Proceedings of the 5th International Conference on Social Psychology and Humanity Studies
DOI: 10.54254/2753-7048/2027.38885

Effects of Avatar Facial Aggressiveness on Negotiation Behavior: The Moderating Role of Perceived Self-Avatar Similarity in the Proteus Effect

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Abstract. According to the Body Specific Hypothesis and the Proteus Effect, bodily experiences can shape people's cognition and behavior. Yee & Bailenson's study of the Proteus Effect suggested that interaction with avatars may shape people's self-representation in virtual environments and further alter people's social behaviors. However, less is known about whether facial characteristics of avatars influence social behaviors, and whether this effect depends on how similar people perceive the avatars to themselves. This proposed study examines the effect of avatar facial aggressive cues, such as facial width-to-height ratio, on people's behaviors in bargaining tasks, and investigates perceived self-avatar similarity as a potential moderator. A hundred undergraduate male students aged 18-25 will be recruited and randomly assigned to conditions with high facial aggressiveness and low facial aggressiveness. We will vary facial aggressiveness by varying such traits as face waist-to-height ratio, chin width, eyebrows, and nose size. Afterward, we'll leave people a few minutes to get to embody their avatars and to perform a bargaining task: an ultimatum concession bargain with a hypothetical $100 allocation. We will ask participants to offer initial offers in bargaining and end-game concessions. Perceived self-avatar similarity would be assessed using the subscale of Perceived Similarity of the Player Identification Scale (PIS). We will hypothesize that more aggressive people will make more self-beneficial offers in initial offers, make less concessions in bargaining tasks, and perceived self-avatar similarity will moderate the relationship with a higher effect among those with a higher perceived self-avatar similarity. This study may offer further support to the Body-Specificity Hypothesis and the Proteus effect. Furthermore, by exploring the possible moderating effect of perceived self-avatar similarity, this study may help clarify when virtual representations are more likely to shape participants' social behaviors.

Keywords: Body-Specificity Hypothesis, Proteus effect, facial aggressiveness, perceived self-avatar similarity, bargaining behaviors

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DOI: 10.54254/2753-7048/2027.38885

1. Introduction

The Body-Specificity Hypothesis suggests that features and constraints of the body can influence cognitive processes [1]. Virtual reality provides a unique way to test whether such a kind of body-specific effect can be generalized from a physical body to a temporary embodied virtual body. If the physical body characteristics influence cognition in the physical world, it is at least theoretically possible that the characteristics of a virtual body—through which a user perceives and acts in the world—may also have an influence on cognition and behavior. This is the theoretical starting point of the present study. Early evidence for the Proteus Effect—individuals behave in ways consistent with the stereotypes associated with their virtual self-representation—was provided by Yee and Bailenson [2]. Their results showed that participants who used tall avatars tended to make more self-beneficial offers and were less likely to accept unfair offers, while participants who used short avatars made less self-beneficial offers and accepted unfair offers. Despite the findings in these studies, this body of research fails to fully account for why the Proteus Effect occurs. Yee and Bailenson provided one explanation by appeal to Bem's [3] self-perception theory, which assumes that people infer their attitudes based on their own behaviors. However, this explanation does not fully account for whether it may vary with differences of self-avatar relationship.

To fill this gap, some studies in subsequent works have proposed how the self-avatar relationship can potentially affect the Proteus effect. Yee, Bailenson, and Ducheneaux [4] argued that the Proteus Effect can occur when an avatar's outer appearance is perceived as matching corresponding personality and behavior expectations by individuals. Although there are some kind of avatar-user relation which can amplify the Proteus Effect, Ratan & Sah [5] found that some kind of avatar embodiment can also mitigate the negative effects such as gender stereotypes. Sibilla et al. [6] argued that there are two kinds of user-avatar relationships that are important: actualization and idealization. In many previous studies, they put emphasis on the participant-avatar relationship as an important relationship for shaping self-representation in virtual environments, embodiment and self-endorsing as well as behavioral consequences [7-9].

Studies also found that embodiment in avatars with different looks can influence people's self-cognition. Differences in individuals' behaviors, traits, etc. can also decrease the interaction effect of perceived similarity. They suggested that a virtual self may be shaped by face-perception and avatar-embodiment processes, rather than by deliberate self-evaluation alone. Slater and Tsakiris [10] found that multisensory integration inducing ownership of an out-group virtual body reduced implicit bias toward that out-group. Prior research has also shown that actively controlling an avatar yields stronger avatar-consistent behavior than merely observing the avatar and adopting its perspective [9]. Together, these findings suggest that virtual representations may depend on how participants experience and interact with their avatars. Based on these findings, the present study therefore proposes that perceived self-avatar similarity moderates the emergence of the Proteus Effect. Accordingly, when an avatar has aggressive facial features, actively operating it, adopting its cognitive perspective, and recognizing the virtual face as similar to oneself may strengthen the internalization of aggression-related stereotypes and avatar-consistent behaviors. When the avatar is highly dissimilar to the user's physical appearance, the Proteus Effect may be weakened. Perceived similarity may therefore moderate the degree to which avatar characteristics influence users' self-schema, and further shape the subsequent behaviors

Accordingly, the present study tests a model in which perceived self-avatar similarity moderates the influence of aggressive facial traits on aggressive or assertive negotiation performance. Overall avatar attractiveness is controlled to rule out the alternative explanation that aggression-looking

DOI: 10.54254/2753-7048/2027.38885

faces are simply perceived as less attractive. The proposed study will address: (i) a body-specific hypothesis in the virtual environment, demonstrated by how facial aggressive cues shape people's aggressive/assertive bargaining behaviors, and (ii) a possible factor that influences the Proteus effect: perceived self-similarity. First, our study examines whether an avatar's facial aggressive cues shape people's aggressiveness/assertiveness in social interaction. Secondly, our study tests the perceived self-avatar similarity as a moderator.

2. Literature review

2.1. Body-specificity hypothesis

Casasanto [1] provided a solid foundation for the Body Specificity Hypothesis: he conducted 5 experiments to reveal the strong links between handedness and cognition of abstract concepts-positive/negative concepts, including spatial and emotional valence. The study proved that different bodily experiences can shape people's different mental processes. In addition to the basic study introducing the Body Specificity Hypothesis in Casasanto [1], Casasanto & Chrysikou [11] found that changing motor fluency- long-term and short-term changes in handedness in stroke patients can alter people's association of positive/negative concepts with the right/left hand. The changes were also observed in healthy participants: forcing right-handers to use their opposite hand, or handicapping their right or left hand, can also alter their prior cognitive association of positive/negative concepts with the right/left hand. That study suggested that bodily motor experiences could causally change people's cognitive processes. Furthermore, the Body-Specificity Hypothesis has been supported at the neurobiological level: bodily experiences are encoded in the neural activation of brain regions related to language and thought. Right-handers activated their left premotor cortex when they read words, while left-handers activated the opposite right premotor cortex [12]. Bodily experiences created by both imagined actions and motor actions activated their related premotor cortex [12, 13]

2.2. From body-specificity hypothesis to the proteus effect

Yee & Bailenson [2] provided strong evidence for the Proteus Effect: embodiment with avatars can alter people's social behaviors by altering self-representation. Yee, Bailenson & Ducheneaut [4] extended evidence of the Proteus Effect from laboratory settings to real online communities and offline face-to-face interactions, indicating that virtual self-representations can shape social behavior in both online and offline contexts. Ratan et al. [14] suggested the effect of virtual bodies in education-that the use of avatars could promote students' academic motivation through games. Virtual bodily experiences can also be associated with stereotypes. Fox et al. [15] found that sexualized virtual bodies even increased self-objectification compared to non-sexualized ones. Ratan & Sah [5] found that female participants with customized male avatars performed better in math tasks compared to people with female avatars, moderated by psychological connection to the avatars, with lower avatar embodiment associated with better math scores. Beyond gender stereotypes, avatar embodiment may also influence racial stereotypes. Maister et al. [16] found that participants with light skin color who experienced body ownership over a dark-skinned body in a virtual environment reduced their implicit biases. Banakou et al. [17] found that the effect of reducing implicit racial biases toward Black people lasted for one week. These studies suggest that avatar embodiment can influence behavior and further shape internalized self and social cognition, while the self-avatar connection is an essential condition for those effects.

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2.3. Self-avatar relationship and perceived self-avatar similarity

Previous research has conceptualized the self-avatar relationship from various perspectives. Two relevant constructs are embodiment, which refers to the experiences of the virtual body as one's own body, and identification, a psychological concept of how participants define the relationship with the virtual body. Kiliteni, Groten & Slater [7] defined sense of embodiment (SoE) over the virtual body as viewing the properties of the body as one's own body properties. SoE consists of three components: self-location, self-agency and sense of body-ownership. Self-location means the place where participants feel themselves to be located. It is one's spatial experience of being inside the virtual body, rather than in the physical world. Self-agency refers to the sense of having control over the motor activity of the virtual body. Sense of body ownership refers to participants' self-attribution of the virtual body, perceiving it as the source of experiences. Toet et al. [18] suggested that embodiment is robust against inconsistency between virtual bodies and the operator's body. Reinhard et al. [19] found that embodiment to the virtual body even changes the walking speed in real life, suggesting the sense of embodiment as an important moderator of the Proteus effect.

Beyond the concept of embodiment, perceived self-avatar similarity also influence proteus effect, and it means to what extent participants perceive the avatar as similar to themselves [20]. Hooi & Cho [21] defined similarity as physical similarity and homophily. Physical similarity refers to the degree of physical resemblance between participants and avatars, while homophily means the psychological beliefs of resemblance. Physical similarity could predict higher homophily, which promotes higher self-awareness of the avatar as "me". Similarity could influence self-disclosure in a virtual environment, viewing an avatar as "me", while it is mediated by identifiability, self-awareness, and self-presence. Marinussen & de Rooje [22] found that self-similar avatars can promote the generation of creative ideas. Self-similar avatars can increase identification with avatars, promoting positive affect and motivating the positive affect-creative idea link. Previous literature suggested the importance of self-avatar similarity in participants' behavior and cognitive changes, but whether perceived self-avatar similarity, which refers to the psychological beliefs of the degree of self-avatar resemblance, could moderate the Proteus effect, still remains unknown.

2.4. Facial aggressiveness and bargaining

Appearance is important in generating social and psychological perceptions as personality traits(Zebrowitz & Montepare, [23]). The original study of the Proteus effect has proved that appearance may associated with aggressive social behavior, people assigned to taller avatar made more self-favorable behavior compared to people assigned to shorter ones. Besides body height, some facial characteristics could be interpreted as aggressive/assertive in social interaction. Studies found that facial width-to-height ratio (FWHR) is associated with aggressiveness [24] and perceived threat [25]; Liu et al. [26] also link FWHR to perceived aggressiveness. Beyond FWHR, other facial features related to the chin, eyebrows, and nose are also found to be related to higher aggressiveness [27] and perceived dominance/masculinity [28].

Negotiation provides an effective socio-behavioral context to show how self-avatar interaction could shape aggressiveness. In distributive bargaining, people compete over allocations of fixed resources. Their bargaining behaviors can be reflected in initial offers and successive conceding behaviors. Schweinsberg et al. [29] suggested that self-favorable initial offers are associated with aggressive bargaining, and often related to negative impasse. Lower concessions are also regarded as more aggressive behavior in the negotiation tasks [30]. Yee & Bailenson [2] also used initial offers as a measurement of participants' aggressive/assertive behaviors in negotiation tasks.

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2.5. Research gap

Despite growing evidence for the Proteus Effect, two questions remain relatively underexplored. First, previous research on avatar appearance and negotiation has primarily focused on characteristics such as avatar height, with taller avatars leading users to adopt more confident or aggressive bargaining behavior [2, 4]. Less is known about whether facial morphology, similarly influenced by perceived aggressiveness, could influence bargaining strategies, including initial offers and subsequent concessions. Second, the effect of the avatar may not be condition-independent. Previous studies have already suggested that the effect of the avatar may vary in different degrees of self-avatar relationship. Beyond that, relatively little research has focused on the influence of perceived self-avatar similarity on the Proteus effect. Therefore, the present proposed study will examine whether facial aggressive characteristics will shape aggressive bargaining behaviors, moderated by perceived self-avatar similarity.

3. Hypothesis

H1: Avatar facial aggressiveness may shape people's aggressive behaviors in the bargaining task, and this effect will be moderated by perceived self-avatar similarity.

4. Method

4.1. Participants

We will recruit 100 male undergraduate students aged 18-25. We will recruit only male participants and confederates and use male avatars to reduce potential gender-related variability in perceiving the facial cues and to avoid interaction among participants' genders, confederates' gender, and avatar gender. Geniole et al. [31] found that facial cues associated with perceived aggressiveness may differ between male and female faces. In addition, males and females may differ in how they process the same facial cues. Proverbio [32] found that men and women processed and evaluated the same human faces with balanced characteristics, age, and sex differently, with women always perceiving human faces as more arousing than men. In that case, we recruited only a male sample to avoid potential gender-related cognitive variability. Thirdly, although Yee & Bailenson [2] assigned participants to confederates from the opposite gender, it is important to consider the gender-pairing effect in the bargaining task. Sutter et al. [33] pointed out that gender per se did not have a significant effect on behavior, but gender pairing systematically shapes people's interactions and behaviors. The article also reviewed literature from evolutionary psychology and suggested that people act more aggressively in interactions with people of the same sex, considering them as potential competitors in the process of reproduction.

Participants should meet the following requirements: normal or corrected-to-normal vision and hearing, and sufficient English to understand the instructions and perform in the bargaining task. Participants are voluntarily recruited and provided with written informed consent. All participants who complete the task will receive a $ 10 Starbucks coupon as a reward.

4.2. Experimental design

Avatar design and rating: We will design two types of avatar-one in high facial aggressiveness and the other in low facial aggressiveness. We manipulate the facial aggressive cues of the avatar by setting the facial height-to-width ratio, a wider chin, more prominent eyebrows and a larger nose.

DOI: 10.54254/2753-7048/2027.38885

The two types of avatar will be subjectively rated by a group of volunteers independent of our experiment, from 0 (not aggressive at all) to 6 (very aggressive). Other characteristics of the avatar, such as body shape, clothing, hairstyle, eye color, skin and facial expression, etc., will be kept balanced and constant across the two conditions. A manipulation check will be conducted at the end of the experiment to test whether the facial aggressive cues trigger the aggressive behaviors of the participants in the bargaining task.

Between subject design: we will set participants to the two conditions-high aggressiveness with avatar in high facial aggressiveness and low aggressiveness with avatar in low facial aggressiveness. Participants in two conditions will perform in the bargaining task following the same script and in the same virtual and physical environment. All participants will be given 6-8 minutes to fully immerse into their avatar.

Measurement of the potential moderator: Perceived self-avatar similarity will be measured using the subscale of Perceived Similarity from the Player Identification Scale (PIS) by Van Looy et al. [20]. The Player Identification Scale contains three dimensions: Avatar (character) Identification, Group (guild) Identification and Game (community), and Avatar Identification also includes three subscales: Perceived Similarity, Wishful Identification and Embodied Presence.

4.3. Physical and virtual environment

We will replicate the physical and virtual setting from Yee & Bailenson [2]. The physical environment contains two rooms connected by an open doorway. In the room where the study will be conducted, a black curtain divides the room to separate participants and confederates. The confederates will stay behind the black curtain until the VR game starts, to avoid being biased by participants' real faces.

The virtual setting will be a white room with the same dimensions in the physical room where participants perform their task. Since we will give 6-8 minutes of avatar familiarization and we will not record interpersonal distance, our study removes the mirror in Yee & Bailenson's study [2].

4.4. Ultimatum concession bargaining

Yee & Bailenson [2] used an ultimatum game to show assertiveness/aggressiveness, and our study will extend their experimental paradigm through adding bargaining and conceding as very important components to demonstrate people's aggressiveness in the negotiation task. Güth & Kocher [34] introduced the idea that the ultimatum game always makes participants initiate an offer or receive an offer. Participants will be measured of their allocation decision, confidence to make an offer in favor of themselves, and rejection of an offer unfair to themselves. Moreover, the ultimatum game was adapted to assess assertiveness/aggressiveness close to real settings-persistence, skills of persuasion and concession. There are mainly three types of adaptations-repeated ultimatum game in which participants play multiple rounds of the basic ultimatum game; the alternating-offer ultimatum game, in which participants bargain with the confederate to reach an agreement; and an ultimatum game involving more than 2 players. Beyond the take-it-or-leave-it game design, our study will combine the alternating-offer ultimate game and repeated ultimatum game. Felli et al. [35] provided a novel paradigm in which confederates didn't always accept offers proposed in favor of the participants. Instead, both sides reached an agreement through conceding in several negotiation attempts, varying from 3-5.

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5. Procedure

1) We will set a hypothetical number of $ 100 for a monetary split, the same as Yee & Bailenson's study [2].

2) The ultimate concession bargaining task contains only on trial. Participants will initiate the offer, and confederates counter the offer if it is over $ 60 in favor of the participants. The pairs will negotiate to achieve an agreement through 3-5 attempts. If they fail to reach an agreement within 5 attempts, then none of them will receive the money.

3) The participants and confederates will perform the game following a very strict script. First, they greet each other, then they are told that they need to split $100 through bargaining. Confederates should always counter the offer until it is below $ 60 in favor of the participants.

6. Predictions

If H1 is correct, then participants in the high aggressive condition will show a higher first offer than those in the low aggressive condition (see Figure 1a). Participants in the high aggressive condition will show a lower concession than those in the low aggressive condition at the termination point (see Figure 1b). People with low perceived self-avatar similarity will have a lower first offer and higher concession than people with high perceived self-avatar similarity in the high aggressiveness condition (see Figure 1c). And in the low aggressiveness condition, people with low perceived self-avatar similarity will have a higher first offer and lower concession than people with high perceived self-avatar similarity (see Figure 1d).

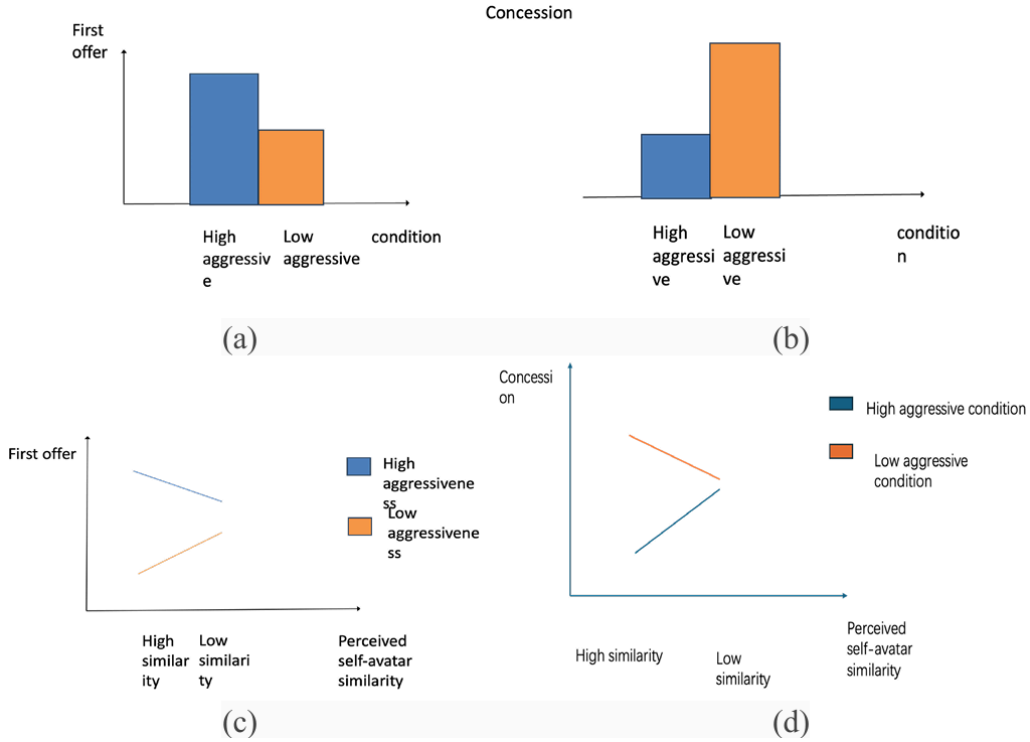


Figure 1. Prediction of the proposed study

1a (upper left): prediction follows H1, first offer. 1b (upper right): prediction follows H1, conceding number. 1c (lower left): prediction follows H1, interaction between aggressiveness and perceived similarity, demonstrated in the first offer. 1d (lower right): prediction follows H1, interaction between aggressiveness and perceived similarity, demonstrated in the conceding number.

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If H1 is not correct and the null hypothesis is correct, then people in a high-aggressiveness condition will not have a significantly different first offer (see Figure 2a) or different concessions than people in a low-aggressiveness condition (see Figure 2b). People with high perceived self-avatar similarity in both conditions will not have a significantly different first offer (see Figure 2c) or concession (see Figure 2d) than people with low perceived self-avatar similarity. Figure 2 illustrates these predicted patterns under H2/H0: Figure 2a shows no significant difference in first offer between the high and low aggressive conditions; Figure 2b shows no significant difference in concession between the high and low aggressive conditions; Figure 2c shows no significant interaction effect on first offer between aggressiveness and perceived self-avatar similarity; and Figure 2d shows no significant interaction effect on concession between aggressiveness and perceived self-avatar similarity.

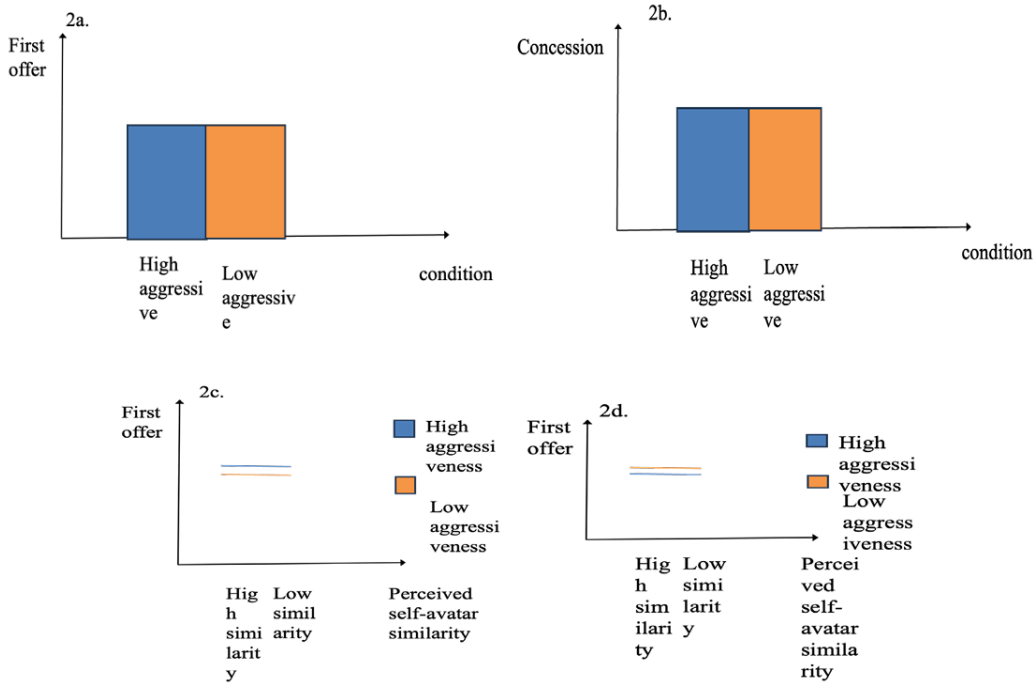


Figure 2. Prediction of the proposed study

2a (upper left): prediction follows H2, first offer. 2b (upper right): prediction follows H2, conceding number. 2c (lower left): prediction follows H2, interaction between aggressiveness and perceived similarity, demonstrated in the first offer. 2d (lower right): prediction follows H2, interaction between aggressiveness and perceived similarity, demonstrated in the conceding number.

7. Discussions

If the results support H1, then the results provide evidence for the Proteus effect-people's social behaviors are shaped by their virtual self-representation and modulated by perceived self-similarity. This is also consistent with a previous study: Aymerich-Franch, Kizilcec & Bailenson [36] provided evidence that participants embodying avatars dissimilar to their own experienced reduced anxiety about speaking in public, suggesting that embodying an avatar dissimilar to oneself may make the speaking perceived as less self-relevant. This is consistent with how perceived self-avatar similarity may influence people's responses to virtual experiences. Bailey, Bailenson & Casasanto [37] found that virtual bodily experiences could shape people's cognition. They tested the embodied cognition theory by assigning people to avatars with normal arm movement or switched arm movement, and

DOI: 10.54254/2753-7048/2027.38885

the results showed that virtual bodily experiences of "right" or "left" body movement influenced people's cognition of "good" and "bad" associated with the "right" and "left".

If the results do not support H1, then there are two conditions. First, if the Proteus effect is supported and the moderating role of perceived self-avatar similarity is not supported, then maybe the facial cues are "too strong" so that the modulation by perceived similarity is not obvious. Differences in individual behaviors, traits, etc. can also reduce the interaction effect of perceived similarity. Second, if the face aggressiveness of the avatar does not affect participants' behaviors in the bargaining task, facial cues may not be strong enough. Individual differences may also have an influence on how people respond to avatars.

One shortcoming of our study is that we only recruited male participants and confederates, so we could not generalize our findings to female populations. Another limitation is that it is always difficult to distinguish facial aggressiveness/assertiveness from other face features such as dominance and competence. Future research should develop and validate female avatars in a female sample and examine whether a similar effect exists in female populations. The potential effect of virtual bodily experience on people's behaviors may also have implications for VR-based behavioral interventions such as interventions for social anxiety. Studies have demonstrated that VR exposure therapy can reduce symptoms in social anxiety disorders, with the effects comparable to cognitive behavioral therapy [38]. There was also a pilot study indicating that integrating VR-based therapy and cognitive-behavioral therapy can reduce generalized social anxiety disorder symptoms effectively [39]. Building upon the present study, future research can explore whether the perceived self-avatar similarly shape how people respond to avatar-based interventions, and whether their impacts change people's behaviors, self-perception, and cognitions in VR-based therapy.

8. Conclusions

This proposed study is conducted to examine the effects of aggressive facial appearance in avatars on people's aggressive bargain behaviors. By measuring people's initial offer and the subsequent concessions, this study extends the previous studies about Proteus effect from general avatar appearance to specific facial appearance of aggression. More importantly, by introducing perceived self-avatar similarity as the potential moderator, this study focuses not only on how an avatar looks, but also on how participants think the avatar as related to themselves. Our findings may contribute to a better understanding of the circumstances under which avatar's appearance can shape people's behaviors and cognitive in VR environments, and may offer foundations for future studies about avatar-based intervention.

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