Advancing a Model of Avatar Evaluation and Selection

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ABSTRACT

Viewers (*N* = 261) evaluated and chose avatars to represent them online. The viewers rated 92 potential avatars that were manipulated along three dimensions – sex, humanness, and integrity. Perceived gender of the image, its anthropomorphic intensity, and realism mediated the effects of the manipulated variables on judgments of homophily as a representation of self, credibility, and the likelihood that it would be used as an avatar during future interactions. Results indicated that anthropomorphic intensity enhanced image homophily, in part by increasing perceived realism. Image gender was found to produce a combination of positive and negative effects on competence ratings and avatar choice. The theoretical and practical implications of the findings are discussed.

1. Introduction

When people go online and interact with others, one way they may present themselves to others is by selecting an avatar. Avatars are often interpreted as symbolic messages about the people they represent and have been found to increase the perceived social potential of an online partner (Barret, 1997; Breazeal, 2003, Reeves & Nass, 1996; Nass & Moon, 2000; Bailenson et al., 2005). As an indication of intelligence and warmth, social potential can, in turn, influence communication outcomes, including attention and learning (DiSalvo & Gemperle, 2003; Galanxhi & Nah, 2007). Entities perceived to have more social potential are allocated more processing resources than those perceived to have less social potential. An avatar's visual features and behavior influence social aspects of communication behavior

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including disclosure, nonverbal behaviors, and perceived presence (Bailenson, Yee, Merget, & Schroeder, 2006; Bente, Ruggenberg, Kramer, & Eschenburg, 2008). That is, people are prone to develop deeper relationships with entities that have greater social potential.

To the extent that the image a person chooses as an avatar conveys intelligence and warmth, it should promote stronger relational ties with others. For those interested becoming better connected in online social networks such as *Facebook*, avatar choice is an important decision. As viewers appraise potential avatars, they evaluate the extent to which the image communicates intellect, social competence, honesty, and reliability. In short, viewers want to know if an image tells them that the entity it represents is *credible*. Current models of avatar selection indicate that human features in an image increase perceptions of anthropomorphic intensity just as the visual integrity (the absence of transformations such as morphing) of an image leads viewers to rate it as more realistic (Nowak, Hamilton, & Hammond, 2009; Yee, Bailenson, & Rickertsen, 2007). In turn, anthropomorphic intensity and realism (or believability) enhance the credibility of an avatar (Brahnam, 2009), where more credible avatars are more likely to be selected for future interactions (Garau et al., 2003; Nowak & Rauh, 2008; Nowak et al., 2009; Sherman et al., 2001; Taylor, 2002; Yee et al., 2007).

These findings highlight the need for a new direction in avatar research. Although much is known about how viewers rate an avatar selected by others, relatively little is known about how or why a person might choose an avatar for self-presentation. This suggests a study in which the source's selection of an image is the equivalent of message encoding. In such a study, sources could exploit the resources a medium offers as they manage their presentation of self, attempting to control the impression that the viewer forms of them (Walther, 1996; 2007).

2. Modeling Avatar Evaluation and Choice

The focus of the present study was on the reception and appraisal of image features within a set of possible avatars, so multiple viewers rated multiple images. When the emphasis is on how viewers respond to the avatars of others, the unit of analysis can be the individual judgment of an image by a single viewer (see Nowak et al., 2009) or the viewer (where judgments are averaged across multiple images). When the emphasis is on how particular image features generate impressions among viewers, a third choice for unit of analysis is more fruitful. The present study demonstrates that the use of image as the unit of analysis (where judgments are averaged across multiple

viewers) provides greater sensitivity to image feature effects on the avatar selection process. The chief reason that judgments can be collapsed across viewers is that perceptions and appraisals are remarkably homogenous across images and contexts.

We respond to avatars and other computer-generated stimuli in the same way they react to the people and objects we encounter offline (Garau et al., 2003; Koda & Maes, 1996; Nowak, 2004; Nowak & Rauh, 2008; Sherman et al., 2001; Taylor, 2002; Wexelblat, 1998). This is a central tenet of the Social Responses to Communication Technology (SRCT) paradigm (Nass & Moon, 2000; Reeves & Nass, 1996). Why does the offline process of assessing the physical characteristics of humans so closely resemble the online process of assessing the image features of avatars? The sequences used to evaluate visual information are hard-wired in most higher-order animals, such that primates in particular respond to objects much like humans (Scherer, 1984). Viewer responses to visual stimuli, whether computer-mediated or not, transcend context because the process that drives them is immutable (Hamilton & Nowak, 2005; Nowak et al., 2009; Ramerez, Walther, Burgoon, & Sunnafrank, 2002). Information processing theory's omnistructure model (Hamilton, 1997; 1998; 2007) describes these universal patterns of stimulus evaluation.

The omnistructure model applied to avatar selection that appears in Figure 1 contains path coefficients based on a judgment-level analysis (Nowak et al., 2009). The image-level analyses employed in the present study made it possible to find patterns of moderation and mediation that were weak or undetectable with judgment as the unit of analysis. These patterns emerged because the effect size of image features on reception and appraisal variables increases as measurement error decreases. That is, the image-level analysis provided a greater signal-to-noise ratio and helped predict more of the processes involved in perceiving avatars and other computer generated stimuli. Three patterns of effect that could not be fully appreciated at the judgment-level or viewer-level unit of analysis were uncovered by the image-level analysis. The first emergent pattern pertained to moderated effects. Previous research found that users refer avatars with matching gender, such that men prefer male avatars and females prefer female avatars in most cases (Nowak & Rauh, 2008). At the judgment level (see Figure 1), viewer sex has been found to interact with image maleness on homophily, where a portion of that impact is mediated by perceived gender match, or the viewer's perception that the avatar represents the same gender to which he or she self identifies. When performed at the image level, the moderator analysis shows that viewer sex moderates much more than just the effect of image maleness on ratings of homophily.
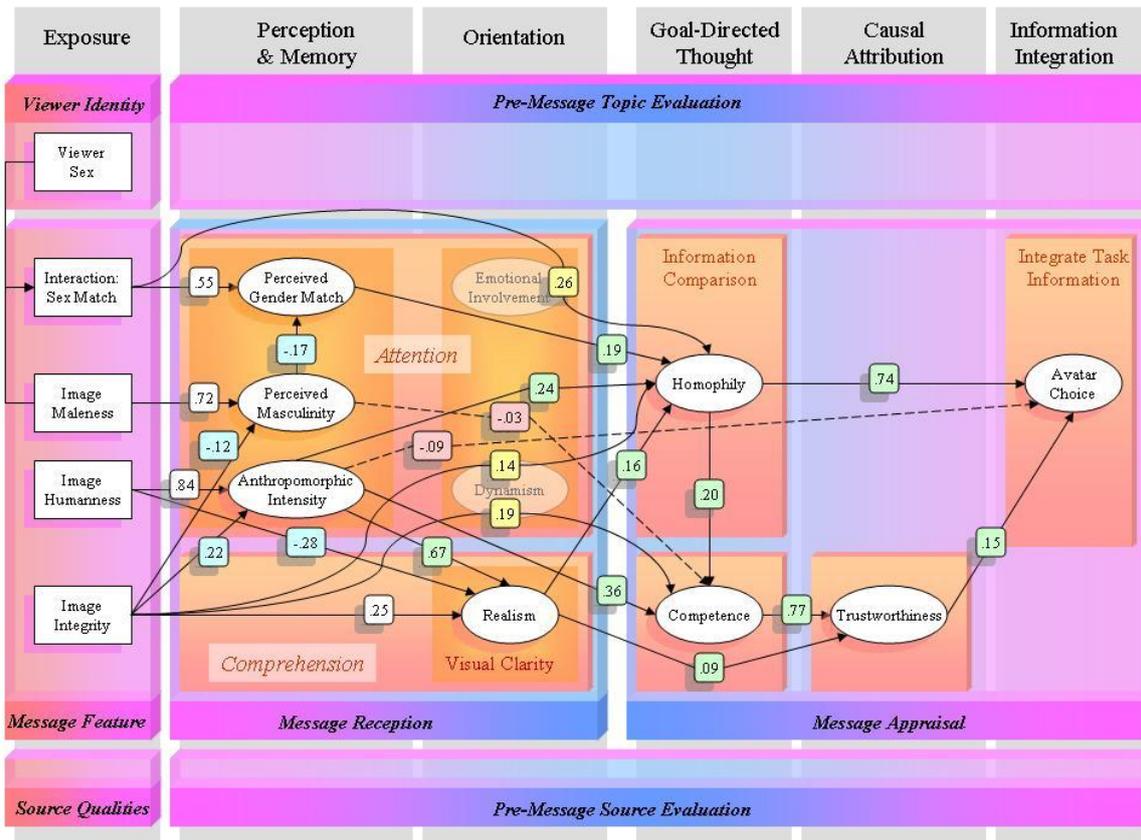
Figure 1. Proposed Model of Avatar Choice. The five exogenous variables are represented as rectangles. Their impact as manipulation effects appear as white coefficients, incidental confounds as blue coefficients, and implicit mediating variables as yellow coefficients. The curved lines travel through the implicit mediating variables. The eight endogenous variables are represented as ovals. Their positive effects appear as green coefficients and their negative effects as red coefficients. The dotted line indicates the hypothesized negative effects involved in antagonistic processes.

The differences in effect size between male and female viewers were so stark that separate causal models had to be constructed based on viewer sex.

The second emergent pattern was related to the effect of implicit mediating variables. Information processing theory predicts that the effect of image features on goal-directed thought should be mediated by reception variables (Hamilton, 1997). At the judgment-level (see Figure 1), the effects of image features on goal-directed thought were mediated by anthropomorphism, perceived masculinity, and realism variables with only three exceptions. The model in Figure 1 sought to explain the three anomalies that represent direct effects of image features on goal-directed thought (marked in yellow). The model proposes that the three "direct" effects are actually mediated by implicit orienting variables. A review of the literature on message effects provided in the next section explains the origins of the model, comparing viewer evaluations of visual images to receiver evaluations of verbal texts. The review points to viewers' emotional involvement and image dynamism as variables that should

mediate the effect of image features on assessments of homophily and competence. The present study uses a latent variable analysis to estimate the role of these implicit orienting variables.

The third emergent pattern concerned offsetting effects. Further analysis of the Nowak et al. (2009) judgment-level data revealed two new and theoretically provocative effects. Both were direct but weak negative effects of image perceptions on viewer appraisal of the image (marked as red in Figure 1). These direct negative effects combine with indirect positive effects (marked in green) on two of the appraisal variables -- competence and avatar choice. The negative perception effects work to offset the positive effects in the model.

2.1 Phases and Sequences in a General Model of Message Evaluation

The more general social influence model of information processing theory (Hamilton, 1997, 1998; Hamilton, Hunter, & Boster, 1993; Hamilton & Nowak, 2005; McGuire, 1968; 1969; 1985) was used to develop an omnistructure model specific to avatar evaluation (Nowak et al., 2009). The general process model describes how message evaluation occurs as a series of six phases: exposure, perception, orientation, goal-directed thought, causal attribution, and information integration (Hamilton, 2007). The first three phases pertain to reception of the message and the second three phases pertain to appraisal of the message.

After they receive a message on a given topic from a particular source, the model predicts that receivers move through the six phases along two parallel tracks or sequences. One of these sequences involves the process for the evaluation of topics and the other is for the evaluation of sources. Following exposure to either a visual or verbal message (including images or text), the topic and source evaluation sequences interface with one another during message evaluation as the viewer moves through the predicted processes.

2.2 Sequences of Premessage and Postmessage Evaluation

As part of the pre-message topic evaluation, receivers' identity shapes and activate topic-relevant schema, activating available information on task. This process determines receivers' interest in the topic, with involvement polarizing attitude toward topic. Prior exposure to a source or category of sources leads to receivers' pre-message evaluation of source dynamism, with dynamism increasing competence, competence increasing trustworthiness, and trustworthiness increasing likeability (Hamilton & Stewart, 1993; Hamilton & Thompson, 1994). The linkages among these four variables constitute the charisma sequence (Hamilton, 1997).

Following exposure to a message, the processes of attention and comprehension operate within the phases of perception and orientation. Receivers orient toward topic and source to varying degrees and this influences how they transition from message reception to message appraisal (Hamilton, 1997). Attention to topic leads to goal-directed information comparison, causal inferences about ability to cope with new information, and information integration on topic (Hamilton, 1997; 1998). Attention to source (reflected in dynamism ratings) improves competence ratings, with competence increasing trust, and trust increasing liking. Source and topic evaluation interface when dynamism increases attention to topic (Hamilton, 1997). Attention boosts comprehension (indicated by message clarity ratings), with message clarity improving competence ratings (Hamilton, 1997; 1998).

3. When Image Features are the Message

During online interaction, image features convey information about the person who has selected a given avatar, even when there is little or no accompanying textual or verbal information (Nowak, 2004; Nowak & Rauh, 2005; Walther & Bunz, 2005). That is, the features of an image become the message. Figure 1 shows the message evaluation sequence through six phases. The premessage source and topic evaluation sequences are not articulated in Figure 1 because they were not an explicit part of the present study.

The first trio of phases covers how viewers' interpret and process an image that is a potential avatar: it covers exposure and perception of the image, as well as relevant memory structures it invokes, and their orientating toward the image. The second trio of phases covers viewers' appraisal of the potential avatar, where viewers assess whether it could meet their goals for future interaction, support their self-concept, and whether they are likely to select the image as a representation of self when interacting with others.

3.1 The Effect of Image Features on Message Reception Processes

When people encounter an image such as an avatar, they progress from exposure to perception and memory activation, and then on to orientation. As they move from the exposure phase to the perception phase, the features of an image influence their perceptions of it in predictable ways. The model in Figure 1 distinguishes between the sex and gender of an avatar user. Markers of biological sex contained in an image should have a large impact on viewer perceptions of an avatar's gender. The model

also distinguishes between human features in an image and viewer perceptions of *anthropomorphic intensity*. As a measure of viewer perceptions, anthropomorphic intensity indicates the degree to which an image appears human. The term "anthropomorphism" applied to avatars refers to the assignment of human characteristics to nonhuman images. Hence, the term would be most appropriate for inanimate objects or nonhuman animals but would make less sense applied to avatars that are veridical representations of humans.

The recognition of objects and activation of relevant memory structures during the perception phase influences the perception of social potential, as discussed above. The perceived social potential influences the allocation of mental effort and attention during the orientation phase. Avatars that look minimally human or display recognizable signs of intelligence or emotion are perceived to have social potential (Nowak et al., 2009; Barret, 1997; Breazeal, 2003; Reeves & Nass, 1996; Nass & Moon, 2000). Receivers differ in the extent to which they orient toward self or others (Hamilton, 1997; 1998). Receivers approach or avoid existing knowledge structures, just as they can approach or avoid message content (image features). An internal focus of attention leads receivers to allocate cognitive capacity to existing knowledge structures, whereas an external focus of attention leads receivers to allocate cognitive capacity to message content (image features). An approach orientation toward message content should increase the correspondence between image features and accurate perceptions.

Two reception processes lend coherence to the progression from perception to orientation -- attention and comprehension. The model in Figure 1 proposes that image gender and anthropomorphic intensity are perceptions influenced by attention processes whereas realism is a variable that is as much concerned with comprehension as attention. Just as attention facilitates comprehension (McGuire, 1968; 1969), anthropomorphic intensity should increase realism during the orientation phase of avatar evaluation.

Attention: Viewer interest in image features

Visible features provide information about the entity behind the image. Hence, viewer curiosity is a motive that drives attention to image features. The need for closure and the motive to reduce uncertainty is present in nearly all social interaction (Kruglanski, Webster, & Klem, 1993; Berger & Calabrese, 1975) and has been shown to apply to online interactions in particular (Walther, 1996). For a viewer attending to avatar features, the cues present in the image trigger the activation of memory structures such as personae (Eddy, Gallup, & Povinelli, 1993). These personae allow the viewer to

locate the avatar on key continua such as perceived gender and anthropomorphic intensity.

Image features that mark gender facilitate the sex-typing of avatars as viewers activate gender schema. Nearly all viewers have been found to attend to gender markers (Nowak et al., 2009). In fact, the presence of image features indicating avatar sex has a massive impact on perceptions of image masculinity and femininity (ρ = .72), as predicted in Figure 1. The gender continuum ranges from feminine to masculine with neuter anchoring the middle of the scale. Since inanimate objects do not reproduce, they are most likely to be perceived as neuter, although objects may be gendered due to associations with gender-stereotypic views of how objects are used. If people do infer the gender of an inanimate object, such inferences are likely to be idiosyncratic and obscure (Nowak & Rauh, 2005; 2008). At the group level, the random nature of these inferences would cancel out, producing null or trivial effects. Although non-human animals reproduce, our ability to distinguish males from females depends on the extent to which the species is sexually dimorphic.

With humans, cultural stereotypes often provide viewers with expectations of what males and females are supposed to look like. Markers such as physical characteristics, clothing, and makeup facilitate the triggering of sex stereotypes (Ashmore & Del Boca, 1979; West & Zimmerman, 1991). As the number of sex markers associated with an avatar increase, perceptions of its gender should be disambiguated. Given the dichotomous nature of the image sex variable, its impact on gender could be interpreted as a massive positive effect of image femaleness on viewer perceptions of the image's femininity or as a massive positive effect of image maleness on viewer perceptions of the image's masculinity. Images with more male-specific sex markers should be perceived as more masculine whereas images with more female-specific markers should be perceived as more feminine. By contrast, inanimate objects should be perceived as relatively gender-neutral.

The extent to which an image is perceived to have human features should increase the likelihood that viewers will perceive it in anthropomorphic terms, giving it the appearance of an actor capable of social behavior, or having high social potential (DiSalvo & Gemperle, 2003; Noske, 1989; Nowak, 2004; Nowak & Rauh, 2005; Shapiro, 1997). This explains the enormous positive effect of image humanness on viewer ratings of the image's anthropomorphic intensity (ρ = .84) obtained in earlier research (Nowak et al., 2009) and predicted in Figure 1. Human features allow viewers to "connect" with the image at a basic biological level (Scherer, 1984) and then identify with it. This perceptual connection might occur to a lesser extent with non-human

animate objects and would not occur at all with inanimate objects. Entities represented by images with fewer human features are likely to be perceived as less sentient, even when the entity is a person rather than a computer (e.g., an internet robot or bot). The model in Figure 1 holds that markers of humanness elicit anthropomorphic intensity (Nowak, 2004; Nowak & Rauh, 2005).

Comprehension: Understanding the image

Comprehension ranges from simple word recognition to complex pragmatic understanding (Hamilton, 1997), brought about through verbal or visual clarity. An avatar is a symbolic representation of the person selecting it. Avatars with more complex imagery will require more pragmatic inferences from viewers where the visual clarity of the image facilitates such inferences. Hall (2003) refers to this clarity as "perceptual persuasion" creating "a compelling visual illusion" that contributes to perceived realism. Images vary along a continuum of heavily manipulated and morphed to those with more veridicality, which tend to be more intact and accurate. Previous research has found that viewers perceive avatars with more integrity (fewer transformations) as more realistic (ρ = .25) as predicted in Figure 1.

Thus, the most artificial avatars are predicted to be cartoons or computer-generated composites. These artificial avatars are also likely to be less associated with representing truthful, veridical or intact images of things or people. Thus, photographs that have been morphed should be rated as having higher realism than cartoons but less realism than photographs that have not been morphed. Signs of image modification include blurring, over-enhancement, and implausible juxtapositions of objects. Thus, more contrivances in an image make it less genuine, meaning viewers should perceive it to be less realistic. Thus, the features of an image interact with a viewer's memory structures to determine perceptions of realism (Busselle, 2001; Busselle & Greenberg, 2000).

Just as attention increases comprehension, avatar features that enhance viewer involvement with the image such as human features (Koda & Maes, 1996; Wexelblat, 1998) should contribute to realism. From the SRCT perspective (Reeves & Nass, 1996), anthropomorphic intensity should have a positive effect on realism, an effect that previous research (Nowak et al., 2009) has found to be massive (ρ = .67). In fact, the robust verbal effect of perceived language intensity enhancing message clarity (Hamilton, 1997) is paralleled by the visual effect of anthropomorphic intensity on image realism.

Incidental confounds in naturalistic images

For each of the three anticipated manipulated effects shown in Figure 1, there was a corresponding image effect that complicated the progression from exposure to perception (marked as blue in Figure 1). Image humanness had a medium-size negative effect on ratings of realism (ρ = -.28), image integrity had a small negative effect on ratings of perceived masculinity (ρ = -.12), and image integrity had a moderately small positive effect on ratings of anthropomorphic intensity (ρ = .22). Adding to the complexity introduced by the incidental confounds, two of the three perception variables were not completely independent. Image masculinity was found to decrease the chances of gender match (ρ = -.17).

The act of manipulating avatars introduces artifacts and confounds into the evaluation process. When sources modify the images they present to others (particularly when they use a computer), they may inadvertently alter more than the features they intend to change. These accidental changes in secondary features can produce effects on two or more reception measures. For example, Figure 1 predicts that the humanness manipulation will influence realism as well as anthropomorphic intensity and that the integrity manipulation will influence anthropomorphic intensity and perceived masculinity as well as realism. These incidental confounds are inherent in any experimental design that seeks to generate naturalistic stimuli (Hunter & Hamilton, 1998).

3.2 The Effect of Image Features on Message Appraisal Processes

As receivers engage in message appraisal, they move from goal-directed thought to causal attribution, and then integrate new information into memory structures as shown in Figure 1. During the message reception phases, receivers orient toward self (an internal topic focus) or others (an external source focus). The motivation to focus on self should result in attention allocated to existing knowledge structures (e.g., stereotypes), leading to an acceptance or rejection of the message during goal-directed thought. The motivation to focus on others should result in attention allocated to message content, leading to source-related processing.

Information comparison: Image similarity

As the receiver engages in goal-directed thought, self-orientation initiates the information comparison process, where receivers compare the old information they have in memory to the new information contained in the message (Hamilton, Hunter, & Boster, 1993; Hunter, Danes, & Cohen, 1984). A smaller discrepancy should boost ratings of message quality.

When undertaking the task of selecting an avatar, many choose an image that closely resembles themselves (Nowak & Rauh, 2005). Viewers who are judging a potential avatar (as a new image of self) compare it to their self-concept (old image of self or a current identity) in an effort to maximize similarity. For those seeking similarity, the smaller the assessed discrepancy between new identity represented by an image and old identity representing the self, the greater the likelihood that an avatar will be chosen. This explains the massive effect of homophily on avatar choice (ρ = .74) observed in the judgment-level analysis shown in Figure 1.

Image credibility

As receivers engage in goal-directed thought, they assess the extent to which the source is capable of providing useful information to accomplish their task. A competent source serves as a resource for the achievement of receiver goals, to the extent that the source holds similar beliefs and attitudes. Meta-analysis indicates that source competence produces a large positive effect on trustworthiness in nearly all contexts (Hamilton & Hunter, 1998; Hamilton & Nowak, 2005).

When receivers consider an image as their avatar, they ask themselves "Does the image convey the level of competence that I want to establish with others?" and "Does the image convey the level of trustworthiness that I want to establish with others?" Figure 1 shows the massive positive effect of avatar competence on trustworthiness (ρ = .77). In turn, an avatar that projects the degree of trustworthiness the source desires is more likely to be selected for use in future interactions, although the effect is somewhat small (ρ = .15). This trustworthiness effect is similar in direction and magnitude to the effect of trustworthiness on postmessage attitudes toward topic in persuasion studies (Hamilton, Hunter, & Burgoon, 1990).

3.3 Effects of Message Reception on Message Appraisal

Attention and comprehension processes have been found to influence message appraisal, on both topic and source. For example, source dynamism and verbal clarity have been shown to influence ratings of message quality, competence, and trustworthiness (Hamilton, 1998; Hamilton & Nowak, 2005). When viewers evaluate images as possible avatars, reception variables (e.g., gender, anthropomorphism, and realism) should have an impact on image appraisal.

Effects of gender perceptions on information comparison

Figure 1 illustrates how the effect of image sex-typing and avatar gender on viewers' ratings of homophily should be moderated by viewer sex and partially mediated by gender match (ρ = .19). Image sex and viewer sex should interact, such that sex-

matching will increase ratings of similarity. For male viewers, image maleness and perceived masculinity should increase homophily. For female viewers, image femaleness and perceived femininity should increase homophily. This gender-discrepancy effect parallels the influence that manipulated message discrepancy has on argument quality in verbal intensity studies (Hamilton, 1998).

The model in Figure 1 predicts that homophily increases competence (ρ = .20), so gender match should have a positive (.04) indirect effect on competence that is slight. That is, male viewers should rate more masculine images as presenting a more competent image; female viewers should rate more feminine images as presenting a more competent image.

The hypersexualized imagery hypothesis

One reason perceived avatar gender may have limited positive effect on competence ratings is that it is offset by an antagonistic force. Images of males that are rated as extremely high in masculinity may be perceived as "hypermasculine" just as images of females that are rated as extremely high in femininity may be perceived as "hyperfeminine." There is a trend toward hypersexualized avatars in cyberspace (Clark, 1995; Biocca & Nowak, 2002), although hypermasculine and hyperfeminine imagery has been criticized as aesthetically grotesque within popular culture. Hence, hypermasculine images might be rated by male viewers as less competent than moderately masculine images. Similarly, hyperfeminine images might be rated by female viewers as less competent than moderately feminine images. Generally, viewers are less fond of androgynous avatars than avatars that are sex-typed (Nowak & Rauh, 2008; Nowak et al., 2009) because ample gender cues disambiguate the sex of the avatar. This overall preference for sex-typed (male or female) avatars is due to an interaction between image sex and viewer sex on homophily.

Reactions to hyper-gendered imagery may involve more than aesthetics. The hypermasculine image may be associated with excessive dominance and the hyperfeminine image may be associated with excessive submissiveness. Because of its "hegemonic" connotations, hypermasculine imagery has been criticized in popular culture more often than hyperfeminine imagery. Further analysis of the judgment-level data from Nowak et al. (2009) did show a slight negative effect of perceived masculinity on competence (*beta* = -.03, *p* = .04, *one-tailed*).

The aesthetic salience hypothesis

Anthropomorphic intensity has been found to have a moderately large positive effect (ρ = .36) on viewers' ratings of avatar competence (Nowak & Rauh, 2005; Nowak & Rauh, 2008; Nowak et al., 2009). This effect parallels in both direction and magnitude

the influence that perceived intensity has on competence in verbal intensity studies (Hamilton, 1997). Anthropomorphic intensity should have a positive effect on homophily (ρ = .24), an effect obtained in previous research and predicted in Figure 1. This effect parallels the influence that perceived intensity has on argument quality in verbal intensity studies (Hamilton, 1998).

Anthropomorphic intensity produces two sets of positive effects on avatar choice. In the first set, anthropomorphic intensity enhances choice by increasing homophily (in part by increasing realism). In the second set, anthropomorphic intensity enhances choice by increasing trust (mediated by realism or competence). The positive effect of anthropomorphic intensity on choice mediated by homophily is relatively large (cumulative effect = .27). By contrast, the positive effect of anthropomorphic intensity on choice mediated by trust and not homophily is rather slight (cumulative effect = .05). Further analysis of the judgment-level data from Nowak et al. (2009) indicated a small negative effect of anthropomorphic intensity on choice (*beta* = -.09, *p* < .001) shown in Figure 1. This negative effect nullifies the positive effects of trust and mitigates the positive effect of homophily. This negative effect may be related to aesthetics; further research testing this explanation is underway. Suppose that anthropomorphic intensity increases the aesthetic salience of an avatar. As salience increases, viewers may elevate their aesthetic standards, increasing the probability that a given avatar will fall short of their expectations.

Realism should have a positive effect on homophily (ρ = .16), an effect obtained in previous research and predicted in Figure 1. This effect parallels, but is somewhat smaller than the effect of message clarity on argument quality observed in verbal intensity studies (Hamilton, 1998). The model in Figure 1 proposes that realism enhances avatar credibility. Realism has a tiny (.03) positive effect on competence by increasing homophily. Realism also had a small positive effect on trustworthiness that was not mediated by homophily (ρ = .09). These small positive visual clarity effects parallel the effect of verbal clarity on competence observed in message intensity studies (Hamilton, 1997), although the verbal effects were somewhat larger than the visual effects.

Effects of orienting on information comparison

Three of the effects of exposure variables on goal-directed thought variables appeared to be mediated by implicit orienting variables. First, gender match of the image had a moderate positive effect on homophily (ρ = .26). Suppose that viewers' emotional involvement with representation of self in online environments had been measured. We suspect that this variable would have mediated this gender match-on-

homophily effect such that image sex match would increase emotional involvement with online representation and emotional involvement would have increased homophily ratings. Second, image integrity had a moderate positive effect on homophily (ρ = .14). Third, image integrity had a moderate positive effect on avatar competence (ρ = .19). Had avatar dynamism been measured, we suspect that it would have mediated these two effects. That is, image integrity would increase dynamism, with dynamism increasing homophily and competence ratings.

4. Method

Each of the 261 viewers was randomly assigned a set of 10 images to judge, out of a total pool of 92 images, which were nested within rather than crossed by condition. The pool of images was the same one used in Nowak et al. (2009). Samples of the various types of images can be found in Appendix A. The images were presented on the top of an online questionnaire. The viewers were students at a large university in the United States. Their informed consent was obtained and they received a nominal amount of extra credit for participation. Of the 2610 possible judgments, occasional missing data reduced the number of judgments so that each image was rated by 25 to 29 viewers. For each of the seven measures used, the average number of viewers was almost exactly 28.

Viewers evaluated the images on three message reception measures and four message appraisal measures. All items were 7-interval bipolar scales. The specific items used were from (Nowak et al., 2009). Item quality had been assessed with confirmatory factor analysis.

4.1 Avatar Evaluation Measures

The perceived masculinity of the avatar was measured with two adjective items (Nowak & Rauh, 2008). The two items were *not masculine* to *very masculine* and *not feminine* to *very feminine* (α = .76). Anthropomorphic intensity was measured with three Likert items where responses could range from *Not at All* to *Very Much (α = .89).* The three items were *(Does this image look human?, Does this image have human features?*, and *Does this image have human-like expressions?)*. Realism was measured with four 7- interval bipolar adjective items *(α =.90).* The four items included *(Real* to *Not Real, Cartoon-like* to *photorealistic*, *Natural* to *Artificial* and *Do you think this image could possibly exist outside the computer screen*: Possible to Impossible*).*

Homophily was measured with four 7-interval items (α =.95) obtained from McCroskey et al. (1972, 1981). Responses to the four items could range from *Not at All* to *Very Much.* The four items were *this image is similar to me*, *this image is different from me*, *How much do you identify with this image?*, and *Does this image represent something in you?*. *Competence* was measured with two 7-interval bipolar adjective items (α =.87) obtained from McCroskey et al. (1972, 1981). The two items were *intelligent* to *unintelligent* and *incompetent* to *competent*). Trustworthiness was measured with two 7-interval bipolar adjective items (α =.89). The two items were *reliable* to *unreliable* and *trustworthy* to *untrustworthy* from the character dimension of the McCroskey scale. *Likelihood of selecting the image* as an avatar was measured with one 7-interval an item that ranged from *not at all likely* to *very likely*. Participants indicated how likely they would be to choose the image to represent them in an online interaction.

4.2 Manipulated Avatar Features

The experimental design included three manipulated variables. The features of the potential avatar that were manipulated included: (1) the biological sex of the image (ranging from extremely male, to neuter, to extremely female); (2) the extent to which the image had integrity (free of researcher modification such as morphing); and (3) the extent to which the image had human features. Images included untouched and morphed pictures of male and female humans and non-humans, landscapes and scenery, as well as random shapes. The 10 avatars in a set of images that were randomly assigned to each judge yielded a nesting of the images within the manipulated maleness, integrity, and humanness conditions. This nesting of the avatars variable prevented the traditional repeated-measures analysis where each judge would see the same set of 10 images. This is one of several disadvantages to the nested multiple messages design (Hunter & Hamilton, 1998; Hunter, Hamilton, & Allen, 1989). Another disadvantage is that the interactions among the three independent variables could not be computed because of an unequal distribution of images across cells of the interaction term.

In addition to the internal consistency of the items that were indicators for each of the scales, the degree of agreement between viewers judging images was estimated for each of the seven measures. In order to calculate the reliability of a single judgment for each measure, a Case 1 intraclass correlation coefficient (*ICC*) was computed (Shrout & Fleiss, 1979). The *ICC* values for each of the seven measures can be found in the first column of Table 1. The mean ICC value for the reception measures (.64) was

substantially larger than those for the appraisal measures (.19). The difference between the reception and appraisal reliabilities was massive: $t(5) = 13.20$, $p < .001$.

4.3 Reliability of the Image-Level Means

For designs in which multiple observations are made on the same individual, researchers sometimes inflate their sample size by counting all observations, even though they are not independent (Altman & Bland, 1997).

Variable	Intraclass Correlation Coefficient	Total Reliability	Number of Items to Attain $r_{xx} = .80$
Message Reception			
Perceived masculinity	0.62	0.98	2.47
Anthropomorphism	0.70	0.99	1.69
Realism	0.59	0.98	2.74
Mean	0.64	0.98	2.30
Message Appraisal			
Homophily	0.18	0.86	18.16
Competence	0.23	0.89	13.52
Trust	0.19	0.87	17.07
Likelihood of choosing	0.15	0.83	23.56
Mean	0.19	0.86	18.08

Table 1. Reliability Analysis for Seven Measures.

For example, analysis was conducted with both judgment (observation) and individual viewer as the unit in the Nowak et al. (2009) study. Emphasis was placed on effect size rather than significance tests, where the size of the effect was compared across judgment and individual to minimize Type I error. In the present study, the number of images (92) was much smaller than the number of judgments (2572) or even the number of individuals (261). Hence, moving to image as the unit of analysis substantially reduced the probability of Type I error. A second concern is that the image means obtained by averaging across viewers would not be representative. That is, heterogeneous viewer scores would be meaningless if they were averaged. The degree of homogeneity in viewer scores was assessed by determining the reliability of the mean image scores (see Hamilton & Hunter, 1985).

The reliability of the image-level means, aggregated across 28 viewers, was computed using the Spearman-Brown prediction formula. The reliabilities for each of the seven measures can be found in the second column of Table 1. The mean reliability value for the reception measures (.98) was noticeably larger than those for the appraisal measures (.86). This difference was massive: $t(5) = 7.25$, $p < .001$. The Spearman-Brown formula was also used to estimate the number of viewers necessary

to obtain a reliability of .80. The average n^* value for the reception measures (2.3) was much lower than the average n^* value for the appraisal measures (18.08).

5. Results

Image scores were averaged across the set of viewers that judged them on the seven dependent measures. As a first step, seven univariate analyses were conducted to examine the effects of the three image features and viewer sex on the three reception and four appraisal measures. For each of the seven measures, viewer sex was included as a within-subjects factor in a repeated measures analysis of variance (ANOVA) where image maleness, humanness, and integrity were between-subjects factors.

The image manipulations were all successful, although each of the three intended perception variables showed influence from one of the other manipulations; this indicates the presence of the anticipated incidental confounds This incidental confounding is typical of designs that employ naturalistic messages that sacrifice control (Hunter & Hamilton, 1998) in an effort to obtain greater generalizability (Jackson & Brashers, 1994). In fact, two of the three manipulations were correlated rather than orthogonal. Manipulated humanness was negatively correlated with integrity ($r = -.40$, $p < .001$) but unrelated to gender ($eta = .10$, ns). Nor was there much covariation between integrity and gender ($eta = .13$, ns). The F-values from the ANOVAs in Table 2 indicated that viewer sex was a key predictor of perceived masculinity, homophily, and avatar choice. In addition to its main effects on these three dependent variables, viewer

Measure	Viewer Sex	Viewer Sex by Humanness	Viewer Sex by Integrity	Viewer Sex by Avatar Sex	Humanness	Integrity	Avatar Sex
Perceived Masculinity	0.14	1.05	1.28	0.05	0.17	15.23a	303.3a
Anthropomorphism	5.82c	5.95c	1.28	3.52	493.76a	34.64a	0.00
Realism	0.24	0.60	2.51	1.40	14.09a	25.87a	0.00
Homophily	3.56	0.62	5.89c	168.64a	50.54a	56.76a	3.62
Competence	0.75	1.11	0.36	0.41	76.98	70.43	2.20
Trustworthiness	1.19	1.88	0.18	0.47	46.15	44.26	0.93
Choice	5.61c	2.19	8.21b	128.76a	16.07a	60.19a	3.74

a: p < .001

b: p < .01

c: p < .05

Table 2. F-Values for Repeated Measures Analysis.

sex also interacted with image integrity and image maleness on homophily and choice.

Image integrity and maleness had pervasive main effects on the dependent measures. By contrast, the impact of humanness appeared limited to a main effect on anthropomorphic intensity.

As a second step, separate multiple regressions were conducted to estimate the size of the image integrity and maleness effects separately for female viewers and male viewers. Image integrity and maleness were effect coded and entered in a reduced model without manipulated humanness for the dependent variables homophily and choice. Given that image integrity and maleness generated such different effects for male and female viewers, separate causal models were constructed. Figure 1 was the template for the two causal models.

5.1 Main and Moderating Effects of Viewer Sex

Male viewers tended to rate images as more masculine (M = 3.90, SD = 1.38) than female viewers (M = 3.18, SD = 1.45). This assimilation bias could also be restated as female viewers tending to rate images as more feminine than male viewers. Male viewers also tended to rate images as more homophilous (M = 2.52, SD = .78) than female viewers (M = 2.33, SD = 1.02). Finally, male viewers were more likely to choose the image as an avatar (M = 2.62, SD = .79) than female viewers (M = 2.47, SD = 1.02).

Consider the size of the F-values for the main effects of viewer sex on image masculinity (52.60), homophily (9.85), and avatar choice (7.72) shown in Figure 2. The size of the effects is diminished proportional to the size of links between the variables in the chain: image masculinity is linked with homophily, with homophily influencing avatar choice (see Figure 1). That is 9.85/52.60 = .19 and 7.72/9.85 = .78. In fact, the predicted effect of image masculinity on homophily in Figure 1 was .19 and the predicted effect of homophily on choice in Figure 1 was .72. Thus, the main effects of viewer sex on image masculinity, homophily, and choice are consistent with the model proposed in Figure 1.

In addition to its main effects, viewer sex was expected to moderate the effect of image maleness on perceived masculinity (see Figure 1). Separate regression analyses were conducted for male and female viewers. Regression analysis with male viewers found that (1) homophily increased with image maleness (*beta* = .59, p < .001) and integrity (*beta* = .18, p < .001) and (2) avatar choice increased with image maleness (*beta* = .55, p < .001) and integrity (*beta* = .27, p < .001). The findings were consistent with a model for male viewers in which image maleness enhances

homophily (in part by increasing perceived masculinity) and integrity enhances homophily (in part by increasing realism), where homophily increases avatar choice.

Regression analysis with female viewers found that (1) homophily decreased with image maleness (*beta* = -.65, *p* < .001) but increased with integrity (*beta* = .33, *p* < .001) and (2) avatar choice decreased with image maleness (*beta* = -.62, *p* < .001) but increased with integrity (*beta* = .44, *p* < .001). The findings were consistent with a model for female viewers in which image femaleness enhances homophily (in part by increasing perceived femininity) and integrity enhances homophily (in part by increasing realism), where homophily increases avatar choice. Note that the image sex and integrity effects on homophily and avatar choice appear larger for female viewers than they do for male viewers. Causal models allowed us to determine where in the avatar evaluation process these viewer sex differences were taking hold.

5.2 Causal Models

Humanness was co-linear with anthropomorphic intensity (*r* = .88) and had little effect on any of the other criterion variables so it was not included in the causal models. The two manipulated variables, three perception variables, and four appraisal variables were correlated separately for male and female viewers. The structure of the models for the female viewers closely resembled that for the male viewers. Regardless of viewer sex, the impact of the three manipulations on the appraisal variables was at least partially mediated by perception variables, as predicted in Figure 1. Nonetheless, given that viewer sex substantially moderated the effect of image maleness and integrity on homophily and avatar choice, separate causal models were constructed for male and female viewers.

Male viewers

The model for male viewers had exceptional fit and was largely consistent with the proposed model in Figure 1. The Root Mean Squared Error (*RMSE*) for the model shown in Figure 2 was .03 with $\chi2(15, 92) = .68$, *p* = 1.0. Avatar maleness had a massive positive effect on perceptions of masculinity (ρ = .91) and integrity had a large positive effect on realism (ρ = .46). Integrity influenced perceived masculinity and realism but not anthropomorphic intensity. The anticipated confound from integrity to anthropomorphic intensity was not present. Integrity did have an impact on the two goal-directed thought variables homophily and competence. Specifically, integrity reduced perceived masculinity (ρ = -.12) but increased homophily (ρ = .18) and competence (ρ = .38). Stated in reverse, it appears that morphed images were perceived as more masculine and assessed as lower in quality.
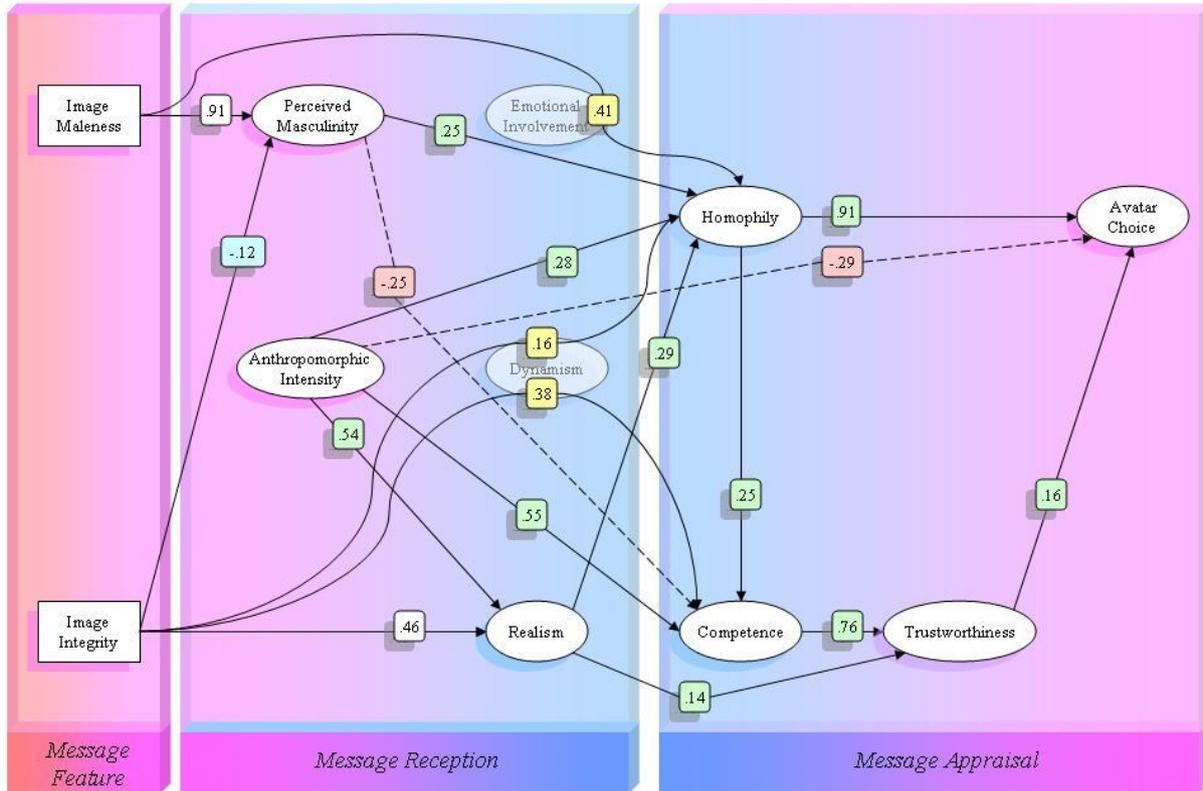
Figure 2. Test of Proposed Model with Male Viewers. Overall goodness of fit of this model was RMSE = .033, χ2 (15,92) = .68, p = 1.0.Suppose that dynamism is a latent variable in the present study, with an effect on competence of approximately .64. This would imply that the effect of image integrity on dynamism was .59 and the effect of integrity on homophily was .25.

Paralleling the effect of attention on comprehension, anthropomorphic intensity increased realism (ρ = .54). There were two paths from homophily to avatar choice. Homophily had a massive direct effect on avatar choice (ρ = .91). Homophily also had a barely detectable indirect effect (.03) on avatar choice through a 3-step causal chain. In this 3-step chain, homophily increased competence (ρ = .25), with competence increasing trustworthiness (ρ = .76). In turn, trustworthiness increased avatar choice (ρ = .16). Homophily increased with avatar masculinity (ρ = .25), anthropomorphic intensity (ρ = .28), and realism (ρ = .29). Anthropomorphic intensity increased competence (ρ = .55), and realism increased trustworthiness (ρ = .14).

Extensions of the proposed model

As hypothesized, the manipulated variables had "direct" effects on homophily that appear to be mediated by orienting variables. Image maleness had a "direct" effect on homophily (ρ = .41) that was suggestive of the emotional involvement effect proposed in Figure 1. Image integrity had "direct" effects on homophily (ρ = .16) and competence (ρ = .38) that were suggestive of the dynamism effect proposed in Figure 1. In a previous study (Hamilton & Thompson, 1994) that examined the effect of dynamism on

competence in the absence of a text (prior to its delivery), the effect was .64. This would imply that the effect of image integrity on dynamism was .59 and the effect of integrity on homophily was .25.

Consistent with the hypersexuality hypothesis (see the dotted path in Figure 1), avatar masculinity had positive and negative effects on competence. On the one hand, perceived masculinity had a small positive effect on competence (mediated by homophily). This indirect positive effect (.06) at the image level was only trivially larger than that observed at the judgment level (.04). On the other hand, perceived masculinity had a substantial negative effect on competence (ρ = -.25). Note that this direct negative effect at the image level was over eight times larger than that observed at the judgment level.

Consistent with the aesthetic salience hypothesis (see the dotted path in Figure 1), anthropomorphic intensity had positive and negative effects on avatar selection. The positive effects were all indirect (and cumulatively moderately large, .35). The indirect positive effects at the image level were only trivially larger than that observed at the judgment level (.32). Anthropomorphic intensity had a direct negative effect on avatar choice (ρ = -.29). Note that this direct negative effect at the image level was over three times larger than that observed at the judgment level.

Female viewers

The model for female viewers was also largely consistent with the proposed model in Figure 1, although fit was merely adequate. The *RMSE* for the model in Figure 3 was .09 with $\chi2(15, 92)$ = 6.29, *p* = .97. Avatar femaleness had a massive positive effect on perceptions of femininity (ρ = .86) and integrity had a large positive effect on realism (ρ = .40). The magnitude of these effects matched those for male viewers. Integrity influenced perceived masculinity and realism but not anthropomorphic intensity. Thus, the anticipated confound from integrity to anthropomorphic intensity was not present for either female or male viewers. Integrity influenced the goal-directed thought variables homophily and competence. Integrity increased perceived femininity (ρ = .23). For male viewers integrity had decreased perceived masculinity. Regardless of viewer sex, integrity tends to decrease perceived masculinity. Integrity increased homophily (ρ = .18) and competence (ρ = .31). The magnitude of both effects matched those for male viewers. Stated in reverse, it appears that morphed images were perceived as more masculine and viewers assessed those images as lower in quality. Anthropomorphic intensity increased realism (ρ = .55) just as it did for male viewers. The two paths from homophily to avatar choice for female sources matched those for male sources. Homophily had a massive direct effect on avatar choice (ρ = .94).
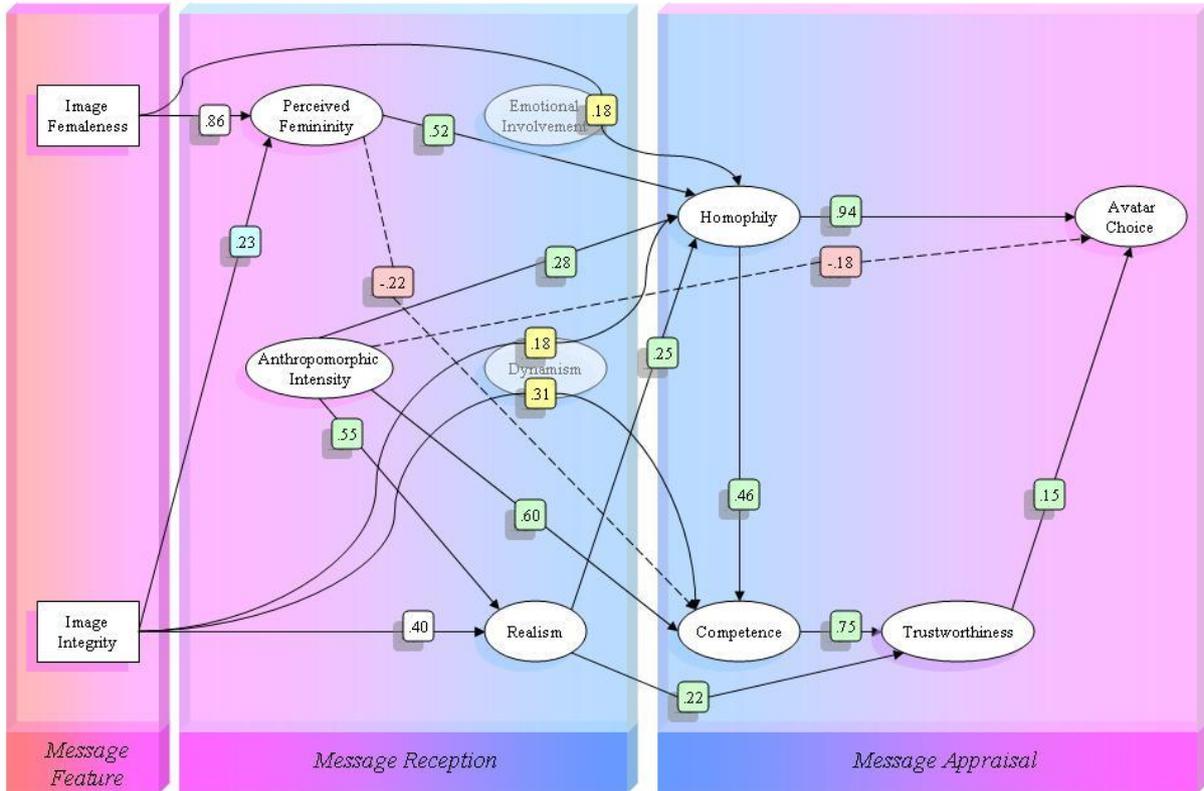
Figure 3. Test of Proposed Model with Female Viewers. Overall goodness of fit of this model was RMSE = .088, χ2(15,92) = 6.29, p = .97.

Homophily also had a slight indirect effect (.05) on avatar choice through a 3-step causal chain. Homophily increased competence (ρ = .46), an effect size that was almost twice as large for female viewers than male viewers. Competence increased trustworthiness (ρ = .75), trustworthiness increasing the likelihood of selection (ρ = .15). The magnitude of these two effects closely matched those for male viewers.

Avatar femininity increased homophily (ρ = .52), an effect size that was over twice as large for female viewers than male viewers. Anthropomorphic intensity (ρ = .28) and realism (ρ = .25) both increased homophily. The magnitude of both effects closely matched those for male viewers. Anthropomorphic intensity increased competence (ρ = .60), and realism increased trustworthiness (ρ = .22). The magnitude of these two effects approximated those for male viewers.

Extensions of the proposed model

As predicted in Figure 1, the manipulated variables had "direct" effects on homophily that appear to be mediated by orienting variables. Image femaleness had a "direct" effect on homophily (ρ = .18) that was suggestive of the proposed emotional involvement effect. Image integrity had "direct" effects on homophily (ρ = .18) and competence (ρ = .31) that suggested dynamism as a mediating variable. Assume, as

with the male viewers, that the effect of the latent variable dynamism on competence was approximately .64. This would imply that the effect of integrity on dynamism was .48 and the effect of integrity on homophily was .28.

Consistent with the hypersexuality hypothesis (see the dotted path in Figure 1), avatar femininity had positive and negative effects on competence. On the one hand, perceived masculinity had a small positive effect on competence (mediated by homophily). This indirect positive effect (.24) at the image level was six times that observed at the judgment level (.04). Similarly, perceived femininity had substantial negative effect on competence (ρ = -.22). This direct negative effect at the image level was over seven times larger than that observed at the judgment level.

Consistent with the aesthetic salience hypothesis (see the dotted path in Figure 1), anthropomorphic intensity had positive and negative effects on avatar selection. The positive effects were all indirect (and cumulatively moderately large, .48). The indirect positive effects at the image level were somewhat larger than that observed at the judgment level (.32). Anthropomorphic intensity had a direct negative effect on avatar choice (ρ = -.18). Note that this direct negative effect at the image level was twice as large as that observed at the judgment level.

6. Discussion

This article extends understanding of the processes involved in avatar evaluation and decision-making based on information processing theory plus it explains the existence of the antagonistic effects of perceived gender on competence and anthropomorphic intensity on avatar choice. The image-level analysis reveals the dynamics of offsetting positive and negative effects, where the negative effects were barely noticeable at the judgment level. The results from regression analyses had indicated the need to construct separate models for male and female viewers. Although the structure of the models was identical, homophily was found to be a more relevant mediating variable for female viewers than male viewers, which supports the needs for separate models for male and female viewers.

The proposed model in Figure 1 distinguishes reception processes that link avatar features to perception and orienting variables from appraisal processes that link perception and orienting variables to goal-directed thought, causal attribution, and information integration. The results indicate that during image reception, perceived gender and anthropomorphic intensity exerted independent effects on homophily and

competence, where realism partially mediated the positive effect of anthropomorphic intensity on homophily. During image appraisal, the positive effect of homophily on avatar choice was partially mediated by avatar credibility (competence and trustworthiness).

6.1 Reception and Appraisal Associations

The three reception-appraisal links proposed in Figure 1 were present regardless of viewer sex and the results for female viewers generally resembled those for male viewers, with two interesting exceptions. Both of these exceptions are related to schematized, top-down processing. These memory-driven associations imply the existence of personae for the interpretation of avatars and is consistent with predictions that avatars increase perceived social potential. First, matching image sex with viewer sex promoted homophily. The positive effect of gender consistency on homophily was twice as large for female viewers as it was for male viewers. This finding supports previous research showing that female viewers place more emphasis on avatar homophily than male viewers.

Second, perceived anthropomorphic intensity had a very large direct positive effect on competence (ranging from .55 to .60) at the image level, at least 50% larger than at the judgment level (.36). The effect of source dynamism on competence in the present study was estimated to be .64, suggesting that the effect of anthropomorphic intensity on dynamism, had it been directly measured, would have been enormous: .86 to .94. Subsequent studies should seek to establish whether anthropomorphic intensity is a perception that involves the triggering of human personae and expectations or if anthropomorphic intensity is akin to dynamism. The parallel effects of dynamism and anthropomorphic intensity on competence suggest that the two variables are generating effects based on a feeling of interpersonal connectedness with the avatar. Images such as nature scenes do not foster such connections.

Third, more realistic images were more likely to be trusted, although this effect is relatively weak (ranging from .14 to .22). Viewers appear to infer that a doctored image is a "fake," which might lead to further inferences that the user is someone capable of deception. Future research should explore the relationship between these two variables.

6.2 Information Processing Findings

The models represented by Figures 2 and 3 were consistent with information processing theory, showing identical structures. The magnitude of the results for the two models was also similar, with the key difference the greater emphasis on

homophily by female viewers. Once the degree of integrity of an image was controlled, markers of humanness led to anthropomorphic intensity with near-perfect accuracy. The manipulation of image sex led to expected gender perceptions with surprising certitude, such that images with more male features were perceived as more masculine and images with more female features were perceived as more feminine. The certitude was surprising because some of the images were heavily morphed, blurring sex markers to make the images appear more androgynous.

The integrity manipulation was more diffuse, producing a less powerful impact on perceptions of realism. The integrity manipulation did, however, increase perceptions of image femininity for both female and male viewers. This modest effect might be better understood in reverse, where images that appear to have been modified are associated with greater masculinity and lower competence. Whereas humanness and sex markers are almost perfectly reliable in the perceptions they generate, image features that mark an image as transformed are less reliable. It may be that assessments of an avatar's realism are less a perception than an orientation. That is, when viewers respond to items about image realism, they are reflecting on the extent to which they feel immersed in the environment in which the avatar is presented.

Reception processes

Two hypotheses might account for the large positive effect of anthropomorphic intensity on realism predicted in Figure 1 and observed in the present study. First, anthropomorphic intensity may increase visual clarity: as viewers perceive human features in an avatar it increases their involvement (arousal), with involvement increasing attention; increased attention should improve comprehension of visual content. Second, anthropomorphic intensity may increase involvement (presence), with involvement increasing a sense of emersion; increased emersion should make avatars seem more real.

Appraisal processes

The model in Figure 1 proposed two variables that would increase the probability that an image would be selected as an avatar – homophily and trust. Homophily had a massive (.93) and direct effect on avatar choice. The effect of trust on avatar choice was somewhat small (.15) but exactly as predicted (see Figure 1). The enabling effect of homophily on trust was mediated by competence, as predicted in Figure 1. The indirect effect of homophily on avatar choice mediated by the enabling process was quite weak (.04) and was dwarfed by the direct effect, which was over 23 times larger.

The results suggested the presence of charisma in the source evaluation sequence. That is, avatar dynamism mediates the positive effect of image integrity on competence, with competence increasing trustworthiness. The results also suggest the

presence of identification in the topic evaluation sequence. That is, viewers' emotional involvement with the virtual environment (presence) should mediate the positive effect of image maleness and perceived masculinity on homophily, with homophily driving avatar choice. Anthropomorphic intensity was influenced by neither the integrity nor the maleness of the image. Anthropomorphic intensity did, however, have pervasive effects on the source and topic evaluation variables, increasing realism, homophily, and competence.

6.3 Antagonistic Effects

Antagonistic effects occur when an antecedent variable has both positive and negative effects on a consequent variable. In order to differentiate the positive from the negative effects, at least one of the paths from the antecedent variable to the consequent variable must be mediated by a third variable. Ideally, both the positive and negative effects can be fully explained by the presence of mediating variables. The two sets of antagonistic effects observed in the present study were mediated by homophily, underscoring the central role of the variable in the model. In both cases, it was the positive effect of the antecedent variable on the consequent variable that was mediated by homophily; the negative effect of the antecedent on the consequent was direct.

Gender and competence

The impact of image gender on competence ratings depended on the sex of the viewer. Consider male viewers. Perceived masculinity had a positive effect on homophily, with homophily increasing competence. This indirect positive effect on competence (.06) was more than offset by a direct negative effect of masculinity on competence (-.25). This finding suggests that overly masculine imagery lowers competence ratings by men. Why would male viewers be less accepting of excessively masculine avatars? Perhaps they feel more competitive in the presence of what looks to be a domineering image.

Now consider female viewers. Perceived femininity had a positive effect on homophily, with homophily increasing competence. This indirect positive effect on competence (.24) was larger than the direct negative effect of femininity on competence (-.22). Thus, the overall impact of image gender-matching on competence was slightly positive for female viewers but negative for male viewers. This finding suggests that overly feminine imagery is not as perilous for women as overly masculine imagery is for men. That is, female viewers appear more accepting of hypersexuality than male viewers. People in our society tend to identify with and be inspired by extreme positions (e.g., heroes who are passionate about their cause). Yet they may see such extreme positions as maladaptive and not likely to prevail. Gender polarized

images (masculine or feminine) are easier to disambiguate and therefore easier to identify with as gender-consistent (or to reject as gender-inconsistent), yet they may also come across as more extreme, with extremity decreasing competence (less adaptive). Viewers may be attracted to media personae like the hyper-masculine Sylvester Stallone or Arnold Schwarzenegger or the hyper-feminine Kate Moss or Mary-Kate Olsen, but see the pragmatic limitations of such characters. Future research should explore this possibility.

Anthropomorphism and avatar choice

Anthropomorphic intensity had both positive and negative effects on avatar choice, regardless of viewer sex. In both Figures 2 and 3, the positive effect of anthropomorphic intensity on avatar choice was mediated by realism, competence, and trustworthiness but most importantly homophily. In that key link, anthropomorphic intensity increased homophily, with homophily increasing avatar choice. Anthropomorphic intensity also enhanced trust, with trust increasing avatar choice. The positive effect of homophily on avatar choice was about six times the size of the effect mediated by trust, regardless of viewer sex. Hence, homophily was far more important than trust as a mediating variable. As an antecedent variable, realism had a small role to play in facilitating avatar choice.

Anthropomorphic intensity had a direct negative effect on avatar choice. The aesthetic salience hypothesis holds that the occurrence of human features in an avatar drives up perceived anthropomorphic intensity, with anthropomorphic intensity increasing viewers' aesthetic revulsion to the image. In turn, aesthetic revulsion should lead to a more negative attitude toward the avatar. Future research should seek to determine why anthropomorphic intensity increases aesthetic revulsion, whether it is an expectancy phenomenon or a more visceral phenomenon.

7. Acknowledgments

8. References

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9. Appendix
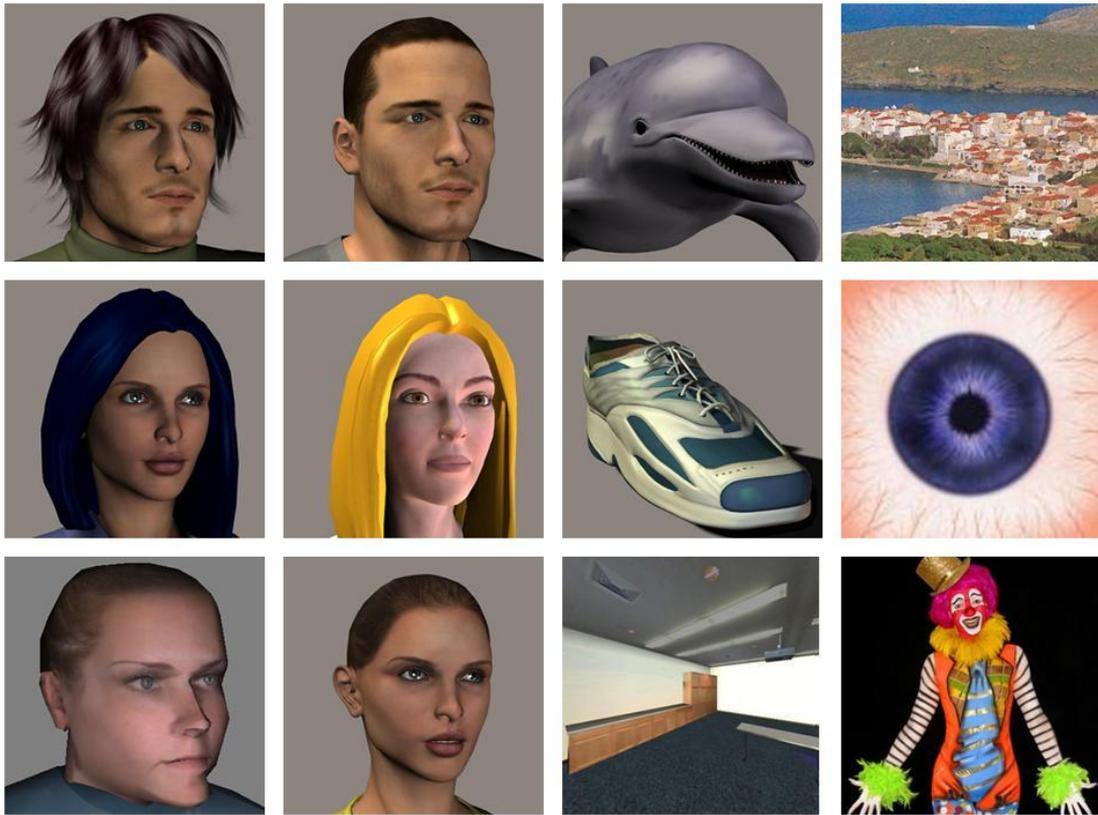
Appendix A. Examples of Images Presented to Viewers.