

Do You Trust Me? Facial Width-to-Height Ratio of Website Avatars and Intention to Purchase from Online Store

Short Paper

Steffen Wölfl

University of Bamberg
Bamberg, Germany
steffen.woelfl@uni-bamberg.de

Jasmin Feste

University of Bamberg
Bamberg, Germany
jasmin.feste@uni-bamberg.de

Abstract

This research investigates whether the facial width-to-height ratio (fWHR) of avatars can serve as a first cue to website impression formation. Research has demonstrated that fWHR triggers people's inference making regarding the behavioral intentions of others and therefore behavioral responses in the form of approach vs. avoidance behavior. Our research model examines the effect of an online store avatar's fWHR on intention to purchase from the online store and whether this effect is mediated by perceptions of avatar's warmth and online store's trustworthiness. Mediation analysis revealed that a higher fWHR causes a lower intention to purchase and that this effect is mediated by perceptions of avatar's warmth and resulting online store's trustworthiness.

Keywords: Avatar, fWHR, impression formation, online shopping websites

Introduction

In the ongoing battle between stationary retail and online shopping, one of the most important factors to customers that favors stationary retail (and hinders online retail) is represented by the personal component of a respective salesperson since it provides individual attention and social interaction, as well as direct customer assistance (Cox et al. 2005). Because online shopping websites usually lack such personal sales representatives, low conversion rates are associated with this characteristic of online stores (Holzwarth et al. 2006). Previous research shows a high degree of consensus that this shortcoming could be overcome through the use of avatars (virtual characters) as company representatives (e.g., Nowak and Rauh 2006). Avatars serve as a first point of social information, enhance virtual re-embedding of website visitors, and transform behavioral responses (Riegelsberger and Sasse 2001; Messer et al. 2017). Findings indicate that avatars increase satisfaction with the retailer, result in a positive attitude toward the product, lead to a higher purchase intention (due to the higher trustworthiness and persuasiveness of online sales channels), and enhance the shopping experience in general (Kim et al. 2013).

A topic of specific importance pertains to the consequences of online avatars' design features vis-a-vis the effectiveness of web-based sales channels, as they usually promote higher website socialness and persuasiveness. Several authors deal with this issue by investigating the implications of different types of avatars (such as human vs. fantasy vs. animal vs. humanoid), by recommending the creation of ones that are similar to their target customers' actual or ideal physical appearance, or by investigating avatars' attractiveness (Luo et al. 2006; Mull et al. 2015; Holzwarth et al. 2006). However, perceptual studies on the visual design of avatars fall somewhat short. For example, expert-looking avatars are created solely by having them wear glasses, making them look older and less athletic, whereas attractive avatars apparently have to look younger, thinner, and more athletic (Holzwarth et al. 2006). A knowledge-oriented transfer of

the plentiful insights of impression formation cues of human-to-human perceptions on virtual avatars de facto has not been made. Furthermore, recent research on avatar design lacks a separate investigation of potential social cues. Consequently, designing an avatar to represent specific values and other characteristics of a certain company or brand cannot be achieved on the basis of previous research findings.

One social cue of social psychology that has been proven to have remarkable influence on the interpersonal decision of whether to show approach or avoidance behavior is the physiological characteristic of facial width-to-height ratio (fWHR; Mileva et al. 2014; Stirrat and Perrett 2010). In human-to-human interactions, fWHR serves as an indicator for social behavior and therefore influences perception (Carré et al. 2009). Predictions of perceptions on the basis of fWHR also hold for non-human entities, such as physical products (Maeng and Aggarwal 2017). An exploratory study by Ferstl et al. (2016) recently transferred fWHR to avatar design to provide a guideline for implying an aggressive, trustworthy, or dominant personality by manipulating avatar facial cues. To deepen our understanding of the consequences of avatars' facial characteristics for avatar personality perception, this study focuses on the potential effects of avatars' fWHR in their common contextual area of application, that is, online shopping websites. More specifically, we examine whether the fWHR of an avatar influences the intention to purchase from an online store.

In an experimental study with 131 individuals, our research shows that individuals have a significantly higher intention to buy from the online shop when the face of the avatar has a low (vs. high) fWHR. The reason for this finding may be due to a perception of increased warmth, which is usually associated with faces of lower fWHR (Hehman et al. 2014), resulting in a higher perception of the website's trustworthiness overall. The findings of our study contribute to the literature of website avatar design by transferring knowledge from social psychology to the online shopping context and identifying potential levers that will increase users' intention to purchase from online stores by modifying appropriate avatar design characteristics.

The structure of our article is as follows. In the upcoming section, we briefly describe the theoretical foundation and the research model for our study. Next, the experimental study is explained and its results reported. Our conclusion highlights avenues for future research to further explore the relationship between website avatars' facial cues and their implications for online shopping behavior.

Theoretical Foundation and Research Model

Impression Formation, Trust, and Intention to Purchase in Online Stores

Our research is rooted firmly in the theory of impression formation for electronic commerce. In this context, impression formation deals with the fact that information presented on a website serves visitors as a first cue for building perceptions of an online store (Cotlier 2001). In its original sense, impression formation literature focuses on the human capacity to form immediate personality trait impressions easily. This process happens on the basis of different stimuli as soon as we encounter an unknown person (Asch 1946). It is assumed that individuals make use of learned mental categories or stereotypes, which automatically and mostly unconsciously decide on which informational cues the perceptual focus is set, how the information received is processed, and what types of judgement result (Fiske and Taylor 2013). In the context of online websites, impression formation starts with the initial contact. While forming an impression, website visitors process individual pieces of presented information according to existing mental schemata and consequently derive a holistic judgement about the website (Everard and Galletta 2005). A study by Cotlier (2001) found that visitors form impressions of websites in mere seconds. This highlights the need to place cues or signals carefully via online store design elements. The latter can automatically activate mental categories or stereotypes leading to the intended judgement of the website.

Since consumers' distrust in the credibility of online shopping websites is one of the main drivers for underperforming online sales and poor conversion rates, this phenomenon has received a high level of attention in extant research (e.g., Corritore et al. 2003; Grabner-Kräuter and Kaluscha 2003). This fundamental lack of trust is assumed to exist due to the temporal and spatial distance between buyer and seller but also due to the non-simultaneous exchange of money and goods (Grabner-Kräuter and Kaluscha 2003). Furthermore, the missing social presence of other individuals can negatively influence shoppers'

willingness to pay for offerings (Messer et al. 2017), their product interaction and purchase likelihood (Zhang et al. 2014) or, more generally, their psychological responses (O’Guinn et al. 2015).

Consequently, website designers are interested in creating websites that appear trustworthy to reach a higher acceptance. Succeeding in this goal should result in behaviors that are more cooperative or emotional, while fostering completed purchases (Jarvenpaa et al. 2000; Ku et al. 2000).

Facial Width-to-Height Ratio and Stereotypical Perceptions

One important mental scheme for impression formation in human-to-human interactions is the human face. Studies show that the perception of the facial width-to-height ratio triggers inferences regarding the behavioral intentions of others (Stirrat and Perrett 2010). Evidence exists that the fWHR is linked to prenatal testosterone level, since it leads to wider faces, especially for men (Carré and McCormick 2008). Specifically, research has demonstrated that wider faces (i.e., faces with higher fWHR) are perceived as more dominant (Mileva et al. 2014), less friendly (Hehman et al. 2014), and less trustworthy (Stirrat and Perrett 2010) and that people with greater fWHR tend to be more aggressive (Carré and McCormick 2008; Carré et al. 2009). In contrast, individuals with narrow faces are perceived as more friendly, approachable, and trustworthy than persons with wider faces (Hehman et al. 2014). Furthermore, it was proven that these perceptual effects are related to both dimensions of fWHR, so horizontal as well as vertical differences matter in human facial cues (Costa et al. 2017). By means of observational learning processes, people build implicit knowledge about the common behavioral patterns attributed to individuals with wider or narrower faces. Consequently, perceptual patterns are ingrained unconsciously and are manifested in learned stereotypical assumptions (Sell et al. 2009).

Socio-psychological literature and the stereotype content model in particular show that people classify others along the primary trait dimension of warmth (Fiske et al. 2002). Warmth captures traits related to the perceived intent of a person, including friendliness, helpfulness, sincerity, trustworthiness, and morality. In interpersonal perception, information about others’ intentions (is the person well-intended or ill-intended?) is the most important aspect for deciding about approach and avoidance behavior. Therefore, warmth judgments receive a high weighting in interpersonal perception (Fiske et al. 2007). Recent studies on fWHR have shown that the face ratio in particular influences evaluations relating to this warmth dimension (e.g., Hehman et al. 2014; Stirrat and Perrett 2010). In line with impression formation literature, individuals make use of different cues (such as fWHR) that serve as first information in order to form an opinion about other individuals who are unknown or unfamiliar. Since avatars are non-human but anthropomorphized entities, this anthropomorphizing can act as a gatekeeping mechanism enabling the transfer of stereotypical human-to-human inferences to non-human objects (Eyssel et al. 2012). In conclusion, our research model examines the relationship between avatars’ fWHR and the intention to purchase on online shopping websites. We therefore assume that avatars can serve as a first cue in website impression formation and are ascribed the same personality evaluations as in human-to-human perceptions.

Research Model

Based on findings from prior research, our research model combines insights from social psychology with models that draw on the impression formation perspective to deal with the effect of website design elements on online shopping behavior (Everard and Galletta 2005). In this context, the fWHR of a website avatar can act as a first cue for impression formation about online shopping websites. In line with prior research, faces with lower fWHR (i.e., narrower faces) are perceived as more friendly, approachable, and trustworthy, whereas persons with wider faces give the opposite impression (Stirrat and Perrett 2010). Since individuals with assumed cooperative intentions are stereotyped as warm, fWHR information serves as an important cue for the decision about approach or avoidance behavior toward a person (Fiske et al. 2007). Furthermore, prior research shows that the ascription of personality traits derived from appearance-based characteristics also holds for virtual faces (Ferstl et al. 2016). Thus, effects of fWHR should also hold for website avatars, so that those with a lower fWHR (i.e., narrower face) should lead to higher stereotyping as being warm. More formally, we state:

Hypothesis 1: The fWHR of a website avatar has a negative effect on perceived avatar warmth.

Due to the direct connection between warmth stereotyping and trust perception, avatars evaluated as warm should also imply a higher trustworthiness of the website they represent. The extant literature on impression formation assumes that people form integrated impressions via different stimulus information. Avatars as design elements could serve as a first cue or stimulus to form an impression about the website as a whole (Everard and Galletta 2005). More specifically, individuals are presented with information that fits existing mental schemata (avatar face) in an unknown context (new website), which leads them to transfer knowledge from existing mental schemata to the new contexts (Everard and Galletta 2005). Thus, we assume perceptions about website avatars to serve as a basis for deriving impressions about the website. Therefore, we state:

Hypothesis 2: Perceived warmth of a website avatar has a positive effect on trustworthiness perceptions of a website.

Furthermore, trust serves as basis for cooperative or approaching behavior. It is present especially when individuals are aware of their vulnerability due to potential harm from others but do not believe these others would harm them (Friedman et al. 2000). Transferred to online shopping behavior, a cognitive state of trust can therefore encourage individuals to engage in financial or emotional transactions online (Cassel and Bickmore 2000). In addition, prior studies found that trust can be a good predictor for the intention to purchase in an online context (Everard and Galletta 2005; Gefen 2000). Based on these prior findings, we assume:

Hypothesis 3: Perceived trustworthiness of an online store has a positive impact on the intention to purchase from this online store.

Summarizing the individual stages of effects from an online store avatar's facial characteristics to customers' intention to make a purchase, we assume that the intention to purchase from an online store can be enhanced by using avatars with narrower faces, due to an increased perception of avatar warmth and subsequent trustworthiness of the online store. Concluding, we state:

Hypothesis 4: An online store's avatar fWHR has a negative effect on intention to purchase from the online store. This effect is mediated by perceptions of an avatar's warmth and online store's trustworthiness.

Empirical Study

Design and Participants

To examine the effect of a website avatar's fWHR on the intention to purchase from the online store, we conducted a two-factorial (fWHR of avatar: low vs. high; type of online store: low purchase decision involvement vs. high purchase decision involvement) between-subjects online experiment with undergraduate and graduate students. We recruited participants via university-related groups in online social networks and asked participants to fill out an online questionnaire to evaluate an online store. 131 participants took part in the experiment. Gender percentages of male and female participants were almost equally distributed, while the mean age was 24.9 years ($SD = 3.5$). The online questionnaire exposed participants randomly to one of the four experimental conditions, so that age and gender are equally distributed across all four conditions.

Stimulus and Procedure

To validate our research model for different purchase situations, we created two fictional online stores that elicit different levels of purchase decision involvement. Defined as "the extent of interest and concern that a consumer brings to bear upon a purchase decision task" (Mittal 1989: 150), it is related to products' aspects such as price level or heterogeneity of competitive offerings. We manipulated the purchase decision involvement of the online stores by altering the type of products offered in them. Their overall layout was oriented towards the regular style of an online store and did not differ between the two offerings. A holiday website offered a 7-day, all-inclusive luxury holiday in a five-star resort, while an office supply website showed an offering of ordinary adhesive notes.

On these web pages, we placed a self-designed human male avatar with either a low or a high facial ratio. In line with prior research, we manipulated fWHR of the avatar's face by using horizontal as well as

vertical facial modifications. In human faces fWHR is measured and calculated as the ratio of the distance between left and right zygion (i.e., cheekbones) to the distance between mid-brow and upper lip. Thus, higher ratios indicate wider faces and lower fWHRs indicate more longish ones. We realized our manipulation using an online tool that allowed us to increase/reduce the distance between the cheekbones of an avatar as well as the distance between the mid-brow and the upper lip, all other characteristics being equal. Therefore, manipulation of fWHR was done strictly in line with prior research (e.g., Carré and McCormick 2008; Stirrat and Perrett 2010). The resulting ratios are 1.63 for the avatar of low fWHR and 2.25 for the avatar of high fWHR, which fits into the range of fWHR of male humans measured in prior studies (Bird et al. 2016). Except for providing a slogan via speech bubble (“The best offer on the Internet!”), the avatar did not interact with the website visitors. We consciously decided to use a non-interactive avatar that was exclusively manipulated by its facial width-to-height ratio. The reason behind this is the assumption that each particular form of interaction, as another potential social cue, should have its own specific impact on the resulting behavior of the online shoppers. Due to the complexity of interactions and their enormous variety of essential components, this could be termed another stand-alone field of research.

The participants, who answered the questionnaire online, were told they were taking part in a study about the perception of online stores. As an introduction, an imaginary frame was created by encouraging them to view the experimental website carefully and to put themselves in the situation of browsing for the product presented. In the following, participants answered questions about their impressions of the online store, the avatar, and their intention to purchase. Figure 1 shows the implemented avatar and its manipulation of fWHR.

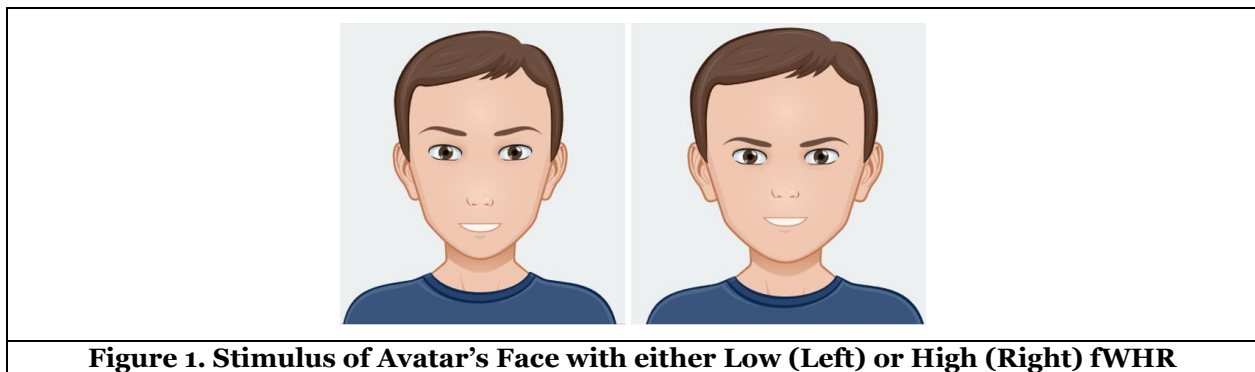


Figure 1. Stimulus of Avatar's Face with either Low (Left) or High (Right) fWHR

Construct Measures and Manipulation Checks

To assess the constructs of interest, we used established scales that have been developed and validated in multiple previous studies. We used three items to capture the avatar's stereotypical warmth (Cuddy et al. 2007; Ivens et al. 2015), four items to capture perception of the online store's trustworthiness (Jarvenpaa et al. 2000), and three items to measure intention to purchase from it (Everard and Galletta 2005). We established the measurement model using CFA and by assessing global fit indices and criteria for the internal structure of the model (e.g., Bagozzi and Yi 1988; Schreiber et al. 2006). Results for the evaluation of the overall model fit using multiple indices show that all thresholds are met ($\chi^2/df \leq 3$; CFI ≥ 0.95 ; TLI ≥ 0.95 ; RMSEA ≤ 0.05 ; SRMR ≤ 0.08), which points to an acceptable overall model fit. Furthermore, local fit parameters show evidence for the validity and reliability of the construct measures (e.g., Gagne and Hancock 2006; Nunnally 1978; avatar's warmth: $\alpha = 0.87$, CR = 0.88, AVE = 0.72, coefficient $H = 0.90$; trustworthiness: $\alpha = 0.76$, CR = 0.76, AVE = 0.52, coefficient $H = 0.78$; purchase intention: $\alpha = 0.92$, CR = 0.92, AVE = 0.80, coefficient $H = 0.95$). All factor loadings exceed 0.6. The highest squared correlation between the constructs is 0.36, so that all average variance extracted values for each construct are larger than the squared correlation between any pair of constructs, which indicates discriminant validity (Fornell and Larcker 1981). Because some manifest variables slightly deviate from a normal distribution, we used 5,000 bootstrap samples to calculate the p -values of the factor loadings (Byrne 2010; all $p < 0.01$). Additionally, we performed a Bollen-Stine bootstrap analysis (Bollen and Stine 1992) to test the null hypothesis that the model fits the data. Based on that, the null hypothesis cannot be rejected ($p > 0.05$), which indicates that the model fits the data well. These additional tests validate the measurement model under conditions of non-normality.

Manipulation checks. We performed a check for the facial width-to-height ratio manipulation of the avatar by including a question that reads “The avatar has a wide face.” It was presented using a seven-point Likert-type rating scale ranging from 1 (“Does not apply at all”) to 7 (“Applies fully”). A two-sample t-test indicated a significant effect ($t(119,85) = -2.19, p < 0.05$; $M_{high} = 4.16, M_{low} = 3.5$), thus pointing to a successful manipulation of fWHR of the website avatar. Furthermore, we checked the manipulation of different store conditions as evoking either high or low purchase decision involvement (holiday website vs. office supply website). The item used reads “In making your selection of this product, how concerned would you be about the outcomes of your choice?” with answers ranging from 1 (“Not at all concerned”) to 7 (“Very much concerned”) (Mittal 1989). Results of a two-sample t-test also prove a successful manipulation of different store conditions ($t(126,96) = -15.53, p < 0.05$; $M_{holiday} = 5.86, M_{office supply} = 2.24$).

Results

We analyzed the postulated serial mediation model using regression analysis. We tested whether the fWHR of a website avatar has a significant influence on customers’ intention to purchase from this online store. Furthermore, we examined whether this effect is mediated by the perceived warmth toward the avatar and by the perceived trustworthiness of the online store. All multi-item constructs were combined into average scores. In order to examine the serial mediation effect, we conducted mediation analysis using the SPSS macro PROCESS as proposed by Hayes (2013). We used Hayes’ model 6 and entered avatar’s fWHR (1=high) as an independent variable, intention to purchase from online store as a dependent variable, perceived avatar’s warmth as a first-stage mediator, and perceived online store’s trustworthiness as a second-stage mediator. This mediation model was examined separately for each store condition. To test the indirect effect of avatar’s fWHR on intention to purchase from online store, we used a bootstrapping approach (Preacher and Hayes 2008) based on 5,000 bootstrap samples and calculated a 95% bias-corrected confidence interval (CI). Mediation exists when the CI around the indirect effect excludes the value zero (Preacher and Hayes 2008).

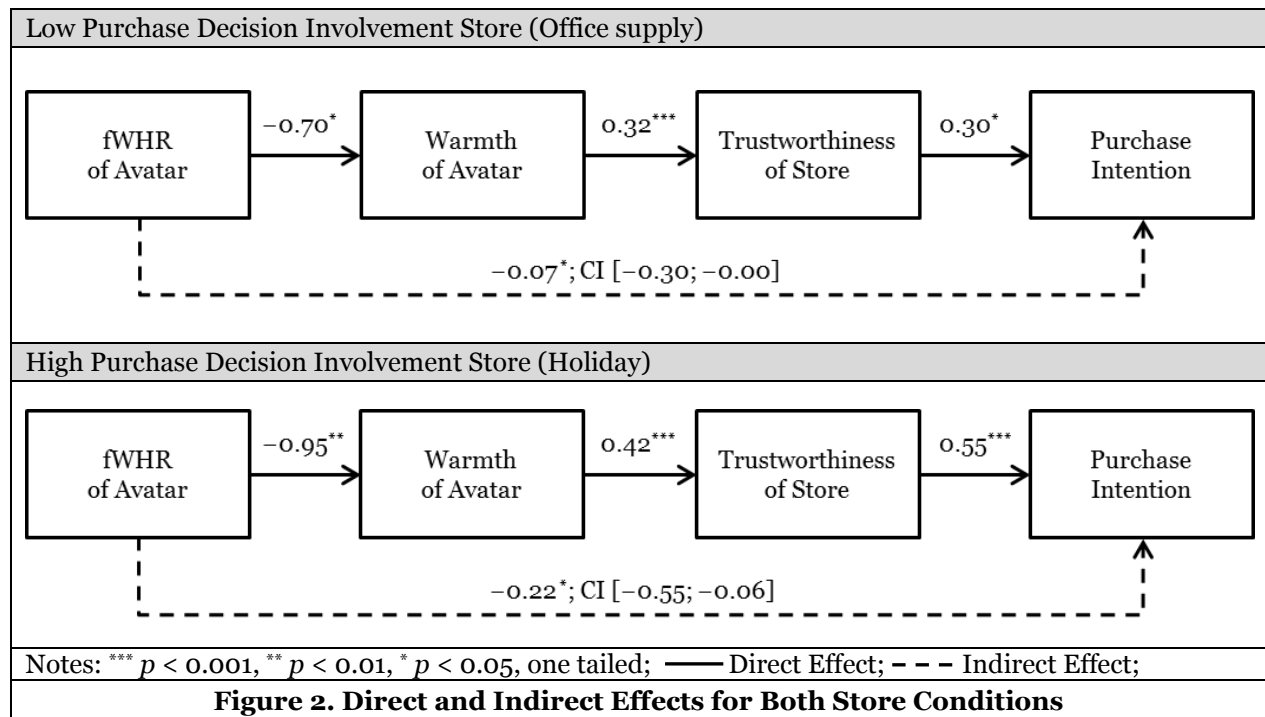


Figure 2. Direct and Indirect Effects for Both Store Conditions

Hypothesis 1 predicts a negative effect of facial width-to-height ratio on warmth perception. Results for this direct effect show that a higher fWHR leads to a significantly lower warmth perception toward the avatar. As was assumed for the second hypothesis, there is a highly significant and positive effect of avatars’ warmth perception on perceived trustworthiness of the online store. Furthermore, certain spillover effects exist that transfer the impressions of the avatar onto the impression of the website. This

trustworthiness perception for the online store has direct implications for the intention to purchase from it (the higher the perceived trustworthiness of the online store, the higher the intention to do so). All direct effects are significant for both store conditions. Additionally, the indirect effect (for both stores) was also confirmed for our research model. According to this, the fWHR of the avatar has an effect on the intention to purchase from that online store, and this effect is mediated by warmth perception of the avatar and trustworthiness perception of the online store. We conducted additional analyses to test whether relationships differ statistically between both store conditions. Therefore, we conducted multiple moderation analyses using Hayes' model 1 (2013) to check if store type significantly affects the relationships between avatar's fWHR and avatar warmth, avatar warmth and store trustworthiness, and store trustworthiness and purchase intention. None of these analyses showed any significant interaction effect (all $p > 0.05$), thus proving that the relationships do not differ significantly between both store conditions.

Discussion

Contributions of the Research

Research on facial ratios of avatars provides important contributions to the literature. First, by transferring existing findings of a human appearance-based cue on website avatar design, we opened a new field of research options for avatar design studies. Previous research dealt with rather overarching design aspects, such as different avatar types or their attractiveness (e.g., Mull et al. 2015; Holzwarth et al. 2006). We therefore applied human appearance cues to avatars and analyzed their impact on consumers' perception and resulting online shopping behavior. This represents a possibility to deepen the understanding of appropriate avatar design. Furthermore, we added to the fWHR literature by showing that not only does fWHR affect stereotype ascription to a non-human entity (i.e., avatar), but it also has consequences for the overall context in which the perception takes place (i.e., online shopping). In summary, our research implies that the facial cue of avatars' fWHR has substantial meaning for the evocation of trust and resulting intention to purchase in an online store. Since online shopping always involves some underlying uncertainties (e.g., there is no direct contact person,) creating trust is one of the main challenges for online retailers. This can be addressed by means of avatar design that draws on existing knowledge from social psychology.

Avenues for Further Research

According to our research, the fWHR of website avatars can impact the intention to purchase from that store, independently of purchase decision involvement. Nevertheless, our study is just an initial step in illuminating the potential benefits of avatars' facial design characteristics. Thus, to better understand the role that avatars' facial ratios can play in customers' online shopping behavior, a series of further experimental studies could be conducted to fully explore the relationship between avatars' fWHR and other intended outcomes (e.g., customer loyalty or brand awareness). In this case, avatars could serve as online brand mascots and therefore support brand image creation (e.g., Malik and Guptha 2014). As Mull et al. (2015) have already differentiated between different types of avatars (human, fantasy, animal, humanoid), the effects of fWHR on intended outcomes should also be explored in a differentiated way for respective avatar types. The underlying assumption would be that a wider face for an animal-type avatar could have other effects than for a human-type one. Furthermore, avatars should always be designed to support the underlying character of the product type offered (e.g., Brakus et al. 2009). Research should thus investigate the effects of fWHR depending on the underlying product type offered, since wider faces could have positive effects when marketing dominant-image products (e.g., sports nutrition) and narrow faces could have positive effects for warmth/friendliness-image products (e.g., home furniture). Furthermore, manipulations of fWHR could also lead to potential changes in perceptions of facial expressions. Additional studies would be necessary to investigate any differential perceptions of facial expressions that might arise, along with behavioral consequences. Finally, the herein investigated types of offerings differ largely in their price level and have been designed to manipulate purchase decision involvement. Nevertheless, they may also differ according to their levels of hedonic or utilitarian value. Thus, further studies should take this issue into account and validate whether the proposed relationships hold for both hedonic and utilitarian products, independent of the purchase decision involvement.

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