

The Proteus Effect: Influence of Avatar Appearance on Social Interaction in Virtual Environments

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Abstract. In virtual interactions, avatars can affect people's perceptions, attitudes, and behaviors consciously or unconsciously, which is known as the Proteus effect. The study created a new paradigm of "virtual scenario simulation" to investigate the impact of avatars on social behavior in different social interaction contexts. Experiment 1 investigated the impact of avatars on social participation level in participating-social-interaction contexts. Experiment 2 extended the work to maintaining-interaction context. Results showed that: (1) both situational factor (social interaction contexts) and individual factor (shyness level) could affect the occurrence of the Proteus effect. (2) The Proteus effects were moderated by the social interaction contexts. (3) In the maintaining-interaction context, the Proteus effects were moderated by the level of shyness.

Keywords: Proteus effect · Virtual environment · Avatar · Shyness · Social interaction

1 Introduction

Originally, the Proteus effect means that when given a role, individual tends to behave in line with the characteristic of the role. Yee and Bailenson [1] defined the Proteus effect in virtual world: In general, users make inferences about their expected dispositions from their avatar's appearance and then conform to the expected attitudes and behavior. Avatar cues are linked with particular images, those can prime social stereotypes. In other words, perception of avatar is the start point of Proteus effects.

Previous work has preliminarily demonstrated that features of avatar have large implications on social influence [2,3,4]. Nevertheless, the Proteus effect in virtual social environment needs to be supported by more empirical researches.

For explaining the mechanism of this effect, one theoretical framework is proposed based on self-perception theory, which argued that an observation of avatar's appearance led participants to make inferences about their disposition that in turn led to changes in behavior [5,6]. It is difficult to find that the situational factors are ignored by existing empirical research and theoretical construction. Therefore, it is necessary to investigate the influence of situational factors on the Proteus effect.

In addition to situational factors, individual differences are also ignored. Taking into account the specificity of shyness in virtual environment, it interests us in this study. Shy individuals tend to be more self-focused than non-shy individuals [7,8]. Thus, low-shy individuals are more likely to reference avatar cues than high-shy individuals in virtual environment. Above all, Proteus effect is possible moderated by shyness level.

In the current work, we were interested in exploring how avatars can affect how we interact with other people. Referencing the division of social context by Wang, we divided the social context to participating-interaction context and maintaining-interaction context. Two experiments would be conducted in this study.

2 Experiment 1 Proteus Effect in Participating-Interaction Context

2.1 Hypotheses

Hypothesis 1 (H1): Participants employing avatars with high attractiveness will display higher social participation level.

Hypothesis 2 (H2): The Proteus effect will be moderated by shyness levels.

2.2 Methods

Participants. Total 247 undergraduates were recruited and measured shyness level, then 46 high-shy and 46 low-shy participants were selected to participant experiment.

Design. The experiment involved a 2 attractiveness (high/low) \times 2 shyness (high/low) two-factor between-subject design. Participants were randomly assigned to an avatar with attractive or unattractive appearance of his or her own gender.

Materials. Avatars and virtual scenarios. The study created a new paradigm of “virtual scenario simulation” to further understand the Proteus effect. The avatars and virtual scenarios were modeled using a video game “The Sims 3”. Creating two sets of avatars with high or low attractiveness (see Fig. 1). Constructing 4 virtual social scenarios reflecting participating- interaction context. For different groups, the scenario depicted the same setting. The only variation was the employed avatars (Fig. 2).



Fig. 1. Snapshots of avatars



Fig. 2. Virtual scenario in different avatar conditions

Measure. A question assessing social participation level would be depicted in the end of each scenario, and participants select the description in line with his/her behavior (Fig. 3).

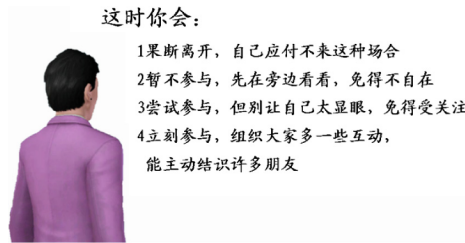


Fig. 3. Reaction interface example

Procedure. Experimental process is shown in Fig. 4.

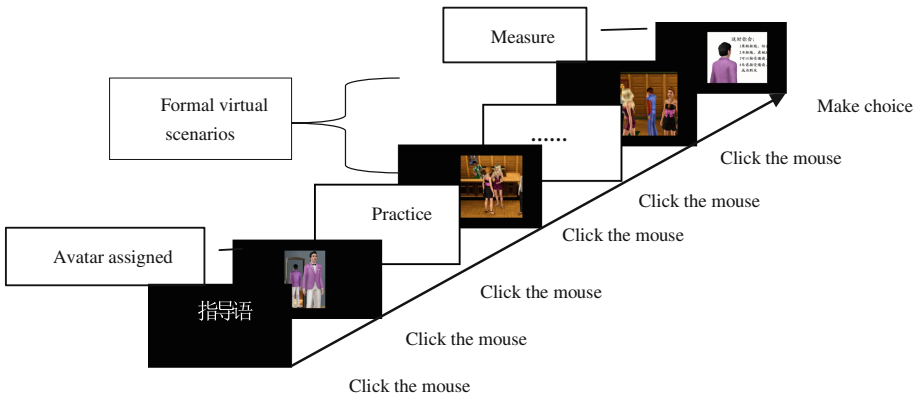


Fig. 4. Process flowchart

2.3 Results

A one way ANOVA was conducted and results showed a significant main effect of attractiveness condition, $F(1, 88) = 13.06$, $p = 0.001$, $\eta_p^2 = 0.129$. Participants employing avatars with high attractiveness ($M = 3.20$, $SD = 0.53$) were significantly more likely to participate in virtual social interaction than participants employing avatars with low attractiveness ($M = 2.82$, $SD = 0.50$), which supported H1. The main effect of shyness condition was marginally significant, $F(1, 88) = 3.85$, $p = 0.053$, $\eta_p^2 = 0.042$. Low-shy participants ($M = 3.11$, $SD = 0.55$) were more likely to participate in virtual social interaction than high-shy participants ($M = 2.90$, $SD = 0.52$).

The interaction was not significant, $F(1, 88) = 0.52$, $p = 0.472$, which indicated the moderating effect of shyness was not significant. The reason may be that the situation strengthens the attention and reference to avatar, which influenced both high-shy and low-shy individuals. If that is the case, the moderating effect will be found when eliminating the additional influence of situation.

3 Experiment 2 Proteus Effect in Maintaining-Interaction Context

3.1 Hypotheses

If the situation changed, the effects found in experiment 1 may be different.

Hypothesis 1 (H1): There will be no significant main effect of avatar attractiveness.

Hypothesis 2 (H2): The effect of avatar attractiveness on social performance will be moderated by shyness.

3.2 Methods

Participants. Participants were same with experiment 1.

Design and Procedure. The experiment involved another 2×2 two-factor between-subject design. The procedure was same as experiment 1.

Materials. Avatars and virtual scenarios. Avatars are same as experiment 1. Constructing virtual social scenarios reflecting maintaining-interaction context, the form of those is same with experiment 1.

Dependent Measure. Two items (Cronbach's $\alpha = 0.847$) assessing social performance level would be depicted in the end of each virtual scenario, and participants evaluated the behavior description on Likert 9-point scale.

Item 1: Your behavior will be: uncommunicative 1 2 3 4 5 6 7 8 9 communicative

Item 2: Your behavior will also be: colorless 1 2 3 4 5 6 7 8 9 humorous

3.3 Results

A one way ANOVA was conducted, results didn't found the main effect of attractiveness condition, $F(1,88) = 3.08$, $p = 0.083$, which was different with result in experiment1, but supported H1.

There was significant main effect of shyness condition, $F(1, 88) = 4.35$, $p = 0.040 < 0.05$, $\eta_p^2 = 0.047$. Low-shy participants ($M = 12.50$, $SD = 2.91$) were significant more likely to participate in virtual social interaction than high-shy participants ($M = 11.27$, $SD = 2.90$).

The interaction was marginally significant, $F(1,88) = 3.55$, $p = 0.063$, $\eta_p^2 = 0.039$. To clarify the significant interaction effect, we conducted follow-up analyses of simple main effects and found that low shy participants in attractive avatar condition ($M = 13.58$, $SD = 3.05$) achieved higher posttest scores than in unattractive avatar condition ($M = 11.42$, $SD = 2.37$), $F(1,89) = 6.38$, $p < 0.05$. For high shy participants, the analyze was non-significant, $F(1, 89) = 0.01$, $p > 0.05$. These results indicated the moderating effect of shyness was significant, which supported H2.

4 General Discussions

The current study conducted two experiments to investigate the Proteus effect in virtual social interaction contexts, and investigate the effect of situational factor and Individual differences on Proteus effect.

In present study, the effects of avatar attractiveness were moderated by social contexts. The appearance of avatar can affect a person's confidence [1,4], so individuals behaved depend on avatar in participating- interaction context. But in maintaining- interaction context, the social performances were most depended on actual social skills instead of appearance, which decreased the attention to self-presentation [9].

Shyness moderated the Proteus effect in experiment 2. Shy individuals tend to be more self-focused than non-shy individuals [7,8], there is a tendency for shy individuals to attribute reactions to stable internal rather than unstable internal or external causes [10]. Thus, low-shy individuals are more likely to reference self-presentations in virtual environment. That was the reason why the social performances of high-shy individuals were significantly affected by the avatar cues.

According to the self-perception theoretical framework [11], when entering into the virtual environment, the perceptions to avatar lead to Proteus effect. Nevertheless, Proteus effect is also influenced by situation and shyness. We explained the moderating effects of social contexts and shyness levels in an extend self-perception framework based on current results (see Fig. 5).

One limitation of this study is that we examined this effect with avatars of different races with each other, but participants are all from china. So, although we have controlled their differences on attractiveness, it remained an open question as to whether the race differences would cause interference. An additional limitation is that the virtual environments are lack of ideal interactivity—specifically that avatars can't directly express the behavior that users really want to express. Future work should solve these

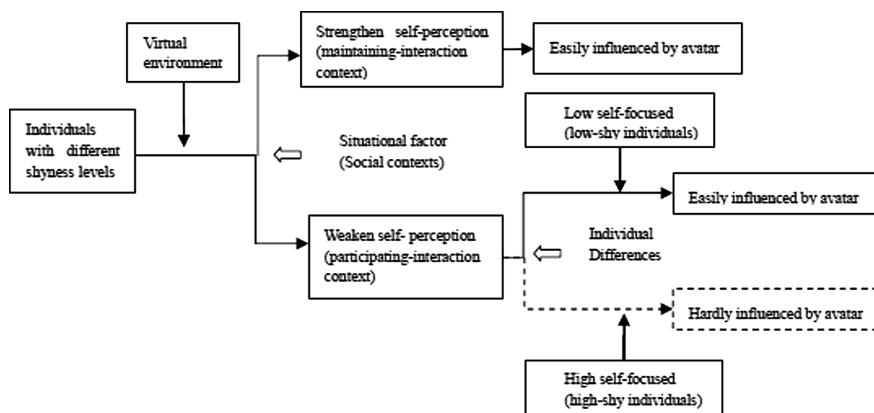


Fig. 5. Self-perception theoretical framework based on current work

issues. Overall, the results of current study would be beneficial to the field of virtual reality and virtual psychology.

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