Rock Your Story: Effects of Adapting Personality Behavior through Body Movement on Story Recall

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ABSTRACT

In order to design social agents for long term interactions, it is important to enable them to adapt to the users. In this paper, we chose personality as a medium for adaptation. We conducted a study with 20 participants who watched a story presented by a virtual character in one of two conditions: extroverted or introverted. The study aimed at assessing the impacts of matching the personality of the user with the virtual character through body language on the likability of the character and the information recall of the story. Our findings do not appear to coincide with theoretical expectations since the extroverted character had higher ratings of likability regardless of the personality of the user. Results have also shown a marginal positive effect of the encounter with the introverted character in terms of memory recall. We discuss the important implications that these results may have in the future for human agent interaction design.

KEYWORDS

social agents, body movement, adaptation, similarity, personality

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1 INTRODUCTION

According to the similarity attraction theory [6], humans are more attracted to other humans with whom they identify as self similar. Research on social agents suggests that the same theory applies to the human interaction with social robots as well. One crucial aspect of the similarity adaptation is the agent's personality [1]. The most descriptive personality model is the Big Five personality [7] with the extroversion dimension as the trait that influences social interactions the most. And since body language is one of the most important communication channels, in this research, we manipulated body language to match the personality between humans and virtual characters. We then measured the effects of matching the similarity on both the likability of the characters and the information retain of the users from the encounter.

2 BACKGROUND

The similarity attraction theory in terms of personality has elicited attention lately in the field of human computer interaction and human robot interaction [11] [10] [4] [2] [3]. For instance, a computer interface that was manipulated to display extroverted or introverted behavior has proved that introverted users performed the required task faster when they interacted with the introverted version of the software [10]. In [3], the authors have examined the effects of matching the personality extroversion of the robot to the users through eye gaze behavior on the compliance of the user to a given task. Moreover, extroverted users ratings of likability were higher for an extroverted robot rather than an introverted robot in a restaurant information request task [2]. The robot's personality was expressed via some basic hand gestures as well as the speech content that was richer and friendlier in the extroverted case.
Our current work extends previous literature by introducing the following novel aspects:

- Examining the similarity attraction theory for interaction with virtual characters rather than plain interfaces or robots.
- Using body language as the communication channel rather than eye gaze behavior or verbal cues.
- Investigating the effects of varying extroversion levels of a social agent on a memory recall task.

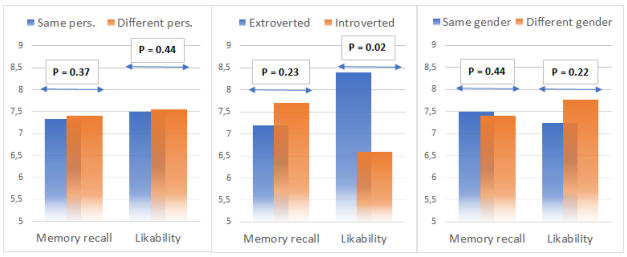
3 METHODOLOGY

To generate the virtual scenarios, two MIXAMO [1] 3D humanoid robotic characters (one male and one female) with no facial features were used to ensure that the perception of the characters will result from the body movement exclusively. To generate the body language behaviors, 2 professional mime artists (one male and one female) have been hired to act out the storytelling scenario in the two conditions (introverted and extroverted). The scenario aimed at informing about plastic pollution in a storytelling context. The actors' body language and articulated voices have been recorded using 17 RGB gray scale motion capture cameras and a compact portable digital recorder respectively. The captured animation files have been modified using Autodesk Maya 3D graphics application and the recorded audio files have been modified using Audacity digital audio editor. They were then applied to the corresponding virtual characters through Unity game engine to generate the 4 different scenarios for the virtual characters: extroverted male, extroverted female, introverted male and introverted female.

4 EVALUATION

The virtual scenarios were validated by 15 participants: 11 males, 4 females, age ranging from 20 to 33 (*M=25.1, SD=3.48*) to ensure accurate impressions of each virtual character's personality.
The main study was then conducted where two variables were

[1] https://www.mixamo.com/



(a) (b) (c)

Figure 1: Results of the memory recall and likability tests: a significant effect of likability for the extroverted characters(p=0.02) and a marginal effect noticed for both memory recall in case of the introverted characters(p=0.23) and the likability of different gender characters(p=0.22)

measured: the likability of the character and the users' memory recall of the presented story.
We had two hypotheses:
H1: in terms of likability, users will like the character classified similarly to themselves on the extroversion scale.
According to previous research [2] [3], people liked interacting with a robot exhibiting the same personality type on the extroversion spectrum as them.
H2: in terms of memory recall, users will remember more details of the story if they interact with the introverted version of the characters.
The story's aim in our research was to inform about plastic pollution and thus can be regarded as an instructional presentation or as a form of teaching. According to previous research [9], children who were taught by an introverted robot performed better on a post experiment test than children who were taught by an extroverted robot. These results may be explained by the fact that some professions such as teaching are viewed as jobs for introverts [5].

Procedures: the study was structured in a between subjects design where each user only watched one 10 minutes scenario of the available 4 scenarios. The virtual scenarios were shown on a 55 inch smart TV screen. Before the study, users signed a consent form and filled two questionnaires one with some demographic information (age, gender...etc) and the other was the Big Five Inventory to determine their position on the extroversion spectrum [8]. After watching the virtual scenario, participants were prompted to answer two tests: one that evaluated their memory recall and the other evaluated their likability of the virtual character. Each participant received a cinema ticket as a compensation for the participation. 20 participants participated in the study. They were recruited from a local university population, they were 12 males, 8 females and their ages ranged from 20 to 33 (*M=26, SD=3.48*).

5 RESULTS

The results are shown on Figure 1.
Same personality-different personality conditions: (Figure 1a) in terms of both memory recall and likability, there was no effect of having similar personality classification on the extroversion spectrum between the users and the virtual characters (*p=0.38* and *p=0.42* respectively). Therefore, hypothesis H1 is rejected.
Extroverted versus introverted conditions: (Figure1b) in terms of memory recall, there was a slight tendency for users who watched the introverted characters to perform better in the memory recall test. The results however, are not significant (*p=0.23*). Consequently, hypothesis H2 will need further evaluation to be fully supported.
In terms of likability, there was a significant tendency (*p=0.002*) for users who watched the extroverted characters to give higher scores of likability of the characters than users who watched the introverted versions.
Same gender-different gender conditions: (Figure1c) no significant effect has been found of having the same or a different gender than the virtual character on the memory recall of the story (*p=0.44*). However, a marginal effect of having a different gender has been observed for the likability of the characters (*p=0.22*). Users who watched virtual characters with a different gender than themselves rated the characters higher in terms of likability than users who watched same gender characters.

6 DISCUSSION

This study has yielded some intriguing findings that illustrate the importance of the social context of the interaction between users and agents. Our results may have important implications on the use of social agents in an educational context. We suggest that the findings imply the following: if the aim of the encounter between the user and the social agent is of informative nature then it may be better to use the introverted version of the agent. For instance, our results illustrated better performance on memory recall by users who watched the introverted scenarios. If the task is more of an interactive nature, then matching the personality similarly between the user and the agent will generate better results as proved by previous research in the field. Nevertheless, in case of a task aiming at entertainment without interaction, using the extroverted version of the agent might yield to better outcomes. In our study, the users have significantly enjoyed watching the virtual scenario of the extroverted characters more than the introverted ones.

7 CONCLUSION

As a step towards designing social agents that adapt to the user's behavior in real time we conducted this initial study. Our results suggested that contrary to previous research, matching the personality between users and social agents may not always be the optimal choice. Designing the behavior exhibited by the social agent might need to change according to the nature of the task performed during the interaction between the human and the social agent. It is also worth noting that previously, research has explored matching the similarity of personality between users and robots rather than virtual agents. In future studies, we aim at investigating the similarity in more interactive scenarios between users and virtual agents to validate the results obtained by this study.

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