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When brands come to life: Experimental research on the vividness effect of Virtual Reality in transformational marketing communications

Abstract

Mobile Virtual Reality provides a gateway for marketers to innovatively reach consumers. This study examines the impact of Virtual Reality in the context of transformational brand experience appeals, focussing specifically on the determining role of vividness. A three-dimensional conceptual framework is presented, offering a systematic review of the literature on vividness effects in marketing communications, revealing the major gap that most available studies only focus on informational messages. We conducted an experiment to address this gap and demonstrate in the context of a transformational ad that Virtual Reality generates higher perceptions of vividness and presence than a regular 2-Dimensional video, with vividness positively affecting attitude towards the ad, both directly as well as indirectly via presence. Our study also reveals that vividness in turn elicits a positive effect on brand attitudes which stimulates consumers' purchase intentions. As such, the strategic potential of Virtual Reality for marketing communications is highlighted.

Keywords

Virtual Reality; vividness; marketing communications; presence; brand attitudes

1. Introduction

Virtual Reality (VR) currently is one of the most promising emerging technologies in terms of business innovation (Gartner 2016). VR technology has become more accessible to the consumer markets with the availability of smartphone-enabled headsets such as Samsung Gear VR, but also low-cost versions such as Google Cardboard-type devices which are available at prices which are affordable to the consumer. As such, VR has also caught the attention of marketers, as it provides a new, creative and innovative way to reach consumers in order to advertise products and brands (Adams 2016). Virtual Reality opens doors for companies to allow consumers to visit a specific location or event (e.g., visiting a travel destination or hotel; e.g., Marriott International, Thomas Cook), or to experience a lifestyle associated with a brand (e.g., The North Face) (Mandelbaum 2015). Several companies have already exploited the potential of VR for business. Volvo, for instance, provides a virtual test drive for their newest car model (Stott 2016). Jaguar, as a sponsor of Wimbledon, provides a virtual visit to the stadium in which the user impersonates tennis player Andy Murray (Stott 2016). Adidas provides a VR experience featuring NBA-player James Harden in their flagship store in New York as well (Alvares 2016). In addition, Carrefour has also embarked on a VR marketing strategy, by creating virtual environments in which the consumers can see the various products on offer (Carrefour 2016). The Chinese e-commerce company Alibaba is also exploring opportunities for Virtual Reality shopping online by creating a 3D commodity warehouse (Zheng 2016).

In the past, advertising has always evolved along with technology from traditional advertising (such as television advertising) to more interactive internet- and mobile advertising. Since the introduction of the latter, advertising continued to advance further from banner ads to animations, 3D product presentations, and so forth (Choi and Taylor 2014; Li et al. 2002). Technologies such as 3D product presentations or 360-degree rotation possibilities have enabled higher levels of interactivity and vividness, as compared to traditional media, thus impacting imagery richness (Choi and Taylor 2014; Coyle and Thorson 2001; Li et al. 2002). Imagery richness, also referred to as vividness, is of importance in product presentations and marketing communications as it enables more realistic representations of products or environments. Imagery richness can be affected by e.g. audio, video or animations (Cheng et al. 2014). Marketing literature has demonstrated that a more vivid representation elicits more positive consumer responses in terms of, for instance, attitudes (cf. section 2.3). In this study, we test the impact on advertising effectiveness of this new medium.

In line with the other above mentioned new technologies, Virtual Reality provides opportunities within the same direction and beyond. Existing studies prove the benefits of 3D- and VR-technology for mainly functional,

objective product feature inspections (i.e., informational marketing communication). Such informational marketing communications allow consumers to, for instance, visualize products such as jackets and watches in more advanced, 3D ways (i.e., with the ability to rotate or enlarge the product) as opposed to 2D pictures (Choi and Taylor 2014).

Marketing *practitioners* are starting to experiment with VR in experience marketing. Experience marketing entails marketing communications that focus on the experience of using a product or a brand, rather than focussing on specific product features or product information. It portrays to consumers how they could feel or live if they were to own or purchase a certain product or brand. Therefore, this paper focuses on the potential of VR for enabling hedonic (i.e. 'fun') and subjectively perceived brand experiences of 'living' the brand. In marketing *academia*, this potential is still a fairly unexplored domain.

We first provide a theoretical backdrop concerning the definition and components of Virtual Reality. In addition, the link between marketing and VR is discussed both in the areas of virtual worlds and marketing practice examples. A conceptual framework is presented containing the literature on vividness and the effectiveness of marketing communications, illustrating some gaps in the literature, one of which is addressed in this paper. Next, we present the hypotheses for our study based on advertising literature. Our methodology for the experimental design and its results are presented, and we proceed with a discussion and conclusions, highlighting the most important managerial implications. Finally, some limitations of the study are addressed and suggestions for further research with regard to the impact of vividness elicited by Virtual Reality in transformational marketing communications are provided.

2. Theoretical Backdrop

2.1 Virtual Reality.

When a user is immersed in a human-computer environment that can be perceived or interacted with, he finds himself in a Virtual Reality system (Borsci et al. 2016). Virtual Reality can be defined as an "environment created by a computer or other media, an environment in which the user feels present" (Biocca 1992 p.5-6). This feeling of being present in an environment can be referred to as 'presence', a term which originates from the term 'telepresence' (Baus and Bouchard 2016). Various scholars have formulated different definitions of presence and used terms such as presence and telepresence interchangeably (Lombard and Jones 2015). Telepresence occurs in the case of teleoperation, when a person feels as if they are actually at the remote site of

operation; whereas presence refers to the feeling of being present in the computer-generated environment (Sheridan 1992). In other words: "While Telepresence is associated with the illusion of being at a distant, but real location, the term Presence designates the illusion of being in a virtual location, and thus, in a location that is neither close nor distant." (Baus and Bouchard 2016). Hence, in the case of Virtual Reality, this paper refers to the phenomenon as 'presence'.

The sense of being present is affected by two determinants: '*vividness*' (i.e., "the representational richness of a mediated environment", Steuer 1992) and '*interactivity*' (i.e., "the extent to which users can participate in modifying form and content of a mediated environment in real time", Steuer 1992). In this study, we focus on the former (i.e., vividness) because current VR applications in marketing communications provide limited interactivity, while the vividness aspect is pronounced. While a VR department store has only just been introduced into the market (Chang 2016), most marketing-related VR applications at present allow the user to be only a passive observer, who cannot interact with the environment presented (cf. section 2.2.2).

What its core components are concerned, vividness is composed of two factors: '*breadth*' (i.e., "the number of sensory dimensions, cues, and senses presented") and '*depth*' (i.e., "the quality and resolution of the presentation") (Fortin and Dholakia 2005). So, when comparing a VR environment to, for example, a traditional 2D (or even 3D) environmental representation, the former offers a broader and deeper experience to the user (Shih 1998). The experience is 'broader' in that VR is able to address multiple senses (including kinematic and proprioceptive stimuli, i.e., being able to look around and having the sensation of moving and being able to fall), and 'deeper' in that the quality of the represented environment is more realistic.

2.2 Marketing and Virtual Reality.

2.2.1 Virtual worlds.

While specific marketing applications using Virtual Reality in-store or at home are currently only just starting to emerge and as such most of them are still far from being commonplace, marketing in a virtual environment, also known as a virtual world or metaverse (e.g., Second Life, There and Meet Me), has been in place for some time (Hassouneh and Brengman 2011). While certain studies refer to a virtual world as a synonym for Virtual Reality or virtual environments (e.g., Menzies et al. 2016), most scholars restrict the definition of a virtual world to being a 3D internet-based simulated environment (Bainbridge 2007) that can be categorized into game-oriented virtual worlds (i.e., where users must follow a set of rules to advance in the game) and freeform virtual worlds (i.e., where no predetermined goals exist). The latter mimics the real world and bears resemblance

to real world economies (Hassouneh and Brengman 2011; Houliez and Gamble 2013). In a virtual world, consumers are represented by a virtual avatar, whereas in Virtual Reality, users are generally not represented by an avatar: they usually do not see a visual representation of themselves.

Regarding the marketing literature concerning virtual worlds, researchers have, for example, studied stores in virtual worlds in terms of their impact on shopping intentions for virtual as well as for real-life products (Domina et al. 2012; Hassouneh and Brengman 2015), focussing on virtual store atmospherics (Hassouneh and Brengman 2015), and on in-world branding opportunities (Hassouneh and Brengman 2011; Muzellec et al. 2012). In virtual worlds, brand-building can namely be accomplished by, among others, enabling consumers to virtually experience the brand or product by facilitating the examination of a virtual prototype (e.g. Nike shoes). Dahan and Srinivasan (2000) for example studied the effect of users' evaluations and preferences when allowing them to try-out 11 fictional, virtual prototype bicycle pump brands. Another more experiential example involves perfume branding in virtual worlds: perfume bubbles floating around the avatar/owner's head indicate the virtual presence of a fragrance in order to make other avatars virtually aware of the 'presence' of this branded scent associated with the avatar wearing it (cf. Hassouneh and Brengman 2011). However, virtual worlds only reach a specific target audience (i.e., virtual world users) rather than the majority of consumers (Hassouneh and Brengman 2014). Thus far, specific VR branding applications in the *real* world have not yet been studied. As such, in this study, we consider VR applications in marketing practice, targeted at a broader audience.

2.2.2 Virtual reality in marketing practice.

The use of Virtual Reality in marketing practice is still rather limited. However, affordable Virtual Reality headsets are reaching consumer markets (e.g. Samsung Gear VR, Oculus Rift). Recently, even cheaper alternatives, such as the Google Cardboard, make use of the consumer's smartphone as the screen, and are already available at a mere cost of ca. 20 US Dollars. The low prices make the headsets financially accessible to a vast number of consumers. The range of opportunities for marketing communications is yet to be discovered, although some noteworthy practitioner examples are available: for example a fully immersive 3D 'World of Lancôme' experience offered at London Heathrow airport where users can experience different facets of the brand through a fully immersive 3D experience (cf. Figure 1a; Newhouse 2013); an immersive in-store skydiving experience presented by Nissan in Frankfurt and Paris (cf. Figure 1b; N.a. 2014b); Topshop's Virtual Reality front row fashion show experience in London (N.a. 2014a); and Marriott's virtual travel experiences that include all human senses by adding, for instance, wind and heat sensations, tested in London and NY (Rubin

2014).



Fig. 1a 3D 'World of Lancôme'



Fig. 1b Nissan in-store skydiving experience

2.3 Vividness and marketing communication effectiveness.

Steuer (1992)'s definition of Virtual Reality, indicates that Virtual Reality has the capacity to evoke the sensation of *[tele]presence*, which consists of two factors: *'interactivity'* and *'vividness'*. In this study, we focus on vividness because, according to Cheng et al. (2014), the "influential power of vividness is three times more than that of interactivity", indicating that "vividness remains the primary factor that affects [tele]presence". In addition, the scarce existing VR applications in marketing provide no – or at best only limited – interactivity, while the vividness aspect (i.e., the quality of the images and the sense of movement in the surroundings) is the dimension that generally has been emphasized so far. As there is only a scarce amount of academic literature concerning the impact of Virtual Reality on consumers in marketing communications, we first consider *general* relevant literature on vividness effects in the marketing communications domain in order to determine the impact of vividness in a VR brand experience.

A literature review reveals that in the context of marketing communications, vividness has been manipulated in various manners. We propose a three-dimensional conceptual framework (1) to systematically review the different types of studies performed in this regard, and (2) to identify several gaps in the existing literature.

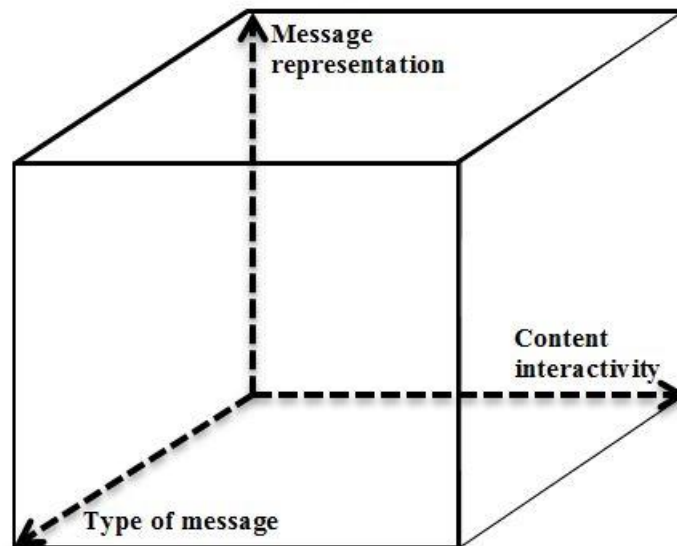


Fig. 2 Conceptual framework

The three-dimensional model (cf. Fig. 2) is represented by a cube (cf. Zeltzer, 1992) and particularly contains the following three dimensions: (1) '*message type*', which can be either informational or transformational, (2) '*content interactivity*' which can be either non-interactive or interactive and (3) '*message representation*', which can be either 2D or 3D/VR.

First, marketing communications can be distinguished in terms of the '*type of message*' they aim to convey. Studies can focus on either '*informational advertising*' (i.e., advertisements that present factual and relevant product and brand data, such as materials used, weight or care instructions, or measurements/dimensions) or '*transformational advertising*' (i.e., advertisements in which the experience of using the product is expressed, for example an advertisement showing a person feeling adventurous and lively when using Red Bull, or a man seeming more attractive when using Axe) (Puto and Wells 1984). We note that most studies addressing vividness effects focus on the former, while the latter remains largely unexplored. Research has been conducted on vividness in informational advertising for different types of products, often with geometric-diagnostic properties (i.e., products that require vision to be examined in terms of their shape, size,...) or material-diagnostic properties (i.e.,

products that require touch to be examined in terms of their texture, weight,...) (cf. e.g., Choi and Taylor 2014; Newman et al. 2005).

Second, with regard to '*content interactivity*', marketing communication messages can be either '*non-interactive*', relying on the use of static or dynamic 'fixed' images that do not provide consumers with the ability to have control over what they see or the ability to give input; or '*interactive*', allowing consumers to interact with the advertisement (i.e., user-controlled), by choosing how they view, for instance, a product. In non-interactive advertisements vividness can be elicited for instance by presenting vivid vs. pallid text to advertise a frying pan (i.e., using colourful language instead of a plain focus on product attributes; cf. Fennis et al. 2012). Vivid descriptions contain more abstract adjectives and descriptions about using the product, such as 'sizzling', whereas attribute descriptions focus on the actual characteristics such as the material being 'teflon-coated' in the case of a frying pan. Interactive advertisements can for instance provide the ability to zoom in and out, rotate and move products advertised (Debbabi et al. 2010).

Finally, concerning '*message representation*', the advertising format can be either *2D*, referring to traditional 'flat' pictures, videos or '3 dimensional' *3D/VR*, which brings about a naturally more real 'immersive experience' (i.e., the subjective impression that one is participating in a comprehensive, realistic experience). In the current study, we consider VR and 3D to go beyond the properties of 2D interactive advertisements, as we focus on the immersive aspect of it. Therefore it is important to note that a number of empirical studies that claim to investigate Virtual Reality, use this term rather broadly, as they are actually considering 2D interactive representations. Hence, a distinction between actual Virtual Reality/three-dimensionality vs. two-dimensionality should be made. 2D refers to traditional pictures, but this does not make interactive 2D representation qualify as VR, although some authors do use that term to denote the 2D interactive marketing application they are studying (cf. Choi and Taylor 2014; Debbabi et al. 2010; Klein 2003; Overmars and Poels 2015).

In order to facilitate a discussion on the studies on the impact of vividness in marketing communications along the three defined axes, the three-dimensional figure is divided into octants, each labelled using a letter (cf. Figures 3a and 3b).

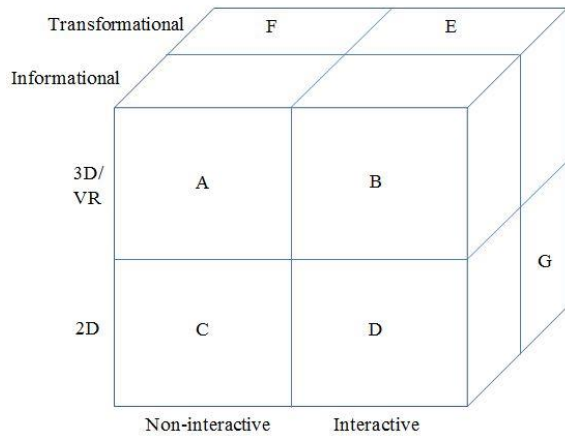


Fig. 3a Conceptual framework: front view

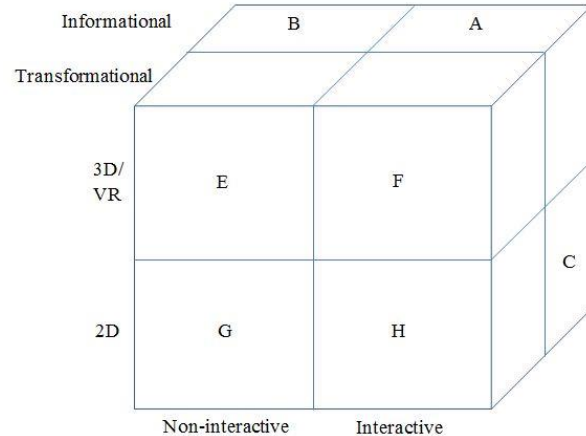


Fig. 3b Conceptual framework: rear view

Existing studies on the impact of vividness in marketing communications are of such a nature that they can be situated either within one of the eight axial combinations (octants) in this model or that they compare effects between octants or types of marketing communication messages. In what follows, we review several studies (albeit non-exhaustively) from existing marketing literature on vividness effects alongside the three dimensions explained above. A more detailed description of the task, performance measures and results of the studies used for the discussion below can be found in a table in appendix 1. Let us start with literature on within-octant studies (i.e. pertaining to one particular condition of message, interactivity and representation).

Within octant C (i.e., an informational, non-interactive, 2D advertisement), we find empirical work that considers various levels of vividness (Coyle and Thorson 2001; Fennis et al. 2012; Klein 2003); comprising comparisons of pictures and text vs. video and audio promoting wine and face cream (Klein 2003); images with non-vivid vs. vivid written language promoting a fictional brand of frying pan (Fennis et al. 2012); and the presence or absence of audio and animations for advertising movies, CDs, hot sauce and women's golf clothing (Coyle and Thorson 2001). As is indicated in Figure 3a, all these studies have been conducted for informational advertisements (i.e., the studies examine slightly different ways of product information transfer). From these studies, we learn that media richness (i.e. vividness) evokes telepresence, which in turn has a positive mediating effect on belief strength and attitude toward the product (Klein 2003), we also learn that vividness positively affects brand attitude (Fennis et al. 2012), and attitude toward the website (Coyle and Thorson 2001).

A last within-octant study identified in the literature concerns octant A (i.e., an informational, non-interactive, 3D/VR advertisement), textual vs. audio stimuli have been tested in a Second Life environment (Jin 2009). Here, the advertisement tested presented information about a product (iPhone), with an avatar communicating via text-visual vs. audio-visual stimuli. Given the three-dimensional nature of Second Life, and

the non-interactive, informational nature of the advertisement, this study can be situated in octant A. This empirical research found an effect of modality richness (i.e. vividness) on purchase intention, product attitude and shopping enjoyment.

Now, let us move on to comparison studies between different conditions. We found three types of inter-octant studies in the literature, each concerning informational advertising: covering either a comparison of A-B (non-interactive vs. interactive 2D informational messages), A-C (non-interactive, informational messages in 2D vs. 3D/VR), or A-E (non-interactive, informational vs. transformational 2D messages). First, a number of C-D studies experimentally compared the impact of interactive vs. non-interactive, informational, 2D advertising (e.g., Choi and Taylor 2014; Debbabi et al. 2010; Li et al. 2002). Given the informational nature of the advertisements, the product on sale is central to the advertisement. A first type of non-interactive vs. interactive manipulation in a 2D message representation can be found in studies that have been devoted to the comparison of non-interactive pictures as opposed to interactive images which the user can manipulate by zooming, rotating and moving the product. This has been studied for various products (respectively geometric and material/experience products): namely a watch and a jacket (Choi and Taylor 2014; Li et al. 2002), a watch and a coat (Debbabi et al. 2010), a watch and a notebook computer (Keng and Lin 2006). The interactive representation as compared to the non-interactive representation appears to lead to greater vividness, which in turn leads to a more positive attitude toward the website, and toward the brand, higher purchase intentions and increased re-patronage intentions. In addition, according to Li et al. (2002), vividness effects also lead to greater product knowledge, brand attitudes and purchase intentions, with 'presence' mediating the relations with product knowledge and brand attitude. Above mentioned findings hold for the geometric product for which the effects are stronger than for the material product (Choi and Taylor 2014). Similarly, Debbabi et al. (2010) found that product type (i.e., geometric- vs. material-diagnostic properties characterized) moderates the relationship between the advertising format (interactive vs. non-interactive) and advertising effectiveness measures, with geometric products having a stronger impact on the outcome variables.

Another type of C-D manipulation includes seeing a garment on a picture vs. on a model with the ability to match clothing and adjust viewing angles (Overmars and Poels 2015). The interactive condition with the model leads to greater mental imagery processing (i.e. vividness), positively impacting aesthetics, playfulness, consumer return on investment and service excellence, each in turn positively affecting the intention to revisit the store (Overmars and Poels 2015). Various effects on outcome variables such as website attitudes, playfulness, and brand

attitude were established, whereby the 2D interactive representations generally outperformed the 2D non-interactive representations.

A second type of inter-octant studies involves studies examining the impact of 3D/VR versus 2D in a non-interactive, informational ad context (octants A vs. C). Jin (2009) examined the impact of using 2D vs. 3D representation for the sale of an iPhone. The original site under study, which was three-dimensional, was compared with a two-dimensional version which was created by capturing screen shots of the original site. The ad format (3D vs. 2D) was found to positively impact users' enjoyment, brand equity and behavioural intentions.

A last inter-octant study identified in the literature concerns octants A and E (i.e., an informational vs. transformational, non-interactive, 2D advertisement). Fennis et al. (2012)'s second study compares a picture of a champagne bottle with a picture of a group of people enjoying the same brand of champagne, concluding that the latter leads to a more positive brand attitude among consumers being exposed to this advertising appeal. As such, the study is classified as a transformational advertisement.

Although several comparisons within the proposed conceptual model have already been addressed, the framework shows that quite a number of opportunities remain for further scientific exploration. In this particular study, we focus on transformational advertising, which appears clearly under-examined and more specifically on the comparison between E-G octants (i.e., comparing the effectiveness of a VR vs. 2D non-interactive transformational video; cf. Fig 3).

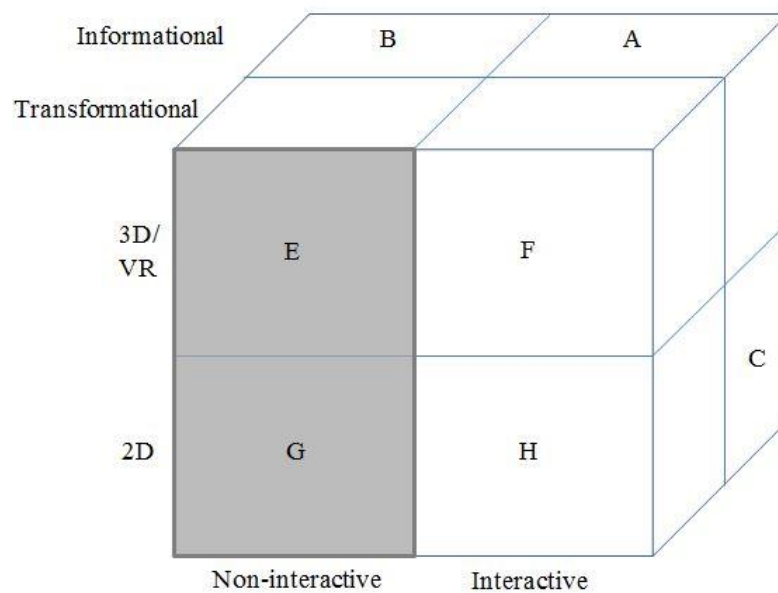


Fig. 4 Situation of the study in the conceptual framework

2.4 Hypotheses

In this study, we examine the impact of a VR- vs. regular 2D video representation portraying a brand experience (i.e., a transformational advertising message) by examining key strategic outcome variables framed within the affect transfer hypothesis (Homer 1990): (1) attitude toward the ad, (2) attitude toward the brand, and (3) purchase intentions. In what follows, we formulate a set of research hypotheses embedded in the literature (cf. our encompassing conceptual model illustrated in Figure 5).

For our first two hypotheses, we refer to Steuer (1992)'s definition of vividness and [tele]presence. First, vividness consists of two aspects: breadth (i.e., the number of senses being addressed) and depth (i.e., the quality of the representation). A Virtual Reality video excels as compared to a regular 2D video in terms of breadth, as the senses are more strongly awakened. In addition, the realism of the images in VR positively affects the depth aspect. As such, we expect vividness to be higher when VR is implemented. Second, presence refers to the feeling of 'being there'. Due to VR's 'immersive' nature (cf. Dede 2009), it provides a much stronger feeling of presence. Hence, in the context of a transformational marketing communication video we pose the following hypotheses:

H1: Vividness levels are higher for VR than for 2D representation.

H2: The level of presence is higher for VR than for 2D representation.

In an informational advertising context, studies have shown the impact of 3D vs. 2D on consumer attitudes. Choi and Taylor (2014) studied the impact of 2D (static picture) vs. 3D (with the possibility to zoom, rotate and move) product representations on an experimental website. This was studied for both a watch (i.e. a geometric product) and a jacket (i.e. a material product). They found that the 3D presentation led to higher brand attitude and purchase intentions, only in the case of the geometric product. The attitude toward the website and the intention to revisit the site were positively impacted for both products, although the effect was also stronger for the geometric product (i.e. the watch). Similarly, Li et al. (2002) also tested 2D photographs vs. 3D representation (i.e. with the possibility to move, zoom and rotate the product) for a watch and a jacket. This study found that the type of experience (3D vs. 2D) positively impacted product knowledge and brand attitude for both products. Purchase intentions, however, were only higher for the geometric product. This experiment also showed product knowledge and brand attitude to be positively mediated by presence. In addition, Klein (2003) studied the impact of static (i.e. still pictures and text) vs. non-static (i.e. video and audio) information for the products wine and face cream. As such, she confirms that media richness (i.e. vividness) creates a sense of presence, which in turn has a positive mediating effect on belief strength and attitude toward the product.

To summarize, the literature has shown relatively stronger positive effects of 3D (over 2D) on attitude toward the website (Choi and Taylor 2014), attitude toward the product (Klein 2003) and brand attitude (Choi and Taylor 2014; Li et al. 2002). In addition, 3D vs. 2D research found that purchase intentions are higher in a 3D vs. 2D setting (Choi and Taylor 2014; Li et al. 2002). We extend above mentioned expectations concerning consumer attitudes, and purchase intentions to the context of a transformational marketing communication message and to Virtual Reality:

H3: Attitude toward the advertisement (Aad) is more positive for VR than for 2D representation.

H4: Attitude toward the brand (Ab) is more positive resulting from VR than from 2D representation.

H5: Purchase intentions are higher for products advertised in VR than in 2D.

In addition to testing above mentioned direct effects, we test whether presence also mediates consumer attitudes in VR (cf. Figure 5), as it does in non-interactive vs. interactive 2D message content (e.g. (Li et al. 2002). Finally, based on (Homer 1990)'s affect transfer hypothesis, we also formulate the following more general hypotheses:

H6: Vividness positively affects attitude toward the ad.

H6a: Vividness positively affects attitude toward the ad *directly*.

H6b: Vividness positively affects attitude toward the ad *indirectly* via presence, which acts as a mediator.

H7: The attitude toward the ad positively impacts the attitude toward the brand.

H8: The attitude towards the brand positively affects purchase intentions.

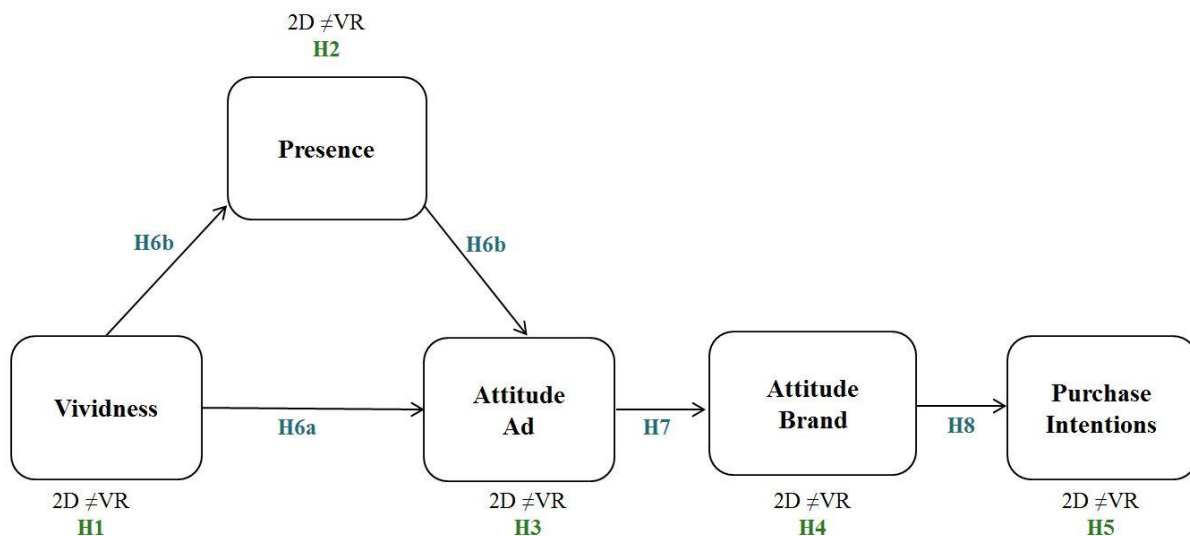


Fig. 5 Conceptual model.

3. Methodology

3.1 Procedure and measures.

Our study consists of an experimental between-subjects design. Participants were randomly assigned to a condition and either viewed a video on a mobile phone (2D) or via a Google-cardboard type head-mounted device (VR). The particular video¹ used in the 2D manipulation showed landscapes of Yosemite National Park with athletes rock climbing. In the Virtual Reality manipulation, a similar video is shown in 3D/VR. In this case, the viewer actually has the impression to be in the scenery, and is able to look around 360 degrees, feeling the actual sensation that he could fall off the cliff (i.e. strongly impacting the breadth and depth dimensions of vividness) (cf. (Jaunt 2015).

Prior to being exposed to either the VR or the 2D manipulation, the participants had to complete a short questionnaire (pre-test), pertaining to the construct purchase intention toward the brand (The North Face), operationalized by means of 2 items (adapted from Homer (1990). The post-test, after the viewing experience measured the following 5 constructs: vividness (6 items adapted from Keller and Block (1997), [tele]presence (8 items adapted from Coyle and Thorson 2001), attitude toward the ad (3 items), brand attitude (3 items) and purchase intentions (2 items) (adapted from Homer 1990) by means of 7-point Likert scales (with a score of '1' corresponding to 'totally disagree' and score '7' to 'totally agree'). The full list of items pertaining to the constructs that were measured in the questionnaire can be found in Appendix 2.

Construct reliability for each construct is tested by means of Cronbach alpha analysis in case of three or more items, and by means of Pearson correlation analysis in case of two items. Purchase intentions pre ($r = 0.941$), purchase intentions post ($r = 0.916$), vividness ($\alpha = 0.836$), presence ($\alpha = 0.882$, after deletion of item 6 and 8, cf. appendix), attitude toward the ad ($\alpha = 0.816$) and attitude toward the brand ($\alpha = 0.866$). All construct measurements are deemed very reliable with α substantially exceeding the threshold of 0.70 (Hair et al. 2006) and as such they are used for further analysis.

3.2 Sampling and participant information.

In total, 160 usable responses from a Belgian student sample were collected (80 for each condition). Participants were randomly assigned to one of both conditions (VR or 2D). The average age of the respondents is 22.6 (SD = 2.92) (range: 19-40 years old). A Pearson Chi-square test indicates that no gender effects are present

¹ <https://www.youtube.com/watch?v=FLiipi5jamA&feature=youtu.be>

($\alpha = 0.342$), and an independent samples t-test indicates that no age effects are present either ($p = 0.843$). An independent samples t-test is also applied to determine the difference in pre-test purchase intentions for each condition, indicating that there is no significant difference between both conditions ($m_{VR} = 3.14$; $SD_{VR} = 1.45$; $m_{2D} = 3.39$; $SD_{2D} = 0.20$; $p = 0.316$), assuring us that we can exclude potential pre-existing biasing effects.

4. Results

4.1 Measurement model.

Hypotheses 1 to 5 (i.e., higher levels expected in case of VR as compared to 2D representation for (H1) vividness, (H2) presence, (H3) attitude toward the advertisement, (H4) attitude toward the brand and (H5) purchase intentions) are analysed using independent samples t-tests. For hypothesis 6 (a positive expected relationship between vividness and attitude toward the ad both directly (H6a) and indirectly via the mediator presence (H6b)), hypothesis 7 (a positive expected relationship between attitude toward the ad and attitude toward the brand) and hypothesis 8 (a positive expected relationship between attitude towards the brand and purchase intentions), structural equation modelling is conducted via Smart-PLS 2.0 software. Partial Least Squares Structural Equation Modeling (PLS-SEM) is used as it is a variance-based estimation technique which is less sensitive to small sample sizes than covariance-based SEM techniques (e.g., AMOS, Lisrel). It is moreover not restrictive in terms of dataset distribution, and can handle more complex models (Hair et al. 2014). A 5000 resample bootstrap was applied to evaluate the statistical significance of the model. First, we evaluated the measurement model. All constructs contain reflective items, which are unidimensional in accordance with the guidelines of Karlis et al. (2003). The psychometric properties of the model are examined, including item validity, discriminant validity and within-method validity (cf., Appendices 2 and 3). Further details may be obtained from the authors.

4.2 Independent samples t-test results.

The hypothesized positive direct effects comparing 2D vs. VR are tested by applying an independent samples t-test. Vividness experienced in the VR-condition appeared significantly higher than in the 2D-condition ($m_{VR} = 5.48$; $SD_{VR} = 0.83$ versus $m_{2D} = 4.80$; $SD_{2D} = 1.11$; $p < 0.001$; confirming H1). We also find that the VR representation scored significantly higher in terms of presence ($m_{VR} = 4.39$; $SD_{VR} = 0.98$ versus $m_{2D} = 3.64$; $SD_{2D} = 1.16$; $p < 0.001$; confirming H2), attitude toward the ad ($m_{VR} = 5.89$; $SD_{VR} = 0.78$ versus $m_{2D} = 5.16$; $SD_{2D} = 1.09$; $p < 0.001$; confirming H3), brand attitude ($m_{VR} = 5.41$; $SD_{VR} = 0.86$ versus $m_{2D} = 4.89$; $SD_{2D} = 0.88$; $p < 0.001$; confirming H4) and post-purchase intentions ($m_{VR} = 4.25$; $SD_{VR} = 1.35$ versus $m_{2D} = 3.58$; $SD_{2D} = 1.67$; $p < 0.01$; confirming H5). As such, the data set supports our first five hypotheses (H1-H5).

4.3 Structural model.

To unravel the mechanisms explaining the significantly higher purchase intentions in case of VR representation (cf. section 4.2), we apply a structural model in which we examine hypothesis 6 regarding the expected direct relationship between vividness and attitude toward the ad (H6a), and the indirect relationships between these variables via presence (H6b); hypothesis 7, the expected positive relationship between attitude toward the ad and attitude toward the brand; and hypothesis 8, the expected positive relationship between attitude toward the brand and purchase intentions (cf., Fig 6).

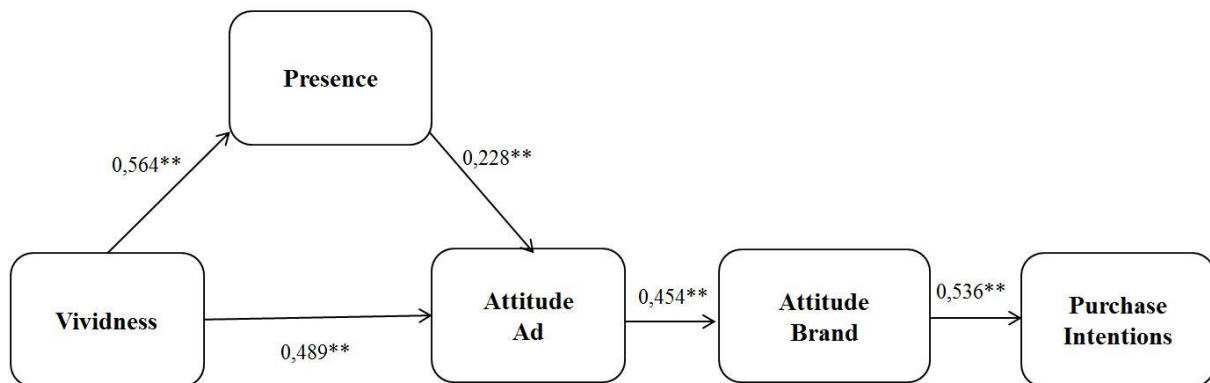


Fig. 6 Structural equation model
 Note. **=significant at the 0.01 level

The direct and indirect effect of vividness on A_{ad} with presence as a mediator (H6a and H6b) is analysed using a bootstrap sampling method, which is considered most suitable for PLS-SEM (Hair et al. 2014). Via mediation analysis we find that, first, the simple relationship between vividness and A_{ad} is significant ($\beta=0,62$; $p<0.01$). Second, when including presence as a mediator, we find a positive relationship between vividness and presence ($\beta=0,564$; $p<0.01$) and presence and A_{ad} ($\beta=0,228$; $p<0.01$), as well as a remaining direct effect of vividness on A_{ad} ($\beta=0,489$; $p<0.01$). Hence, the total effect is 0.62 ($0.564*0.228+0.489$). Next, we confirm that A_{ad} positively affects A_b (cf., H7; $\beta=0,454$; $p<0.01$) and that A_b positively affects purchase intentions (cf., H8; $\beta=0,536$; $p<0.01$).

5. Discussion

The purpose of this study was to examine the impact of 'Virtual Reality' vs. 2D representation, particularly in the context of non-interactive, 'transformational' brand experience appeals, focussing specifically on determining the role of 'vividness'. As such we extend the currently existing academic knowledge in this area, which mainly seems to focus on purely 'informational' messages and the impact of 'interactivity' (cf. our

conceptual framework presented earlier in Figure 2). The vividness concept is important to advertisers, as previous studies have shown its positive impact on strategic advertising outcomes.

Our analyses confirm our hypotheses in the context of transformational marketing communications. First, we found that Virtual Reality leads to higher vividness as compared to a 2D representation. Second, we also confirmed that the level of perceived presence is higher for VR. These findings are in line with our expectations based on Steuer's work (1992). Moreover, we found that attitude toward the ad, attitude toward the brand, and purchase intentions are higher in the case of VR vs. 2D. In addition, consistent with the findings of Li et al. (2002) in an informational context, our results show that also in the context of a transformational ad, presence has a mediating effect in the relationship between vividness and attitude toward the ad. Previous research found a positive impact of vividness on consumer attitudes (Choi and Taylor 2014; Klein 2003). The current findings also reinforce the view that there is a direct positive impact of vividness on attitude toward the advertisement. Our last findings pertaining to the affect transfer hypothesis (Homer 1990) confirm that attitude toward the ad positively impacts attitude toward the brand, which in turn positively affects purchase intentions.

As such, the findings of this study indicate that investing in VR for marketing communication purposes rather than in 2D marketing communications, can pay off. In particular, it allows to vividly immerse consumers in staged transformational brand experiences, as if they were actually present in the scene, inducing more positive brand attitudes and ultimately also higher purchase intentions. The effectiveness of Virtual Reality in advertising deserves more attention in both academia and in marketing practice.

Opportunities for VR present themselves in two environments, namely (1) at home and (2) in-store. First, home usage presents opportunities for marketers to bring the brand experience to people's homes. As such, the online store environment may also be enhanced with 'virtual theatrics' (Manganari et al. 2009) via mobile-enabled VR apps. In doing so, marketers must however be aware of the legal restrictions regarding the implementation of Virtual Reality advertising (Barfield 2006). Second, in-store applications may also provide a fruitful alternative. Flagship or 'experience' stores may be perfectly suited to creatively implement VR technology (Dolbec and Chebat 2013). In order to encourage consumers to bond with their brand, retailers or flagship stores "may need to continue to innovate in order to provide cutting edge experiences for their increasingly sophisticated customers and to develop store designs that translate their brand identity from their products and services into the customer experience of a retail environment" (Jones et al. 2010). For instance, Carrefour recently launched a Virtual Reality application in which the user can travel through different imaginary worlds, with each world containing a different

product categories (e.g., a futuristic world full of high-tech and multimedia products) (Carrefour 2016). TopShop also presented an in-store VR catwalk show of TopShop garments. In a similar fashion, The North Face presented their VR application in-store as well, as they did in their Manhattan store (Mandelbaum 2015).

6. Conclusion

This study provides insights into the impact of VR versus a two-dimensional representation of a transformational marketing communication message, focussing in particular on the role of vividness. The findings of this study confirm that the level of vividness and the level of presence are higher in case of a Virtual Reality representation than for a 2D video, with vividness positively affecting presence. Our study also reveals that this elicits a positive effect on attitudes toward the ad and subsequently toward the brand, stimulating consumers' purchase intentions.

7. Limitations and suggestions for further research.

Although this study provides insights into the usefulness of applying Virtual Reality in advertising, some limitations remain. First of all, the study was conducted using a student sample. As age acts as a moderator in the adoption of new technologies (Venkatesh et al. 2003), a replication among a wider audience is called for. Furthermore, as some kind of 'novelty' effect (i.e., "providing a fun, new stimulus to consumers"; Jin 2011) may positively bias consumer responses when being exposed to exciting new technology applications, some longitudinal follow-up studies are advisable to examine whether the positive effects found in this study remain over time, when people are more accustomed to such experiences. In line with this, the moderating effect of 'consumer innovativeness' could also be taken into account in order to examine consumers' reactions to Virtual Reality (Goldsmith and Hofacker 1991). As Wallach et al. (2010) found that the personality traits 'empathy' and 'internal locus of control' play an important role in the sense of presence; these may also be considered as potential moderators. Empathy (i.e., the emotional connection a user has with a place) is expected to positively affect the feeling of presence and internal locus of control (i.e., the feeling of control over the virtual environment) may develop presence.

Finally, while our study focusses on one comparison between octants in the proposed conceptual framework (cf., octants E and G in Figures 2, 3a, 3b), a number of other gaps still remain to be addressed. Further research could, for instance, investigate the difference in impact between different octants. To name one, an inter-octant study could, for instance, examine the impact of addressing not only the senses of vision and hearing (as well as proprioception), but also the other human senses such as 'touch' (Metz 2016). The sense of touch can be

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addressed via touch-enabling technologies designed for virtual environments (e.g., Hernoux and Christmann (2015)). Stimulating an additional human sense could lead to increased vividness; hence the study would be situated in octant A or E, depending on the message type being either informational or transformational respectively. Alternatively, given that the haptic technology also allows for interaction with the environment, a comparison between octants E and F (a non-interactive vs. an interactive 3D/VR transformational message) could be investigated. Such study would be in line with our research, which had a particular focus on the under-examined dimension of transformational advertising message appeals. The difference in this case could, for instance, be that in one condition (non-interactive) the viewer sees only a specifically chosen adventurous sequence performed by others, whereas in the other condition (interactive) the user can choose to actually interact with his/her environment (e.g., choose where to walk, what products to pick up,...). As such, it could be determined whether interactive VR can take consumers yet another level further in a transformational marketing communications context.

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Appendix

Appendix 1. Task, performance measures and results for the vividness studies under discussion.

Source	Task	Manipulation	Sample description	Performance measures and results (confirmed hypotheses are indicated with an asterisk)
Choi & Taylor (2014)	Participants were instructed to thoroughly examine the website they were assigned to, in order to determine how they think and feel about the product presented on the site. After they browsed the website, they filled out a questionnaire.	The study uses experimental websites with 2D (static picture) and 3D (possibility to zoom, rotate, move) formats for two types of product. The products under study are a watch (geometric) and a jacket (material).	207 undergraduate students	In comparison to 2D, 3D leads to: <ul style="list-style-type: none"> - More positive attitudes toward the site* (higher effect for the geometric product) - More positive brand attitudes* (only for the geometric product) - Higher purchase intentions* (only for the geometric product) - Higher intentions to revisit the site* (higher effect for the geometric product)
Coyle & Thorson (2001)	Participants were asked to explore 4 websites (in randomized order) and were instructed to explore and find out as much as possible about each site and the products described there. Each website could be explored for 3 minutes, and after each site visit, participants completed a survey.	The study comprises four experimental websites, each presenting one type of product. Products under study were videocassette movies, blues music CDs and cassette tapes, hot sauces, women's golf clothing. Two types of manipulations are present: audio and animation. The stimuli are present in a 2x2 experimental within-subjects design.	68 participants (20% students) from a large Midwestern University and the city in which the university is located.	Vividness as manipulated by audio and animation, resulted in: <ul style="list-style-type: none"> - Stronger and more enduring attitude toward the website*
Debbabi, Daassi, & Baile (2010)	Participants were invited to go to the advertising websites to view the product (and interact with it in the 3D condition). Exposure times were equal for all subjects. Afterwards, participants completed a questionnaire.	The study uses website advertisements, both in 2D (static image) and 3D (possibility to rotate, move, zoom,...) for both geometric and material products (watches and coats).	199 undergraduate and graduate students	<ul style="list-style-type: none"> - The type of product moderates the relationship between ad format and advertising effectiveness (belief confidence, attitude, attitude confidence, purchase intentions; not for belief strength)*, as the effect is more pronounced in case of the geometric product

				<ul style="list-style-type: none"> - Telepresence mediates the relationship between ad format and advertising effectiveness (belief strength and attitude toward the product), especially for the geometric product.*
Fennis, Das, & Fransen (2012)	Participants first completed a questionnaire. Then they were handed a magazine advertisement, to which they were exposed for about 60 seconds. Participants could look at and read the ad. Next, they completed a post-questionnaire.	The study considers print (magazine) advertisements with two levels of verbal vividness: vivid (i.e. colourful concrete language) vs. pallid (i.e. listing product attributes) wording for a fictional brand of frying pan in study 1. In study 2, Moët & Chandon champagne is used. The product is presented in a pallid (i.e. a picture of the bottle) and a vivid (i.e. a picture of a group of people enjoying champagne) manner.	114 participants (mainly students)	<p>Vividness positively impacts:</p> <ul style="list-style-type: none"> - Brand attitude* <p>Informational ads, contrary to transformational ads (i.e. where the experience is central) are impacted via moderation by the likelihood of individuals to experience vivid visual imagery (i.e., the propensity of an individual to experience visual imagery). The greater the likelihood of experiencing vivid visual imagery, the greater the impact of vividness on brand attitude.</p>
Jin (2009)	Participants were invited to lab computers on which Second Life was pre-installed and running and were randomly assigned to a condition. Before the exposure, they were asked to take a pre-experimental questionnaire. Then they were exposed to one of the advertisement conditions and were asked to complete a survey.	The study uses a store in a 3D virtual environment (Second Life). Manipulations included are audio-visual and resp. text-visual (i.e. an avatar either communicates with the consumer using sound or using written language). The product on sale is an Apple iPhone.	48 college students	<p>Modality richness (i.e., audio > text) results in:</p> <ul style="list-style-type: none"> - Higher purchase intentions* - More positive attitudes toward the product* - Higher enjoyment of shopping* <p>(only participants with low involvement are affected by modality richness)</p>
Keng & Lin (2006)	First, participants completed a pre-questionnaire (e.g. their gender, involvement,...). Then, participants were randomly assigned to either a search or an experience product website. After browsing this experimental advertisement, they	The study considers a webshop offering a search (wristwatch) product and an experience (notebook computer) product. This study varies vividness in different stages. The first stage contains low quality 2D images, FAQs and hyperlinks; the second level adds a	221 students	<p>Telepresence (resulting from greater vividness) results in:</p> <ul style="list-style-type: none"> - Greater subject recall* - Higher recognition * <p>(only experience goods are affected by level 3)</p>

	were asked to complete a questionnaire.	discussion forum and background music; the third level adds personal recommendations and 3D product images.		
Klein (2003)	Participants received guidelines concerning the task and computer operation, on evaluating internet advertisements across product categories. Participants then viewed two or three screens of their randomly assigned product category. Then, they were directed to the following (different) product category and again viewed two or three screens with information. Afterwards, the participants completed a survey.	The study uses an internet advertisement for wine and face cream. The information available to participants was either static (still pictures and text) or non-static (video and audio).	140 participants (mainly university staff members for study 1 (wine); 100 women (university staff and students) for study 2	Media richness creates telepresence* Telepresence positively mediates the relationship between media richness and results in: <ul style="list-style-type: none"> - Higher belief strength* - Higher attitude strength*
Li, Daugherty, & Biocca (2002)	Participants were invited to access a randomly assigned website through a lab computer to evaluate the advertised product. After, the completed a questionnaire.	The study uses a product website with an advertisement. The static, 2D version presents photographs of the products, while the 3D version allows for moving, zooming and rotating of the product. Products used were a watch (geometric) and a jacket (material).	60 undergraduate students	In comparison to the 2D-experience, the 3D-experience positively impacts: <ul style="list-style-type: none"> - Product knowledge* - Brand attitude* - Purchase intention (only for the geometric product)* - Presence mediates above mentioned factors (only true for product knowledge and brand attitude)*
Overmars & Poels (2014)	Participants were instructed to follow a link to an online questionnaire and were then randomly assigned to one of the two versions of the online store. Participants were asked to navigate to the appropriate section of the store (i.e., men's or women's apparel) to compose an outfit, with a budget of approximately 100 euro. They were also instructed to make use of the website features to explore	The study uses the non-static H&M clothing website e-shop (it is possible to judge the look on a model, match clothes and adjust viewing angles), as well as a professionally produced static version (fixed, rigid images) of the website.	771 participants, partly undergraduate students	In comparison to static websites, non-static websites lead to mental imagery processing*, which in turn positively impacts: <ul style="list-style-type: none"> - Aesthetics* - Playfulness* - Consumer return on investment* - Service excellence* Above mentioned factors contribute to Re-patronage intentions*

Helena Van Kerrebroeck, Malaika Brengman and Kim Willems (2017). "When brands come to life: Experimental research on the vividness effect of Virtual Reality in transformational marketing communications. *Virtual Reality*. DOI 10.1007/s10055-017-0306-3

	the apparel items thoroughly. Participants were in control of the length of the visit and the sequence in which they visited the online store, similar to a real situation.			
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Appendix 2. Scale items, item loadings and item validity.

Construct	Item	Statement	Loading	p-value
Vividness (Keller & Block, 1997)	V1	Not vivid/vivid	0.84	0.001
	V2	Not personal/personal	0.66	0.001
	V3	Not concrete/concrete	0.65	0.001
	V4	Not easy to imagine/easy to imagine	0.81	0.001
	V5	Not easy to relate to/easy to relate to	0.72	0.001
	V6	Not easy to picture/easy to picture	0.77	0.001
Presence (Coyle & Thorson, 2001)	T1	After watching the movie, I felt like I came back to the "real world" after a journey.	0.84	0.001
	T2	The movie created a new world for me, and the world suddenly disappeared when I left the web site.	0.83	0.001
	T3	While I was watching the movie, I felt like I was in the world The North Face created.	0.81	0.001
	T4	While I was watching the movie, I sometimes forgot that I was in the middle of an experiment.	0.80	0.001
	T5	While I was watching the movie, my body was in the room, but my mind was inside the world created by The North Face.	0.85	0.001
	T6	The world generated by The North Face seemed to me only "something I saw" rather than "somewhere I visited".	/	/
	T7	While I was watching the movie, the world generated by The North Face was more real or present for me compared to the "real world".	0.61	0.001
	T8	While I was watching the movie, my mind was in the room, not in the world created by The North Face.	/	/
Attitude toward the ad (Homer, 1990)	AAD1	Positive/negative	0.88	0.001
	AAD2	Favourable/unfavourable	0.83	0.001
	AAD3	Interesting/uninteresting	0.87	0.001
Brand attitude (Homer, 1990)	BA1	Like/dislike	0.89	0.001
	BA2	Favourable/unfavourable	0.88	0.001
	BA3	Good/bad	0.90	0.001
Purchase intention (Homer, 1990)	PI1	Likely/unlikely	0.98	0.001
	PI2	Probable/not probable	0.98	0.001

Appendix 3. Discriminant validity.

	Aad	Ab	PI	Presence	Vividness
Aad	0.74*				
Ab	0.21	0.79*			
PI	0.07	0.32	0.96*		
Presence	0.25	0.21	0.23	0.63*	
Vividness	0.38	0.15	0.07	0.32	0.56*

Note. Grey shaded values are the AVE; other values are the squares of the path coefficients.