

# Assessing the Impact of Virtual Human's Appearance on Users' Trust Levels

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## ABSTRACT

Virtual humans are used to facilitate interactions in sensitive contexts such as health-care. In such contexts, trust in the information source plays an important role in reception of the information. Prior work has shown that physical appearance affects trustworthiness in human-human interactions; therefore, we examined the effect of virtual human's appearance on users' trust. We ran a between-users study with 12 adult participants, who watched a video of a virtual human with professional attire (e.g., lab coat) or with general attire (e.g., button-down shirt). We examined the duration of eye fixation on the virtual human's face along with participants' self-reported trust levels. We found that there was no statistical difference in eye contact or trust between the two test conditions.

## CCS CONCEPTS

• **Applied computing** → *Psychology*; • **Human-centered computing** → *Interaction paradigms*;

## KEYWORDS

Virtual Human, User trust, Eye-tracking, Health-care

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## 1 INTRODUCTION

Virtual humans (VHs) are increasingly being used to facilitate interactions in different contexts, such as health-care [3]. For example, VHs are being used to simulate doctor-patient conversations, which aim to persuade users to follow self-care routines. VHs simulate human-human interaction, and physical appearance like clothing

plays an important role in generating trust in human-human interactions [4, 6]. However, the effect of physical appearance is not extensively examined in VH interactions [7]. Therefore, to examine the effect of VH's appearance on user's perceived trust, we ran a between-users study with 12 adult participants who watched a video of a VH delivering information on managing stress. Participants were grouped into two conditions: VH with professional attire (e.g., lab coat), or VH with general attire (e.g., button-down shirt). We used an eye-tracker to track the participants' eye movements while watching the video of the VH, since maintaining eye contact is correlated with higher trust levels [2]. The participants also filled out a self-report questionnaire [5] on their trust of the VH. We hypothesized that a person's trust in the VH's professional expertise would be positively correlated with the VH's professional appearance. However, we did not find any statistical differences between the two conditions. The physical appearance of the VH did not affect user's perceived trust.

## 2 RELATED WORK

Persuasive communication is "any message that is intended to shape, reinforce, or change the responses of another or others" [1]. The persuasion during conversation is influenced by trust and credibility in the source of message, and the source's appearance affects perceived trustworthiness in conversation [6]. Prior work [4] has shown that attractive communicators are perceived as more persuasive and credible than non-attractive communicators. We hypothesized that the effect of the source's appearance on perceived trustworthiness would also be reflected when VHs are the source of information. As trust is subjective, it measured in several ways like using standardized questionnaires [5], social dilemma games and measuring eye movements [2]. Our study uses both eye tracking data, and self-report questionnaires [5] to measure trust in users.

## 3 EXPERIMENT

We recruited 13 university students: 8 Males and 5 Females, with mean age 24.69 years (SD = 2.69). Participants were shown a two minute and twenty-one second video of a VH delivering information on stress; the VH had either professional attire (Fig. 1b) or general attire (Fig. 1c). The information on how to cope with chronic stress was obtained from the UF Counseling and Wellness Center. The VH video was created using Unity. An Eyetracker eye tracker along with Ogama software was used to track the participant's eye fixations

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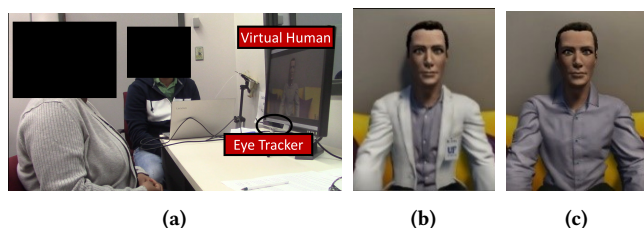
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**Table 1: Mean and Standard Deviations (SD) for Trust Level Rating and Eye Fixation Duration**

Attire	Trust Level Ratings	Proportion of time focused on face
Professional	51.17 [SD = 18.38]	0.92 [SD = 0.09]
General	53.00 [SD = 10.00]	0.75 [SD = 0.32]

while watching the VH speak about managing stress on a desktop monitor (Fig. 1a). We excluded data from one participant (male) as the eye tracker failed to record the participant's data. The remaining 12 participants were equally distributed across two test conditions. To analyze perceived trust in VH from the questionnaire [5], participant ratings from 17 Likert scale items were added to obtain a single trust score for each participant (maximum score = 85). For example, on a scale of 1 (strongly disagree) to 5 (strongly agree), participants responded to "VH is truthful in its dealings with me"; higher values indicated higher perceived trust. Later, trust scores from each participant were averaged in each condition (e.g., professional vs general attire as shown). When examining the duration of eye fixations, we defined two areas of interests for eye tracking data: VH face and the rest of the screen. The two areas of interests were defined using the Ogama software and the coordinates of the areas of interest were kept constant between the two conditions. The Ogama software provided the duration of fixations in each area of interest for each participant. We calculated the ratio of the duration of eye fixations on the VH face compared to the duration of eye fixations on the entire screen. The total duration of eye fixations on the entire screen was used to normalize the data.

**Figure 1: Details of experiment: (a) Experiment setup with eye tracker (b) VH in professional attire and (c) VH in general attire.**

## 4 RESULTS

We found the data for both dependent variables: (1) self-reported perceived trust, and (2) proportion of time focused on VH's face, to be normally distributed (Shapiro-Wilks test:  $p > 0.05$ ). A one tailed independent sample t-test was performed to verify if the difference in the means for each condition was significant. Our study found that, the mean user trust ratings were 51.17 for VH with professional attire and 53.00 for VH with general attire (Table 1). The difference was not statistically significant as revealed in t-test ( $t(10) = -0.22$ ,  $p > 0.05$ ). Also, the mean proportion of time focused on the VH's face was 0.92 for VH with professional attire

and 0.75 for VH with general attire (Table 1). These results indicate that on an average, 92% of the time users focused on VH's face in professional attire condition and 74.90% in general attire condition. However, the difference was not statistically significant as revealed in t-test ( $t(10) = 1.27$ ,  $p > 0.05$ ).

## 5 DISCUSSION

Overall, there was no statistical difference between the two conditions (e.g., professional vs general attire) when examining user trust levels and the proportion of time focused on the VH face. Although prior work in human-human interaction has shown that physical appearance affects trust, our results show that physical attire of the VH did not affect user's trust levels.

These results could have been caused by several factors. The post-experiment debriefing revealed that attire manipulation was not noticeable for participants. Participants found VH with general attire (i.e. with button-down shirt) as sufficiently professional for given context. We also found that the participants in the general attire condition were significantly more trusting ( $t(10) = -2.40$ ,  $p = 0.02$ ) than in the professional attire condition. This difference in inherent trust level explains the higher trust in the VH in the general attire condition, even though there was no statistical difference between the two conditions. These results agree with previous research that perception of VH is affected by user personality [8].

In summary, the results from this experiment indicate that VH's appearance may not influence user's trust in VH. However, it was observed that user's inherent trust inclination plays an important factor in perception of VH. Future experiments could examine the effect of the VH's gender on user's gaze behavior with a larger sample size. Possible experiments may also investigate effect of VH's appearance and gaze behavior on user perception during long-term interactions and more interactive tasks.

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