

The Effect of Avatar Perception on Attributions of Source and Text Credibility

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Abstract

Previous research has established that avatars influence perceptions of those they represent, but little is known about how these perceptions influence the processing of messages associated with these avatars. This process was explored using a 2 by 2 factorial design where 450 participants were randomly assigned to condition and each rated the credibility, anthropomorphism and realism of a high or low credibility avatar matched with a high or low credibility text. This project used causal modeling techniques to test the effect of perceptions of avatar anthropomorphism and realism on message credibility and trust as well as the role of the avatar and associated text on participant's purchase intention. Results are consistent with expectancy violations theory revealing that people process and categorize visual images associated with a message before associated text. Further, the processing of visual images frames and influences perceptions of associated textual messages. Theoretical and practical implications of the results are discussed.

1. Introduction

People are increasingly purchasing products and conducting product research online. Many consumers take the time to fill out reviews of products they have purchased. These reviews are called peer reviews and are available on a variety of websites. These peer reviews of products have a significant impact on opinions of products and reported purchase intention [1, 2]. In addition to the text describing the product, computer generated images are increasingly included to represent users in these peer reviews. These images, called avatars, are influencing how people process and use information provided in the reviews [1, 3, 4]. Essentially, the avatars enhance consumer experiences and may be able to act as sales agents for the company in an online marketplace [3]. This is consistent with research showing that the way people attend to and process information associated with the avatar is analogous to the way people attend to information associated to the physical body offline [5-7].

The question of how much influence the avatar has relative to other information presented in the product review is largely unknown. This project uses causal modeling techniques to examine the respective influence of role of perceptions of avatar characteristics and text quality on

consumer evaluations of source credibility and purchase intention in the context of online product reviews.

2. Avatar characteristics drive expectations

People pay careful attention to visual information presented in any context and are very sensitive to communication cues provided by body morphology or movement. These communication cues include attractiveness, facial expression, gestures, and body movement [8, 9]. This is true with online interactions as well, where the sensitivity to bodily cues have been automatically applied to avatars by individuals who draw inferences about the "intentions" and "mental states" of computers when facial or body displays (even simplified simulations of these cues) a provided [10, 11].

While people process information using all indicators associated with a message or person, visual indicators such as those related to the physical body are usually processed automatically and immediately, requiring almost no cognitive resources [12, 13]. Information presented from other channels is frequently ignored or overlooked, particularly if it is inconsistent with information presented to visual channels. People use visual information to make attributions of others that lead to expectations about the behavior and abilities that influence future interactions. Visual cues are so powerful and influential that when cues provided by the body or nonverbal "signals" contradict information communicated verbally, people have more faith in the veracity of the cues provided by the body [14]. The visual information influences expectations for how people will behave and interact and these expectations influence people's uncertainty in the interaction.

Uncertainty reduction theory predicts that communication between individuals should lead to a reduction in uncertainty [15, 16]. Further, uncertainty is reduced when people feel they have information relevant to the judgments they need to make for a given interaction [17, 18]. Essentially, the less information people have during an interaction, the more heavily they rely more on the information available, such as avatars, to reduce uncertainty and form expectations.

Some uncertainty reduction theorists assume that a violation of expectations leads to an increase in uncertainty [15], though not all violations increase uncertainty [19]. Expectations can be positive or negative and further

observation and direct information seeking behaviors can lead to violations of expectancies that may surpass expectations or disappoint the perceiver [15]. In fact, positive violations can produce high attraction and credibility ratings, with the opposite for negative violations [20].

Expectancy violations theory predicts that it is the visible information people can attain from passive observation that generally determines impressions of others. These impressions are then used to form expectations for how others will behave [9, 14, 15, 21].

The same is true for perceptions of those represented by avatars. Online, avatars are used in the process of reducing uncertainty and forming attributions as visual or nonverbal information is used offline. This means that people's perceptions of the visual characteristics of avatars influence the information processing, message and source attribution, and the interaction and these attributions influence expectations for behavior [7, 22-25]. The impact of attributions on uncertainty is key to CMC expectancy violation research and an attribution made from an avatar could increase or decrease uncertainty. If a visual association such as an avatar cues a positive attribution it is likely to reduce uncertainty, whereas an avatar leading to a negative attribution about the individual may increase uncertainty. These perceptions have a strong and significant influence on perceptions of the person or message represented by the avatar. Associated text based information is also likely to influence expectations and attribution in a different way because the processing of text-based information requires more cognitive resources and takes more time than the processing of visual information.

Confidence also plays an important role in terms of these attributions. If an individual is confident in their assessment of the avatar, then the attribution that flows from that assessment may lead to uncertainty reduction regarding that individual's future behavior. Yet, the attribution must remain consistent with the individual's behavior in order for expectations to be met, otherwise the perceiver will feel that expectations have been violated with positive or negative outcomes. Both online and offline, uncertainty is only reduced when individuals feel they have the correct or sufficient information to make the desired judgments [26, 27]

There are unique considerations people make when perceiving others encountered online, whether they are represented by avatars or not. People have to make determinations about the social potential of the person or entity encountered [28]. The social potential of the entity frequently involves perceptions of their avatar characteristics. Assessments of the visual anthropomorphism and realism of avatars seem to be central to this process.

Visual anthropomorphism is used to measure the extent to which an object has human morphology or visual characteristics [6, 25, 29]. Visual realism as used here is the user's perception of the extent to which an image is typical, probable, or likely to exist in a non mediated context [30-34]. Perceptions of the visual characteristics of avatars drive

categorization and influence expectations for behavior and interactions.

Consistent with expectancy violations theory, more anthropomorphic and realistic avatars lead to higher expectations and leads people to perceive the entity represented by the avatar as more social [35]. These expectations can be difficult to meet and may lead to disappointment as illustrated by lower credibility and likeability ratings [26, 36]. The same phenomenon appears to occur with interfaces and systems design. Some designers have arbitrarily applied certain anthropomorphic characteristics to interfaces, which has led to increased expectations from users and disappointment when the system fails to live up to these expectations [37]. This makes the effect of avatar characteristics on peer reviews an important area of research.

2.2. Uncanny Valley

There is a variety of research on the influence of avatar characteristics that can provide insight into how people process avatars. It is likely that the violation of expectations (as discussed above) influences the level of uncertainty as well as a variety of attributions, and contributes to what has been called the uncanny valley [38]. [38, 39]. The uncanny valley occurs when a less than exact emulation of human characteristics makes the avatar seem eerie. The uncanny valley hypothesis predicts that people prefer avatars that are consistent on a variety of variables. Viewers prefer avatars where appearance and behavioral attributes have equal levels of anthropomorphism (representing human morphology or characteristics) and realism (reflecting people or images experienced offline). Any level of perceived inconsistency on these variables has a strong influence on perceived communication quality [5, 6, 31, 39].

Images that are rated high on visual realism and anthropomorphism have higher expectations for social potential and credibility [6, 40] and the uncanny valley hypothesis predicts that people expect anthropomorphic entities to also be highly realistic. The discussion of expectancy violations above reveals that people are uncomfortable or disappointed when expectations are not met so it is likely that people expect certain visual characteristics to be correlated as they are offline and they are disappointed when there is no match. For example, an avatar with high levels of anthropomorphism will be expected to have high levels of realism as well and viewers will be uncomfortable when the level of visual realism and anthropomorphism do not match. In fact, it is the perception of inconsistency across these distinct constructs (low anthropomorphic avatar with high visual realism) that has a stronger influence on perceived communication quality than image type [5, 31].

As with other issues related to interface development, it is likely that the closer computer simulations get to replicating realism or human characteristics the more people are likely to realize that it is just not the same. Images that

are anthropomorphic increase expectations for what might be considered realistic or credible [39]. Avatars that appear highly realistic and anthropomorphic are more likely to fall within the “uncanny valley.” Thus, the uncanny valley is most likely to emerge when highly realistic images depict human faces with abnormal or obviously manipulated features [6, 39]. Images that are only moderately

anthropomorphic may therefore have greater appeal to viewers because expectations are lower.

Thus, the model in Figure 1 assumes that realism and anthropomorphism are separate constructs and predicts they will influence expectations and exert distinct influence on attributions of credibility and homophily as well as on perceptions of the review quality, source credibility, and trust.

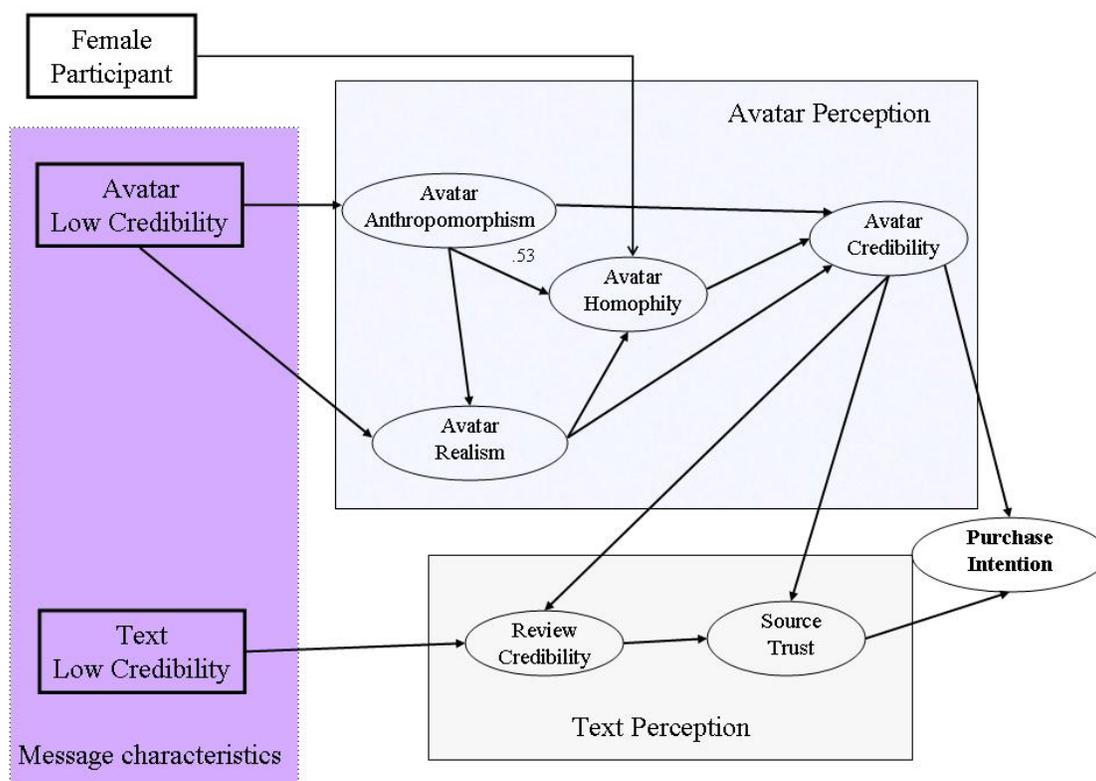


Figure 1 Predicted Model

3. Processing of Text

In any interaction, people pay attention to all the information associated with the source and message presented as they decide what information to process and how to use it [25, 41]. While the avatar influences how people perceive one another and associated messages as discussed above, so too does the context of the interaction and behavior (e.g. phrasing choices and content of interaction) [25]. Figure 1 predicts that perceptions of the avatar and quality of text will influence this process but that visual information will be processed first.

The initial impressions people get from the visible indicators such as physical appearance of others have been shown to be more influential than impressions obtained from

other factors, including behavior, because visual cues are processed first [42]. The processing of visual information is almost automatic and requires few cognitive resources [12]. As the interaction progresses, behavioral cues may be incorporated and the model adapted to reflect that information [43]. However, incorporating behaviors into the model requires more cognitive resources than processing visual information and is therefore secondary to processing the visual information.

Similarly, there are multiple factors influencing the process of making assessments of credibility and deciding how to use information provided in an online review. While it is possible that the perception of the avatar will be influenced by the text portion of the review, the process described above suggests that the visual information will be processed first. Further, information perceived early in the

interaction influences the processing of information that is received later meaning that visual cues influence inferred attributions such as credibility. It is likely that certain characteristics of avatars cause certain attributions consistently across contexts [25] and that these same inferences will influence the perception of the information processed after exposure to the avatar.

Thus, the perceptions of the visible characteristics of the avatar will likely influence the perceptions of the review and source credibility. This deduction leads to the prediction in Figure 1 that the perceptions of visual characteristics of the avatar (including homophily, credibility, anthropomorphism, and realism) will influence the perceptions of credibility of the source of the message and the quality of the review itself.

4. Credibility and purchase intention

The perception of a source's credibility is central to communication in that it influences the way information is processed, what is remembered, and how the information is used. Sources and messages that are perceived to be less credible are less effective and influential [44]. Essentially, the perception of source credibility has implications for all parts of an interaction [45]. The influence of credibility is likely the same online and off [35], but the cues used to make attributions of credibility are different because people have access to different forms of information about the source [4].

The cues influencing credibility of sources online are still relatively unknown and people have a high degree of uncertainty about what information provides reliable indicators of credibility. Cues and information considered important in making attributions of credibility offline are less apparent or not available online so people have to adapt and use different cues to make attributions online [1, 46, 47].

Further, different perceptions and categorizations are becoming relevant online that are not considered offline. Specifically, the perceptions of avatar realism and anthropomorphism have been shown to strongly influence perceptions of the homophily and credibility of the avatar and the person or message associated with the avatar [24, 25, 48, 49]. This is consistent with predictions discussed above that the visual characteristics of the person or avatar associated with the message drive expectations and influence the perception of and receptivity to messages as well as perceptions of the source credibility.

Previous research has shown homophily to strongly influence perceptions of credibility of avatars when the task was to select an avatar to represent the self [6, 25]. It is likely that homophily will predict avatar credibility in this context as well. Thus, the model predicts biological sex will directly influence homophily levels. However, it is possible that homophily will be less central to predicting credibility of a source in an online review than it is when the task is to select an avatar to represent the self.

The model in Figure 1 predicts these paths will be replicated and further predicts that the characteristics of the

avatar's credibility will strongly influence perceptions of the quality of the review and source credibility. Further, the credibility of the avatar associated with the review will directly influence perceptions of the credibility of the source and the review itself as well as purchase intention. It is likely that the effect of avatar characteristics will be as large as, or perhaps larger than, the effect of manipulated text quality on perceptions of credibility. Finally, the model predicts that avatar credibility and source credibility will directly predict reported purchase intention.

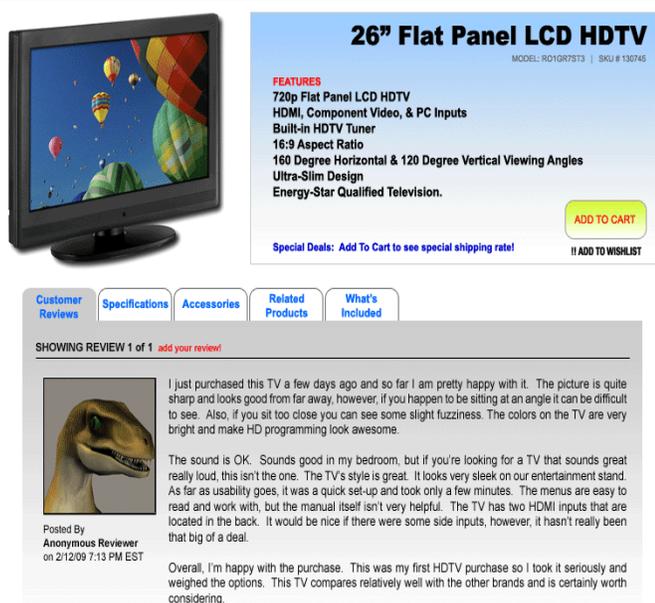
6. Procedure

The model in Figure 1 was tested with a 2 (high or low avatar credibility) –by 2- (high or low text credibility) design. Participants (450) were undergraduates at a large university and received extra credit for participation. Participants were instructed to go to a website on their own time and were randomly assigned to condition after giving informed consent. Participants responded to a pre-test measuring both demographics and their involvement with television and home theatre technology. Additionally, participants were asked if they planned to purchase a television in the next three months.

Participants were randomly assigned to a condition where they viewed an online product review for a flat-panel television set.

6.1. Stimulus materials

The information was presented to participants online as a "screenshot of a web page" partially shown in Figure 1, which was designed to look similar to several popular electronics web sites with consumer reviews in terms of layout and content. To guard against potential participant biases, the brand name of the television was digitally removed from the photograph and omitted from the product features outline. Similarly, the price of the model was omitted due to its potential to confound the research with a college-aged audience.



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 I just purchased this TV a few days ago and so far I am pretty happy with it. The picture is quite sharp and looks good from far away, however, if you happen to be sitting at an angle it can be difficult to see. Also, if you sit too close you can see some slight fuzziness. The colors on the TV are very bright and make HD programming look awesome.

The sound is OK. Sounds good in my bedroom, but if you're looking for a TV that sounds great really loud, this isn't the one. The TV's style is great. It looks very sleek on our entertainment stand. As far as usability goes, it was a quick set-up and took only a few minutes. The menus are easy to read and work with, but the manual itself isn't very helpful. The TV has two HDMI inputs that are located in the back. It would be nice if there were some side inputs, however, it hasn't really been that big of a deal.

Overall, I'm happy with the purchase. This was my first HDTV purchase so I took it seriously and weighed the options. This TV compares relatively well with the other brands and is certainly worth considering.

Posted By
Anonymous Reviewer
on 2/12/09 7:13 PM EST

Figure 2 Screen shot of Product to be reviewed

Text credibility was manipulated on the basis of the review's textual quality. Pretests of the reviews confirmed a sample of participants perceived these to vary on credibility. The review was not manipulated on the basis of relevant content but rather the level of grammatical and syntactical proficiency.

The avatars associated with the product reviews were shown to be high and low credibility in an earlier study and are shown in Figure 3.

Upon viewing the stimulus, individuals responded to a series of post-test questions about their perception of the avatar, the review, and the source of the message.



Figure 3 Avatars used in product review

6.2. Avatar perception measures

Perceptions of avatar characteristics included anthropomorphism, realism, homophily and credibility. It is important to measure perceptions of these variables given that they have been shown to influence information processing and that they were not controlled across avatar conditions. All items were likert type scales with a 7 point metric (1 not at all, 7 very much) based on scales reported in previous research [6]. Anthropomorphism ($\alpha = .86$) was measured with the 3 item scale. Avatar homophily ($\alpha = .88$) was measured with a 5 item scale. Realism ($\alpha = .88$) was measured with a 4 item scale. Avatar credibility ($\alpha = .94$) was measured with a 5 item scale.

6.2. Source and review perception measures

To evaluate overall source expertise, source trustworthiness, perceived textual message quality, perceived avatar source authority, and purchase intention were measured. Source trust ($\alpha = .87$) was a measure of source credibility, expertise and trust and was adapted from [1]. Perceived trustworthiness of the review ($\alpha = .88$) was measured with a 5 item scale including whether the review was well written, easy to read, communicates clearly and is of high quality. Finally, participants were asked again about their interest in purchasing the television.

4. Results

The predictions made in Figure 1 were tested using PATH software version 6.0, which is a causal modeling software. The 3 exogenous variables in the predicted model were the biological sex of participants (Males were coded as 1 and females 2) as well as the avatar and text conditions, which were treated separately in these analyses. The low credibility avatar and text were coded as 2 and the high credibility avatar and text were coded as 1. Independent samples t-tests were conducted to assess the avatar and text manipulations and showed a significant difference on perceptions of credibility of avatars and text. While all predicted paths were present, the predicted model was not a good fit with the data ($RMSE = .07$, $X^2(27) = 55.03$, $p = 0.00$).

The re-specified model is depicted in Figure 4 and resulted in no errors over .10 and a good fit with the data ($RMSE = .05$, $X^2(22) = 8.47$, $p = .995$). No paths were removed, but 4 small to moderate paths were added from participant sex to purchase intention, from avatar homophily to source trust, from avatar condition to avatar homophily, from avatar realism to review trust, as discussed below.

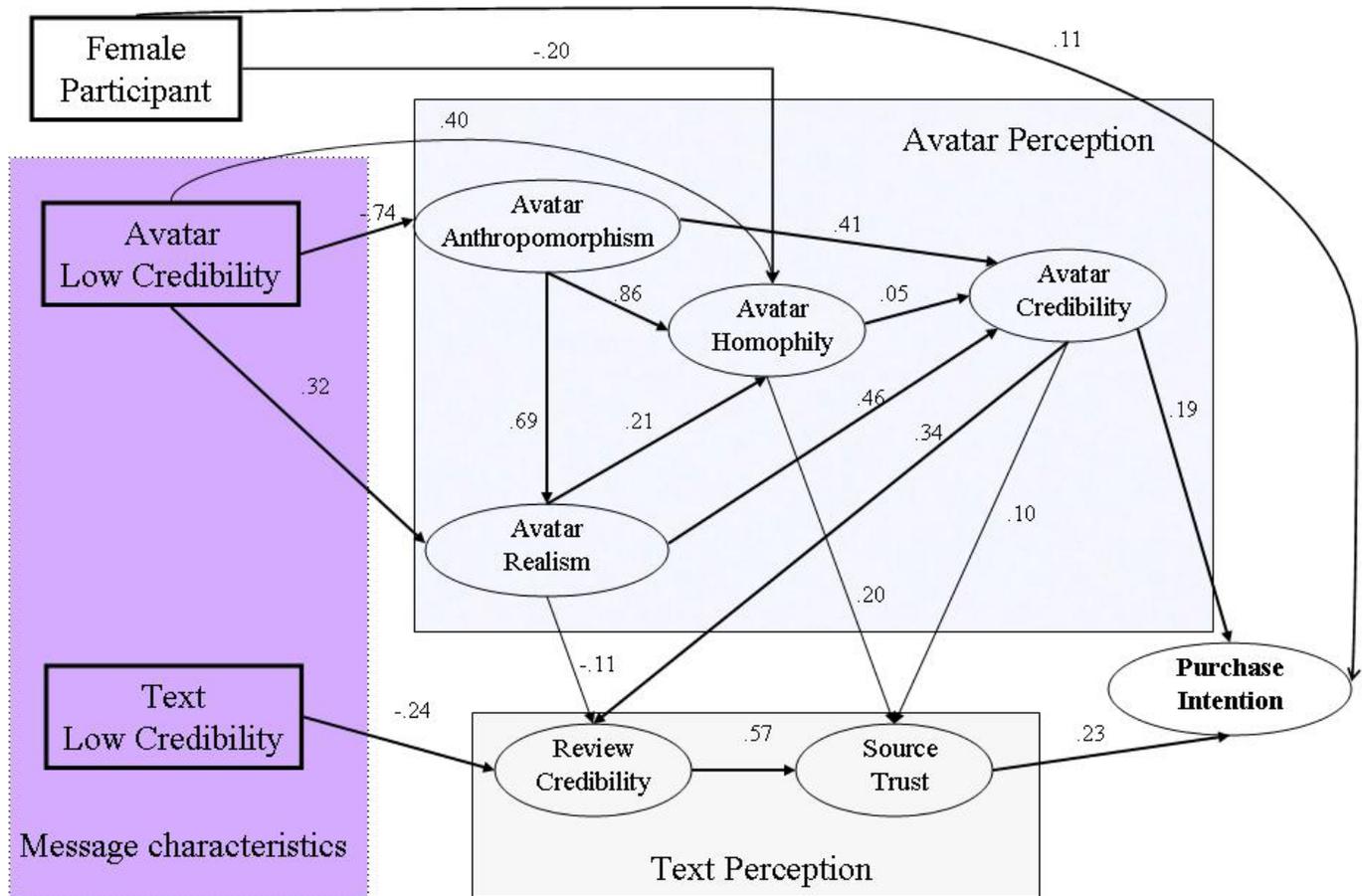


Figure 4 Respecified Model

The respecified model is largely consistent with the predicted model. The model replicates previous research showing that avatar characteristics predict perceptions of anthropomorphism and realism, which predict homophily and credibility [6]. Importantly, avatar condition did not directly drive perceptions of avatar credibility. Avatar credibility was predicted by perceptions of avatar anthropomorphism and realism, which varied across participants.

While it was predicted that avatar credibility would drive review credibility and source trust, it is surprising to see that avatar credibility has a larger effect on review credibility than the credibility of the text, and there was an unexpected causal link with avatar realism reducing review credibility, giving further support to predictions based on expectancy violation theory.

Another unpredicted link was a positive link between avatar homophily and source trust. This replicates the centrality of perceived homophily on avatar perceptions found in other research. While there is a path between avatar homophily and avatar credibility, it was predicted to be larger than .05. Although homophily has been shown to be a strong predictor of avatar credibility when one is deciding whether

or not to choose it [6], it does not seem to strongly predict avatar credibility when the avatar is associated with a reviewer and the outcome variable is purchase intention.

As predicted, women reported less homophily with the avatar regardless of condition. Previous research has shown that both of the avatars used in this study receive high masculinity and low femininity ratings. One of the non-predicted paths was between biological sex and purchase intention (.11) indicating women reported a higher likelihood of purchasing the television regardless of condition.

Overall the model supports the predictions in Figure 1 that perceptions of the avatar drive perceptions of the text and the source.

Conclusions

The results confirm that visual information is processed first and influences perceptions of associated text and sources. In fact, the added paths in the respecified model show that avatar condition and perceptions of avatars had a larger influence on perceptions of the review and source relative to the credibility of the text than what was predicted in the original model. This provides further support for the

notion that people process and use avatars online in a process that is remarkably similar to the way they process the physical characteristics of the human body offline.

The causal order of realism, anthropomorphism and credibility are the same as in previous research. This model also shows that people form expectations of sources based on visual information and that those expectations are higher for avatars with more realism. It further shows that perceptions of anthropomorphism influence perceptions of realism. This suggests that assessments of avatar credibility vary across contexts. The very small link between avatar homophily and avatar credibility (.05) is a little surprising when combined with the unpredicted moderate link between avatar homophily and source credibility (.20). Future research should more closely examine this piece of the process.

The path model shows there are a variety of factors involved in the process and many different variables influence purchase intention. Both source trust and avatar credibility directly predicted purchase intention.

Although the avatars varied significantly in terms of perceptions of credibility, the process model shows that avatar manipulation did not directly affect perceptions of credibility (either avatar or source). This underscores the importance of measuring participant perceptions of avatar characteristics of realism and anthropomorphism in avatar research. Future research should look for any possible individual difference variables that predict these different perceptions of avatars.

This project provides further support for the notion that uncanny valley hypothesis is predicted by violations in expectations. First, participants exposed to avatars they perceived to have higher realism reported the review to be less credible regardless of text condition. The avatar condition had opposite effects on realism than on anthropomorphism, again underscoring the importance of separately measuring and controlling for these variables. The dinosaur was perceived to have higher levels of realism than the male avatar, but the male avatar was perceived to be more anthropomorphic. Also, the less anthropomorphic dinosaur image received higher realism ratings than the more anthropomorphic male looking image. This is consistent with the prediction based on expectancy violations that the standards for realism are higher for more anthropomorphic images than for those with less anthropomorphism and that those perceived to have higher realism are expected to be more credible.

Future research should continue to explore the process involved in the uncanny valley and whether it is explained by expectancy violations. These results are consistent with the prediction that it is the high expectations for anthropomorphic and realistic characters that drive lower perceptions of credibility and liking found in uncanny valley research. However, these results also suggest that the uncanny valley occurs when avatars get so close to realistic that people are reminded that these avatars are not, and will never be, real or human. Future research should continue to

examine this process and avatar designers and users should be aware of the pros and cons of selecting highly realistic and anthropomorphic avatars for their interactions and ensure consistent levels visual anthropomorphism and realism.

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