with the universal criteria measures (such as fit, layout, and style), and the VR environment is showing obvious visible information that aligns with the measures, the benefit of going through it is typically obvious.

Also, differences within a gender (such as people's frequency of purchasing or their product awareness) are more significant than differences between genders, so the concept of flat moderation leads to the rejection of H6.

Chapter VI

Conclusions

This chapter provides conclusions for the whole paper, with a focus on managerial implications, theory contribution, limitations of the study, and recommendations for further research

Conclusions

ii. Theoretical Contributions

This research informs us about VR merchandising and its impact on purchasing products. It contrasts high, low, and no exposure to VR with standard web pages and discovers that viewing VR encourages purchasing greater than viewing standard images. It also declares that what goes through a consumer's mind from VR is more influential than simply spending a great deal of time with VR. The findings reveal that short and quality-made VR experiences have the potential to provide consumers with good cues they must view products better, encouraging them to purchase.

One of the key results is that telepresence is the primary manner through VR exposure influences purchasing decisions. Together with self-location and potential actions (Tussyadiah et al., 2018), telepresence is the individual experience transforming sensory information into decision confidence. This regards presence, rather than being merely an experience, as a decision-making state that alleviates uncertainty, facilitates mental trying on (such as fitting and placement), and enhances perceived control—translating immersive experiences directly into action.

The experiment has obvious boundary conditions. Although such factors as familiarity with VR, age, and sex were expected to provide explanations of differences, none significantly influenced the exposure-intention relationship in the context of this study. This trend appears to demonstrate that if there are obvious benefits in a VR scenario (such as simple navigation, minimal change in setup, and obvious product information) and it rapidly surpasses presence, perhaps stimulus quality has more value than individual demographics or familiarity with VR. In short, once individuals are "present" and are able to handle objects like they do when purchasing, their intentions are the same across various groups of different ages and gender.

The work relates immersive shopping to the S–O–R model, and it is obvious: Stimulus (VR) → Organism (Cognitive “feeling present”) → Response (Purchase) (Buxbaum, 2016).

Finally, this study examines how how being mentally present for a defined duration of time affect shopping behaviour, and it finds that being there on the first visit matters more than duration in determining whether one makes a purchase. It also confirms that purchases can be predicted based on telepresence. In general, the findings contribute to what we know about immersive technologies and provide a practical understanding of how VR impacts purchasing decisions.

iii. Managerial Implications

This thesis provides valuable insights and takeaways for managers and scholars. Through empirically comparing high, low, and no exposure to the VR through website baseline, the findings show that VR can meaningfully elevate purchase intention when the experience quickly delivers “being-there” cues and decision-relevant interactions. The below ideas translate these insights into practical actions for retail, e-commerce, and showroom leaders.

Managers first need to integrate VR trials into the core commercial journey rather than treating them as side attractions. The use of VR should be done strategically at key times, when new collections drop, when customers face lots of options, or with high-ticket items.an the experience into what comes next (such as saving the configuration, comparing, quoting, or adding to cart). Short and targeted experiences on design, layout, material, and price at the beginning perform better than long, free-roaming ones. Design the experience like a linear path that leads customers from "explore" to "decide," and also ensure the same decisions are easy to access online and in stores for seamless buying. In the case of this study, people with 2/3min exposure shown more willing to purchase but less telepresence, and the reverse is correct. Yet, we cannot conclude wether 2/3min is enough

Besides, this study indicates that age, gender, or prior experience in VR does not influence the way exposure affects purchase intention. This is to say that they can design VR experiences that will suit nearly every segment. Yet, personalization will be embedded in the experience itself. This adaptability ensures everyone is included and takes their own shopping behaviours and desires into account.

It is very important to mention that the components of VR presence (delivery of sensations of being there, vividness and interactivity) should be strongly taken into account as this study further demonstrates that such components significantly impact the purchase intention. For example, tourism managers could design VR communications using VR headsets, which appear to be more powerful to convince potential future travellers.

Lastly, since VR is commonly utilized in industries such as tourism, real estate, healthcare, and retail, this paper provides valuable information for any business that aims implementing immersive technologies to enhance customer Engagement.

iv. Limitations and further research

Firstly, it was time consuming to gather data. All the data had to be gathered by the author after establishing experiences to participants. Moving to various locations in Liège, such as participants' homes etc… made the research experimentation take longer time.

Although it encompassed various types of people, it was challenging and took a considerable amount of time, which could have altered the circumstances in which the participants were tested. In addition, the research was conducted in July when summer vacation rendered it more difficult to reach participants.

Second, although 108 usable responses are sufficient for analysis, some hypotheses (particularly H5 concerning age and H6 concerning gender as moderators) were rejected. I believe this could be due to issues with the sample. A larger and more balanced sample taking into account both age and gender would have facilitated examining these moderating effects. Thus, although the overall sample size is sufficient, the lack of diversity in critical demographic dimensions halted conclusions regarding moderators.

Third, working with an Ikea VE elaborated by the Digital Lab of HEC placed the participants in a virtual reality setting, but not all aspects of the experiment were controlled. Performing the experiment in various locations (such as homes and institutions) resulted in various diversions that could have altered or biased the extent to which participants felt engaged and focused. A more controlled laboratory setting would have ensured fewer variations and made participants feel more immersed in the VR setting.

Lastly, self-report measures also raise the issue of whether participants told the truth or not, especially with the web-based survey, since participants were not supervised.

Further research may work on larger samples and diversified ones, which will allow a larger and wider generalization of the findings, particularly in questions related to age and gender, as it was a lack for this research. Besides, future work could target a comparison between actual behaviour and intentions.

Executive Summary

This work investigated the impact of exposure to Virtual Reality on consumer telepresence and buying intention and examined the mediator effect of telepresence and the moderating effects of prior familiarity with VR, age, and sex. The findings revealed that exposure to VR significantly amplified telepresence compared to a control website, while longer exposure did not always contribute to greater presence. This highlights the fact that the efficacy and character of the VR occasion, and not exposure time, are the leading influences on presence.

The findings also showed that exposure to VR had positive effects on purchase intention, and moderate exposure had the strongest effect. Short, intense sessions delivered diagnostic, fluent product information increasing confidence and buying intention, while over-exposure threatened to slow down the momentum. Telepresence constituted an important mediator, intensifying purchase intention through greater psychological immersion, perceived control, and mental simulation of product use.

On the other hand, the moderating variables exerted no significant influence. Familiarity with VR, age, and gender did not alter the relationship between VR exposure, telepresence, and purchase intention. This would suggest that VR, as a marketing stimulus, is perhaps more universal than we thought, based on immersive design dimensions rather than differential experiential or demographic ones. Overall, the findings highlight VR's great potential in facilitating consumer decision-making, if experiences are created more on the dimensions of quality, engagement, and decision relevance rather than on duration or based on demographic targets.

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RawMarketing : https://rawmarketing.ie/portfolio-item/coca-cola-santa-sleigh/

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Appendices

i. Figures

Figure 2. Global virtual reality market share by component

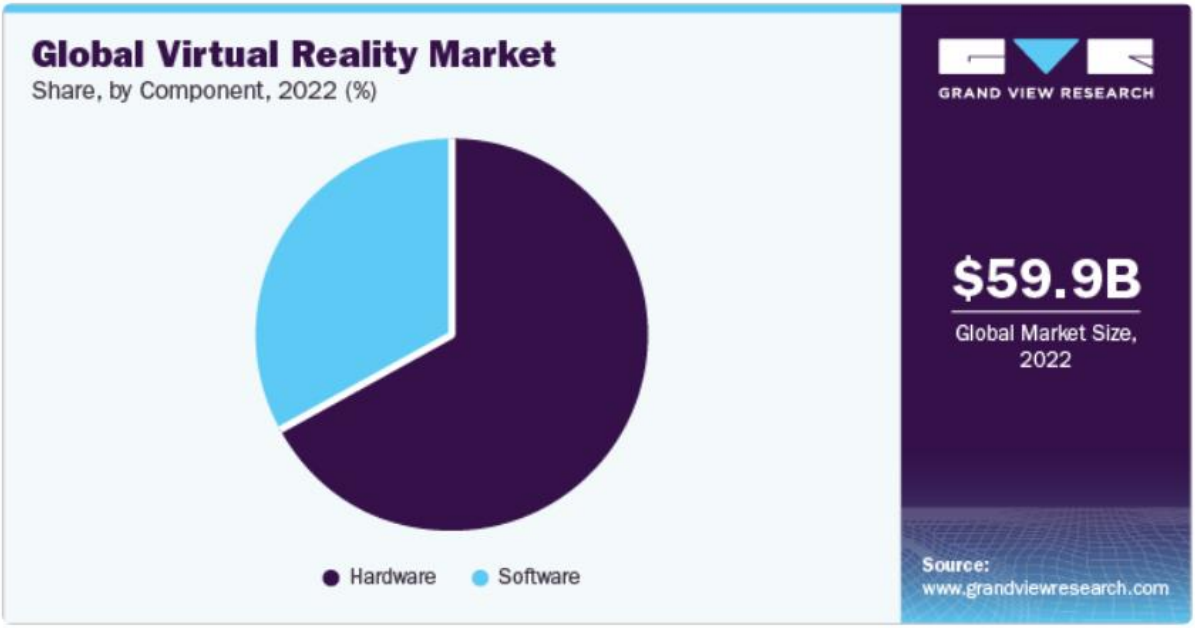


Figure 3. Virtual reality market trends by region

Figure 6. The StarCAVE from above, looking down on a RNA[‡] protein rendering, Adapted from (DeFanti et al., 2008)

[‡] RiboNucleic Acid

Figure 7. The StarCAVE from the outside showing the entry door quasi-closed, Adapted from (DeFanti et al., 2008)

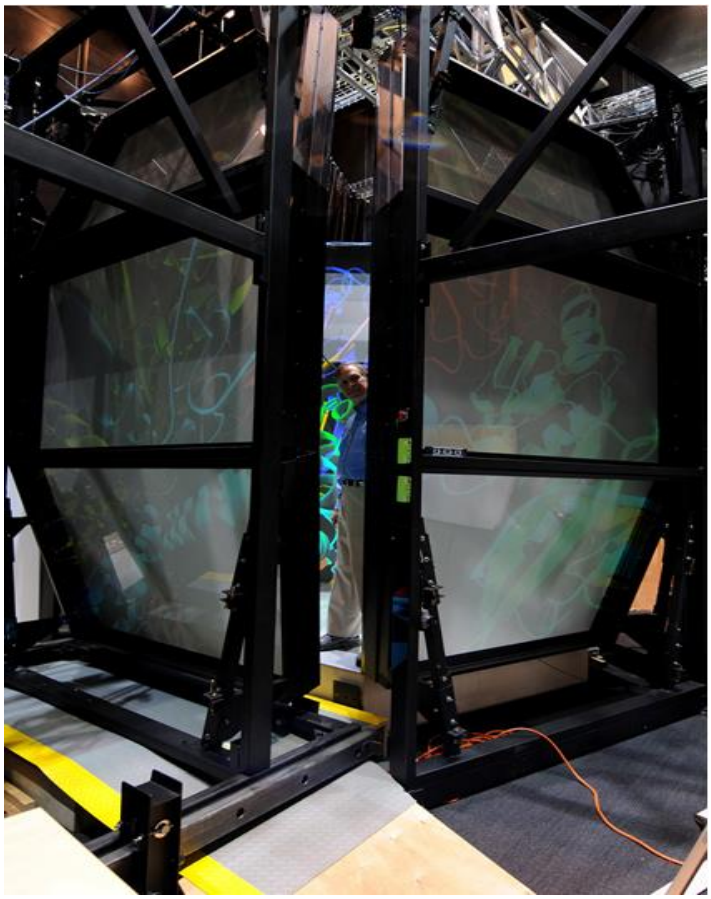


Figure 10. word cloud for immersion definition. Own elaboration

Figure 14. word cloud for presence definitions. Own elaboration

Figure 19. First setup of the showroom, Digital Lab HEC elaboration

Figure 20. Second setup of the showroom, Digital Lab HEC elaboration

Figure 21. Interactive table, Digital Lab HEC elaboration

Ambiance	Armoires	Décoration
Scandinave	Fermées	Avec
Classique	Ouvertes	Sans
	Vides	

Figure 22. Position mark, Digital Lab HEC elaboration

Figure 23. Products, Digital Lab HEC elaboration

Figure 24. Products, Digital Lab HEC elaboration

Figure 25. Products, Digital Lab HEC elaboration

Figure 26. Products, Digital Lab HEC elaboration

Figure 27. Products, Digital Lab HEC elaboration

ii. Tables

Table 1. Virtual reality application fields and some technology examples. Own elaboration

Sector	Application fields	Technology examples
Gaming / Entertainment	. Virtual Reality in gaming . Movies and 360° Cinematics . Theme Parks & Simulations	PlayStation.VR, AVATAR INDEX, oculus, VIVE htc | STEAM VR
Healthcare / Medicine	. Surgical Training & Simulations . Therapy & Rehabilitation . Medical Imaging & Diagnosis	Microsoft HoloLens, RelieVRx Formerly EaseVRx

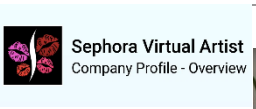
	. Mental Health Treatment	
Education / Training / Learning	. Technical Training . Medical Education . Soft Skills Training . STEM[§] model	 
Military	. Combat Training & Tactical Simulations . Flight & Vehicle Simulations . Remote Surveillance	 
Industry / Manufacturing	. Engineering & Product Design . Assembly Line Training . Remote Maintenance & Repair	
Retail	. Virtual Showrooms . Augmented Reality Shopping . Personalized Retail Experiences	 
Architecture / Design	. Virtual Property Tours . Architectural Visualization . Interior Design Previews	 
Automobile	. Vehicle Prototyping & Design . Driver Training & Safety Simulations . Customer Test Drives	  
Tourism	. Virtual Travel Experiences . Museum & Cultural Heritage Tours . Event Planning & Conferences	
Sports / Well-being	. VR Sports Training . Immersive Workouts . Live Sports Streaming	 

Table 4. words and frequencies used in the definition of immersion. Own elaboration

Word	Immersion	system	vivid	reality	extent	inclusive	experience
Frequency	6	5	4	4	4	3	3

[§] Educational approach: integrates four disciplines "*Science, Technology, Engineering, Mathematics*" into a coherent learning model

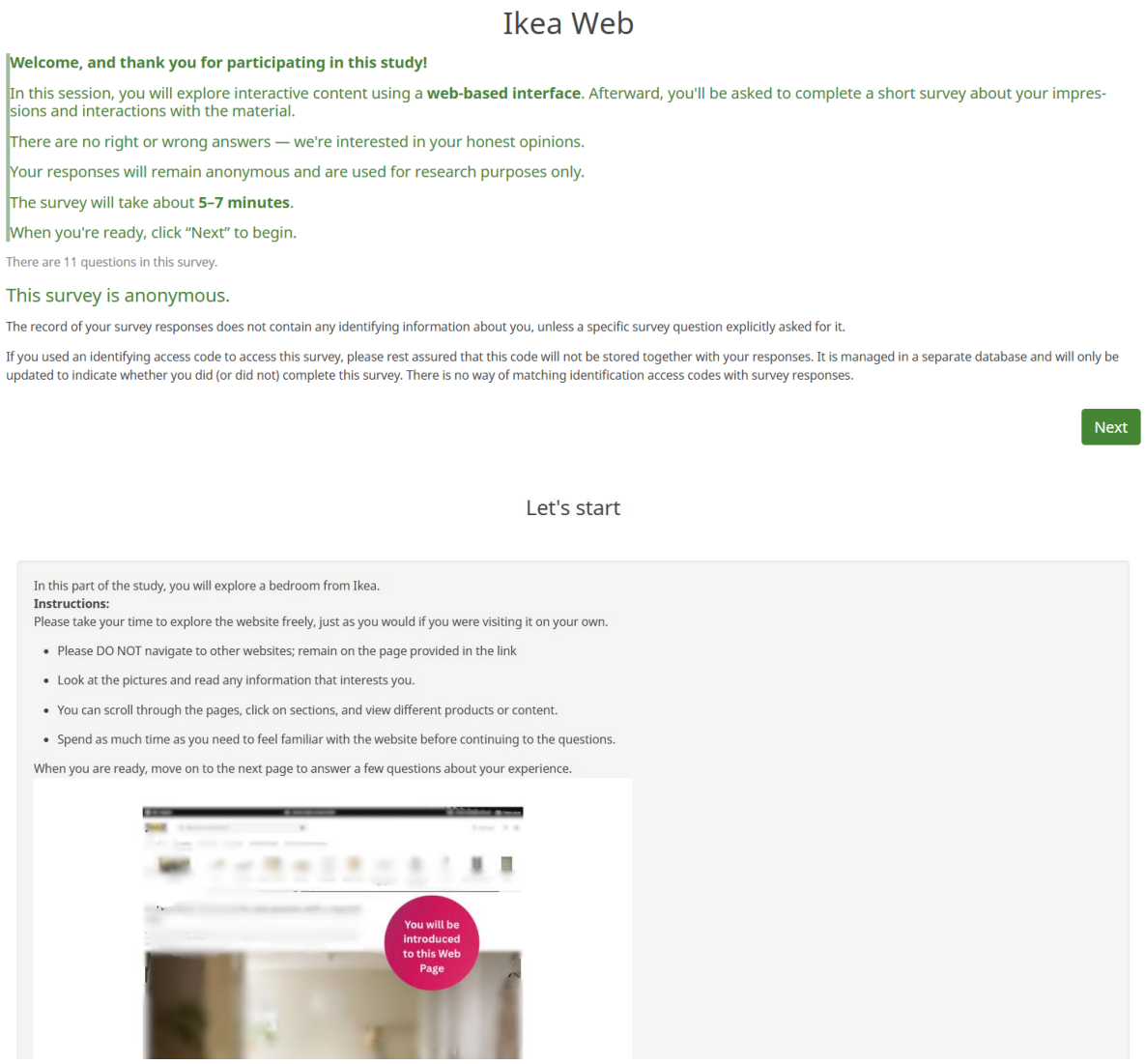
Word	Extensive	surrounding	objective	vr	technology	displays	
Frequency	3	3	3	3	3	3	

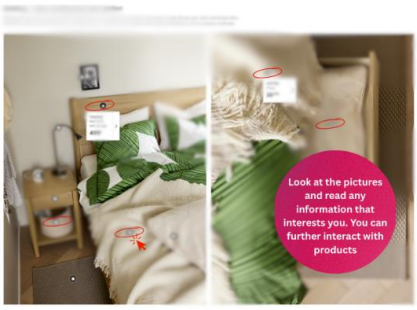
Table 7. words and frequencies used in the definition of presence. Own elaboration

Word	environment	presence	virtual	psychological	mediated	subjective	state
Frequency	11	9	6	5	5	4	4
Word	perceptual	illusion	real	physical	system	experience	
Frequency	4	4	3	3	3	3	

iii. Surveys

Web-Based Experience Survey





Click next to continue

IKEA'S website

Take a moment to explore the following webpage:

Click here to visit Ikea

Take your time to browse the page as if you were naturally exploring it — observe the layout, images, and content.
Once you've spent **a few minutes** exploring the website, **please return to this window and click "Next" to proceed with the survey.**

Your impressions and feedback are important, so feel free to take in the experience at your own pace.

How was it ?

*Did you visit and explore the IKEA webpage before continuing with this survey?

Choose one of the following answers

- ○ Yes, I visited and explored the webpage.
- ○ No, I did not visit the webpage.

Were you really there ?

*Ranging from Strongly Disagree (1) to Strongly Agree (5)

	1 - Strongly Disagree	2	3	4	5 - Strongly Agree
I felt like I was actually there in the place shown in the pictures.	○	○	○	○	○
It seemed as though I was actively involved in what was happening in the pictures.	○	○	○	○	○
It was as though my true location had shifted into the scene shown in the pictures.	○	○	○	○	○
I felt as though I was mentally present in the place shown in the pictures.	○	○	○	○	○

*Ranging from Strongly Disagree (1) to Strongly Agree (5)

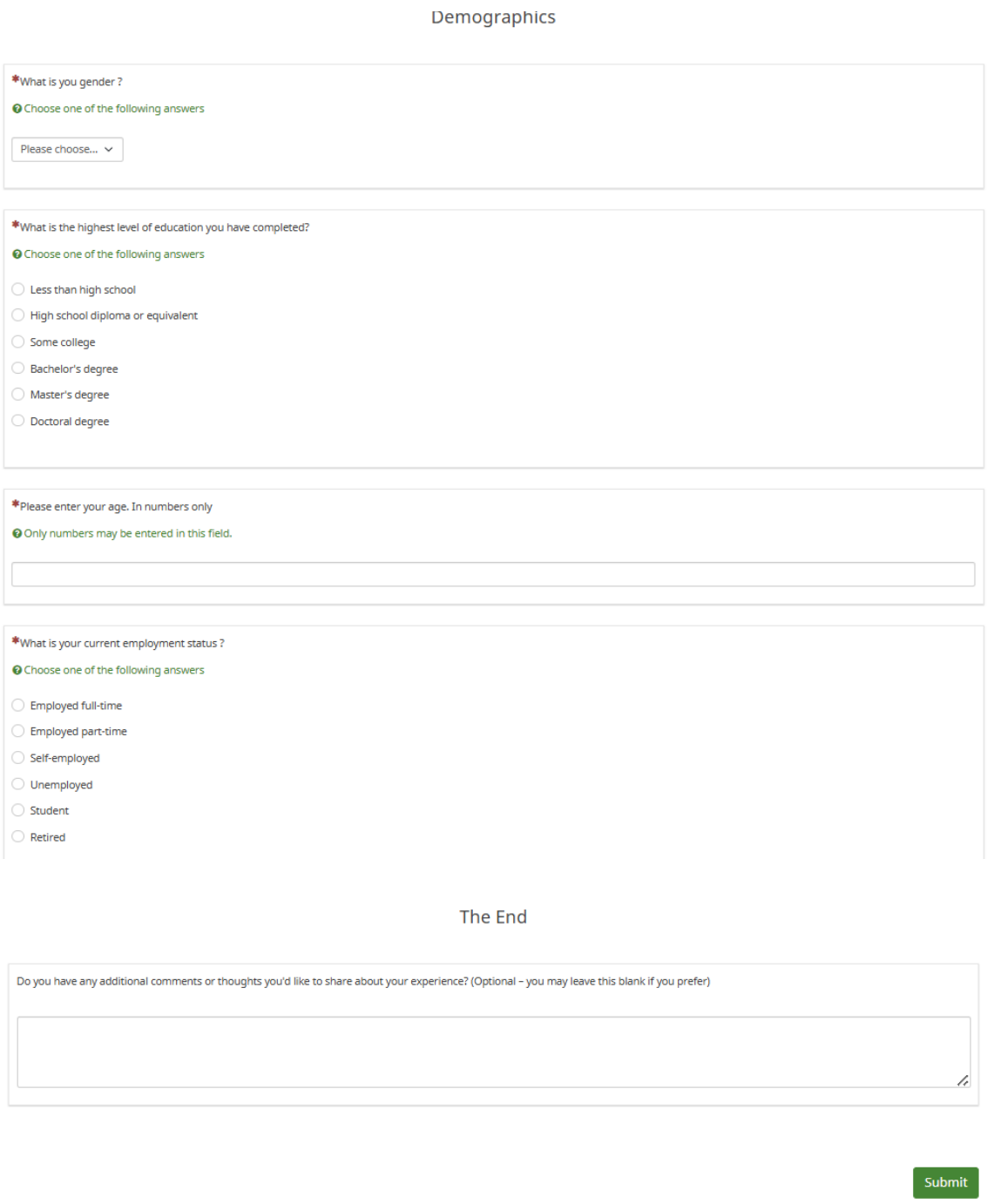
	1 - Strongly Disagree	2	3	4	5 - Strongly Agree
The pictures and other content on the website gave me the feeling that I could interact with them.	○	○	○	○	○
I had the impression that I could be active while exploring the pictures and content on the website.	○	○	○	○	○
I felt like I could move around and navigate freely through the pictures and sections of the website.	○	○	○	○	○
It seemed to me that I could explore the pictures and website content however I wanted.	○	○	○	○	○

Imagine you had to buy a bedroom from IKEA. How likely are you willing to choose IKEA ?

*Ranging from Strongly Disagree (1) to Strongly Agree (5), please answer to these questions

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
If I needed a new bedroom in the future, I would purchase that new bedroom from IKEA	○	○	○	○	●
If you were in the market for an additional bedroom, how likely would you be to purchase it from IKEA.	○	○	○	○	●
If I were to purchase a new bedroom in the near future, I would NOT use IKEA as my provider	○	○	○	○	●

Next



The VR Experience Survey

VR Experience Survey

Thank you for participating in the VR experience!

Virtual Reality (VR) is a technology that lets users experience and interact with a simulated environment through a headset.

It creates the feeling of being inside a different space, often in 3D.

Virtual Reality is commonly used in video games, but it is also found in museums, tourist attractions where people can explore places without being there physically.

In this study, Virtual Reality was used to let you explore a bedroom space as if you were really inside it.

This short survey is designed to collect your thoughts, impressions, and experiences immediately after using the virtual reality.

Your responses will help us understand how users perceive and engage with VR.
There are no right or wrong answers — please answer honestly based on your personal experience.

The survey will take about **5–7 minutes** and your responses are **totally anonymous**.

Click **"Next"** to begin.

There are 16 questions in this survey.

This survey is anonymous.

The record of your survey responses does not contain any identifying information about you, unless a specific survey question explicitly asked for it.

If you used an identifying access code to access this survey, please rest assured that this code will not be stored together with your responses. It is managed in a separate database and will only be updated to indicate whether you did (or did not) complete this survey. There is no way of matching identification access codes with survey responses.

Next

*First of all, did you feel that you spent enough time in the virtual reality environment to be able to make a purchase decision?

Choose one of the following answers

- ○ Not at all
- ○ Slightly
- ○ Moderately
- ○ Mostly
- ○ Completely

*In your opinion, how long did you spend in the virtual reality environment?

Choose one of the following answers

- ○ 2/3 min
- ○ 5/6 min

*Once here, you can call me over to assist you !

Only numbers may be entered in this field.

Next

Let's talk about your familiarity with Virtual Reality

*

	Very unfamiliar 1	2	3	4	Very familiar 5
In general, would you consider yourself familiar or unfamiliar with Virtual Reality ?	○	○	○	○	○

*

	Not at all informed 1	2	3	4	Highly informed 5
Would you consider yourself informed or uninformed about Virtual Reality ?	○	○	○	○	○

*

	Know nothing at all 1	2	3	4	Know a great deal 5
Would you consider yourself knowledgeable about Virtual Reality ?	○	○	○	○	○

Next

Were you really there in the Virtual Environment ?

*Ranging from Strongly Disagree (1) to Strongly Agree (5), please answer to these questions

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I felt like I was actually there in the Virtual Reality Environment.	○	○	○	○	○
It seemed as though I actually took part in the action of the Virtual Reality.	○	○	○	○	○
It was as though my true location had shifted into the Virtual Reality Environment.	○	○	○	○	○
I felt as though I was physically present in the Virtual Reality Environment.	○	○	○	○	○

*Ranging from Strongly Disagree (1) to Strongly Agree (5), please answer to these questions

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The objects in Virtual Reality gave me the feeling that I could do things with them.	○	○	○	○	○
I had the impression that I could be active in the Virtual Reality Environment.	○	○	○	○	○
I felt like I could move around among the objects in Virtual Reality.	○	○	○	○	○
It seemed to me that I could do whatever I wanted in the Virtual Reality Environment.	○	○	○	○	○

Next

Imagine you had to buy a bedroom from IKEA. How likely are you willing to choose IKEA ?

*Ranging from Strongly Disagree (1) to Strongly Agree (5), please answer to these questions

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
If I needed a new bedroom in the future, I would purchase that new bedroom from IKEA	○	○	○	○	●
If you were in the market for an additional bedroom, how likely would you be to purchase it from IKEA.	○	○	○	○	●
If I were to purchase a new bedroom in the near future, I would NOT use IKEA as my provider	○	○	○	○	●

Next

Demographics

*What is you gender ?

Choose one of the following answers

Please choose...

*What is the highest level of education you have completed?

Choose one of the following answers

- ○ Less than high school
- ○ High school diploma or equivalent
- ○ Some college
- ○ Bachelor's degree
- ○ Master's degree
- ○ Doctoral degree

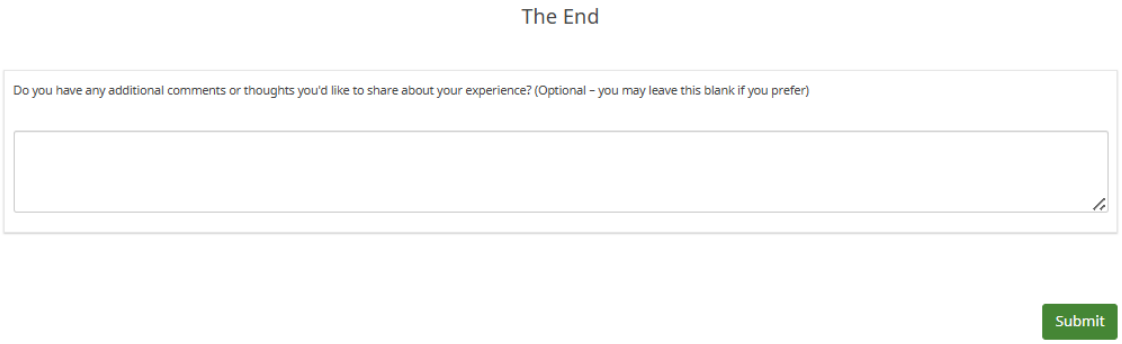
*Please enter your age. In numbers only

Only numbers may be entered in this field.

*What is your current employment status ?

Choose one of the following answers

- ○ Employed full-time
- ○ Employed part-time
- ○ Self-employed
- ○ Unemployed
- ○ Student
- ○ Retired



iv. JASP Tables

Tab1

Descriptive Statistics

	Age
Valid	108
Missing	0
Mean	30.50
Std. Deviation	13.21
Minimum	17.00
Maximum	65.00

Tab2

Descriptive Statistics

	Age	
	0	1
Valid	47	61
Missing	0	0
Mean	34.43	27.48
Std. Deviation	14.47	11.38
Minimum	18.00	17.00
Maximum	65.00	63.00

Tab3

Descriptive Statistics

		Valid	Missing	Mean	Std. Deviation	Minimum	Maximum
Age	Bachelor's degree	30	0	31.07	13.48	20.00	65.00
Age	Doctoral degree	3	0	35.33	13.58	27.00	51.00
Age	High school diploma or equivalent	10	0	25.30	12.43	17.00	60.00
Age	Less than high school	4	0	29.00	22.67	17.00	63.00
Age	Master's degree	42	0	31.71	12.11	23.00	65.00
Age	Some college	19	0	29.21	14.23	18.00	64.00

Tab4

Descriptive Statistics

		Valid	Missing	Mean	Std. Deviation	Minimum	Maximum
Age	Employed full-time	28	0	36.50	12.515	23.00	61.00
Age	Employed part-time	6	0	34.00	16.174	23.00	65.00
Age	Retired	5	0	63.40	1.517	61.00	65.00
Age	Self-employed	8	0	39.88	9.357	27.00	54.00
Age	Student	56	0	22.30	2.649	17.00	28.00
Age	Unemployed	5	0	36.60	15.742	20.00	60.00

Tab5

Binomial Test

Variable	Level	Counts	Total	Proportion	p
Gender_1W_0M	0	47	108	0.435	.211
	1	61	108	0.565	.211
Education Level	Bachelor's degree	30	108	0.278	< .001
	Doctoral degree	3	108	0.028	< .001
	High school diploma or equivalent	10	108	0.093	< .001
	Less than high school	4	108	0.037	< .001
	Master's degree	42	108	0.389	.026
	Some college	19	108	0.176	< .001
Status	Employed full-time	28	108	0.259	< .001
	Employed part-time	6	108	0.056	< .001
	Retired	5	108	0.046	< .001
	Self-employed	8	108	0.074	< .001
	Student	56	108	0.519	.773
	Unemployed	5	108	0.046	< .001

Note. Proportions tested against value: 0.5.

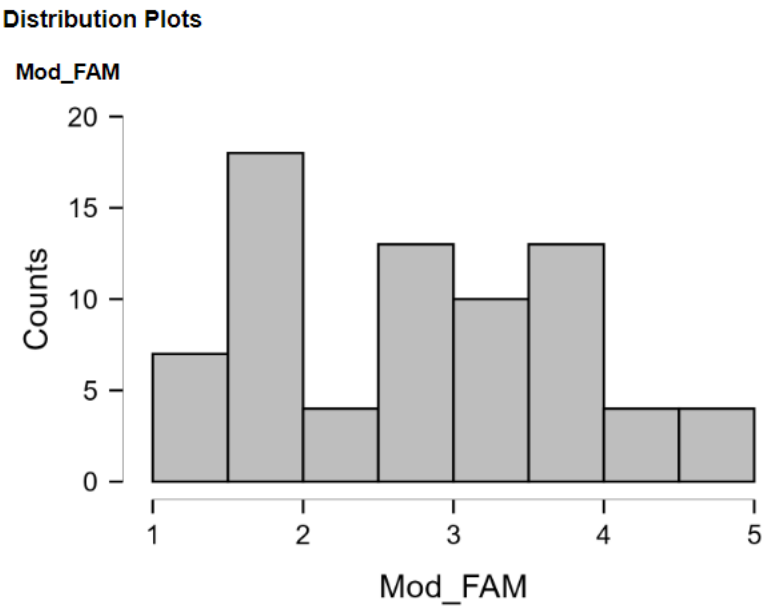
Tab6

Descriptive Statistics

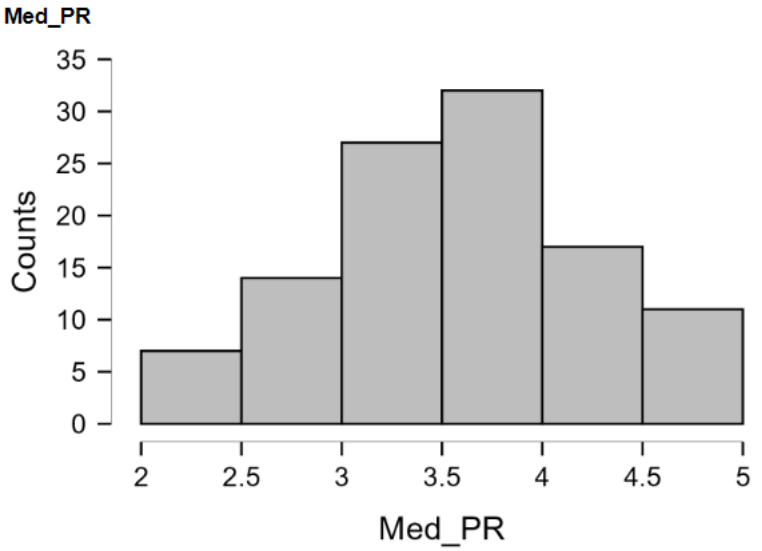
	Valid	Missing	Mean	Std. Deviation	Minimum	Maximum
Age	108	0	30.500	13.213	17.000	65.000
Mod_FAM	73	35	2.845	1.054	1.000	5.000
DV_PI	108	0	3.611	0.724	1.667	5.000
Med_PR	108	0	3.666	0.694	2.125	5.000

v. Plots

Plot1



Plot2


Med_PR
Counts
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4
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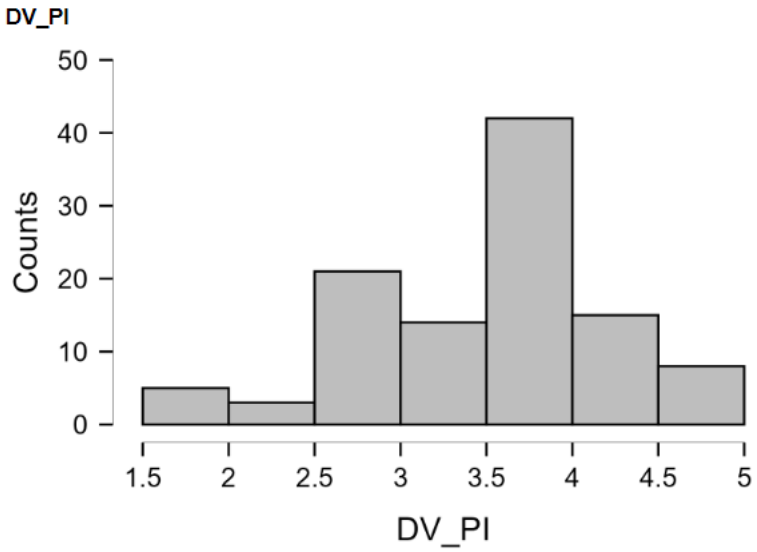
Med_PR

Plot3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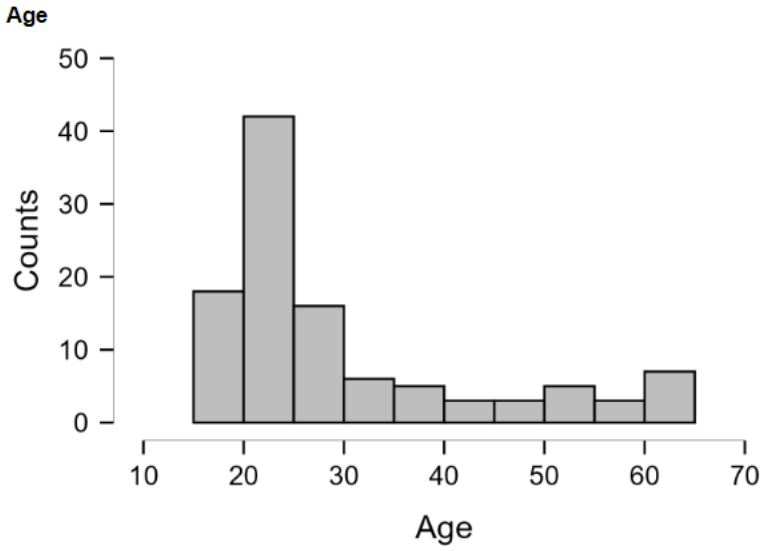
40
30
20
10
0
1.5
2
2.5
3
3.5
4
4.5
5
DV_PI

Plot4


Age
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10
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40
50
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70
Age