AVATAR-BASED SELF-INFLUENCE IN A TEXT-BASED CMC ENVIRONMENT

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ABSTRACT

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Avatar-based self-influence in text-based CMC was examined through the lens of self-perception theory and the Proteus effect. Avatar embodiment is discussed as a moderator for the Proteus effect, as well as the need for inducing this embodiment in experimental studies in order to observe evidence of the Proteus effect. Two possible methods for inducing embodiment are tested along with a proposed model for the Proteus effect in social media environments. Significance in this study was found for main effect of a familiarity task on perceptions of avatar embodiment, an interaction effect of avatar embodiment and avatar condition on aggressive behavior, and an unpredicted main effect of embodiment on aggressive attitude. Results are discussed as are possible explanations for the observed effect of embodiment on aggression.

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INTRODUCTION

Much early computer-mediated communication (CMC) research explored the ways that humans communicate when only text carries one's messages. However, the complete lack of a digital visual representation online no longer accurately describes the modern CMC environment. From Facebook to Snapchat, profile photos and images abound in contemporary digital environments. Visual information, whether an actual profile photograph, a google-able image of an individual, or other visual information that augments and influences the interpreted meaning of text is ubiquitous in the modern internet.

The current study examines visual representations of the self in CMC research, or avatars, through the lens of self-presentation and self-influence. The self-perception theory and the Proteus effect were used to examine the self-influencing effects of avatars. The self-perception theory stipulates that individuals know their own beliefs and attitudes through objective observations of themselves, making judgments much as a third party would (Bem, 1972). The Proteus effect presents evidence of this behavior in virtual reality environments where individuals have been found to take on the behaviors and attitudes of their avatars (Beyea, Ratan, Li, & Graciano, 2019). These constructs are examined in a text-based digital environment, taking into account possible driving factors such as choice and avatar embodiment.

This study seeks to examine the self-influencing effects of avatars in text-based CMC. The current work first reviews the contributions of both self-perception theory and Proteus effect research, as well as evidence for the need of avatar embodiment to be present in order to observe these self-influencing effects. Next, this study reports the results of an original experiment exploring avatar embodiment and the Proteus effect in text-based CMC environments. Results

are then discussed, specifically in regards to the theoretical perspectives of self-influencing effects in text-based CMC environments.

SELF-PERCEPTION THEORY AND THE PROTEUS EFFECT

Self-perception theory posits that an individual may infer his/her own beliefs much in the same way that they infer the beliefs of others, by observing themselves as a third party would (Bem, 1972). The first of two postulates in self-perception theory states that individuals come to know their own attitudes, emotions, and beliefs partially by observing their own overt behavior and appearance, and the circumstances around that observation. The second postulate states that to the extent that an individual's internal cues are ambiguous, or uninterpretable, that individual is in the same position as an outside observer and must rely on those external cues that they viewed to infer their attitudes and beliefs (Bem, 1972). Following these postulates, individuals might infer their attitude, based on their behavior, as long as that behavior is free from the control of explicit corroborating circumstances.

Bem (1965) demonstrated self-perception theory's ability to predict a change in attitude in a study looking at magazine cartoons. Participants were trained, under the guise of building experimental stimuli, to answer a series of questions truthfully when they saw a red light, and to lie when they saw a green light. After a series of questions, the participants were shown magazine cartoons that had been previously rated as neither funny nor un-funny. For each cartoon the subjects were instructed to say either, "This cartoon is very funny," or, "This cartoon is very unfunny." Although they were not told to pay attention to the lights, the "truth" and "lie" lights would turn on for different cartoons. After each statement about the individual cartoons was made and the truth or lie light turned off, the participant's actual attitude toward the cartoon was measured. Subjects' attitudes towards the cartoons followed the self-perception theory's predictions. If a subject made the "This cartoon is funny," statement in the presence of the "truth" light, he subsequently rated the cartoon as funnier than if the statement was made in the

presence of the “lie” light. Participants viewed themselves making a positive statement about the cartoon in the presence of an indicator that they were telling the truth (i.e., the light). Just as a third party would observe this behavior, and infer that the subject was telling the truth and has a positive attitude towards the cartoon, so did the subject.

Valins’ (1966) demonstrated similar findings using seminude photos while manipulating participants’ perceived heartbeats. Participants ranked photos that were viewed while they heard their “heartbeat” speed up, as more attractive than other photographs. Consistent with self-perception theory, when the participants observed their heart rate increase for specific photographs they inferred that they were more attracted to the women in those photographs.

While the above studies show self-perception’s effect on attitude, Frank and Gilovich (1988) provided evidence of a self-perception related change in behavior. In the first study of their paper, Frank and Gilovich (1988) rated the attitudes towards NFL and NHL uniforms, finding that black uniforms were seen as more aggressive, mean, and malevolent than non-black uniforms. In a follow up experimental study, participants, under the guise of being on competitive teams, were asked to pick what games they wanted to play while wearing white or black uniforms. Subjects in the black uniforms chose significantly more aggressive games than those wearing the white uniforms. Participants viewed themselves wearing black uniforms which affected their attitudes about themselves. As black uniforms were perceived to be more aggressive, as seen in the first study, the individuals wearing those uniforms viewed themselves as more aggressive. Perceiving themselves as aggressive then influenced the individual’s behavioral intent, to be aggressive.

Similar results were found by Peña, Hancock, and Merola (2009) using black and white cloaked avatars online. In their study, Peña, et al. (2009) participants played an online video

game where their avatars had been altered to appear as wearing white or black cloaks. Once in the game, participants interacted in three-person groups, where they discussed possible punishments for a player that had repeatedly attacked unarmed players within the game. In comparison to those using white-cloaked avatars, participants using the black-cloaked avatars had higher behavioral intentions to attack unarmed players as well as more aggressive attitudes. As in Frank and Gilovich's (1988) study, participants using black-cloaked avatars perceived themselves as aggressive, which influenced their behavioral intention and attitude in the direction of the aggressive self-perception.

Johnson and Downing (1979) demonstrated how self-perception works with perceived stereotypes, having participants dressed as nurses or Ku Klux Klan members. When a confederate learner made a mistake, participants were allowed to lower or raise the level of electric shock that the confederate received. As part of the experiment, participants wore prosocial (nurse uniform) or antisocial (KKK robes) disguises. Johnson and Downing (1979) found that subjects wearing the KKK robes delivered more severe shocks to the learner than those participants in nurses' uniforms. These results are consistent with self-perception theory. Subjects observed themselves either dressed as a nurse or in KKK robes and their behavior conformed to the perceived stereotype of their appearance.

Effects consistent with self-perception theory have been found in high fidelity digital environments, when researchers examine the effects avatars have on their users, dubbed the Proteus effect. The Proteus effect occurs when individuals take on the characteristics and behavior of their virtual self-representation (Yee & Bailenson, 2007). Individuals view their avatar's appearance as their own appearance, and change their behavior to conform to the stereotype of that virtual appearance. The Proteus effect occurs regardless of whether or not the

avatar represents the individual's actual appearance. This effect has been found in virtual environments by manipulating avatar attractiveness, height (Yee & Bailenson, 2007), weight (Li, Lwin, Jung, 2014), gender (Yee, Ducheneaut, Yao, & Nelson, 2011), and dress (Peña, et al., 2009). In each of these cases, individuals using an avatar as a representation of their virtual-self, conformed to the perceived stereotype of that avatar. For example, Li et al. (2014) manipulated the weight of avatars used in an exercise game played by over-weight children. Those children with skinnier, fit, avatars were found to perform better on the exercises in the game, than those with overweight avatars. The children conformed to the stereotype of their skinny avatars being physically fit.

If the mechanics of self-perception theory operate in the same fashion in CMC environments as they do in FtF communication then self-perception can be used to predict and explain the Proteus effect. When an individual is using an avatar, whether in an immersive VR environment or in a video game on a monitor, the avatar represents the individual in the digital environment. By viewing the avatar as a representation of the self, the individual will infer attitudes from the appearance and behavior of the avatar, just as would happen when viewing the self in a non-CMC environment. That inferred attitude would then make it more likely that the individual, acting through the avatar, would behave in accordance to that attitude.

In their original study, Yee and Bailenson (2007) observed the Proteus effect by manipulating the attractiveness and height of participants' avatars. In the first experiment of their study, participants were randomly assigned to either an attractive or unattractive avatar. The participants viewed their avatar via a mirror present in the virtual environment. Following the viewing of their avatar, subjects participated in a conversation with a confederate, who was blind to their attractive/unattractive condition. Individuals using attractive avatars were found to

display interpersonal behavior closer to the stereotype of an attractive person, than those in the unattractive condition. They stood closer to the confederate and self-disclosed more information. In a second experiment within the same study, Yee and Bailenson (2007) manipulated the relative height of avatars, finding that individuals embodied by taller avatars were more aggressive than those in shorter avatars during a money splitting game played when using the avatar in the immersive virtual environment

The Proteus effect has also been found to occur outside of the laboratory, in online communities and video games. In a content analysis of census data from the online game *World of Warcraft*, Yee, Bailenson, and Ducheneaut (2009) found a correlation between character avatar appearance and performance in the game. An analysis of more than 2,000 characters found that players with attractive and tall avatars were more likely to perform better in the game, even though avatar appearance gave no in-game advantage.

The Proteus Effect in Text-Based CMC

While there is evidence of self-perception theory being present in text-based CMC (Walther, et al., 2010; Van der Heide et al., 2017), this has been in the form of message-based counter attitudinal advocacy and not through the use of avatar-based visual cues. That being the case, there is no reason to believe that the visual representation of the self in text-based CMC will not affect an individual's self-perception. Social media sites often provide an avatar for the user, in the form of a profile photo, which acts as a visual representation of the self in the digital environment. If this static avatar is seen as a digital representation of the user, then the mechanics described in self-perception theory should result in a self-influencing effect similar to counter attitudinal advocacy.

Yet, Van Der Heide, Schumaker, Peterson, and Jones (2013) failed to find any evidence of the Proteus effect within the confines of text-based CMC communication. In their study, Van Der Heide et al. (2013) explored the predictions of the Proteus effect in dyadic computer-mediated interactions. Participants communicated using static full-body avatars, created using the online virtual environment *SecondLife*, in attractive, unattractive, or no avatar conditions. In mixed-sex dyads, female participants communicated with male participants with the conversation task of planning a hypothetical romantic date that they would go on together. Following a ten-minute conversation, participants filled out a questionnaire. According to self-perception theory, participants that used attractive avatars should have viewed themselves as more attractive. As a stereotype for attractive individuals is that they are seen as more likely to have relational happiness (Dion, Berscheid, & Walster, 1972), participants seeing themselves as attractive should behave along that stereotype, displaying higher levels of relational closeness than the control and unattractive conditions. The authors, however, did not find these results. Rather, they found that communication partners that saw themselves represented with an unattractive avatar showed more intimacy, affection, depth and similarity than those with attractive avatars or the control. These findings are more in line with behavioral compensation, where the participants in the unattractive condition are compensating for being seen as unattractive, with higher levels of relational closeness (Van Der Heide, et al., 2013).

It is, however, possible that Van Der Heide et al. (2013) were unable to identify evidence of self-perception theory based effects due to the experimental task inducing the same behavior as the experimental manipulation. In the study, participants were instructed to plan a "hypothetical romantic date," in a CMC conversation with their communication partner. The participants were then rated on the Relational Communication Scale (Burgoon & Hale, 1984) by

their communication partner and naïve coders. The hypothesized higher scores in relational communication for individuals with attractive avatars were not observed. The authors did find evidence to support a behavioral compensation hypothesis, which suggest that behavioral compensation has a stronger effect than self-perception theory.

The lack of an observed Proteus effect in text-based CMC could have been due to the task performed in all of the conditions having a similar self-influencing effect to the Proteus effect. While not explored in the context of the Proteus effect, self-perception theory predicts an attitude change due to viewing one's own behavior, and not just appearance (Bem, 1972). By performing the task of planning a romantic date, the study participants were performing a relational communication behavior. According to self-perception theory, an individual would view him/herself performing the behavior, and might infer a positive attitude towards a romantic relationship with their communication partner. This, in turn, could result in a non-avatar-based self-influencing effect similar to the Proteus effect. It is possible that any increase in relational communication due to communication task could have overshadowed an avatar-based self-influencing effect. It is equally as likely that an un-hypothesized ceiling effect along with a task based effect resulted in an unobserved Proteus effect. While one cannot know for sure if either of these possibilities occurred, it is advisable to avoid using a task and avatar manipulation simultaneously that could both produce self-influencing effects along the same direction, in order to increase the relative strength of the experimental induction.

Aggressive Avatars

While attractiveness as an independent variable (IV), predicting positive behavior as a dependent variable (DV), has been successfully used multiple times (Bian, Zhou, Tian, Want, & Gao, 2015; Yee & Bailenson, 2007; 2009), it has already been attempted in a text-based CMC

environment (Van Der Heide, et al., 2013).The lack of observable evidence of the Proteus effect in Van Der Heide, et al.'s (2013) study may be due to methodological issues or other variables not examined that relate to prosocial communication behavior and the text based CMC environment. For example, the hyperpersonal model predicts increased levels of positive communication behavior, such as self-disclosure, in text based CMC environments (Walther, 1996) that are not necessarily predicted to occur in the fully immersive virtual environments in which the Proteus effect is most often observed. It is therefore prudent to use a different DV than positive communication behavior when examining visual based self-perception effects in the text-based CMC environment. At the minimum, this would avoid any effects explained by the hyperpersonal model overshadowing avatar-based effects. For this study, aggressive avatars will be used to induce aggressive communication behaviors, as it provides an improved opportunity to detect an effect in a text-based CMC environment.

The most common method of examining the Proteus effect has been through the use of aggressive behavior as a DV (Chen, Schweisberger, & Gilmore, 2012; Christou & Michael, 2014; Peña, et al., 2009; Yee & Bailenson, 2007; Yee, Bailenson, & Ducheneaut, 2009; Yee, et al., 2011). Aggression is any behavior toward another individual that is intended to cause harm (Anderson & Bushman, 2002). While the belief that the behavior will harm a target individual is necessary, the harm does not need to be physical or extreme. For instance, Yee and Bailenson (2007) observed aggressive behavior in a negotiation exercise, during their exploration of the Proteus effect. In their study, the intent to harm was an attempt to gain more money at the expense of the negotiation partner.

Aggression can be conceptualized into four dimensions: physical aggression, verbal aggression, anger, and hostility (Buss & Perry, 1992). Physical aggression, the intent to

physically harm others, will not be examined in this study. Verbal aggression is defined as the intention to verbally, rather than physically, harm others. Anger and hostility are the emotional and cognitive components of aggressive behavior, respectively. Verbal aggression, anger, and hostility can be expressed using the channels available to users within text-based CMC (Walther, Slovacek, & Tidwell, 2001), and therefore will be used as dependent variables in this study.

Following self-perception theory (Bem, 1972), if an individual uses an avatar with an aggressive or malevolent appearance, they will view themselves as aggressive, which will result in their attitude and behavior shifting to align with the stereotypical behavior of an aggressive individual. This will result in study participants performing more antisocial communication behaviors, displaying a greater level of verbal aggression, hostility, and anger than participants that are using non-aggressive avatars.

H1: Individuals in aggressive avatar conditions demonstrate higher levels of (a) self-reported aggression and (b) aggressive communication behavior than those in non-aggressive avatar conditions.

Proteus Effect and Embodiment

Another possible reason for Van Der Heide et al. (2013) not finding evidence of the Proteus effect in text-based CMC could be due to participants not feeling embodied by their avatars. Embodiment is the condition where a user views an avatar as a digital representation of him/herself in the digital environment (Gomes, 2012). This is a psychological experience developed by controlling the avatar (Ratan & Sah, 2015) in the digital environment.

Many of the experimental studies where the Proteus effect was observed involved a methodological procedure that may have induced embodiment. Participants viewed their avatars in a virtual mirror while tasked with performing several exercises, such as tilting their heads and

lifting their arms (Fox, Bailenson, & Tricase, 2013; Groom, Bailenson, & Nass, 2009; Yee & Bailenson, 2007). When they moved, their avatar moved in the same fashion. This allowed the participants to become familiar with and commit to their avatars as a digital representation of themselves.

Some studies have found an avatar-based self-influencing effect that occurred without any embodiment task, offering an alternative explanation for the Proteus effect (Peña, Hancock, & Merola, 2009). Peña et al., (2009) suggest that individuals are primed by cues within a virtual environment, acting in specific ways due to held stereotypes associated with these cues. In response to this research, Yee and Bailenson (2009) emphasized a conceptual difference between self-perception and priming. Key to this conceptual difference is the assessment of the avatar as a representation of the self (i.e., self-perception theory) as opposed to focusing on cues external to the self (i.e., priming). Yee and Bailenson (2009) provided evidence for their assertion, revealing that avatar embodiment, via viewing the avatar in a virtual mirror, resulted in larger behavior changes than observing an avatar as an external party.

In their study looking at the Proteus effect in text-based CMC, Van Der Heide et al. (2013) did not account for participants' embodiment in their avatars. While in a more naturalistic setting, an individual may begin to view their static-avatar as a digital representation of themselves over a relatively long period of time; such a time period is not realistic in non-longitudinal experimental settings.

For the predictions of self-perception theory to occur, the user of an avatar must see the avatar as a representation of him/herself in order to be embodied by it. This lack of embodiment may be why Van Der Heide et al.'s (2013) did not find evidence of avatar-based self-influence.

H2: The relationship between avatar and (a) aggressive attitude/(b) aggressive communication behavior is moderated by perceived embodiment such that the effect of the avatar on attitude/behavior is stronger with higher levels of perceived embodiment.

The movement exercises done in studies that have found evidence of avatar-based self-influence (Fox, Bailenson, & Tricase, 2013; Groom, Bailenson, & Nass, 2009; Yee & Bailenson, 2007; 2009) likely resulted in user embodiment to an avatar. It is possible that by seeing their avatar move as they move, participants were more likely to see the avatar as a representative of the self in the virtual environment. As the participant moved they viewed their avatar move in a virtual mirror, becoming more familiar with and embodied by the avatar. No such familiarity task was done in Van Der Heide et al.'s (2013) study. Without such a task, participants may not have seen their assigned avatar as a digital representation of the self, resulting in the absence of an avatar-based self-influencing effect. Thus, a familiarity task should be performed by participants in order to induce embodiment in the avatar resulting in the Proteus effect.

H3: Individuals who complete a familiarity task report greater avatar embodiment, than those who complete no familiarity task.

Choice is another method in which embodiment may be induced in a text-based CMC environment. Choice in video game avatars, via customization, reinforces an individual's psychological connection with an avatar (Ratan & Sah, 2015). If an individual observes themselves making a choice they are likely to feel more attached to the item chosen, than the rejected items (Bem, 1972; 1968), leading to individuals being more connected to the chosen avatar. If an individual is more connected with their avatar, they are more likely to view it as a digital representation of the self. While research into avatars has not yet looked at the connection

between choice and embodiment, it has examined related constructs that can inform on this connection.

Lim and Reeves (2009) observed increased arousal, as measured by skin conductivity and self-reported presence in participants that chose their avatar, as opposed to those that were assigned an avatar. In their study, participants ether chose their avatar from a selection of six different characters, or were assigned an avatar, before playing *World of Warcraft*. In the game, participants were given four tasks to complete. The assigned tasks represented common gameplay activities. Participants that chose their avatar, rather than being assigned an avatar, self-reported having higher levels of presence when playing in a third-person point of view (POV). Lim and Reeves (2009) define presence in their study as the sense of "being there" in the digital environment, as a visually embodied avatar in the case of third-person POV. This feeling of presence then envelops embodiment, within the observed interaction of choice and third-person POV play. Additionally, the authors also observed increased arousal among participants that chose their avatar as opposed to being assigned one. Lim and Reeves (2009) argued that avatar choice allowed players to feel more connected to their avatar and its activity within the game, which resulted in the increased levels of arousal. This increased connectedness makes it more likely that the participants saw their avatars as digital representations of the self.

By allowing participants to choose their avatar, they are more likely to feel that said avatar represents or embodies them in the online environment. The act of choosing an avatar leads to individuals feeling more connected to it. Being more connected to the avatar may then induce participants to be more embodied by the profile photo, than if the avatar was assigned to them.

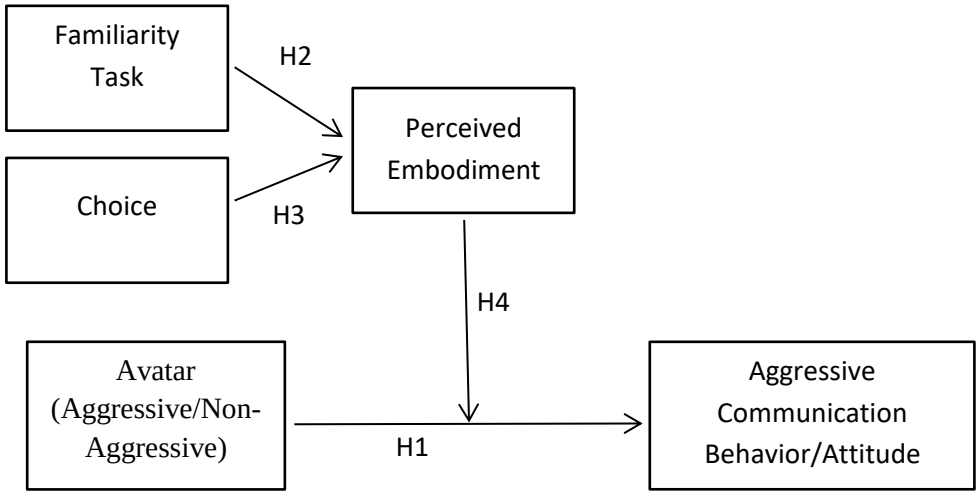
H4: Individuals who are able to choose their own avatar report greater avatar embodiment than when they cannot choose their avatar.

Proteus Effect Path Model

This study predicts that a familiarity task and avatar choice will positively increase an individual's feeling that the avatar represents them in the digital environment. It is predicted that this feeling of embodiment will then moderate the avatar's effect on communication behavior, such that higher levels of embodiment will result in higher levels of communication behavior that aligns with the stereotypical behavior of the profile photo. (i.e. aggressive avatars will induce aggressive communication while non-aggressive avatars will induce non-aggressive communication).

H5: The proposed path model fits, such that avatar choice and familiarity task increase the likelihood of perceived embodiment in the avatar, and that perceived embodiment moderates the relationship of avatar condition on (a) aggressive attitude and (b) aggressive behavior. (See Figure 1).

Figure 1. Proposed path model.



METHODS

Pretests

Two pretests were run in order to develop stimuli for the main experiment of this paper. The first pretest examined 20 images to identify aggressive, non-aggressive, and neutral avatars. 176 individuals took part in the pretest; however 26 were excluded from the analysis for failing to complete the pretest. The remaining 150 participants each rated five randomly assigned images, resulting in 727 within-subject ratings for avatar images. The Malevolence index (Frank & Gilovich, 1988), a seven-point semantic differential scale (e.g., good/bad; nice/mean), was used to insure that images were perceived as aggressive, non-aggressive, or neutral. 20 images were rated resulting in reliability of α=0.84 (See Appendix A). A one-way analysis of variance (ANOVA) found the images to be significantly different in levels of aggression (F[19, 707]=33.428, p<.001). A Tukey post hoc test was run, to ensure that the aggressive and non-aggressive images selected for the study were significantly different from each other (See Table 1). Profile photos rated closest to the mean in malevolence were used as neutral images in stimulus creation. Images were also rated using scales for physical aggression (e.g., "If somebody hit his individual, they'd hit back." "This individual has threatened people.") (Buss & Perry, 1992), perceived gender (e.g., feminine/masculine), and physical attractiveness (e.g., "I think he (she) is quite handsome (pretty)." "He (she) is not very good looking.") (McCroskey & McCain, 1974). (See Appendix D).

Table 1. Summary of Post Hoc for non-aggressive and aggressive stimuli images.

Non-Aggressive Image	Aggressive image	Mean Difference	95% CI	
			LL	UL
AV3	AV4	-1.79*	-2.40	-1.18
	AV12	-1.67*	-2.29	-1.05
	AV16	-1.61*	-2.23	-0.98
AV7	AV4	-1.96*	-2.58	-1.34
	AV12	-1.84*	-2.57	-1.21
	AV16	-1.77*	-2.40	-1.14
AV17	AV4	-1.93*	-2.53	-1.33
	AV12	-1.81*	-2.42	-1.20
	AV16	-1.75*	-2.36	-1.14

* $p < .001$.

A second pretest was run to test the familiarization task to ensure that it induced a change in perceived embodiment. 183 individuals took part in this pretests, however 31 were excluded from the analysis for failing to complete the pretest. The remaining 152 participants were randomly assigned to conditions where they performed the familiarization task (task condition) or a non-familiarization task (control condition). Following the pretest task, participants filled out a questionnaire containing modified items from Van Looy, Courtois, De Vocht, and De Marex's (2012) embodied presence measure (e.g., "I felt like I was inside my profile photo when I used it to comment." "When reading and making comments, it was as if I became one with my profile photo.") (See Appendix D). There was a significant difference in reported embodiment scores (t[150]=-2.76, p=.006) for participants that underwent the familiarity task (M=4.14, SD=1.69) and those that did not (M=3.37, SD=1.76).

Participants

A analysis was run in the R programing language to calculate the number of participants needed for the current study, using Cohen's (1988) power analysis formulas. The analysis was based on Beyea et al.'s (2019) meta-analysis, which found a medium effect size (r =.25) for the

Proteus effect. The power analysis resulted in a minimum of n=240 (r=.25, power = 0.8, p=0.05) to identify the expected effect.

678 individuals took part in the experiment; however 272 were excluded from the analysis for failing to follow instructions during the induction portion of the experiment. For three items of the familiarity task, participants were asked to select their profile photo from a selection of four. If a participant did not select their avatar they were excluded from the analysis for failure to follow instructions. Additionally, in seven items participants were instructed to describe their avatar (or themselves dependent on the condition) using "I" statements. Again, participants were dropped from analysis if they failed to follow these directions.

The remaining 406 participants (300 female) passed all attention checks and followed experimental instructions. The sample included 68.5% Caucasians, 9.9% Asian, 9.6% Black or African American, 8.9% Hispanic, and 1% "other." Participants' age ranged from 18 to 29 years (M=23.59, SD=3.48). Eighty-nine participants were students from a large university in the Midwestern US, and received course participation credit for taking part in the experiment. The remaining 317 participants were collected through a data collection service and were compensated for their participation by Qualtrics LLC. For all cases, excluding the verbal aggression measure (t[404]=02.23, p=.03), there was no significant difference between the student and paid population pools (hostility t[404]=-.76, p=.45; anger t[404]=-1.47, p=.14; NRC anger t[404]=-.18, p=.86; Embodiment t[404]=1.7, p=.09) (See Table 2).

Table 2. Paid vs. student population results.

	Paid Population		Student Population				95% CI	
Measure	Mean	*SD*	Mean	*SD*	*t*(404)	*p*	LL	UL
Hostility	3.06	1.07	3.16	0.91	-0.76	0.45	-0.34	0.15
Verbal Aggression	3.92	1.08	4.2	1.03	-2.23	0.03	-0.54	-0.04
Anger	3.19	1.25	3.4	1.12	-1.47	0.14	-0.5	0.07
NRC Anger	1.35	1.93	1.39	1.55	-0.18	0.86	-0.48	0.4
Embodiment	3.45	1.69	3.11	1.46	1.7	0.09	-0.05	0.73

Experimental Design and Stimulus Material

Participants were randomly assigned to one of the eight conditions resulting from the 2 (aggressive/non-aggressive avatar) x 2 (choice) x 2 (embodiment task) experimental design.

Stimulus profile photos. Profile photos were created using *Hero Machine 3* (www.heromachine.com/heromachine-3-lab/), an online tool for creating fantasy character images. The images were pretested to insure that they were perceived as aggressive, non-aggressive, or neutral (see above).

Social media bulletin board mock-ups. As part of this study, participants viewed and commented on mock-ups of social media comment threads. Comment threads were built using examples from Reddit, YouTube, and other bulletin board services. Five threads were developed, covering a range of topics, to control for any possible aggression priming from a singular specific topic.

Mock-ups of a generic social media bulletin board were created using graphic editing software. For every experimental condition, the mock-ups included the developed comment threads and the neutral profile photo images, as well as an aggressive or non-aggressive profile image dependent on the condition. See Appendix B for profile images and bulletin board mock-ups.

Measures

Aggression. General aggression was assessed using a modified version of three scales (verbal aggression, anger, and hostility) from Buss and Perry's (1992) aggression questionnaire. The physical aggression scale from the same questionnaire was used for pretesting stimuli images. The wording of items was altered to represent a state, rather than trait measure, to more accurately tap participants' response to the induction (Farrar & Krcmar, 2006). To measure the state aggression, participants were shown a neutral rated image (See Appendix B) and asked how much they agree or disagree with a series of statements in reference to the individual represented by the image. (e.g. "I would find myself disagreeing with this person." "This person makes me feel like a powder keg ready to explode."). Higher scores on the aggression questionnaire indicate higher levels of aggression. The eight item hostility measure had a reliability of α=.85. Verbal aggression (5 items) had a reliability of α=.78, while anger (6 items) had a reliability of α=.89. Physical aggression (7 items) had a reliability of α=.95. (See Appendix D)

*Sentiment Analysis***.** To assess aggressive communication behavior, a sentiment analysis was run on the comments made by participants in response to the thread stimuli. This study used a unigrams lexicon-based approach, evaluating each word within the statements for affect valance, as unigrams tend to be the most successful approach (Taboada, et al., 2011). The NRC (National Research Council in Canada) emotion lexicon, from the R tidy text statistical package (De Queiroz, Keyes, & Robinson) was used for this analysis.

The NRC lexicon evaluates the affect of words on a binary basis, as "anger", "anticipation," "disgust," "fear," "joy," "sadness," "surprise," or "trust" (De Queiroz, Keyes, & Robinson). For the purposes of the current study, the anger sentiment was analyzed. The number of "anger" words in a text were summed, resulting in a NRC anger score for participants.

Embodiment. Embodiment was measured using modified items from Van Looy, Courtois, De Vocht, and De Marez's (2012) embodied presence measure. Items were altered and added to this scale to reflect a text-based CMC environment rather than a video game environment (e.g., "When making comments, it was as if I commented directly through my profile photo." "I felt connected to my profile photo."). A higher mean score on this 5 item scale indicated greater perceived embodiment in the profile photo, α=.94.

Procedure

Participants signed up for this study online and were directed to a web page where they were informed that they would be participating in an online experiment designed to evaluate how individuals communicate on CMC bulletin boards, such as Reddit. Participants were instructed to find a quiet environment and use a provided link to open the web page where the study took place. Participants, therefore, viewed the stimuli in a natural setting where they would typically use the Internet.

Upon going to the website of the study, subjects were presented with a consent form and instructed to read through it and agree or disagree to participate in the study. If the subjects did not agree to participate in the study, they were sent to a webpage that thanked them for their time. Subjects that agreed to participate in the study were randomly assigned to one of eight conditions and were then shown instructional text explaining the process of avatar selection for their condition (See Appendix C).

Participants in the choice condition were given a selection of three images from which to pick their profile photo. All three images were rated as either aggressive or non-aggressive (as per avatar condition) by a pretest so that, although participants were given a choice as to which avatar they could select, it was an aggressive or non-aggressive avatar consistent with the

experimental condition to which they had been randomly assigned. Participants in the no-choice condition were assigned a random profile photo matching their avatar condition.

Participants in the familiarity exercise condition were then presented four images, including their own selected or assigned avatar, and asked to identify their avatar. This task was repeated three times. In a VR system, individuals interact with avatars and the environment via movement. In a text-based environment, individuals interact with the environment by clicking on items. By having participants click on their avatar, correctly selecting it from a number of images, they interacted with and familiarized themselves with the avatar in an environmentally consistent method. Participants in the non-familiarization conditions were shown a similar selection of images, minus their avatar image, and asked to click on a random image.

Participants were then asked to describe their profile photo using "I" statements, based on a series of prompts. For example, if prompted with the question, "What color eyes does your profile photo have?" participants were asked to respond with "I have blue eyes," if their profile photo had blue eyes. Participants were then given a series of seven prompts. This task was designed to familiarize the subjects with their static avatar in the same way that movement exercises while viewing avatars in a virtual mirror were used by Yee and Bailenson (2007; 2009). Participants in non-familiarization task condition were given a similar task, instructed to answer the prompts based on their own appearance rather than the profile photo's appearance.

A pretest was run to ensure that these inductions affected a change in embodiment in subjects, using modified items from Van Looy, Courtois, De Vocht, and De Marex's (2012) embodied presence measure, with a resulting reliability of α=.92. There was a significant difference in reported embodiment scores (t[57]=-2.74, p=.008) for participants that underwent the familiarity task (M=4.43, SD=1.63) and those that did not (M=3.22, SD=1.78).

Following the familiarity tasks, participants were presented with a series of five comment threads on various topics including a neutral rated profile photo for each comment (See Appendix B). Participants were instructed to carefully read each comment thread and to then comment at the end of the thread. Only one thread was shown at a time. The order in which comment threads were viewed by participants was randomized. While participants were instructed to leave a comment, there was no suggested valiance for the comment (i.e., they were asked to "make a comment," but not to "make an aggressive comment."). This was done to avoid the possible task/manipulation agreement from Van der Heide, et al. (2013) discussed above. Thus, participants were not asked to perform an aggressive communication behavior in the task, in contrast to the positive communication behavior they were asked to perform in Van der Heide, et al.'s (2013) study (i.e. plan a hypothetical date with their partner).

Once participants commented on the threads they were given a questionnaire, in order to collect additional measures.

Manipulation Check

A manipulation check was run to insure that the choice induction was successful. A three-item measure (e.g., "I was able to choose my profile photo for this study.") of perceived choice (α=.92) was used, in which a lower score indicated a greater feeling of having had a choice in avatar selection. The measure showed a significant difference in the scores of participants in the choice (M=2.30, SD=1.33) and the no-choice (M=5.49, SD=1.75) conditions; $t(406)$=-20.86, p<.001 (See Appendix D) . These results indicate that the choice induction was successful.

RESULTS

Hypothesis 1 predicted a main effect of avatar aggressiveness on the (a) aggressive attitude and (b) aggressive communication behavior of the participants. An ANOVA was run for each of the four aggression measures used, to assess the effect of the avatar condition on aggression. There was no significant main effect for any of the measures, hostility $F(1, 404)=1.22$, $p=.270$; verbal aggression $F(1, 404)=.005$, $p=.941$; anger $F(1, 404)=.235$, $p=.628$; NRC anger sentiment $F(1, 404)=.208$, $p=.649$. (See Table 3 for means and standard deviations). Hypothesis 1a and 1b were not supported.

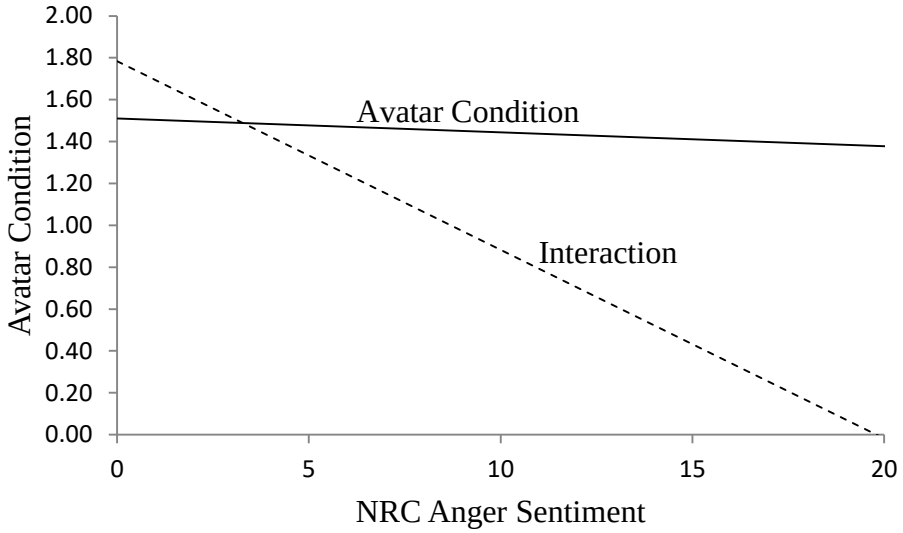
Table 3. Means and SD for main effect of avatar conditions on aggression.

	Aggressive Avatar		Non-aggressive avatar	
Measure	Mean	*SD*	Mean	*SD*
Hostility	3.14	1.00	3.03	1.07
Verbal Aggression	3.98	1.08	3.99	1.08
Anger	3.204	1.19	3.26	1.26
NRC anger	1.40	2.08	1.32	1.60

Hypothesis 2 predicted an interaction effect of perceived embodiment and avatar condition on the aggressive (a) attitude and (b) communication behavior of the participants. A linear regression was run for each of the five aggression measures used to assess if there was a moderating effect. For all measures, the moderation model was found to be significant, hostility $F(3, 401)=17.20$, $p < .001$, $R^2=.11$; verbal aggression $F(3, 401)=9.91$, $p<.001$, $R^2=.07$; anger $F(3, 401)=20.75$, $p<.01$, $R^2=.13$; nrc anger sentiment $F(3, 401)=4.99$, $p=.002$, $R^2=.04$. The individual predictors were examined further and indicated that neither avatar condition (hostility [$\beta = -.02$, $t(401)=-.18$, $p=.860$], verbal aggression [$\beta = .08$, $t(401)=.75$, $p=.454$], anger [$\beta = -.04$, $t(401)=-.33$, $p=.744$]) nor the proposed interaction effect (hostility [$\beta = .10$, $t(401)=.82$, $p=.411$], verbal aggression [$\beta = -.10$, $t(401)=-.80$, $p=.422$], anger [$\beta = .02$, $t(401)=.18$, $p=.855$]) were

significant for the attitudinal measures. There is an unpredicted significant main effect of perceived embodiment on the attitudinal measures of aggression (hostility [β = .29, t(401)=4.33, p<.001], verbal aggression [β = .30, t(401)=4.34, p<.001], anger [β = .36, t(401)=5.37, p<.001]). Hypothesis 2a was not supported. In the regression model run with the behavioral measure (NRC anger sentiment), there was a significant main effect of avatar condition (β = .29, t(401)=2.59, p=.010), such that participants in the aggressive avatar condition used more "angry" words that those in the non-aggressive condition, as well as a significant interaction effect of embodiment and avatar condition on aggressive communication behavior(β = -.33, t(401)=-2.66, p=.008), such that embodiment increased the effect of the avatar condition. (e.g., Embodied participants using aggressive avatars used more "angry" words than non-embodied participants using aggressive avatars.) (See Figure 2) No significant main effect of embodiment on aggressive communication behavior was observable (β = -.002, t(401)=-.02, p=.981) in this model (see Table 4). Hypothesis 2b was supported.

Figure 2. Avatar condition and avatar-embodiment interaction results.



* Aggressive Avatar Condition = 1; Non-aggressive Avatar Condition = 2. ** Lower scores equal increased feelings of embodiment.

Table 4. Summarized regression tables for interaction effect of perceived embodiment and avatar condition on aggression.

Measure	Variable	B	95% CI
Hostility	Constant	2.40***	[2.08, 2.71]
	Avatar	-.04	[-.48, .40]
	Embodiment	.19**	[.10, .27]
	Avatar x Embodiment	-.05	[-.07, .17]
Verbal	Constant	3.32***	[2.98, 3.65]
Aggression	Avatar	.18	[-.29, .64]
	Embodiment	.20***	[.11, .28]
	Avatar x Embodiment	-.05	[-.18, .07]
Anger	Constant	2.36***	[1.99, 2.72]
	Avatar	-.09	[-.60, .43]
	Embodiment	.27***	[.17, .36]
	Avatar x Embodiment	.01	[-.12, .15]
NRC	Constant	1.33***	[.74, 1.91]
Anger	Avatar	1.07*	[2.58, 1.89]
Sentiment	Embodiment	0.00	[-.16, .15]
	Avatar x Embodiment	-.29**	[-.51, -.08]

* p < .05. ** p < .01. *** p < .001

To further explore the main effect of perceived embodiment on aggressive attitudes, a linear regression was run for each of the attitudinal aggression measures. Embodiment was found to have a main effect on aggression with all measures, hostility $F(1, 403)=49.22$, $p<.001$, $R^2=.11$; verbal aggression $F(1, 403)=29.19$, $p<.001$, $R^2=.07$; anger $F(1, 403)=62.36$, $p<.001$, $R^2=.13$.

In order to explain the observed main effect of perceived embodiment on aggressive attitude, a series of regressions were run to determine if there are any variables collected in the current study that are interacting with perceived embodiment on aggressive attitude. Regression models that included participant sex (hostility $F[3, 401]=20.68$, $p<.001$; verbal aggression $F[3, 401]=10.25$, $p<.001$; anger $F[3, 401]=23.39$, $p<.001$), average time spent on the internet (hostility $F[3, 401]=17.39$, $p>.001$; verbal aggression $F[3, 401]=10.43$, $p<.001$; anger $F[3, 401]=21.28$, $p<.001$), average time spent on social media websites (hostility $F[3, 401]=17.38$,

p>.001; verbal aggression *F*[3, 401]=9.94, *p*<.001; anger *F*[3, 401]=21.39, *p*<.001), and time spent participating in the online experiment, or duration (hostility *F*[3, 401]=18.79, *p*>.001; verbal aggression *F*[3, 401]=10.47, *p*<.001; anger *F*[3, 401]=21.87, *p*<.001) were significant. For the regression models examining time spent on the internet, and on social media websites, the above observed main effect of perceived embodiment on aggressive attitude was the only significant relationship, suggesting that these variables did not interact with perceived embodiment or have any effect on aggressive attitude.

We next examined the relationships observed in the set of regressions that examined participant sex alongside embodiment. Using the hostility measure as the DV, there was a main effect of participant sex (β = -.12, *t*(401)=-2.59, *p*=.010) and an interaction effect of participant sex and embodiment (β = -.38, *t*(401)=-2.02, *p*=.044), such that embodied male participants were less likely to be hostile than embodied female participants. The main effect of embodiment on attitude remained (β = .69, *t*(401)=-3.64, *p*<.001), such that the more embodied a participant was the more hostile they were. Using the anger measure as a DV, there was a significant main effect of sex (β = -.11, *t*(401)=-2.41, *p*=.016), but no significant interaction effect (β = -.17, *t*(401)=-.91, *p*=.362). The significant main effect of embodiment on attitude (β = .53, *t*(401)=2.78, *p*=.006) remained. Verbal aggression as a measure resulted in no main effect (β = -.06, *t*(401)=-1.22, *p*=.225) or interaction effect (β = -.05, *t*(401)=-.23, *p*=.817) involving participant sex, as well as no embodiment main effect (β = .30, *t*(401)=1.52, *p*=.129).

Examining the regression of duration and embodiment on aggressive attitude showed a significant main effects of duration (β =-.11, *t*(401)=-2.20, *p*=.029) and embodiment (β = .33, *t*(401)=7.08, *p*>.001) as well as a significant interaction effect of duration and embodiment (β =-.08, *t*(401)=-2.10, *p*=.036) with the hostility measure. This relationship was such that, the longer

the participant took to complete the experiment, the less hostile they were. For the remaining two measures, there was no observed main effect (verbal aggression, β = .02, t(401)=.438, p=.662; anger, β = .07, t(401)=1.44, p=.150) or interaction effect (verbal aggression, β = -.06, t(401)=-1.12, p=.263; anger, β = -.02, t(401)=-.33, p=.739) involving duration. The main effect of embodiment remained (verbal aggression, β = .26, t(401)=5.46, p<.001. b=.26; anger, β = .37, t(401)=7.96, p<.001, b=.37).

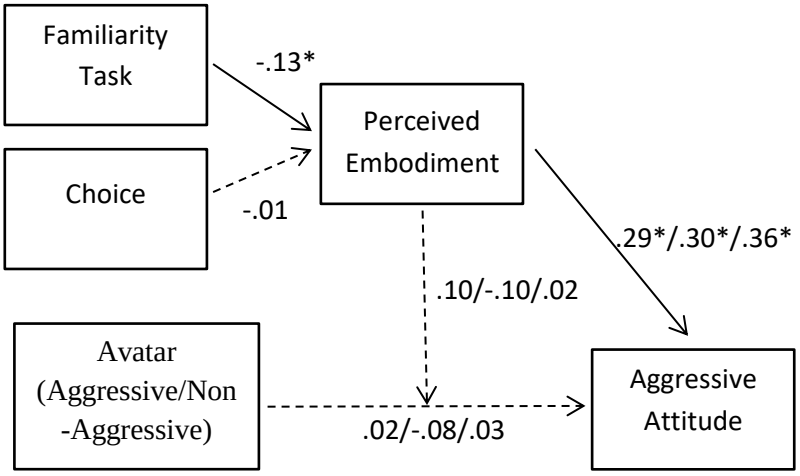
Another set of linear regressions were run using profile photos ratings in homophily (α=.89), disgust (α=..95), physical attraction (α=.87), and perceived gender (one item semantic differential scale; Feminine/Masculine) from the current research's pretest. All regressed models were significant; homophily (hostility F[3, 401]=17.67, p>.001; verbal aggression F[3, 401]=9.71, p<.001; anger F[3, 401]=21.02, p<.001), disgust (hostility F[3, 401]=17.55, p>.001; verbal aggression F[3, 401]=9.76, p<.001; anger F[3, 401]=20.77, p<.001), physical attraction (hostility F[3, 401]=16.77, p>.001; verbal aggression F[3, 401]=10.19, p<.001; anger F[3, 401]=21.48, p<.001), perceived gender (hostility F[3, 401]=17.00, p>.001; verbal aggression F[3, 401]=9.86, p<.001; anger F[3, 401]=20.78, p<.001). An examination of the relationships within each regressed model showed a lack of significance for all main and interaction effects, with the exception of the above observed embodiment main effect on attitude.

Hypothesis 3 predicted a main effect of performance of a familiarity task on perceived embodiment by an avatar. An ANOVA assessed the effect of the presence or absence of the familiarity task on perceived embodiment. A significant main effect supported the hypothesis, F(1, 403)=6.81, p=.009, η_p^2 =.02. When the familiarity task was performed, participants were more likely to perceive themselves as embodied by their avatar (M=3.60, SD=1.61) than if a filler task was performed (M=3.18, SD=1.66).

Hypothesis 4 predicted a main effect of choice on perceived embodiment by an avatar. An ANOVA assessed the effect of having a choice on perceived embodiment. There was no significant difference between participants that chose their avatar (M=3.40, SD=1.61) and those that were assigned avatars (M=3.35, SD=1.68); F(1, 403)=0.11, p=.738. Linear regressions were run to determine if an interaction with the familiarization task or avatar condition interfered with a main effect of choice on perceived embodiment. The model taking into account familiarization task condition was not significant (F[3, 401]=2.44, p=.064), showing no significant interaction effect between choice and familiarization task. The model that account for a possible interaction with the avatar condition was not significant (F[3, 401]=.194, p=.901), showing no significant interaction effect between choice and avatar condition. Hypothesis 4 was not supported.

Hypothesis 5 predicted that the path model proposed in hypotheses 1 through 4 would fit the (a) attitudinal and (b) behavioral data (See Figure 1). SPSS AMOS was used to run structural equation models (SEM) for each measure to determine if the model fit. A good fit for a model is indicated by an insignificant χ^2, a root mean square error of approximation (RMSEA) less than .1, and a comparative fit index (CFI) approaching or greater than .90 (Wang & Willson, 1996). The first set of SEMs was run to check the purposed model with each attitudinal measure. The model was a good fit for each measure (hostility [χ^2=5.95, p=.311; RMSEA=.022; CFI=.999], verbal aggression [χ^2=7.58, p=.181; RMSEA=.036; CFI=.997], anger [χ^2=4.39, p=.495; RMSEA=.00; CFI=1.00.]), however three of the predicted paths were insignificant (See Figure 3). Hypothesis 5a was partially supported.

Figure 3. Path model results for attitudinal measures.

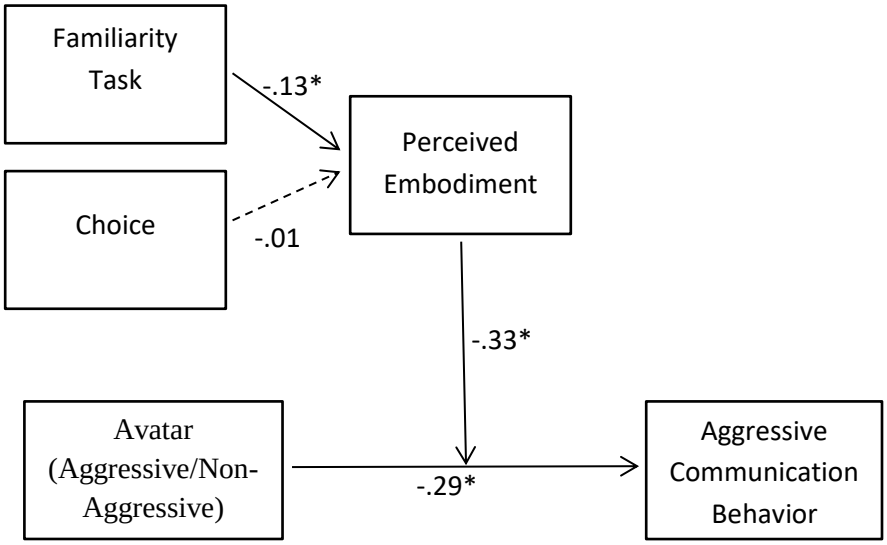


*p<.01.

A secondary SEM was run on the attitudinal models, removing insignificant paths. While the resulting simple mediation model (task → embodiment → aggression) had no insignificant paths (main effect of perceived embodiment on hostility [*b*=.33, *p*<.001], verbal aggression [*b*=.26, *p*<.001], and anger [*b*=.37, *p*<.001]), it was not as good of a fit as the original model (hostility [χ^2=3.28, *p*=.07; RMSEA=.075; CFI=.958], verbal aggression [χ^2=5.67, *p*=.017; RMSEA=.108; CFI=.876], anger [χ^2=2.40, *p*=.122; RMSEA=.059; CFI=.978]).

A SEM was run for the proposed model using the behavioral measure (NRC anger). The path model was a good fit for the data; χ^2=3.27, p=.859; RMSEA=.000; CFI=1.00, with an insignificant main effect of choice on perceived embodiment (See Figure 4). Hypothesis 5b was supported. A secondary SEM was run, removing choice from the model, as it had an insignificant effect on perceived embodiment. The secondary behavioral model, without the choice condition, resulted in a moderately better fit; χ^2=2.63, *p*=.622; RMSEA=.000; CFI=1.00, with χ^2 approaching zero as the insignificant path is removed.

Figure 4. Path Model results for NRC anger sentiment measure.



*p<.01.

A series of factorial ANOVAs were run to compare the main effects of choice, familiarity task, and avatar and the interaction effects of choice and familiarity task; choice and avatar; familiarity task and avatar; and choice, familiarity task, and avatar on each DV examined (i.e., embodiment, hostility, verbal aggression, anger, NRC anger). The first ANOVA looked at perceived embodiment as the DV. The main effect of familiarity task was significant, $F(1, 397)=6.54$, $p=.011$, such that participants in the task condition ($M=3.60$, $SD=1.61$) had higher levels of perceived embodiment than those in the no-task condition ($M=3.18$, $SD=1.66$). All other main effects were statistically insignificant; choice $F(1, 397)=.091$, $p=.764$, avatar $F(1, 397)=.110$, $p=.740$. All of the interaction effects were statistically insignificant; avatar and choice $F(1, 397)=.251$, $p=.617$, avatar and task $F(1, 397)=1.716$, $p=.191$, choice and task $F(1, 397)=.521$, $p=.471$, and avatar, choice and task $F(1, 397)=.161$, $p=.688$.

The next set of ANOVAs examined attitudinal measures as DVs. With hostility as a DV, all main effects were statistically insignificant; task $F(1, 398)=.776$, $p=.379$, choice $F(1, 398)=.607$, $p=.437$, avatar $F(1, 398)=1.40$, $p=..237$. All of the interaction effects were

statistically insignificant; avatar and choice $F(1, 398)=.062$, $p=.803$, avatar and task $F(1, 398)=.869$, $p=.352$, choice and task $F(1, 398)=.037$, $p=.848$, and avatar, choice and task $F(1, 398)=.036$, $p=.849$. The ANOVA inspecting verbal aggression showed all main effect to be statistically insignificant: task $F(1, 398)=2.244$, $p=.135$, choice $F(1, 398)=.247$, $p=.620$, avatar $F(1, 398)=.005$, $p=.943$. All of the interaction effects were statistically insignificant: avatar and choice $F(1, 398)=.038$, $p=.846$, avatar and task $F(1, 398)=.425$, $p=.515$, choice and task $F(1, 398)=3.15$, $p=.077$, and avatar, choice and task $F(1, 398)=.077$, $p=.781$. The final attitudinal measure of anger showed that all main effects were statistically insignificant: task $F(1, 398)=.213$, $p=.645$, choice $F(1, 398)=.004$, $p=.947$, avatar $F(1, 398)=.222$, $p=.638$. All of the interaction effects were statistically insignificant: avatar and choice $F(1, 398)=.093$, $p=.761$, avatar and task $F(1, 398)=.108$, p=.742, choice and task $F(1, 398)=.750$, $p=.387$, and avatar, choice and task $F(1, 398)=.036$, $p=.849$.

The final ANOVA looked at the behavioral measure of NRC anger as a DV. All of the main effects were statistically insignificant: task $F(1, 398)=1.945$, $p=.164$, choice $F(1, 398)=.039$, $p=.844$, avatar $F(1, 398)=.168$, $p=.682$. All of the interaction effects were statistically insignificant: avatar and choice $F(1, 398)=1.277$, $p=.259$, avatar and task $F(1, 398)=.287$, $p=.592$, choice and task $F(1, 398)=.206$, $p=.650$, and avatar, choice and task $F(1, 398)=2.106$, $p=.147$.

DISCUSSION

While this study observed the Proteus effect with behavioral measures (NRC anger sentiment), all three attitudinal measures used showed a consistent lack of significant results. One possibility for this divergence is that the attitudinal measures may lack validity, measuring trait aggression rather than state (discussed below). If this were the case, we could expect the observed results as the Proteus effect is a state change in attitude and behavior.

It is also possible that while the Proteus effect was induced, it did not last long enough to be observed with attitudinal measures. In an experiment using tall and short avatars, Yee, et al., (2009) observed that the Proteus effect carries over into offline behavior, but that the effect diminishes quickly. In their study, participants that inhabited tall avatars behaved more aggressively in a negotiation game than those in shorter avatars. This behavior carried over to offline behavior, but dissipated quickly with participants behaving more aggressively only in the second of three turns of the negotiation game.

It is conceivable that when performing the comment task in the present study, participants viewed themselves as within a social media environment, but that when taking the questionnaire at the end to the experiment they no longer perceived themselves as being in that environment. If this is the case, then the Proteus effect could have been active while performing the comment task, observed with the behavioral measure, but dissipated quickly once the task was over. If the participants no longer viewed themselves as being in a social media environment when they took the questionnaire, the Proteus effect could have dissipated before the attitudinal scales were taken.

However, participants in the present study still observed their avatar while completing the questionnaire. This might suggest that the Proteus effect occurs within specific CMC

environments, but not within traditional CMC as a whole, despite the presence of an embodied avatar. For example, the Proteus effect may occur in social CMC environments, perceived to be for interpersonal communication. This would be support by the present study's observed Proteus effect using a behavioral measure. Yet, the lack of observed attitudinal change could suggest that even with identical avatar conditions, the Proteus effect may not occur in non-socially focused CMC environments, such as an online questionnaire. For example, individuals communicating on a social media site, such as Facebook or Twitter, might experience the Proteus effect, but if the same individuals using the same avatars were on Amazon they might not experience the same effect. If this is the case, then the perception of the environment in which an avatar exists is an important variable to the Proteus effect, such that the effect may only occur in CMC environments that are perceived as social. Future research should explore how the perceived purpose of a CMC environment affects the presence of the Proteus effect. Specifically, does the Proteus effect only influence behavioral change in CMC environments that are perceived as social spaces?

This study expands the work on the Proteus effect into text-based CMC, such as social media sites. While the Proteus effect has been primarily observed in VR and video game digital environments, the behavioral measure used in the current study (NCA aggression sentiment) demonstrated an observed Proteus effect, such that perceived embodiment in a profile photo moderated the effect of the avatar on the aggressive communication behavior of participants. These results challenge Van Der Heide et al.'s (2013) study which did not observe a significant Proteus effect. Van Der Heide et al. (2013) argued that the Proteus effect as described by Yee and Bailenson (2007) may hold true in VR environments where behavior is mediated by the VR avatar. The present study's results suggest that this mediation of virtual actors (i.e., avatars) does

occur in CMC environments, as seen with the behavioral measure (NRC anger sentiment) in the current study (F[3, 401]=4.99, p=.002). Similar to Yee and Bailenson's (2009) results, the Proteus effect was more likely to occur in the present study as participant's perceived embodiment in their avatar increased.

Additionally, the effect size observed in the present study is consistent with the Proteus effect results found in the literature. When comparing the observed effect size for the behavioral measure in the present study (r=.19) to the weighted average effect size for behavioral measures (r=.23) in Beyea et al.'s (2019) Proteus effect meta-analysis, there is no significant difference; z=.78, p=.44. This suggests that the effect size observed in the present study is consistent with effect sizes observed by the Proteus effect meta-analysis.

The current study corroborates Yee and Bailenson's (2009) assertion that embodiment in an avatar is an important element of the Proteus effect, and thus reinforces the self-perception view of said effect. While some scholars suggest that priming is the underlying mechanic of the Proteus effect (Peña, et al., 2009), Yee and Bailenson (2009) successfully isolated the effects of priming in their study. The authors observed a stronger effect of avatar-based behavior change when subjects were embodied by the avatar. Similarly, the current research observed that behavior change due to avatar condition became significant when avatar embodiment was induced. This adds to the body of evidence that embodiment is an important element of the Proteus effect.

This research adds to Proteus effect literature by demonstrating the need for a task that allows individuals to become embodied in their avatar when inducing the Proteus effect in experimental studies that take place in social media environment. While many experimental studies have demonstrated the use of a virtual mirror task to induce embodiment (Fox, Bailenson,

& Tricase, 2013; Groom, Bailenson, & Nass, 2009; Yee & Bailenson, 2007; 2009), other researchers have produced an observable Proteus effect without such a task (Peña et al., 2009). While Yee and Bailenson (2009) stated that embodiment is an important element of the Proteus effect, they did not touch on a need to induce embodiment with a task. It is possible that in high fidelity environments, where most Proteus effect research occurs, there is not a necessity for such a task as moving and interacting with a VR avatar may naturally accomplish this. However, evidence suggests that when conducting a non-longitudinal experiment in a cue sparse environment, as was done in the current research, some form of embodiment task is necessary. In the current study, the induction task increased perceived embodiment which interacted with the avatar condition to produce the Proteus effect. The lack of such a task may be the reason for the lack of an observed effect in previous CMC Proteus effect research (Van Der Heide, et al., 2013).

The current study suggests that choice in one's avatar is not necessary to induce perceived embodiment within social media environments. Previous research has argued that choice in avatar, via avatar customization, does affect the Proteus effect. Ratan and Sah (2015) observed that avatar customization increased the potential for avatar characteristics to influence individuals when the avatar is no longer being used. While this shows that choice is an element that affects the Proteus effect, the current study suggest that within the context of social media environments, choice is not necessary to induce avatar embodiment. It is possible, however, that a higher degree of choice than was feasible in the present study could induce embodiment.

Finally, the current study observed an unexpected and unexplained main effect of embodiment on aggressive attitude, such that increases in embodiment resulted in higher levels of aggressive attitude. Various other measures collected in the present study were regressed with

embodiment, in order to locate any possible explanations for the main effect of embodiment on aggressive attitude. While main and interaction effects were found with both participant sex and the duration of time participants took to participate in the study, these effects were in the opposite direction of the embodiment main effect. When examining the main effect of sex, it was such that male participants were less likely to display aggressive attitudes than female participants (hostility, β=-.28, p=.010; anger β =-.26, p=.016). The interaction effect with sex and embodiment found with the hostility measure followed in the same direction (β =-.21, p=.44). Yet, the mean effect of embodiment on aggression remained in a positive direction (b=.69, p=.044), such that an increase in embodiment lead to an increase in aggressive attitude.

The same dynamic found with embodiment and participant sex was found with embodiment and duration using the hostility measure. The longer an individual took to finish their participation in the study, the less likely they were to have aggressive attitudes (β =-.11, p=.029). The interaction effect between duration and embodiment remained in the same direction (β =-.08, p=.036), while the main effect of embodiment on aggressive attitude continued to be positive (β =.33, p.001). No other measure collected in the current study showed any evidence of a main or interaction effect that could explain the main effect of embodiment on aggressive attitude.

Currently there is no CMC or Proteus effect literature that suggests that embodiment should have a main effect on aggressive attitude. It is, however, possible that the observed main effect is the result of a methodological issue in how aggressive attitude was measured. Upon finishing commenting on the mock-social media posts, participants in this study viewed a neutral rated profile photo, along with their chosen/assigned avatar, and were asked to answer items from a modified version of Buss and Perry's (1992) aggression questionnaire. The wording of

items in the questionnaire were altered to represent a state, rather than trait measure (See Appendix D), where participants were asked about their feelings towards the individual in the neutral rated profile photo (Farrar & Krcmar, 2006). It is possible that this method of measuring aggressive attitude did not operate as designed and measured trait aggression rather than state aggression. If this occurred, as participants became more embodied by their avatars they may have been more comfortable expressing already present trait aggression. In this way, the behavioral measures that took place during the comment task portion of the experiment captured evidence of the Proteus effect, in the form of state aggression, but the attitudinal measures, which occurred in a post task questionnaire, may have captured trait aggression, with embodiment maximizing said trait. Future research should examine different methods for measuring aggressive attitude in a CMC environment, to confirm if the attitudinal results of this study are consistent or a product of a methodological issue.

Limitations

A possible limitation in this study is a high correlation found between the ratings of malevolence/aggression of the stimuli avatars and their perceived gender (r=.68). Aggressive avatars were consistently rated as masculine while non-aggressive avatars were rated as feminine. These ratings are likely due to sex role stereotypes, where males are seen as more aggressive than females (Burke, Stets, & Pirog-Good, 1988; Harris, 1996, Thompson, 1991). While men and women do not significantly differ in actual aggression, males are often rated as more aggressive than females (Eagly & Steffen, 1986). Thus, the observed malevolence-gender correlation is what one might expect to see with aggressive/non-aggressive images, due to the effect of sex role stereotypes.

The avatar stimuli for the present study were selected to induce aggressive stereotypes, and the applicable sex role stereotype is that males are more aggressive (Burke, Stets, & Pirog-Good, 1988; Harris, 1996, Thompson, 1991). As all the avatars in the aggressive condition were perceived as more masculine, and those in the non-aggressive condition were perceived as more feminine, it is likely that the perceived gender ratings were induced via the aggressive and non-aggressive nature of the images.

Most of the images used in this study were designed to appear as aliens or animals (with human bodies); it is likely that images were rated as masculine or feminine based on how aggressive the image appeared. For example, sets of pretested images were aggressive and non-aggressive versions of the same humanoid-animal, with matching color schemes, yet the aggressive version of the same "character" in each pair was rated as more masculine than the non-aggressive avatar. For example, a wolf-person that was rated as non-aggressive (Malevolence = -.64) was rated as less masculine (Gender = .22) than a wolf-person that was rated as more aggressive (Malevolence = .63; Gender = .45). Similar rating behavior, of non-human images, has been seen in previous research where three- to five-year old children asked to label the gender of an animal with an angry expression labeled the animal face as male (Underwood, Galenand, & Paquette, 2001).

For avatars used in the present study (See Appendix B), there was no significant difference between the perceived gender of aggressive avatars: (AV4 on AV12, t[71]=.152, p=.880;AV4 on AV16, t[71]=.406, p=.686;AV12 on AV16, t[68]=.221, p=.826). However, while all non-aggressive avatars used were rated as feminine, one avatar was rated as significantly more feminine than the other non-aggressive avatars: (AV3 on AV7, t[68]=.434, p=.666; AV3 on AV17, t[72]=-3.541, p=.001; AV7 on AV17, t[70]=-4.013, p<.001) . To check

for the possibility of a confound in the current study, participants that used the significantly different avatar were removed from the data set and hypotheses 1 and 2 were re-run. The results seen in the full data set were replicated.

For hypothesis 1 the lack of significant main effect for any of the measures was replicated: hostility $F(1, 301)=1.53$, $p=.218$; verbal aggression $F(1, 301)=.012$, $p=.912$; anger $F(1, 301)=.032$, $p=.858$; NRC anger sentiment $F(1, 301)=.622$, $p=.431$.

For hypothesis 2 the moderation model was still found to be significant with all measures: hostility $F(3, 299)=13.84$, $p < .001$, $R^2=.12$; verbal aggression $F(3, 299)=5.67$, $p=.001$, $R^2=.05$; anger $F(3, 299)=13.01$, $p<.001$, $R^2=.12$; nrc anger sentiment $F(3, 299)=5.50$, $p=.001$, $R^2=.05$. The individual predictors were examined further and indicated that neither avatar condition: (hostility [$t(299)=-.19$, $p=.852$], verbal aggression [$t(299)=.29$, $p=.769$], anger [$t(299)=-1.20$, $p=.232$]) or the proposed interaction effect (hostility [$t(299)=.93$, $p=..354$], verbal aggression [$t(299)=-.32$, $p=.749$], anger [$t(299)=1.33$, $p=.185$]) were significant for the attitudinal measures. The unpredicted significant main effect of perceived embodiment on the attitudinal measures of aggression: (hostility [$t(299)=2.79$, $p=.006$], verbal aggression [$t(299)=2.60$, $p=.01$], anger [$t(299)=2.38$, $p=.018$]) was still observed. Hypothesis 2a was not supported. In the regression model run with the behavioral measure (NRC anger sentiment) there was a significant main effect of avatar condition ($t(299)=3.22$, $p=.001$) as well as a significant interaction effect of embodiment and avatar condition on aggressive communication behavior ($t(299)=-3.22$, $p=.001$). No significant main effect of embodiment on aggressive communication behavior was observable ($t(299)=1.31$, $p=.191$)

With these results, previous literature demonstrating aggressive animal images being rated as masculine (Underwood, Galenand, & Paquette, 2001), and the nature of sex role

stereotypes being in-line with the inductions in the present study, the likelihood of a confound due to perceived gender are low. However, to avoid any possible complications in the future, researchers should avoid avatar stimuli that may have gender based stereotypes, unless specifically dealing with masculine and feminine stereotypes

A final limitation is imbedded in how attitudinal measures were collected in the present study. Participants in the present study read and commented on all five of the mocked up social media threads prior to filling out the attitudinal measure items. Because of this, there is no way of parsing out any possible effects individual thread stimuli may have had on aggressive attitude. Future research that uses multiple comment thread stimuli should make efforts to measure the attitudinal DV between each stimuli, so that any possible effects of an individual stimuli within a group can be observed.

Conclusion

Overall, the current research expands our understanding of the Proteus effect into the relatively static environment of traditional CMC. This is especially notable due to the proliferation of CMC and avatar use in contemporary communication. Previous research has already begun to explore the self-influencing effects of communicating in CMC environments (Walther, Van Der Heide, Tong, Carr, & Atkin, 2010; Van Der Heide, et al., 2017). The current study adds to that literature, introducing the avatar-based self-influencing effect of avatar usage to traditional CMC environments. Future research should continue to examine the Proteus effect with static avatars, specifically to compare the Proteus effect observed in the current study with the VR based Proteus effect that is more often observed.

The results of the present study should also be considered in terms of social media web design and personal avatar selection. Online developers should consider the avatars that are

allowed to be used on their sites when developing their ideal online community. The present study found evidence that the avatars that are used, and are allowed to be used, in social media environments can influence how we behave in those environments. If one wishes to encourage an online community where there is a decreased level of aggressive and negative communication behavior, then avatars that hold stereotypes in-line with aggression should be avoided. Similarly, if the desire is to increase positive social behavior in an online dating site, and eliminate the sharing of crude and unwanted photographs, then the use of images with characters that would suggest the express of positive communication behavior would be advised.

What web designers choose as a default avatar should also be considered. Some of the first interactions individuals take on a social media site are taken before an avatar has been chosen. In these cases the default image for that site is the individual's avatar. It may then be advisable, in consideration of the present study, to ensure that default images used by web designers present a positive influence on the social media site user. A social media site that institutes a human profile as a default avatar may induce users to behave in a more humane fashion than a site that uses an object as a default profile avatar. For example, having an egg as a default avatar, as was the case for Twitter prior to 2017, may induce users to be more guarded in their communications, if the egg is perceived to have a "protected" or "walled of" stereotype. It is thus incumbent on web designers to be cognizant of the stereotypes and schemas that are induced by the images they present as default avatars.

Finally, individual users should be aware of the behavior that their social media avatar may induce, in considering the behavior that they wish to express. With the knowledge that our avatars can affect our behavior comes the ability to influence ourselves towards an ideal online behavior, with the simple choice on an avatar. If an individual wishes to influence their own

online behavior in a given direction, the present study provides evidence that this can be done by using an avatar that exemplifies the desired behavior. For example, if an individual wishes to be more assertive in an online dating website, they should consider using an assertive image as their avatar.

APPENDICES

APPENDIX A: Images pretested for stimuli creation.

Image Label = AV1
Malevolence = -.18
Aggression = -.006
Attraction = .57
Gender = .34

Image Label = AV2
Malevolence = .35
Aggression = .26
Attraction = .16
Gender = .53

Image Label = AV3
Malevolence = -.87
Aggression = -.75
Attraction = -.32
Gender = -1.08

Image Label = AV4
Malevolence = -.92
Aggression = .79
Attraction = -.18
Gender = .63

Image Label = AV5
Malevolence = -.64
Aggression = -.51
Attraction = .13
Gender = .22

Image Label = AV6
Malevolence = .63
Aggression = .56
Attraction = -.58
Gender = .45

Image Label = AV7
Malevolence = -1.04
Aggression = -.88
Attraction = -.09
Gender = -1.15

Image Label = AV8
Malevolence = .65
Aggression = .57
Attraction = .11
Gender = .50

Image Label = AV9
Malevolence = .02
Aggression = -.07
Attraction = -.27
Gender = .54

Image Label = AV10
Malevolence = .68
Aggression = .47
Attraction = -.28
Gender = .62

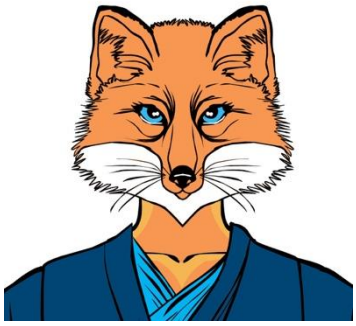


Image Label = AV11
Malevolence = -.81
Aggression = -.78
Attraction = .16
Gender = -.92

Image Label = AV12
Malevolence = .79
Aggression = .73
Attraction = -.13
Gender = .61

Image Label = AV13
Malevolence = -.77
Aggression = -.45
Attraction = .47
Gender = -1.72

Image Label = AV14
Malevolence = .35
Aggression = .22
Attraction = -.03
Gender = .47

Image Label = AV15
Malevolence = .69
Aggression = .52
Attraction = .25
Gender = .53

Image Label = AV16
Malevolence = .73
Aggression = .68
Attraction = -.18
Gender = .58

Image Label = AV17
Malevolence = -1.01
Aggression = -.84
Attraction = -.32
Gender = -.44

Image Label = AV18
Malevolence = .49
Aggression = .49
Attraction = .69
Gender = .16

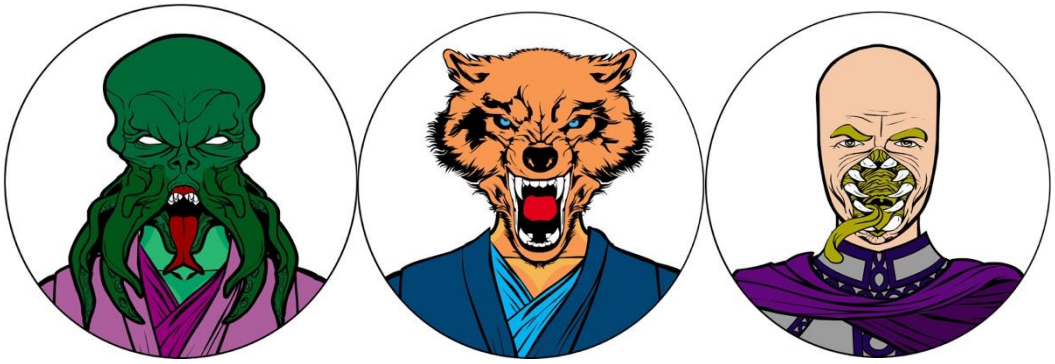
Image Label = AV19
Malevolence = -.79
Aggression = .76
Attraction = -.22
Gender = -.40

Image Label = AV20
Malevolence = -.02
Aggression = -.10
Attraction = -,40
Gender = .15

APPENDIX B: Stimuli

Non-Aggressive Avatars:

Aggressive Avatars:



Neutral Avatar, used in aggression measures:

Comment Threads:

T8LN9

Trump recently Tweeted: Any deal that does not include STRONG border security and the desperately needed WALL is a total waste of time.

1H5HS: I stand with Donald Trump and truly believe that there SHOULD be a way to stop illegal immigrants from coming into this country

IMFXX: Building a wall is not feasible and not a good idea. The current fence is already expensive enough and ther are not enough funds, and too much opposition to build a wall.

PBSAX: I am in support of the trump wall. I agree with @IMFXX, it is not an easy thing to do and it may not happen in the exact time frame that trump wants, but he has the right mind set in that we need to keep the illegal immigrants out until they legalize themselves. Immigrants are part of our economy, but they ned to enter the U.S. fairly and go through the system in order to be a U.S. citizen.

D4SB0: I think some of the above commenters are completely unin-formed. A wall is unnecesary, and completely discriminatory. It is a complete waste of time and money. The wall should not be built.

T8LN9

We should have seen it coming: a self-driving car killed a pedestrian in a crash.

1H5HS: Thousands of pedestrians are kiled by cars every year, so even humans cannot predict human behavior, non-the less a car. Without knowing more about the accident it could.... It could have been unavoidable.

IMFXX: Humans 1; AI 0... my question is what happens when 2 vehicles that are both “self-driving” crash? Who’s fault is it?

PBSAX: Computers are terrible at adapting to the unexpected. Programming probably designed on the assumption that everyone will obey traffic laws whether on foot or in a car. There are just some things for which a computer wil never be able to replace a human.

D4SB0: It’s just not going to work. Time to go back to the old fash-ioned way to drive... with people behind the wheel.

T8LN9

The film critic Leonard Maltin said “if you’ve never seen silent films, or foreign language films, if your education with film begins with Star Wars, then you’re handicaped.” Thoughts?

1H5HS: Clockwork Orange, Raging Bull, Raiders of the Lost ARk, Superman, Stand By Me. His opinion is invalid.

PBSAX: He’s right. You literaly have a handicap to your ability to critique film if you have a limited purview of film. He’s not being derogatory. He’s saying that if you only rely on pop culture and recent popular films, you don’t have the experience to judge films.

IMFXX: The truth hurts. Movies have dumbed down audiences and critics. They don’t reflect life anymore.

D4SB0: It’s not like studies are puting out good movies anymore anyway. All the good stories are on TV nowadays. Movies today are mostly about action, animation, and comic bok characters.

T8LN9

To stop illegal drug use, we typically punish, and shame addicts. This just perpetuates addiction and doesn’t do anything to solve the problem.

1H5HS: I think some politicians have the right idea, those selling drugs on the streets should face a death sentence or life in prison

PBSAX: Most American’s want an end to the drug war, legalized drugs and treatement instead of jail time. If that’s the public sentiment and we live in a democracy, why are drugs still illegal?

IMFXX: When people stop pretending that it’s not their fault that they got addicted to drugs it will be the first step towards progress. People need to take responsibility for their actions. It’s no one else’s fault that they take drugs.

D4SB0: Other countries solve drug problems by focusing on treating the addiction not punishing the addict. Why can’t we?

T8LN9

The 2024 Olympics may include e-sports. The Paris Olympic committee co-president said that e-sports should be considered a legitimate sport, if the Olympics is to maintain its relevance.

1H5HS: I like e-sports, but if you're going to ad them to the Olympics you should add poker, darts, pool, and bowling.

PBSAX: For those who say "Gamers aren't athletes" Pro Gamers nowadays are considered athletes. It's not easy or simple. They practice, they're dedicated, and they coordinate with each other, improving their skills.

IMFXX: Coming up next, the long awaited Rock-Paper-Scissors gold medal final. I love video games but at the Olympics is a bit much.

D4SB0: It looks trivial to those who aren't really into it, but gaming at a competitive level takes extreme hand-eye coordination, reflexes, adaptability, and reaction timeing. I'm totally down for giving this a trial run on an Olympic platform.

APPENDIX C: Participant instruction text

Avatar Selection Instructions:

"Thank you for agreeing to participate in this study. This is a longitudinal study designed to examine how people communicate on bulletin board style websites, such as Reddit. You will be asked to read through a series of online conversation threads, made by previous study participants. After reading through a conversation thread you will be asked to make a comment to the end of that thread. You will be asked to do this for each thread that you read. Comments you make will be viewable by future participants of this study.

"In order to protect participant anonymity, you will (be asked to choose a profile photo from a series of randomly generated images / be assigned a randomly generated image as a profile photo). This profile photo will represent you, and be shown with the comments you make during this study. Please click the below button to (choose / be assigned) your profile photo and begin the study."

APPENDIX D: Measures

Malevolence index (Frank & Gilovich, 1988):

On the scale below, indicate your impression of the individual depicted in the above image. Number 1 and 7 indicate a very strong feeling. Number 2 and 6 indicate a strong feeling. Number 3 and 5 indicate a fairly week feeling. Number 4 indicate that you are unsure or undecided.

1. Good/Bad
2. Timid/Aggressive
3. Nice/Mean
4. Active/Passive
5. Weak/Strong

Image Perceived Gender:

On the scale below, indicate your impression of the individual depicted in the above image. Number 1 and 7 indicate a very strong feeling. Number 2 and 6 indicate a strong feeling. Number 3 and 5 indicate a fairly week feeling. Number 4 indicate that you are unsure or undecided.

1. Feminine/Masculine

Physical Attraction (McCroskey & McCain, 1974)

Please indicate the degree to which you agree to each of the following statements, in reference to the individual depicted in the above image (Strongly Disagree to Strongly Agree).

1. I think he (she) is quite handsome (pretty).
2. He (she) is somewhat ugly.*
3. He (she) is very sexy looking.

4. I find him (her) very attractive physically.
5. I don't like the way he (she) looks.*
6. He (she) is not very good looking.*

*Reverse coded items.

Choice Induction manipulation check:

Please rate how much you agree or disagree with each of the following statements on a scale from 1 to 7, where 1 = Strongly Disagree, and 7 = Strongly Agree.

1. I was able to choose my profile photo for this study
2. I was not given a choice of what I could use for my profile photo in this study*
3. For this study, my profile photo was assigned to me.*

* Reverse coded items.

Modified Aggression Questionnaire (Buss and Perry, 1992; Farrar & Krcmar, 2006)

Please rate how much you agree or disagree with each of the following statements on a scale from 1 to 7, where 1 = Strongly Disagree, and 7 = Strongly Agree.

Physical Aggression (Pretest only)

1. Every now and then the individual can't control the urge to strike another person.
2. Given enough provocation, this individual may hit another person.
3. If somebody hit this individual, they'd hit back.
4. This individual gets into fights a little more than the average person.
5. If this individual had to resort to violence to protect themselves, they would.
6. This individual has threatened people.
7. This individual has become so mad that they have broken things.

Verbal

1. I would tell this individual openly that I disagreed with them.
2. I would find myself disagreeing with this person.
3. If this person annoyed me, I would tell them what I thought of them.
4. This person would say I'm somewhat argumentative.
5. If this person disagreed with me, I would not be able to help getting into an argument with him.

Anger

1. I would be even-tempered around this person. *
2. If this person frustrated me, I would let my irritation show.
3. This person makes me feel like a powder keg ready to explode.
4. When dealing with this person I might flare up quickly but get over it quickly.
5. This person might think I'm a hothead.
6. When talking with this person, I might fly of the handle for no good reason.
7. I would have trouble controlling my temper around this person.

* reverse coded items.

Hostility

1. I feel like I have gotten a raw deal out of life.
2. Other people in this study seem to get the breaks.
3. I feel bitter about my participation in this study.
4. This person makes me feel jealousy.
5. I would be suspicious of this person if they were overly friendly
6. I sometimes feel that people are laughing at me behind my back.
7. If this person was especially nice, I would wonder what they want.

8. This person probably always gets the breaks.

Embodiment Measure:

Please rate how much you agree or disagree with each of the following statements on a scale from 1 to 7, where 1 = Strongly Disagree, and 7 = Strongly Agree.

1. I felt like I was inside my avatar/profile photo when I used it to comment.**
2. When reading and making comments, it was as if I became one with my profile photo.**
3. When I was making comments, I was transported into my profile photo.**
4. When I was making comments, I felt as if my profile photo became me.**
5. When making comments, it was as if I commented directly through my profile photo.**
6. When making comments, my profile photo was an extension of myself.
7. If someone criticized my profile photo, I'd feel like they were criticizing me.
8. My profile photo represented me.**
9. I felt connected to my profile photo.
10. The profile photo I used was a representation of me.
11. I did not feel connected to my profile photo.*
12. I identified with my profile photo.

* Reverse coded items

** Items used in main study at α=.94.

REFERENCES

REFERENCES

Anderson, C. A., & Bushman, B. J. (2002). Human aggression. *Annual Review of Psychology, 53*(1), 27-51.

Bargh, J. A., McKenna, K. Y., & Fitzsimons, G. M. (2002). Can you see the real me? Activation and expression of the "true self" on the Internet. Journal of social issues, 58(1), 33-48.

Bem, D. J. (1965). An experimental analysis of self-persuasion. *Journal of Experimental Social Psychology, 1*, 199-218.

Bem, D. J. (1968). Attitudes as self-descriptions: Another look at the attitude-behavior link. *Psychological foundations of attitudes*, 197-215.

Bem, D. J. (1972). Self-perception theory. *Advances in experimental social psychology*, *6*, 1-62. Academic Press.

Beyea, D., Ratan, R., Li, B., & Graciano L. (2019, May). Avatar characteristics induce users' behavioral conformity with small-to-medium effect sizes: A meta-analysis of the Proteus effect. Paper presented at 69th Annual Conference of the International Communication Association, Washington, D.C.

Bian, Y., Zhou, C., Tian, Y., Wang, P., & Gao, F. (2015, August). The Proteus effect: Influence of avatar appearance on social interaction in virtual environments. In International Conference on Human-Computer Interaction (pp. 78-83). Springer, Cham.

Bodaken, E.M., & Sereno, K.K. (1976). Counter attitudinal advocacy, ego-involvement, and persuasive effect. *Western Speech Communication, 40,* 236-248.

Buisine, S., Guegan, J., Barré, J., Segonds, F., & Aoussat, A. (2016). Using avatars to tailor ideation process to innovation strategy. *Cognition, Technology & Work, 18*(3), 583-594.

Burgoon, J. K., & Hale, J. L. (1984). The fundamental topoi of relational communication. *Communication Monographs, 51*(3), 193-214.

Burke, P. J., Stets, J. E., & Pirog-Good, M. A. (1988). Gender identity, self-esteem, and physical and sexual abuse in dating relationships. Social Psychology Quarterly, 51(3), 272-285.

Buss, A. H., & Perry, M., (1992). The aggression questionnaire. *Journal of Personality and Social Psychology, 63*(3), 452-459.

Chandler, J., Konrath, S., & Schwarz, N. (2009). Online and On My Mind: Temporary and Chronic Accessibility Moderate the Influence of Media Figures. Media Psychology, 12(2), 210–226.

Chen, G. M., Schweisberger, V. N., & Gilmore, K. (2012). Conductor effect: Violent video game play extends anger, leading to triggered displaced aggression among women. Conference Paper – International Communication Association, 1-26.

Christou, C. & Michael, D. (2014, September). Aliens versus humans: Do avatars make a difference in how we play the game? In Games and Virtual Worlds for Serious Applications (VS-GAMES), 6th International Conference on (pp. 1-7). IEEE.

Cohen, J. (1988). Statistical power analysis for the behavioral sciences 2nd edn.

De Queiroz, G., Keyes, O., & Robinson, D. TidyText: text mining using "dplyr", "ggplot2", and other tidy tools [R package tidytext version 0.1.5]

Dion, K., Berscheid, E., & Walster, E. (1972). What is beautiful is good. *Journal of Personality and Social Psychology*, *24*(3), 285.

Eagly, A. H., & Steffen, V. J. (1986). Gender and aggressive behavior: a meta-analytic review of the social psychological literature. Psychological bulletin, 100(3), 309.

Ellison, N., Heino, R., & Gibbs, J. (2006). Managing impressions online: Self-presentation processes in the online dating environment. Journal of Computer-Mediated Communication, 11, 415-441.

Farrar, K., & Krcmar, M. (2006). Measuring state and trait aggression: A short, cautionary tale. *Media Psychology, 8*(2), 127-138.

Fox, J., Bailenson, J. N., & Tricase, L. (2013). The embodiment of sexualized virtual selves: The Proteus effect and experiences of self-objectification via avatars. *Computers in Human Behavior*, *29*(3), 930-938.

Frank, M. G., & Gilovich, T. (1988). The dark side of self-and social perception: black uniforms and aggression in professional sports. *Journal of personality and social psychology*, *54*(1), 74.

Gomes, S. B. (2012). Avatars and Self-Concept Change: The Effects of Embodiment on Identity Shift in Computer-Mediated Environments. University of Connecticut.

Gonzales, A.L., & Hancock, J.T. (2008). Identity shift in computer-mediated environments. *Media Psychology, 11,* 167-185. doi:10.1080/15213260802023433

Groom, V., Bailenson, J. N., & Nass, C. (2009). The influence of racial embodiment on racial bias in immersive virtual environments. *Social Influence*, *4*(3), 231-248.

Harris, M. B. (1996). Aggression, gender, and ethnicity. Aggression and Violent Behavior, 1(2), 123-146.

Hayes, A.F. (2017). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach.* Guilford Publications.

Johnson, R. D., & Downing, L. L. (1979). Deindividuation and valence of cues: Effects on prosocial and antisocial behavior. *Journal of Personality and Social Psychology*, *37*(9), 1532.

Klimmt, C., Hefner, D., Vorderer, P., Roth, C., & Blake, C. (2010). Identification With Video Game Characters as Automatic Shift of Self-Perceptions. Media Psychology, 13(4), 323–338.

Lee, S. G., Kang, M., & Kang, H. S. (2013). Mechanisms underlying aggravation and relaxation of virtual aggression: A Second Life survey study. *Behavior & Information Technology*, *32*(7), 735-746.

Li, B. J., Lwin, M. O., & Jung, Y. (2014). Wii, myself, and size: the influence of Proteus Effect and stereotype threat on overweight children's exercise motivation and behavior in exergames. *GAMES FOR HEALTH: Research, Development, and Clinical Applications*, *3*(1), 40-48.

Lim, S., & Reeves, B. (2009). Being in the game: Effects of avatar choice and point of view on psychophysiological responses during play. *Media psychology*, *12*(4), 348-370.

Liu, B. (2015). *Sentiment analysis: Mining opinions, sentiments, and emotions.* Cambridge University Press.

Lundqvist, D., Flykt, A., & Ohman, A. (1998). The Karolinska directed emotional faces (KDEF(. *CD ROM from Department of Clinical Neuroscience, Psychology section, Karolinska Institute*, (1998).

Martin, M. M., Anderson, C. M., Burant, P. A., & Weber, K. (1997). Verbal aggression in sibling relationships. *Communication Quarterly, 45*(3), 304-317.

McCroskey, J. C., & Teven, J. J. (1999). Goodwill: A reexamination of the construct and its measurement. *Communications Monographs, 66*(1), 90-103.

McKenna, K. Y., & Bargh, J. A. (1998). Coming out in the age of the Internet: Identity "demarginalization" through virtual group participation. *Journal of personality and social psychology*, 75(3), 681.

Miller, G.R. (1973). Introduction: Counter attitudinal advocacy: A current appraisal. In C.D. Mortensen & K.K. Sereno (Eds.), Advances in communication research (pp. 105-152). New York: Harper & Row.

Nielsen, F.A. (2011). A new ANEW: Evaluation of a word list for sentimental analysis in microblogs. *arXiv preprint arXiv:1103.* 2903.

Peña, J., Hancock, J. T., & Merola, N. A. (2009). The priming effects of avatars in virtual settings. *Communication Research, 36*(6), 838-856.

Postmes, t., Spears, R., & Lea, M. (1998). Breaching or building social boundaries? SIDE-effects of computer-mediated communication. *Communication research*, *25*(6), 689-715.

Ratan, R. A., & Dawson, M. (2016). When Mii is me: a psychophysiological examination of avatar self-relevance. Communication Research, 43(8), 1065-1093.

Ratan, R., & Sah, Y. J. (2015). Leveling up on stereotype threat: The role of avatar customization and avatar embodiment. Computers in Human Behavior, 50, 367-374.

Schlenker, B.R., Blugolecki, D.W., & Doherty, K. (1994). The impact of self-presentations on self-appraisals and behavior: The power of public commitment. *Personality and Social Psychology Bulletin*, *20*, 20-33. doi: 10.1177/0146167294201002

Schultze, U. (2010). Embodiment and presence in virtual worlds: a review. *Journal of Information Technology*, *25*(4), 434-449.

Taboada, M., Brooke, J., Tofiloski, M., Voll, K., & Stede, M. (2011). Lexicon-based methods for sentiment analysis. *Computational linguistics*, *37*(2), 267-307.

Thompson, E. H. (1991). The maleness of violence in dating relationships: An appraisal of stereotypes. Sex Roles, 24(5-6), 261-278.

Underwood, M. K., Galenand, B. R., & Paquette, J. A. (2001). Top ten challenges for understanding gender and aggression in children: Why can't we all just get along?. Social development, 10(2), 248-266.

Valins, S. (1966). Cognitive effects of false heart-rate feedback. *Journal of personality and social psychology*, *4*(4), 400.

Van Der Heide, B., Beyea, D., Makki, T., Prchal, P., Schlafhauser, K., (2017, November). Self-influence in CMC: The effect of anonymity on political attitudes. Paper presented at the 103rd National Communication Association Convention, Dallas, TX.

Van Der Heide, B., Schumaker, E. M., Peterson, A. M., & Jones, E. B. (2013). The Proteus effect in dyadic communication: Examining the effect of avatar appearance in computer-mediated dyadic interaction. *Communication Research*, *40*(6), 838-860.

Van Looy, J., Courtois, C., De Vocht, M., & De Marez, L. (2012). Player identification in online games: Validation of a scale for measuring identification in MMOGs. *Media Psychology*, *15*(2), 197-221.

Walther, J. B. (1996). Computer-mediated communication: Impersonal, interpersonal, and hyperpersonal interaction. *Communication research*, *23*(1), 3-43.

Walther, J.B., Slovacek, C.L., Tidwell, L.C. (2001). Is a picture worth a thousand words? Short-term computer-mediated communication. *Communication Research, 28*(1), 105-134.

Walther, J.B., Van Der Heide, B., Tong, S.T., Carr, C.T., & Atkin, C.K. (2010). The effects of interpersonal goals on inadvertent intrapersonal influence in computer-mediated communication. *Human Communication Research, 36,* 323-347. doi: 10.111/j.1468-2958.2010.01378.x

Wang, L., Fan, X., & Willson, V. L. (1996). Effects of nonnormal data on parameter estimates and fit indices for a model with latent and manifest variables: An empirical study. Structural Equation Modeling: A Multidisciplinary Journal, 3(3), 228-247.

Yee, N., & Bailenson, J. (2007). The Proteus effect: The effect of transformed self-representation on behavior. *Human communication research*, *33*(3), 271-290.

Yee, N., & Bailenson, J. N. (2009). The difference between being and seeing: The relative contribution of self-perception and priming to behavioral changes via digital self-representation. *Media Psychology*, *12*(2), 195-209.

Yee, N., Bailenson, J. N., & Ducheneaut, N. (2009). The Proteus effect: Implications of transformed digital self-representation on online and offline behavior. *Communication Research*, *36*(2), 285-312.

Yee, N., Ducheneaut, N., Yao, M., & Nelson, L. (2011, May). Do men heal more when in drag?: conflicting identity cues between user and avatar. In *Proceedings of the SIGCHI conference on Human factors in computing systems* (pp. 773-776). ACM.