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You're Hired! Effect of Virtual Agents' Social Status and Social Attitudes on Stress Induction in Virtual Job Interviews

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ABSTRACT

Virtual reality offers new possibilities for social skills training. In fact, with virtual reality, it is possible to get immersed and train to various social situations, including job interviews. In this paper, we investigate the effect of virtual recruiters' social status and social attitudes on participants' stress during a job interview. Results show that negative recruiter attitudes led to higher subjective stress compared to neutral attitudes, and that participants with high social anxiety react differently to positive feedback compared to participants with low social anxiety. The mechanisms of social stress induction in virtual reality are complex and deserve further study.

Keywords: Social Interactions; Virtual Reality; Job Interviews; Social Stress; Virtual Agents.

Index Terms: Human-centered computing; Human computer interaction (HCI); Empirical studies in HCI.

Introduction

For some people, certain social situations such as public speaking and job interviews can be stressful. To gain self-confidence, build social skills and be able to cope with these socially stressful situations, virtual reality simulations can be a promising solution. For instance, virtual job interview applications help job applicants manage their stress and learn how to make the best possible impression in real interviews. To be effective, such applications need to be able to induce stress when simulating a social situation [1]. While the role of many individual factors on social stress induction has been studied, including technological (e.g., degree of immersion [2], graphical realism [3]), situational (e.g., amount of virtual characters [4]), and personal factors, (e.g., age and gender [2], social anxiety [5]), much remains to be explored regarding the role of the factors involved, and their interactions, in the process of social stress induction in virtual reality. In this study, we explore the mechanisms underpinning stress induction with virtual reality applications that simulate social interactions.

1 THEORETICAL BACKGROUND

Several theories postulate that social stress occurs under social threats such as social evaluation or the possibility of social rejection. Reiss et al. [6] present a typology of different threats, including social ones, and suggest that there are three main human social needs that can be threatened: the need for autonomy, the need for competence and the need for belonging. With that view, the prospect of losing autonomy, being made to appear less competent or the thought of not belonging to a particular social group may lead to negative feelings, such as anger, sadness or anxiety. Another perspective from the self-preservation theory [7] suggests that situations which threaten to demean one's social image or standing can engender negative affect and lead to higher cortisol levels (a hormone produced and released under stress). In Virtual Reality, many studies have investigated stress during social evaluation

situations such as job interviews, public speaking, or specific social induction paradigms [8,9,10]. The results of these studies consistently show that the simulation of such social evaluation situations in virtual reality effectively induces social stress. In this study, we investigate two factors related to the design and presentation of these virtual humans: social status, and social attitude.

Social status has been suggested to be linked to dominance and higher stress. In a study conducted by Hilmert et al. [12], performing a public speaking task seemed to elicit higher stress when facing a committee of experts compared to a group of novices. Beatty [11] suggests that individuals holding subordinate status assume that "appropriate behavior is defined by the person holding higher status", i.e. they experience dominance from people with higher status. Adopting this view, we posit that receiving feedback from virtual characters holding a higher social status may have a stronger influence on users interacting with them. Furthermore, receiving *negative* feedback from a higher social status agent is more likely to negatively impact one's self-image, leading to higher stress. In contrast, receiving negative feedback from virtual characters of a lower status is unlikely to threaten a one's self-image, and therefore would be expected to lead to lower levels of stress increases.

2 PROTOCOL



Figure 1. Virtual interviewers in the low status condition.

We conducted a 2*3 mixed factorial design with different levels of social status (supervisors; subordinates) and social attitude feedback (positive, negative, or neutral feedback). The study protocol was approved by our local university's review board (CERNI ID *IORG0011023*; #09022023). Participants' main task consisted in completing two successive job interviews with 3 virtual characters, one with their future employers (supervisors) and one with their future employees (subordinates). During the interview the virtual agents were controlled using the *Wizard of Oz* paradigm. Initially, they introduced themselves as the future employers or the future employees and then they asked a series of eight scripted questions. Friendliness was expressed through facial expressions (e.g., smiling, frowning) and through verbal feedback (e.g., "you communicate with a lot of enthusiasm and earnest" or "you lack enthusiasm and earnest"). The virtual humans were models of the meta-humanⁱⁱ characters, the voice was recorded with a human actor that played the role of the employers and employees.

31 females and 29 males participated. Subjects were randomly assigned to a social attitude feedback level (i.e., receiving positive, negative, or neutral feedback). All subjects filled out pre-test questionnaires, including trait social anxiety SIAS [14] and state anxiety questionnaires. All subjects were equipped with a HTC Vive Pro Eye VR headset and physiological sensors (Biopac MP160 with EDA and ECG electrodes). A first short interaction (Habituation phase) with a neutral virtual character was provided. After the habituation phase (HB), participants were asked to fill out post-test questionnaires, among them subjective stress with a Visual Analogous Scale (VAS), perceived dominance (ad-hoc), and perceived friendliness (ad-hoc). After that, they completed the two virtual job interviews, one with the employers and another with the employees. The order of the two interviews was counter-balanced and participants were informed about the status of the virtual agent before each interview. After each interview, subjects completed the same set of questionnaires as in the HB phase. A short semi-structured interview was conducted at the end of the experiment.

3 RESULTS AND DISCUSSION

Results showed a significant main effect of Agent Friendliness ($F(2)=5.85$, $p<0.005$). Subjects were more stressed in negative feedback condition than in the neutral feedback condition. There was no significant effect of status ($F(1)=0.15$, $p=0.69$) on stress of participants, and no significant interaction between friendliness and status of the virtual agents on the stress level of subjects ($F(2)=0.39$, $p<0.67$). A Tukey's HSD Test for multiple comparisons found that when status is high (employer) the negative feedback induced more stress ($m=45.45$, $sd=18.68$) compared to neutral feedback ($m=24.25$, $sd=22.14$) ($p < 0.05$, 95% C.I. = [0.22, 42.17]). Other pairwise comparisons were not significant. Given the surprising results, a manipulation check was done and showed that priming status did not lead to differentiable levels of dominance ($t(59)=0.41$, $p=0.67$). This may explain why status did not lead to different levels of stress. Exploratory analysis on trait social anxiety showed that participants with high trait social anxiety (SIAS score) reacted differently from the rest of the sample. When considering a group of participants with low to absent social anxiety (using a cutoff at 34 [15]), the positive feedback condition was no more stressful than the neutral condition, and only the negative led to significantly more stress. However, for participants with high initial levels of social anxiety, we observed that the positive scenario was perceived to be equally stressful as the negative one. We postulate that this may be due to the specific social anxiety mechanisms occurring in this subgroup, such as attentional biases or seeking confirmatory signs of social evaluation [13].

4 CONCLUSION

Overall, we confirmed our hypothesis that negative social attitudinal feedback induced the highest stress responses in participants while neutral feedback was the least stressful, and positive feedback coming between the two. Participants with high social anxiety reacted differently to positive feedback: for them, positive feedback was reported to be just as stressful as the negative feedback while non-anxious participants were only stressed by negative feedback. However, we were not able to confirm the effect of social status on stress or whether it interacts with social

attitudinal feedback, as we did not manage to vary it in our virtual agent design. This factor will be further studied in future.

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