

AVATARS AND VASES: THE AUTOMATIC PROCESSING OF WHAT OTHER PEOPLE SEE¹

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We modified the dot perspective task to conduct a simple visual perception experiment. Our participants had to rapidly judge their own or a perspective of a 3D avatar when those perspectives could show the same (consistent) or different number of stimuli (inconsistent). Participants had to judge, as fast as possible, how many stimuli (vases) were seen in the scene by them, or by the avatar. Other studies have shown information of the other person's perspective was processed automatically prolonging response times for inconsistent trials even when participants made judgments from their own perspective. Recent research has been focused on what is the contribution of social versus perceptual information for the size of this interference. Our goal was to examine whether perspective taking was under the influence of a salient characteristic, skin tone. Participants had to make judgments from self/other perspective in consistent and inconsistent trials for two identical female 3D models which differed only in RGB values of skin color. Results show a significant effect of consistency: participants were faster in consistent trials. A significant consistency-perspective interaction revealed a stronger interference effect when taking the other perspective than the self perspective. The skin color effect was also significant with slightly faster responses for similar-color avatars.

Keywords: dot perspective task, visual perspective taking, mentalizing, visual attention

Introduction

Mentalizing is defined as the ability to represent other people's mental states and is based on the concept of *theory of mind* (Premack & Woodrugg, 1978). People are capable of attributing mental states to others and take their point of view. Recent research indicated that processing other people's perspective happens on an implicit level even when participants are instructed to ignore the other person (Samson, Apperly, Braithwaite, Andrews, & Bodley Scott, 2010). These authors introduced the *dot perspective task* procedure. In this procedure participants are asked to take one of two perspectives: their own (*self*) or the perspective of an observer presented in an image (*other*). In one set of trials the same number of targets could

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be viewed from both perspectives while for the other set a different number of targets can be viewed from the two perspectives (see Figure 1).



Figure 1. An inconsistent type of trial from Samson et al. (2010, pp. 1261)

First, both the perspective and number of targets were cued. Then, participants had to decide whether the cued number of dots could be seen from the cued perspective. The main effect was a slower response in inconsistent conditions. This effect proved to be stronger when they had to take the perspective of the other person, but was also present even when they were instructed to take the *self* perspective which implied that the *other* perspective is automatically processed.

This effect has been replicated in other studies. However, it is not clear whether it is a bottom-up process based on perceptive cues or if there is a top-down social component contributing to the effect. According to Santiesteban, Catmur, Coughlan Hopkins, Bird, and Heyes (2014) the effect is perceptive in nature. They used human-like avatars and arrows which were perceptively similar to the avatar. Results showed no difference in the interference effect for the two types of figures. Using a different paradigm Cole and his colleagues (Cole, Smith, & Atkinson, 2015; Cole, Atkinson, Le, & Smith, 2016) reached the same conclusion. They tested the social component by placing barriers in the field of view of the avatars. Since they found no effect of the barriers on the interference they concluded participants did not automatically process the avatar's mental state. Rather, participants just processed the cueing information. On the other hand Kragh Nielsen, Slade, Levy, and Holmes (2015) found that the interference effect was lower for abstract compared to semi-social and social central figures. They also found a positive correlation between components of the Interpersonal Reactivity Index and interference size for social but not for the other conditions.

The aim of our study was to replicate the typical interference effect with a slightly different procedure by directly asking participant how many stimuli can be seen depending

on the perspective, and to determine the impact of manipulating the similarity of a human-like avatar and our participants on that effect.

Method

Participants and design

A total of 35 participants (all female undergraduate psychology students) completed a 2x2x2 repeated measures experiment. The independent variables were consistency (consistent/inconsistent), perspective (self/other) and avatar skin color (light/dark).

Stimuli

All of the presented stimuli were designed using Daz3D software. They consisted of a female avatar and one or two objects (vases). Depending on the gaze orientation of the avatar and the position of the objects (always one or two present objects) the avatar could “see” the same or a different number of objects as the participant (consistency variable). The same 3D avatar was used for both levels of the skin color variable. The only difference was the RGB value of skin tone color (Figure 2).

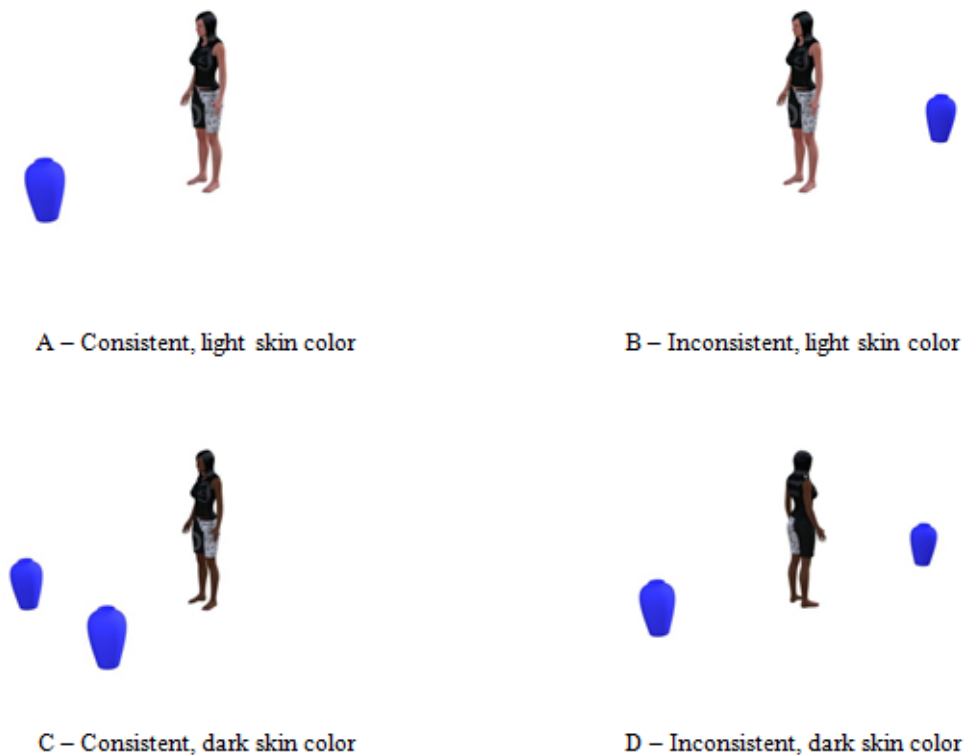


Figure 2. Examples of presented stimuli

Procedure

Participants completed two types of training tasks. The first was a choice reaction task in order for the participants to become familiar with the mode of responding. After that they completed four practice trials using the avatar stimuli. The main measurement consisted of 96 trials (12 per experimental situation). The single trial procedure is depicted in Figure 3.

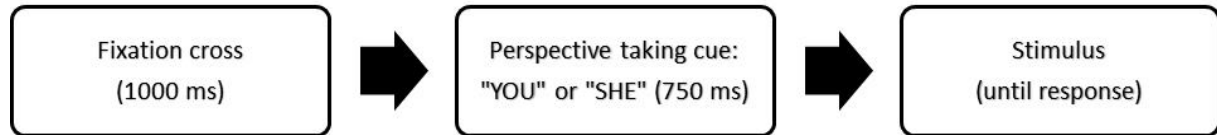


Figure 3. Single trial procedure

Participants were instructed to answer, as fast and as accurately as possible, how many objects could be viewed depending on the perspective taking cue, by pressing the appropriate numerical key ("1" or "2"). This was different from the original procedure in which participants reacted to a cued number rather than the number of targets. Stimuli from all eight experimental situations were randomized for each participant and presented in a single block.

Results

For each participant results were formed as median scores for each condition. Data for response times were normally distributed for all eight experimental conditions. A 2(consistency) x 2(perspective) x 2(skin tone) repeated measures ANOVA resulted in a significant consistency effect ($F(1,34) = 32.49, p < .01, \eta_p^2 = .49$). Participants responded faster in consistent compared to inconsistent trials. Skin tone color effect was also significant ($F(1,34) = 4.88, p < .05, \eta_p^2 = .13$). Participants were slightly faster when reacting to stimuli in which the avatar had lighter skin color. Finally, the consistency-perspective interaction effect was also significant ($F(1,34) = 5.45, p < .05, \eta_p^2 = .14$). The results are depicted in Figure 4.

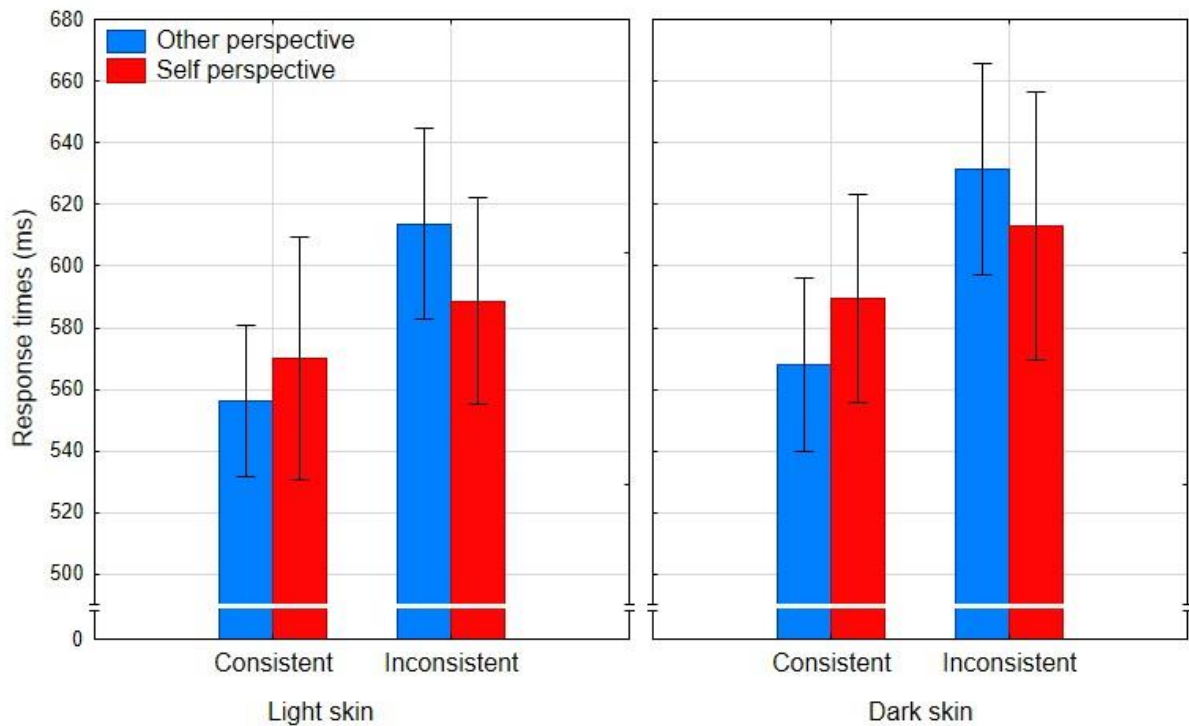


Figure 4. Response times as a function of skin tone, consistency and perspective

The interference effect was stronger when taking the *other* perspective than when taking the *self* perspective which was confirmed by Tukey HSD post-hoc tests. On average participants made 2.62% errors in consistent and 6.31% in inconsistent trials. Error rates were not normally distributed so the difference was compared using the Wilcoxon matched pairs test, which showed the difference was significant ($T = 69$, $Z = 3.36$, $p < .01$). To further test the robustness of the skin color effect the same analysis was conducted only on the last third of trials. We speculated that if the effect was robust it would remain regardless of training effects. The 2x2x2 repeated measure ANOVA showed only a significant effect of consistency ($F(1,34) = 19.51$, $p < .01$, $\eta_p^2 = .36$). The skin color effect was no longer significant. The consistency-perspective interaction effect was also not significant but the same trend remained, even post-hoc comparisons show a stronger interference effect in the *other* perspective.

Discussion and conclusion

Our study replicated the robust interference effect found in previous research. Participants were generally faster to respond in consistent trials compared to inconsistent trials. Additionally, this effect was stronger when taking the *other* perspective than the *self*

perspective. Even though the avatar's perspective had an interference effect in inconsistent trials we can conclude the *self* perspective is more dominant, which is also a replication of the results from Samson et al. (2010). There was no interaction between interference size and skin tone color, and the general effect of skin color disappeared with practice which indicates it is not an effect of social but rather perceptive information. We can conclude our participants experienced the same magnitude of interference regardless of skin tone color. Even though our results do not imply an impact of social information, further research should manipulate one or more social components of the avatars. Gender, age, socio-economic status (based on clothes of the avatar), and more complex signs like subculture affiliation are all candidates for experimental manipulation. It is our hypothesis that the effect of social information is subtle and sensitive requiring strict and thorough investigation.

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