Present it like it is here: Creating local presence to improve online product experiences

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A B S T R A C T

Advanced online product presentation technologies such as virtual mirrors enable consumers to experience products like they are actually present with them in the real world. This study is one of the first to address the mechanism underlying this phenomenon. Inspired by literature on media technology the concept of *local presence* is put forward and applied to the online consumer behavior domain. A key objective of this paper is to examine whether local presence adds to our understanding of how emerging product presentation formats influence online product experiences. To this end, a laboratory experiment ($N = 366$) was conducted with product presentation format as a three level (pictures, 360-spin rotation, and virtual mirror) independent variable, allowing for a comparison of the effectiveness of different presentation formats in creating perceptions of local presence. As a second objective, the influence of local presence on perceptions of product tangibility and product likability, two key facets of the online product experience, were assessed. The results, obtained with the use of analysis of variance and partial least squares modeling, show the superiority of the virtual mirror in creating local presence, and demonstrate that local presence is highly predictive of product tangibility and product likability. Theoretical and managerial implications are discussed.

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1. Introduction

Research has highlighted the importance of technology in providing a convincing experience of products in online shopping situations. Different product presentation formats, such as high and low quality pictures (Jeong, Fiore, Niehm, & Lorentz, 2009), product rotation applications (Jiang & Benbasat, 2007a), and online product trial (Jiang & Benbasat, 2007b) have been demonstrated to make consumers experience products online in a rather realistic way, hereby influencing consumers' product understanding (Jiang & Benbasat, 2007a), moods, and purchase intentions (Jeong et al., 2009; Park, Lennon, & Stoel, 2005). As explanatory mechanism for the relationships between these product presentation formats and their behavioral outcomes, telepresence has been put forward as intermediate variable (Fiore, Kim, & Lee, 2005; Mollen & Wilson, 2010). Referring to the experience of "being there" in a computer-mediated environment (cf. Mollen & Wilson, 2010), telepresence has successfully been used to explain how product presentation formats let consumers perceive products in online environments, and thereby lead to positive online

product experiences (Coyle & Thorson, 2002; Kim & Biocca, 1997; Klein, 2003; Rodríguez-Ardura & Martínez-López, in press).

Despite the progress made in the research field, recent advances in online product presentation technologies suggest that another form of presence has come to play, which brings different perspective to how consumers experience products when shopping online. In particular, we refer to the rise of a category of online product presentation formats that stands out because they provide consumers with the illusion that the product is actually present with them in the real world. Virtual online fitting rooms, for example, enable consumers to see how clothing looks by letting them customize a virtual mannequin to their own body sizes and shapes (adidas.com; stylefruits.co.uk). More technologically advanced examples include augmented reality applications such as virtual mirrors and product visualization apps. On the website of eyewear brand Ray-Ban visitors can make use of a virtual mirror to see what glasses look like on their own face in real time, with the use of their webcam (ray-ban.com). Comparably, though more focused on the consumption setting, by using an app on their smartphone or tablet consumers can visualize how furniture looks into their home before making buying decisions (thefurnishapp.com).

What these emerging product presentation formats have in common is that they give consumers a product experience that resembles physical settings (Cho & Schwartz, 2012) as if the

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product is locally present. This is a significant change compared to more established product presentation formats (e.g., static pictures, video) that mainly have been applied to enable consumers to experience products as realistically as possible in online environments, that is, to generate telepresence of products (Klein, 2003; Mollen & Wilson, 2010). Emerging product presentation formats like virtual mirrors though, are designed to create the illusion of the product being present in the consumer's physical environment. This calls for another concept explaining the influence of online product presentation formats. In this paper we label this concept as *local presence* (*LP*).

The main goal of this study is to propose and validate the concept of LP as explanatory mechanism underlying the influences of product presentation formats on online product experiences. Drawing upon the research on media technology and human–computer interaction (e.g., Benyon, 2012; Floridi, 2007), we aim to bring LP to the field of online consumer behavior research and test its predictive validity in terms of the consumer's online product experience. To study this predictive power two key facets of the online product experience are adopted: product tangibility (PT) and product likability (PL). The decision to include these two facets is supported by previous literature (Chowdury, Olsen, & Pracejus, 2011; Jiang & Benbasat, 2007b) claiming that product experiences consist of cognitive (PT) and affective reactions (PL). Furthermore, enhancing the perceived tangibility of products and adding positive emotions to online shopping experiences seems to tap directly into one of the major challenges that online retailers face to overcome; the disadvantages of the computer-mediated and distant communication via the Internet. Thus, the inclusion of PT and PL also adds to the external validity of our study.

The intended contributions of this study are threefold. First, we propose and empirically validate the concept of LP as a mechanism that explains how product presentation formats may enhance online product experiences. As such, we aim to generate new insights. Second, this study compares the effectiveness of pictures and 360-spin rotation as rather conventional product presentation formats vs. the relatively new and emerging product presentation format *virtual mirror* in generating LP. Pictures and 360-spin applications are prominently available in online retail settings making an examination worthwhile. Virtual mirrors are an upcoming format and are increasingly adopted by large online industries such as fashion, jewelry, clothing, shoes, and cosmetics, which make their examination of particular interest. Third, the derived insights of our study aim to serve online retailers in improving the consumer experience of their products. Understanding will be generated about the importance of LP for online product presentation in making products to be experienced as more tangible and likable. Also, knowledge will be gained about the potential of three product presentation formats (pictures, 360-spin, virtual mirror) in driving LP. The combined insights will assist online retailers in understanding and deciding on the use of the online product presentation formats under study.

The remainder of this paper is organized as follows. In the next section, we provide a conceptual background for our study and elaborate upon the LP concept. We then proceed by developing our research model and introducing the hypotheses. In the subsequent section we describe the methodology used to test the research model and present the empirical results of the study. The paper concludes with a discussion of the implications of our findings and suggests avenues for future research.

2. Conceptual background

2.1. Online product experience

Consumers' experiences with products can vary on a continuum ranging from direct to indirect (Fazio & Zanna, 1981; Mooy & Robben, 2002). Seeing a product in an advertisement is less direct than actual product trial, and viewing a product video on a website is more direct than reading a product description online. General consensus in marketing research is that direct experience is superior to indirect experience (Hamilton & Thompson, 2007). Empirical research consistently supports this notion: product trials produce higher levels of message acceptance and more consistency between consumers' attitudes and subsequent behavior than exposure to advertising messages (Smith & Swinyard, 1982, 1983) or verbal descriptions of products (Fazio & Zanna, 1978, 1981).

In the context of online shopping, indirect experiences are usually the only product experience consumers can rely on before making actual purchase decisions. Convincingly communicating all the qualities of products in an online environment is therefore as important as it is challenging. To meet this challenge, online retailers continuously apply more advanced product presentation formats. Compared to the static picture and plain text formats that were dominant during the early years of online retailing, more recent product presentation formats, such as video and 360-spin rotation depict product information in a more "realistic" manner. They provide a product experience that seems more direct, by enabling consumers to virtually "feel, touch, and try" products (Jiang & Benbasat, 2005; Li, Daugherty, & Biocca, 2001; Suh & Lee, 2005). To describe the degree to which an online product experience appears more direct rather than mediated, this research draws upon the concept of presence.

2.2. Presence

The concept of presence has a history of conceptualizations in multiple disciplines, including media technology, human–computer interaction, and computer science (for an overview see Lee, 2004). Presence can be defined as the observation of an individual experiencing physical things (e.g., objects, activities, persons, oneself) in one's environment (Benyon, 2012; Floridi, 2007; Steuer, 1992). Driven by the rise of emerging applications such as online social networks, teleconferencing, multi-media product visualizations, and virtual worlds, most scholars have conceptualized presence as telepresence, which defines as the sense of "being there" within a mediated environment (Spagnolli, Lombard, & Gamberini, 2009; Steuer, 1992). From this school of thought the focus of study has been on how emerging technologies provide users with feelings of immersion in an online environment and the illusion of non-mediation (e.g., Haans & Ijsselsteijn, 2012; Mollen & Wilson, 2010; Rodríguez-Ardura & Martínez-López, in press; Suh & Chang, 2006; Sukoco & Wu, 2011). While the progress made in the field is noteworthy, recent advances in the research field indicate that conceptualizing presence as telepresence seems rather one-sided given that telepresence solely focuses on users' sense of (objects) being present within virtual settings (cf. Lombard & Ditton, 1997; Loomis, 1992; Steuer, 1992). As such, this conceptualization does not account for experiences generated by technologies that aim to accomplish the opposite, namely, to bring a part of the virtual environment to a users' physical setting (e.g., virtual mirrors). In the present study, we focus on the type of presence that brings objects from another place to a media user's environment. We refer to this type of presence as LP.

The concept of LP is not entirely new; to some extent it has been mentioned in existent presence literature, where it has been described as a sense of "it is here" (e.g., Lombard & Ditton, 1997; Spagnolli et al., 2009). Still, a clear definition of the concept has, to the best of our knowledge, been lacking. To define the concept we draw upon the studies of Floridi (2007), Spagnolli et al. (2009), and Benyon (2012). In these studies the authors view presence as a rather generic, less environment-specific concept and accordingly define it as the observation of an individual

experiencing physical things (e.g., objects, activities, persons, oneself) in one's environment, as such combining presence with a direct simulated physical experience. We adopt this view and apply it to the current research context. Accordingly, LP is defined here as the perception of an individual experiencing physical things presented online (e.g., objects, activities, persons, oneself) as actually being there with him/her in one's offline environment. Being situation specific and context dependent, LP is specified as an individual's psychological state, which is likely to vary across situations and over time (cf. MacKenzie, Podsakoff, & Podsakoff, 2011). Furthermore, as in prior literature no indications were found for LP to exist of multiple distinct characteristics, we conceptualize LP as single dimensional construct. Finally, in line with its focus on a perceived experience, which is the outcome of a psychological process, we follow Howell, Breivik, and Wilconx (2007) and Hardin, Chang, and Fuller (2008) and conceptualize LP as reflective construct.

3. Model construction and development of hypotheses

Fig. 1 shows our conceptual model. LP constitutes the heart of the model. The conventional presentation formats, pictures and 360-spin rotation, and the upcoming presentation format, the virtual mirror, are modeled as drivers of LP.

To assess the predictive influence of LP in determining online product experiences LP is modeled as determinant of PT and PL. Our decision to include PT and PL as key facets of online product experience was based upon numerous studies into how consumers process product presentations (Chowdury et al., 2011; Jiang & Benbasat, 2005, 2007b; Parboteeah, Valacich, & Wells, 2009); all suggesting that product presentations may trigger both cognitive and affective product reactions. PT refers to the extent to which a product is accessible to the senses, has precisely identifiable definitions, features and outcomes, and is easy to grasp mentally (Laroche, Bergeron, & Goutaland, 2001; Laroche, Yang, McDougall, & Bergeron, 2005). PT is dominantly cognitive in nature. PL on the other hand, is principally affective in nature and can be defined as the extent to which a product has the potential to elicit a positive emotional response in the average consumer (Chaudhuri & Holbrook, 2001, p. 82). Finally, adding to the managerial relevance of our research, purchase intentions complete

the model. In the below we will elaborate on all research constructs and their proposed interrelationships.

3.1. Influence of product presentation formats on local presence

Pictures, 360-spin applications, and virtual mirrors aim to provide the consumer with an optimal product experience. Still, the differences between these three product presentation formats are substantial, which is likely to lead to different perceptions of LP. To substantiate this statement we make use of two aspects that are indicative for the richness of product presentation formats in conveying information: *feedback* and *cue multiplicity* (Daft & Lengel, 1984; Daft, Lengel, & Trevino, 1987; Jahng, Jain, & Ramamurthy, 2002).

Feedback refers to the ability of a format to support rapid bidirectional communication (Dennis & Valacich, 1999). The feedback ability of pictures is very limited, whereas the 360-spin format allows the consumer to use their input device (e.g., mouse, keyboard, touchpad) to modify the display of the product and receive real-time feedback on this modification. As such, the 360-spin format allows the consumer to inspect the product in such a way that it, at least to some extent, resembles product inspection in unmediated settings. In comparison, virtual mirrors provide the most elaborated feedback mechanism as they provide consumers with the option to use both their input device and their 'active' body gesture to control the product presentation and receive real-time feedback on their modifications. This feedback not only concerns the product but also the consumer with the product, hereby approximating the experience of the product as if it is actually there with the consumer.

Cue multiplicity equals the number of ways in which information is communicated (Dennis & Kinney, 1998). In online product presentation settings these cues can be divided into product visualization and product experience cues (Jahng et al., 2002). Applied to the three formats in our study, pictures provide static visual information about the product itself, but hardly any product experience cues as the experience of the product mainly is left for one's imagination. 360-spin formats, in comparison, visualize the product from different angles and allow the consumer to actively inspect the product on screen. As such, they not only provide more product cues than pictures do, but also offer some product experience cues that
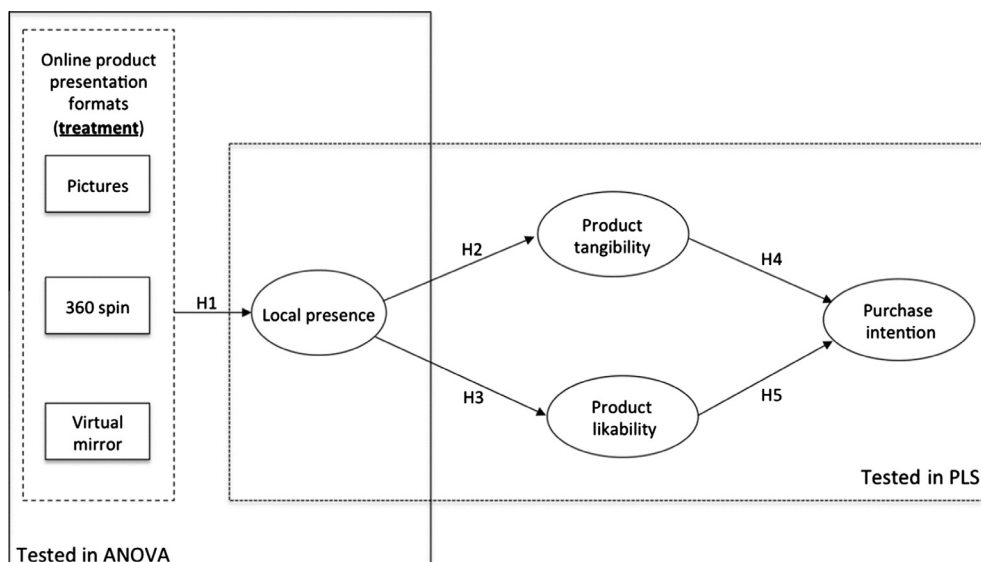

Fig. 1. Conceptual model.

consumers typically would perceive when the product is in close proximity. Virtual mirrors, finally, outperform the 360-spin format in cue provision. They enable consumers to see the product from different angles but, facilitated by using body gestures as input, also to see the product together with themselves, in any wanted on-screen position. Furthermore, the real-time feedback nature of virtual mirrors implies that they provide consumers with experience cues that compare to product trial in physical shopping settings.

Based on the above, it seems safe to conclude that product presentation formats that offer more cues provide consumers with more product information (Dennis & Kinney, 1998; Lim & Benbasat, 2000), thereby allowing consumers to perceive products in a way that resembles actual, unmediated product inspection. Applied to the three formats under study, this leads to the following hypothesis:

H1. Virtual mirrors will elicit a higher perception of local presence compared to 360-spin rotation, which, in turn will elicit a higher perception of local presence than pictures.

3.2. Influence of local presence on product tangibility and product likability

The mediated nature of online shopping puts constraints on the extent to which consumers can explore and experience products. As argued in this paper, however, by generating perceptions of LP these constraints can be decreased, as consumers will be able to perceive products in higher proximity. In terms of product experience this has two consequences.

First, when a product presentation format is able to provide a sense of presence it allows the consumer to inspect the product in a way that resembles physical product trial (cf. Grigorovici & Constantin, 2004). In terms of consumer information processing this entails that more product attributes become accessible through the senses (Biocca & Delaney, 1995), grasping and comprehending the product mentally requires less effort (Klein, 2003; Li et al., 2001), and that some sense-accessible product attributes actually may be perceived as physical (Laroche et al., 2001). As a consequence, echoing Laroche et al. (2001, 2005), consumers will perceive and evaluate the presented product as more tangible. Therefore, we postulate:

H2. Increased local presence will increase product tangibility.

Second, following studies in the field of consumer behavior (e.g., Peck & Childers, 2003), the more direct sensory feedback a consumer gets when experiencing a product the more positive feelings toward this product will be developed. In addition, prior research indicates that consumers like products better when they interact with them in a direct manner, as the proximity of products enhances the intensity of positive affect experienced (Shiv & Fedorikhin, 1999). When extrapolating these findings to the current research context, it seems safe to assume that when LP for a product is created, consumers will be more intended to like this product. Further support for this assumption is provided by studies into hedonic consumption, demonstrating that consumers seek for hedonic sensations via multisensory cues when shopping online (Childers, Carr, Peck, & Carson, 2001; Van der Heijden, 2004). From this perspective, perceiving a sense of LP when shopping online can be seen as a hedonic sensation. When facing such a hedonic sensation consumers tend to attribute their positive feelings to it and develop favorable feelings toward the product displayed to them (Menon & Kahn, 2002). Again, this makes it conceivable to expect that LP will lead to higher PL. Taken the above together, we hypothesize:

H3. Increased local presence will increase product likability.

3.3. Influence of cognitive and affective responses on online purchase intentions

As a basis to relate PT and PL to online purchase intentions, we draw upon the cognitive-affective framework (Ajzen, 2001), the independency hypothesis (Zajonc & Markus, 1982), and the consumer response system (Hirschman & Holbrook, 1982). These paradigms share the view that cognition and affect simultaneously lead to behavior; a view that has been adopted by multiple studies into online consumer behavior (e.g., Jiang & Benbasat, 2007b; Park et al., 2005; Van der Heijden, Verhagen, & Creemers, 2003). In line with these studies we use the online purchase intention as behavioral proxy and assume that both cognition and affect function as determinants. At the construct level this implies that we propose PT and PL to influence the online purchase intention. Specific support for this influence of PT is found in the marketing literature where higher levels of PT have been associated with more easy consumer decision-making and higher purchase probabilities (e.g., Hartline & Jones, 1996; Storey & Easingwood, 1998; Zeithaml, 1988). Regarding the influence of PL on the online purchase intention, we follow Suwelack, Hogreve, and Hoyer (2011) who, drawing upon Schwarz and Clore (1983), applied the 'How-do-I-feel-about-it' heuristic to relate the positive emotion liking to the purchase intention. Following this heuristic consumers heavily base their purchase intentions on their feelings toward the product under consideration. Together, the above justifies the following hypotheses:

H4. Increased perceptions of product tangibility will increase purchase intention.

H5. Increased product likability will increase purchase intention.

4. Method

To test our hypotheses data were collected through a laboratory study with an exploratory experimental design (N = 366). The goal of the experiment was to create an environment that inspired participants to envision themselves an online purchase setting.

4.1. Experimental task

The decision task was to select a pair of sunglasses that participants would consider purchasing. In the introduction of the task the participant were instructed to imagine oneself to be consumers looking for a pair of new sunglasses on the web shop of Ray-Ban (www.Ray-Ban.com). The independent variable in this study was product presentation format, which consisted of three values: pictures, 360-spin rotation, and a virtual mirror. Participants were randomly assigned to one of these three formats, which resulted in three experimental groups of 122 participants. The participants were specifically instructed to select a pair of sunglasses on this site that they would consider purchasing, using only the presentation format that was assigned to them.

4.2. Treatments

The existing Ray-Ban web shop was used to fulfill the decision task. The actual web shop could be used because, apart from the product presentation formats, the layout and functionality of the website remained constant for all three conditions.

To control for confound effects due to different choice sets, we selected the common denominator of sunglasses available in all three presentation formats. From this set, based on rigorous

pre-testing, ten pairs of glasses were selected; five models suited for women and five models suited for men. All male participants were shown the same five pairs of glasses pre-selected for males, and all female participants were exposed to the five models pre-selected for women. To avoid price-based preferences, the sunglasses were all the same price. Prior to every session of the experiment the supervisors made sure that the relevant set of five sunglasses was ready to be selected in a web browser. Five browser tabs were used to present the sunglasses to the participants. Depending on the condition assigned to, the tabs confronted the participants with the sunglasses in either the picture, 360-spin rotation or virtual mirror format. Using tabs not only facilitated easy browsing between the sunglasses but also prevented that participants would browse freely through the web shop and have any kind of interaction with the sunglasses in a presentation format not assigned to.

In the pictures condition, participants could inspect the glasses by looking at pictures of the different models. They could not zoom in on the images. The 360-spin condition allowed participants to virtually rotate images of the different glasses with the use of their mouse. In the virtual mirror conditions participants could virtually try the different glasses. In this condition a webcam and the virtual mirror application were used to recognize the participant's facial features in the webcam footage. The application visually superimposed images of a selected pair of glasses over the webcam image of the participant's face. As such participants could see what the glasses looked like on their own face in real time. The application even allowed them to move their head to inspect the glasses from various angles. Configuration of this application was a seamless process, guided by instructions given by the application. None of the participants reported problems in this configuration process.

4.3. Experimental procedures

Upon entering the lab setting, participants were randomly assigned to one of the three conditions and received instructions about the shopping task from the instructors. To avoid differences across sessions, the same instructors supervised all the sessions, operating according to a strict script. The supervisors informed the participants about the general procedures. The participants were asked to inspect the choice set prepared for them in the five tabs of the web browser and choose their favorite pair of sunglasses accordingly.

The experimental task was executed on a computer situated in an individual cubicle. During the sessions the instructors were available to answer questions and when needed to help participants in a way that did not intervene with the objectives of the experiments. Participants were told to raise their hand when they decided which pair of sunglasses to choose. The instructors then recorded the model of choice for each participant and set up the online post-experiment questionnaire. After participants filled out the online questionnaire they were debriefed and thanked for their participation.

4.4. Participants

Participants were undergraduate and graduate students from a mid-sized university in The Netherlands, and were recruited at the university's study facilities. Participation was voluntary. To enhance involvement and make sure that decision makers took the experimental online shopping task seriously, participants could win the pair of sunglasses selected in the decision task. A pair of Ray-Ban sunglasses was raffled among the participants. A total of 366 participants successfully completed the experimental task (see Table 1).

4.5. Pretests

The experimental setup was developed over the course of a number of trials. Preliminary tests were done on the instructions, online survey, and three conditions (pictures, 360-spin rotation, and virtual mirror). The pretests revealed that some phrasing had to be translated differently for better overall understanding. The results of the pretest were mostly as expected. Sunglass styles were also analyzed in order to control for preference. Pretest participants were further interviewed to make sure the five sunglass choices included a pair that students really liked and would thus motivate them to win in a raffle. This extra analysis also controlled for confound effect.

4.6. Measures

Seven-point multi-item measures were used to measure the research constructs (Likert scaling, 1 = totally disagree, 7 = totally agree). The selected items were taken from established measurement instruments that have been validated in prior studies. Some of the items were slightly adapted to make them more applicable to the context of our study. The constructs LP, PL, and purchase intention were measured as first-order reflective variables. The construct PT was, based on previous literature (e.g., Laroche et al., 2001, 2005), operationalized as a three-dimensional construct consisting of the dimensions physical tangibility, which is the extent to which a product has a physical presence and is accessible to the senses, specificity, which is the consumer's ability to define or describe a particular product, and mental tangibility, which refers to the ease to grasp the product mentally. Following the focus of our research on PT as an abstraction of consumers' cognitive reactions to online product presentations, PT was structured as a higher-order construct. In line with recent methodological insights (e.g., Becker, Klein, & Wetzels, 2012; MacKenzie et al., 2011) we specified the model structure as a second-order formative construct with the three dimensions as indicators. Each of the three dimensions was measured with multiple reflective indicators (MacKenzie et al., 2011, p. 311). The formative approach is one of the most common ways to measure higher-order constructs (Becker et al., 2012), has received wide support within the academic literature (e.g., Cameron & Webster, 2013; Pavlou & Fygenson, 2006; Xu, Teo, Tan, & Agarwal, 2012), and has been demonstrated to be more valid when measuring higher-order models than reflective approaches (see Lee & Cadogan, 2013). Table 2 provides an overview of the instruments used and Table 3 shows the average scores across the different experimental conditions.

5. Data analysis and results

The data were analyzed using analysis of variance (ANOVA) and Partial Least Squares modeling (PLS). ANOVA (IBM SPSS statistics) was conducted to assess the effects of the experimental conditions (the three product presentation formats) on LP. PLS (SMART PLS, Ringle, Wende, & Will, 2005) was applied to test the remainder of the conceptual model.[1] The use of PLS seemed justified as this type of analysis is highly suitable when the research has exploratory characteristics, is mainly predictive, and is applied in a field where theoretical knowledge is limited (Ringle, Sarstedt, & Straub, 2012). Also, PLS is suggested in situations where higher-order formative constructs are part of the conceptual model (Wetzels, Odekerken-Schröder, & Van

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[1] Initially, we planned to use covariance-based structural equation modeling. A first analysis (Amos, maximum likelihood) however, demonstrated a lack of fit with the data. In such situation, PLS is an acceptable and rather robust alternative as it has fewer assumptions about the distribution and normality of the data (Gefen, Ridgon, & Straub, 2011; Hair, Ringle, & Sarstedt, 2011).

Table 1
Participant characteristics and descriptive measures (N = 366).

	% of respondents (n)			% of respondents (n)	
Age			Last time participant bought sunglasses		
15–19	20.2%	(74)	Never	4.1%	(15)
20–24	59.8%	(219)	Last year	54.1%	(198)
25–29	16.4%	(60)	Last three months	18.9%	(69)
30–34	1.6%	(6)	Last month	18.0%	(66)
>35	1.9%%	(7)	Last week	4.9%	(18)
Gender			Familiarity with Ray-Ban brand		
Male	48.8%	(178)	Yes	92.6%	(339)
Female	51.4%	(188)	No	7.4%	(27)
Experience with Internet[a]			In possession of Ray-Ban sunglasses		
Very inexperienced	0.0%	(0)	Yes	33.9%	(124)
Inexperienced	0.0%	(0)	No	66.1%	(242)
Neutral	16.1%	(59)			
Experienced	50.3%	(184)			
Very experienced	33.6%	(123)			
Experience with online shopping[a]			Frequency of visiting Ray-Ban website		
Very inexperienced	2.2%	(8)	Never	63.7%	(233)
Inexperienced	11.5%	(42)	Once a year	28.1%	(103)
Neutral	28.7%	(105)	Once a month	6.8%	(25)
Experienced	38.5%	(141)	Once a week	1.4%	(5)
Very experienced	19.1%	(70)	Every day	0.0%	(0)

[a] Self-reported experience.

Table 2
Convergent validity and reliability statistics (N = 366).

Construct	Items	Cronbach's alpha	Composite reliability	AVE
Local Presence (LP) (Juan & Joele, 2011; Klein, 2003; Slater, Usoh, & Steed, 1994)	LP1: The experience I had on this website was similar to memories of experiencing the product in reality LP2: I experienced the product on the website like they were in the real world LP3: During my experience on the website the product seemed to me "something in reality" rather than "something in a virtual environment" LP4: While I was on the website the products were as present to me as in the "real world"	0.93	0.92	0.81
Product Likability (PL) (Beatty & Ferrell, 1998; Laros & Steenkamp, 2005)	PL1: I felt excited about the sunglasses PL2: I felt enthusiasm toward the sunglasses PL3: I felt proud toward the sunglasses PL4: I felt inspired toward the sunglasses	0.90	0.91	0.79
Physical tangibility (PT) (Laroche et al., 2005)[a]	PT1: It seemed like I could touch the sunglasses PT2: It seemed like I could grasp the sunglasses PT3: It seemed like the sunglasses were physically tangible	0.97	0.98	0.94
Mental tangibility (MT) (Laroche et al., 2005)[a]	MT4: I have enough information about the sunglasses to get a good idea of what they are MT5: It is easy to think about the sunglasses on the website MT6: It is clear to picture the sunglasses	0.88	0.93	0.80
Specificity (SP) (Laroche et al., 2005)[a]	SP7: It is easy to describe many characteristics of the sunglasses on the website SP8: I can easily explain the characteristics of the sunglasses on this website SP9: I is not difficult to give a precise description of the sunglasses on this website	0.84	0.91	0.76
Purchase Intention (PI) (Verhagen & Van Dolen, 2011)	PI1: It is likely that I will soon buy sunglasses via this web site. PI2: It is likely that I will purchase sunglasses from this website in the future. PI3: It is likely that I will return to this website	0.83	0.83	0.75

[a] First-order dimensions that function as formative indicators of the second-order construct product tangibility.

Oppen, 2009). Given that the present study is the first to test the concept of LP in the context of a rather unexplored new product presentation format (virtual mirror), and includes the higher-order formative construct PT, PLS seemed an appropriate choice here.

5.1. Measurement validation

PLS was used to test the adequacy of the measurement model. We first investigated the convergent validity and measurement reliability of the reflective measures by computation of Cronbach's alphas,

composite reliabilities and Average Variance Extracted (AVE) (see Table 2)[2]. The results confirmed the convergent validity of the measures. All scores exceeded accepted criteria (factor loadings: 0.70; alphas: 0.80; AVEs: 0.50). As all Cronbach's alphas and composite reli-

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[2] The three reflectively measured dimensions of the higher-order construct product tangibility were also part of this stage of the analysis. Following Mackenzie et al. (2011) and Becker et al. (2012) this is a prerequisite when validating and constructing formative higher-order latent constructs that contain reflectively measured dimensions.

Table 3
Descriptives (*N* = 366).

	Total (*N* = 366)	Pictures (*N* = 122)	360-spin (*N* = 122)	Virtual mirror (*N* = 122)
Local presence	3.76 (1.65)	2.99 (1.43)	3.55 (1.40)	4.74 (1.60)
Product Likability	4.27 (1.46)	3.59 (1.47)	4.50 (1.30)	4.72 (1.35)
Physical tangibility[a]	3.73 (1.81)	2.79 (1.53)	3.34 (1.50)	5.06 (1.57)
Mental tangibility[a]	5.02 (1.32)	4.29 (1.48)	5.08 (1.19)	5.69 (0.81)
Specificity[a]	4.76 (1.32)	4.10 (1.45)	4.69 (1.11)	5.48 (0.97)
Purchase intention	3.98 (1.41)	3.39 (1.42)	3.93 (1.35)	4.63 (1.17)

Note: Standard deviations are shown in parentheses.
[a] First-order dimensions that function as formative indicators of the second-order construct product tangibility.

Table 4
Discriminant validity: AVE's vs. squared cross construct correlations (*N* = 366).

	Local Presence	Physical tangibility	Mental tangibility	Specificity	Product likability	Purchase intention
Local presence	**.81**					
Physical tangibility[a]	.59	**.94**				
Mental tangibility[a]	.37	.37	**.81**			
Specificity[a]	.35	.38	.61	**.76**		
Product likability	.25	.28	.26	.23	**.79**	
Purchase intentions	.25	.26	.24	.18	.36	**.75**

Note: The bold scores on the diagonal are the AVEs of the individual constructs. Off diagonal values are the squared correlations between the constructs.
[a] First-order dimensions that function as formative indicators of the second-order construct product tangibility.

ability scores exceeded 0.70, and all AVEs surpassed the 0.50 guideline, acceptable reliability of the measures also was demonstrated. We then tested for discriminant validity of the reflective measures by comparing the AVE of each construct with its squared correlations with other constructs (Table 4). As none of the squared correlations between two constructs exceeded the AVE of each of these constructs, the results confirmed discriminant validity.

We then used PLS to validate and construct the formative second-order construct PT. Following Becker et al. (2012) a two-step approach was used. This approach, which has been applied in the information systems field by other scholars before (e.g., Cameron & Webster, 2013; Pavlou & Fygenson, 2006; Xu et al., 2012), is deemed most useful when the researcher is interested in the higher-level estimates, that is, the paths to and from the higher-order construct, as opposed to the paths to and from the separate dimensions. As a first step, we estimated the latent variable scores of the first-order dimensions (mental tangibility, physical tangibility and specificity) in a separate PLS model without their second-order construct (PT). The model related the three first-order tangibility dimensions with their reflective measurements to the other reflectively measured latent variables in our conceptual model (cf. Becker et al., 2012). In step two, we used the estimated latent variable scores of the three first-order dimensions as formative indicators for the second order construct (PT) in a separately estimated PLS model. We assessed the validity of each sub-dimension as a formative indicator of the second-order construct by examining the strength and significance of the relation between each of these three sub-dimensions and the second-order construct. The path weights were 0.24 (*p* < .001) for mental tangibility, 0.76 (*p* < .001) for physical tangibility, and 0.12 (n.s.) for specificity. MacKenzie et al. (2011) recommend that formative indicators of a second order construct that do not have strong and significant loadings on their second order construct are eliminated. Therefore, we dropped the dimension specificity as a formative indicator of PT, which left us with a second order variable PT with two formative indicators, mental tangibility (weight = 0.30 *p* < .001) and physical tangibility (weight = 0.79, *p* < .001). Finally, we computed the variance inflation factor (VIF) scores of each of the indicators to check for multicollinearity. As the VIF scores were below the cutoff value of three (Petter, Straub, & Rai, 2007) we concluded that multicollinearity was not a problem in our data.

5.2. Test of structural model

To test whether different product presentation formats elicited different perceptions of LP, a unifactor ANOVA (product presentation format: pictures vs. 360-spin vs. virtual mirror) was conducted in SPSS, using LP as a dependent variable. This analysis showed significant differences between the three product presentation formats ($F(2,363) = 44.27$, $p < .001$, $\eta^2 = .20$). Post hoc analysis showed that participants in the virtual mirror condition perceived their product presentation format as significantly more locally present ($M = 4.74$, $SD = 1.60$), compared to participants in both the picture ($M = 2.99$, $SD = 1.42$) and the 360-spin condition ($M = 3.55$, $SD = 1.40$, $p < .001$ and $p < .001$ respectively, see Fig. 2). There was also a significant difference in perceptions of LP between the picture ($M = 2.99$, $SD = 1.42$) and 360-spin ($M = 3.55$, $SD = 1.40$) conditions ($p < .05$), in the expected direction. According to these results, the first hypothesis was accepted.

We then applied PLS (bootstrapping, 500 subsamples) to estimate the remaining of the structural model and test the hypotheses two through five. The path coefficients (β) and R^2 values of the structural model are shown in Fig. 3. The structural model showed that all of hypotheses two through five were accepted. As predicted, higher levels of LP increased participants' beliefs about PT ($\beta = .77$, $p < .001$). An impressive 58% of the variance in PT was explained by this factor. Furthermore, the more locally present the presentation format was perceived, the more participants liked the product ($\beta = .50$, $p < .001$). LP accounted for 25% of the variance in PL. PT and PL, in turn, positively affected participants' purchase intentions for the product (respectively $\beta = .31$, $p < .001$ and $\beta = .42$, $p < .001$). Together, these factors explained 42% of the purchase intention variance. Based on these results, we accept hypotheses two through five.

6. Discussion and conclusion

6.1. Summary and key findings

This research advocates LP as explanatory mechanism to grasp how product presentation formats may improve online product experiences. We assessed the extent to which different product
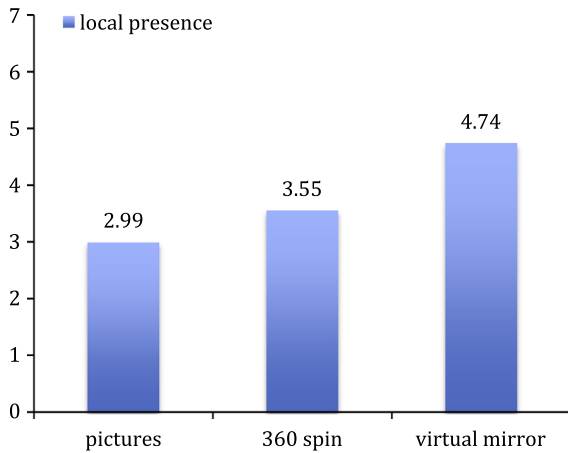
Fig. 2. Means for perceived local presence per condition.

presentation formats (pictures, 360-spin applications, and virtual mirrors) convey perceptions of LP, and estimated the influence of LP on PT and PL as facets of the online product experience, and thereof online purchase intentions. The empirical analyses yield three interesting key findings.

First, the present study shows that virtual mirrors are a promising new product presentation format that makes consumers perceive products presentations significantly more locally present compared to the 360-spin and picture format. Only a few empirical studies so far have investigated the potential of virtual mirror technology in online retailing (Cho & Schwartz, 2010, 2012; Merle, Senecal, & St-Onge, 2012; Smith, Johnston, & Howard, 2011), but as far as the authors of this paper are aware, none has systematically compared the effects of web cam based virtual mirrors with more established product presentation formats.

Second, the results demonstrate that LP is strong determinant of consumer online product experiences. LP explained a high amount of the variance of PT and a substantial amount of the variance of PL. These findings underline the relevance of generating feelings of LP when optimizing online product experiences and as such highlight the predictive validity of the LP concept.

Third and finally, the results of the analysis demonstrate that both PT and PL translate into online purchase intentions, and therefore may be indicative for future online purchase behavior (cf. Fishbein & Ajzen, 2010). As such, this finding seems to emphasize the value of adopting a view on online product experiences that includes facets traditionally associated with the limitations

of buying products in online environments (i.e., the tangibility of products and the extent to which these products can be experienced emotionally). The rise of new online product presentation formats that bridge the gap between virtual and real environments seems thus to justify the inclusion of these facets when studying online product experiences and their consequences.

6.2. Theoretical implications

This study has several implications for the online product experience literature (e.g., Coyle & Thorson, 2002; Jiang & Benbasat, 2005, 2007a, 2007b). First and foremost, it proposes and validates the concept of LP as explanatory mechanism between product presentation formats and online product experiences. Not only do the findings of this study imply that new online product presentation formats may provide consumers with the illusion that products are actually present in the real world, they also suggest that LP translates into how tangible and likable consumers experience these products online. As such, and acknowledging the rise of new online product presentation formats such as virtual mirrors, LP seems a viable conceptual extension to the research field.

Second, we demonstrate that product presentation formats may generate perceptions of LP. At the more abstract level, this findings entails that online retailers can make use of web-based technology to bridge the gap from the online to the offline world. This insight sheds new light on crossing the boundaries between offline and online consumer experiences (cf. Benyon, 2012). Prior research has studied this topic by adopting a telepresence view, that is, a study into the options to use web-based technology to transpose part or all of an individual's offline experience to computer mediated environments (Klein, 2003; Mollen & Wilson, 2010). We put the limitation of this view into perspective by demonstrating that web-based technology may also be used with the purpose to present products online to have them experienced as locally present, hereby enriching product experiences and stimulating online purchase behavior.

Third and finally, we validate that LP triggers both cognitive and affective product responses. The use and validation of PT and PL as typical cognitive and affective responses supports this notion and also shows researchers the value of combining these two concepts. PT has been tested mainly in research that adopts a cognitive lens to study online consumer behavior (Laroche, Nepomuceno, & Richard, 2010; Laroche et al., 2001, 2005). PL on the other hand taps into the emotional domain of online consumption (e.g., Éthier et al., 2008; Koo & Ju, 2010). Apparently, integrating both concepts helps us to obtain a fuller picture of the role of cognition
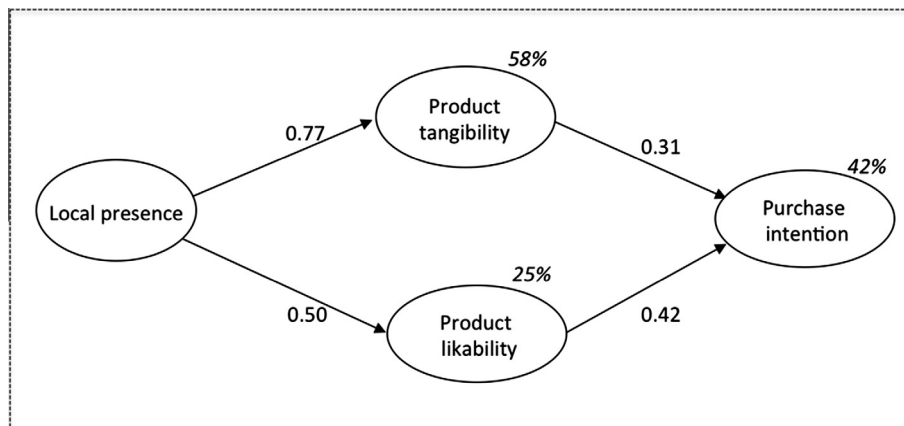

Fig. 3. PLS results structural model: beta values and explained variance.

and affect in online product experiences and to assess the contributions of the underlying streams of research therein.

6.3. Managerial implications

The present study also has implications for online retailing practice. Our results highlight the value of current technological developments for product presentation in online retailing. The fact that virtual mirrors performed significantly better than the more established product presentation formats indicates that virtual formats are not just a technological novelty or gadget, but constitute a valuable addition to the online retailer's product presentation portfolio. By increasing perceptions of LP, virtual mirrors stimulate favorable consumer responses toward products. Thus the adoption of virtual mirror technologies might be used to stimulate online sales. Furthermore, based on our findings, online retailers would be well advised to try and create feelings of LP on their website. This might be especially important for retailers who sell physical products that have sensory attributes consumers need to "feel", "try" and "touch" before buying, such as clothing or apparel. The present study shows that products that are presented in a manner that elicits feelings of LP are considered more tangible and more attractive to consumers, which, in turn, increases purchase intentions. Finally, in the context of this study the effect of the virtual mirror on LP is superior compared to pictures and 360-spin. In case choices must be made due to budget limitations, online retailers that aim for effective online experiences that enhance feelings of LP could give priority to the implementation of virtual mirror like formats over more traditional formats such as pictures and 360-spin.

7. Limitations and recommendations

Some limitations of the current study need to be addressed. First, we used a student sample. This choice was partly made for sampling convenience, but we also considered students a relevant target group for our study, as they are generally experienced with online shopping. We carefully selected a product that would likely appeal to this specific group of consumers, and confirmed this with a pre-test. However, although students as participants can be considered appropriate given the intended conceptual contributions of this study (Greenberg, 1987), this sampling choice limits the external validity of our study. Therefore, caution is needed when extrapolating our findings to online consumers in general.

A second limitation concerns the product that was chosen for this experiment. Sunglasses represent a product category that students are familiar with and attach importance to Polyorat, Alden, and Kim (2007). Even though this contributes to the internal validity of the experiment, we do recognize that sunglasses of a fashionable brand represent a category of high-involvement products. The question remains to what extent the product presentation formats and the functional mechanisms play a role for low-involvement products. When buying low-involvement products consumers are assumed to rely less on external information (Schmidt & Spreng, 1996), which might downgrade the influences of the formats and mechanisms. We suggest future empirical study to address this issue.

A third limitation of this study is that the predictive validity of LP was tested in a nomological network wherein the concept functioned as the solely determinant of PT and PL. Even though this parsimonious structure mirrored our key research objectives, and led to strong empirical support, some caution seems to be required when translating the results to real shopping situations. In such situations more comprehensive modeling may be required to capture reality more fully. We therefore encourage researchers to

model LP in more complex theoretical structures, together with other determinants of online product experiences, to further test its predictive validity and assess the robustness of our findings.

Another issue for further research is the question whether presentation formats that stimulate perceptions of LP are necessary for every product category, or for every consumer. Research indicates that more technologically advanced product presentation formats may not always be more effective. Smith et al. (2011) suggested that the fit between the type of information provided by the technology and the type of information sought by the consumer strongly affects the outcome of online product evaluations. According to their results, virtual presentation formats led to more positive consumer evaluations when consumers were concerned with their self-image, but led to significantly less positive outcomes when consumers were looking for functional information. It is therefore important for future studies to address the influence of consumer needs in the evaluation of product presentation technologies.

Finally, the present study included three different presentation formats that reflect the range of formats that are being used in today's online retailing environments. There are, however, many more product presentation formats in use, and future research could provide insights into the importance of perceptions of LP for other formats. Of particular interest would be a group of emerging technologies that may be used as product presentation formats in the near future. 3D images and holographic images, for example, will be introduced and could open up a realm of new possibilities for online retailers to enrich online product experiences (Kipper, 2013) and blur the boundaries between online and offline shopping environments.

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