How Do You Like Me In This: User Embodiment Preferences for Companion Agents

Elena Márquez Segura[1], Michael Kriegel[2], Ruth Aylett[2], Amol Deshmukh[2] and Henriette Cramer[1]

[1]Mobile Life @ SICS
DSV, Forum 100, 164 40
Kista, Sweden
{elena, henriette} @ mobilelifecentre.org

[2]School Of Mathematical and Computer Sciences
Heriot-Watt University,
EH14 4AS, Edinburgh, Scotland, UK
{m.kriegel, r.s.aylett, a.deshmukh} @ hw.ac.uk

Abstract. We investigate the relationship between the embodiment of an artificial companion and user perception and interaction with it. In a Wizard of Oz study, 42 users interacted with one of two embodiments: a physical robot or a virtual agent on a screen through a role-play of secretarial tasks in an office, with the companion providing essential assistance. Findings showed that participants in both condition groups when given the choice would prefer to interact with the robot companion, mainly for its greater physical or social presence. Subjects also found the robot less annoying and talked to it more naturally. However, this preference for the robotic embodiment is not reflected in the users' actual rating of the companion or their interaction with it. We reflect on this contradiction and conclude that in a task-based context a user focuses much more on a companion's behaviour than its embodiment. This underlines the feasibility of our efforts in creating companions that migrate between embodiments while maintaining a consistent identity from the user's point of view.

Keywords: Embodiment, HRI, User Preferences, Scenario-based study

1 INTRODUCTION

Embodiment is currently a prominent issue in agent research. The field of embodied cognition [5] argues strongly that in the human case, mind and body cannot be separated, but form an interlinked whole. The field of situated agents in turn has argued that embodiment is an important part of the situational coupling between an agent and its environment [23]. With the Uncanny Valley [17], in which near-human embodiments can cause significant negative reactions from interaction partners if appearance and behaviour are at all inconsistent, we see the vital role that embodiment also plays in interaction. Embodied Conversational Agents [4] are a practical demonstration of the importance of an embodiment in non-verbal communication, extending an agent's communicative bandwidth substantially beyond its explicit messages.

For these reasons, our investigation of long-term companions in the Lirec project[1] has focused on embodied agents, whether with robotic or graphical bodies. The project has also addressed migration of an agent or companion between different embodiments [13] so that for example the mobility limitations of a robotic body can be overcome by moving the software-generated 'personality' of the companion into a hand-held device.

This raises significant questions. Some related to functionality (a hand-held device cannot pick up a telephone but a robot can), and others to how users relate to such a companion in their interaction. Does the fact that a robot interacts in a shared physical space with a user, while a graphical character does not, make a difference? In a project studying long-term companionship, this is a question deserving investigation.

The study reported in this paper involves a companion known as Sarah. This can be embodied in a robot, on a large graphical screen or in a handheld device. The facial appearance was deliberately chosen so as to be robotic rather than naturalistic in order to avoid the possibility of Uncanny Valley effects. The social context for Sarah is a university work environment. The robot embodiment is designed to act as a Team Buddy for a group of researchers in a specific lab, issuing reminders about activities, and taking and delivering messages for absent team members from visitors to the lab as example activities. For this reason, the scenario developed for our study involved office tasks. The objective of the study was to establish within this context whether two different embodiments made a difference to interaction with the companion with the broader goal of contributing to design guidelines for embodied companions.

2 RELATED WORK

Embodied agents, including social robots, have been designed to improve interaction for users, taking advantage of social cues that ease coordination between human user and agent and offering a more engaging experience [3]. The particular embodiment chosen has shown to affect how people respond to an agent [16]. For a physically embodied agent, additional social aspects come into play. Physical, expressive movement of the agent can shape perceptions of an agent's behaviours and intentions [18]. Proxemics, relating to the physical distance between interacting humans [9], with different interpersonal distances considered appropriate for specific contexts, also play a more pronounced role.

A number of studies investigated the differential impact of embodiment both on users' perceptions, and in some cases on task execution. In some of these studies [1, 2, 12], a real co-located robot was compared with a filmed version of the same robot. In others, a real robot was paired with a graphical version of it [6, 11, 15, 20, 21, 26]. A wide range of tasks and contexts can be found in these studies, however none fo-

1 http://lirec.eu

cused on an office environment as this study does. In some, verbal communication pre-dominated. These included: taking care of a pet [6]; playing in a children's game of chess [20]; a health interview [21]; the Japanese game of Shiritori [11]. A smaller number involved physical manipulation: interactive drumming [12], a Towers of Hanoi-type puzzle [26] and moving books about in a room [2].

These studies all showed users preferred the physical robot to either a video or a graphical character. In addition a variety of other effects were detected. Thus, playing chess against a real robot was classified as significantly more fun than with a graphical version [20]. In the health interview, subjects forgot more and disclosed least with the physical robot, but spent more time with it and had more positive attitudes towards it [21]. In the interactive drumming game with children, enjoyment of game with the physical robot was higher, and its perceived intelligence and appearance received higher scores. Looking at the task, in the physical robot case, more interaction, better drumming and turn taking were observed [12]. In the Towers of Hanoi type task, users had more positive feelings about a co-located real robot, but interestingly no significant increase in task performance was found [26]. In the book moving task, the most similar to the one in our study, subjects were more likely to agree to an unusual instruction (throwing a book into a bin) given by the physically-present robot and gave it more physical space, than to a video version of the robot [2].

Interesting issues emerge from these studies, relevant to our own. One is the impact of a physically-embodied robot on the user's feelings compared to the impact on their behaviour. A second is how far the study required interaction with the agent. In some cases this was continuous throughout the study, as in collaborative game playing, while in others it was a less-coupled collaboration more typical of the office environment. In the more collaborative tasks, users remained in a fixed position in relation to the agent rather than moving around in the physical space where the agent is located. Finally, some tasks were essentially information-exchange based, while others involved physical manipulation of objects.

While these studies show an overall preference for physical robots, a full understanding of the effects of embodiment has not yet been reached. We aim to further investigate the effect of the expectations raised by an agent's embodiment on the users' attitudes towards the agent and their behaviour during an interaction with an agent. Building on the previous work above, a scenario and agent behaviours were designed to explore these issues further.

3 THE STUDY

The importance of agent appearance matching user expectations is apparent in [8]. Our agent was embodied in two different forms: one robot agent (r-agent) and one virtual agent (v-agent) displayed graphically on a large free-standing screen that is roughly equal in size to the r-agent. Both display the same expressive behaviour (speech, gaze, gestures, posture [22]), reactions, and have the same facial appearance. We hypothesise that: i) the perception and expectations the users have of the agent depend on the type of embodiment; ii) this will shape the kind of interaction they expect and accept from the agent; and iii) this in turn will affect the users' assessment of their interaction with the agent. Specifically:

- Participants will rate interaction with the r-agent more positively.
- They will have higher tolerance for, and acceptance of, potentially annoying behaviour from the agent, such as inappropriate interruptions and mistakes.
- Users will perceive the r-agent as more similar to a human being in terms of communicative capabilities compared to the v-agent.

Fig. 1. Robotic (a) and virtual (b) embodiment of the agent

In order to study the second hypothesis (ii)), we specifically designed the agent's behaviour of the agent to test the user's tolerance of, trust in and acceptance of the agent.

Due to the nature of our scenario, we focused on the communication capabilities expected in the agent. Not only office co-workers but also visitors will interact with the agent. It is therefore important to gain insight into how naive users naturally try to communicate and provide input in different tasks. As in [10], this study recruited subjects that had not had much contact with robots or virtual characters. Apart from helping with the design of agent communication behaviours, this may help to predict what communication behaviours agents in different embodiments are likely to meet. Our findings may suggest guidelines for communication models so that they better fit observed human tendencies in communication.

A scenario was designed in which the user performs activities associated with office tasks, such as finding a paper, working on it, and placing it back somewhere else. The agent assisted with these tasks.

The two embodiments of the companion called Sarah used for this study had the same capabilities and appearance. Each had a non-naturalistic head, modelled on that of a turtle, used a unit-selection text-to-speech system with a Scottish English female voice, and carried out body tracking of the user using a Kinect sensor installed on the embodiment. A user interface was developed to allow a wizard to remotely control speech acts and direct the gaze of the agent head to indicate different locations in the room. The r-agent consisted of a Pioneer P3AT robot with an enhanced superstructure and head, equipped with a laptop PC and Kinect sensor, as in Figure 1a. The graphical v-agent consisted of an animated 3d model of the same robot head displayed on a 42 inch LCD screen. A Kinect is installed underneath the screen as shown in Figure 1b.

3.1 The experiment

We performed an experiment in which participants worked with Sarah as v-agent or r-agent in a role-play situation in which they had to interact to fulfil allocated tasks. Social talk, averted attention, and an occasional mistake were included in the behaviour of the agent so as to study the possible influence of the type of embodiment upon the users' responses to these behaviours and their perception of the agent. We chose a Between-Group rather than Within-Subject experimental design, since logistically it would have presented a challenge to switch the embodiment during each session. Moreover, it would also have been difficult to recruit subjects willing to invest such a significant amount of time. Finally, subjects would have been aware of our 2 experimental conditions had they interacted with both embodiments, which may have biased their answers.

We recruited 42 participants (16 female, 26 male), aged 23 to 56, from the university campus where the role-play was carried out. Eighteen were students (42.9%); most liked gadgets (95.2%); had no previous experience using virtual characters (62.5%) or robots (73.8%); and did not have technical knowledge about virtual characters (85.7%) or robots (81.0%). Participants engaged individually in a 30 to 45 minutes session, in which about 10 minutes were spent interacting with the agent. Before this, the participant filled in a closed questionnaire that took about 10 minutes. This questionnaire included demographic questions, questions related to the participant's use and knowledge of virtual agents and robots, an abridged 10-measure version of the Big-Five personality test [7], and a subset [24] of the Negative Attitude Towards Robots (NARS) questionnaire [19] mainly in the form of 7-point Likert scales. After this, the participant read the following brief:

"Bob and Paul are professors at this university who work together in the Lab you are entering. Bob is now on holiday and needs to mark some exams. He has forgotten one in the lab and has asked you to do that for him. If there's no one in the lab, don't hesitate to ask the Team Buddy for anything you need.

So, your tasks are to: 1) Get the exam paper that Bob has forgotten, 2) Mark that exam paper by comparing it with the answer sheet provided. Score every question and write the final score on the paper (correct answers give 1 point, incorrect answers -0.5 point and unanswered questions 0 points), 3) After you have successfully marked the paper give it to Paul or place it in his mail box if he is not in the office.

When you finish the task, you can come back to this room."

Afterwards, the participant answered a 5 minute closed questionnaire, mainly focused on their perception of the agent and their experience of interacting with it. Finally, a semi-structured interview about 10 minutes long was conducted to gain more insight in the participant's perception of the agent and its behaviour, with particular emphasis on the three behaviours of social talk, averted attention, and mistakes, further described below.

The initial questionnaire, the post-interaction questionnaire, and interview took place in a reception room. The wizard operated the companion's speech and behaviour (gaze) in the same room, in an area concealed by a partition, out of the sight of the participants. The interaction was conducted in a second room, where the participant was directed after the initial questionnaire and instructions. This room was unoccupied except for the participant and the embodied agent. The agent was placed so that it was visible from the entrance and four cameras were used to record the interaction. Both the agents were placed in the same position in the room, but only one agent was prepared for the experiment at a time, the other was hidden.

Two cameras recorded the user's facial expressions at two points during the interaction: 1) while the participant is marking the paper, moment in which the companion interrupts and tries to engage in small talk, and 2) at the end of the experiment when the participant has to leave the exam paper but the companion gives incorrect information about the container into which to drop it.

The two other cameras were used to record the interaction covering the whole room. The Wizard acted as the speech recognition system for the agent, with live audio and video streams from the role-play and a set of scripted sentences from which to choose the agent's response. Occasionally, if no scripted sentence matched the situation, sentences would be typed directly. This was only done for unanticipated but feasibly recognisable utterances from the user. The use of this approach was motivated by the substantial resources that would be required to develop a sufficiently functional speech recognition system to maintain a relatively natural interaction. However we consider the type of speech recognition simulated technically possible. We also expected this experiment to help establish the training data that would be needed to successfully recognise the speech used in this specific setting.
Four modes of agent behaviour were designed for the scenario:

1) **Diligent and cooperative**. The default mode. The agent is cooperative and diligent, focused on the participant and responsive to their requests. Except for the initial greeting when the participant first comes to the room, the companion takes a secondary role in the interaction, leaving the participant to take the initiative in the conversation. Its indications are accurate and help the fulfilment of the participant's tasks.
2) **Interruptions and social talk**. Initiated when the participant starts marking the paper. The agent engages in small talk by asking the participant a battery of 6 prepared questions like "*so… what did you have for breakfast?*". If a participant tried to take the initiative by asking the agent similar questions, they were cut short by a generic reply such as "*I'm not programmed to understand everything*". If the participant expressed an explicit or implicit wish to stop this interaction (e.g. "*I am trying to focus here*", "*Do you want me to finish my task?*") or ignored the agent, it would acknowledge the situation and announce its shift to the averted attention behaviour mode ("*You seem distracted, I'm going to leave you alone and watch some videos*"). Otherwise, after the last question in the battery, the agent would ask the first question again ("*What time is it?*") and then, without any announcement, shift to the averted attention mode.

   The aim of this behaviour is to study the influence of the embodiment in engaging the user in social talk in a context in which they are busy. It was discussed during the semi-structured interview, with a focus on whether the interruptions were annoying or not, on the appropriateness of this interaction, and overall whether the participant would like a companion that engaged in social talk during working time.
3) **Averted attention**. Initiated after the previous behaviour mode. It is explicitly announced if the participant expresses a wish to stop the social interaction with the agent, or unannounced in the case the participant keeps interacting with the agent until the last question is asked. The agent watches videos displayed on a

laptop placed nearby. If the participant asked any questions, the agent would ignore it and keep its gaze fixed on the screen of the laptop. The agent stays in this mode unless the participant actively seeks the agent's attention, either by asking repeated questions (three times), or making a gesture such as waving.

The aim of this mode is to study how the participant would seek the agent's attention and whether this varies for the different embodiments of the agent.

4) **Mistake**. The final behaviour starts when the participant asks the Team Buddy for information about the location of Paul's mailbox. Instead of indicating where it is, the agent describes the location of a box labelled "Trash". This is inspired by [2]. The aim is to study the influence of the embodiment on the participant's trust. If the participant explicitly questions the agent's response by stating the location was incorrect or the object pointed is not the mailbox, but the trash, the agent would ask: "*Are you sure?*" If the user then continues questioning the agent (e.g. "*Yes, I am sure*"), the latter admits its mistake, apologizes for it, and gives the right location.

The behaviour of the companion also included "body language". We expected gaze would improve the interaction [25] and, inspired by [18], designed a set of agent gaze behaviours for the different situations:

i. **Pointing gaze** to indicate locations: the agent moves its head and eyes towards one location while making a mild surprise gesture with the forehead, a facial behaviour used to highlight or indicate something. This was used at the two moments when the agent indicates where to find and leave the exam paper.
ii. **Gaze fixed away** from the user, when the agent is engrossed in looking at videos displayed on a laptop placed nearby as part of the averted attention behaviour.
iii. **Tracking gaze**: the default gaze used in the diligent and cooperative mode. The eyes of the agent follow the user. This gesture is designed to invite interaction engagement by indicating that the user is the focus of the agent's attention.

3.2 Evaluation

Data was gathered by a closed questionnaire, an open semi-structured interview, and through the video recordings of the interactions. In this paper we only discuss the findings from the first two data sources. The perception and expectations of the users were evaluated via questions in the closed questionnaire and in the interview. Inspired by [14], we focused on the communicative and cognitive capabilities of the agent. The participants were asked to reflect on whether they changed and if so, how they changed, their manner of speaking.

The tolerance and acceptance of potentially annoying behaviour from the agent was evaluated through all three types of data source: video analysis gave an indication of how much the participants trusted the agent when there was an obvious mistake in its information (behaviour mode 4 above), the questionnaires covered this issue (e.g. raising the extent to which the agent is trustworthy, or honest), which were then further explored during the open interview. The questionnaire also contained items related to the participant's assessment of the whole experience and the agent, such as "*I enjoyed the interaction with the companion*".

4 RESULTS

Out of the 42 interactions, 4 were discarded due to technical problems. All results reported consequently are based on the remaining 38 interactions, 19 for each of the two embodiments.

4.1 Questionnaires

Analysis of the pre-interaction questionnaires showed, as expected, no significant differences in either participant personality or negative attitude towards robots between the 2 conditions. We can therefore discard the possibility that any differences found between the 2 groups are due to certain personality trait or NARS clusters within the groups. Regarding post-questionnaires, we investigated items indicative of users' overall perception of the interaction and of the 4 agent behaviours listed above. Variables were collected via responses to statements such as "*The companion was very capable in helping me*" on 7-point Likert Items (1-Disagree Strongly, 2- Disagree Moderately, 3 - Disagree A Little, 4 – Neither Agree Nor Disagree, 5- Agree A Little, 6 – Agree Moderately, 7 – Agree Strongly).

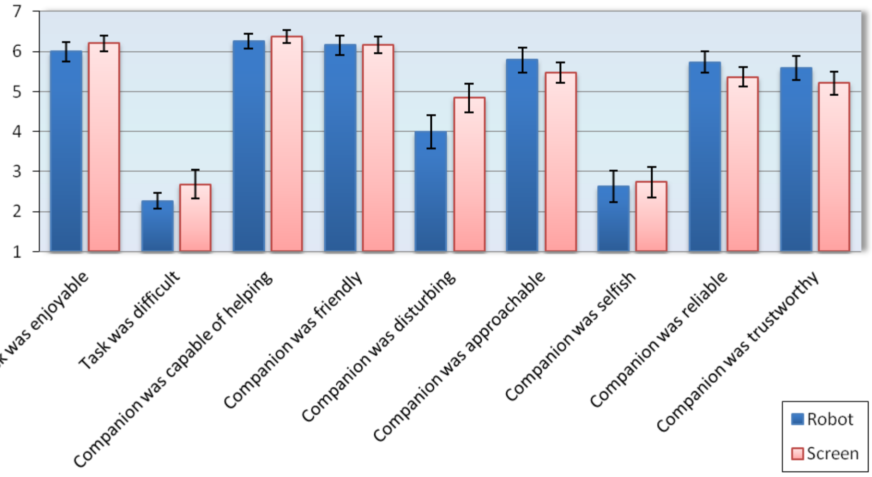

Fig. 2. Post Questionnaire Results for both participant groups

Users overall stated that they enjoyed the interaction with the companion. Looking at measures related to the cooperative agent behaviour, participants overall disagreed with the task being difficult and found the agent very capable of helping. While the agent was perceived as friendly, opinion on whether it is disturbing were more mixed; the agent on average being perceived as just a little disturbing. Both these measures are related to the agent's interruptions and social talk behaviour. Despite its averted attention behaviour the agent was perceived as approachable and not selfish. The agent was also seen as moderately reliable and trustworthy despite its mistake behaviour. Figure 2 summarizes these results.

Kolmogorov-Smirnov tests revealed that none of the dependent variables above are normally distributed. We therefore ran a series of Mann-Whitney U tests to determine whether there are differences in these variables between the group of participants that interacted with the r-agent and those that interacted with the v-agent. The tests revealed that none of the variables reported above is significantly influenced by the type of embodiment. This suggests that many aspects of perceived agent personality are dominated by behaviour and not by embodiment. One should however keep in mind the possibility that significant differences between the groups exist, that were simply not captured by the questions we asked and that would have been brought to light by different questions.

4.2 Open Interviews

The open semi-structured interview yielded interesting results concerning user preferences for one or the other agent embodiment. Participants were confronted with the idea of interacting with the other embodiment than the one they had seen. This was done verbally without showing the other embodiment. They were asked whether they thought the interaction would have been different, with which embodiment they would rather interact, and why.

Twenty six of 38 participants stated they would prefer to have interacted with the robot. Of those, 11 had interacted with v-agent and 15 with r-agent: Of those who interacted with the r-agent and would not choose it as a preferred embodiment (4 participants), 1 did not answer, 2 said the interaction would not have been different for any embodied agent is a human person, and 1 would rather have interacted with the screen, for she was more used to it and would found it easier.

Of those who interacted with the v-agent and would not choose the r-agent (8 participants), 5 said the interaction would not have been different, but then commented on advantages of interacting with the robot ("*Maybe the robot can turn the head. That's useful for directions*"), 1 did not choose any embodiment, but stated the interaction would have been better with the robot (better communication), 1 did not choose any embodiment, said that the interaction would have been different and pointed at advantages and disadvantages in each case, and finally 1 said the interaction would have been the same. Of the 38 participants, 34 motivated their choice, which gives us insight into what is important for the user in each embodiment:

Social Presence - The main reason for choosing the r-agent was its presence. Of the 34 who gave reasons in favour of one or another embodiment, 14 mentioned presence in one or another way (e.g. "*more social presence*", "*more physical presence*", "*more present*").

Movement - Movement was the second most discussed reason. Of the 34, 12 mentioned movement in one or another way: some mentioned the fact that the movement of its eyes and/or head would be more apparent and noticed compared to the movement of v-agent's head/eyes; others assumed the r-agent would have been able to pick things up or move from one location to another one. Anticipating that movement might be a reason to favour the r-agent, we specifically asked whether the participants would like the r-agent to move about. Of 20 responses, most of them (13) would find it useful. However, a few of them (7) would find it scary.

More Interactive, Better Communication - Nine of 34 mentioned the communication or the interaction would improve with the r-agent (e.g. "*better communication*", "*more interactive*", "*more approachable*", "*multimodal interaction*").

Comfort, Company, Relationship - Six participants mentioned the r-agent would make for a more approachable agent (response e.g.: "*more approachable*", "*more comfort*", "*company*", "*display of emotion*", "*relationship*".)

Engaging, Fun, Interesting - Six participants mentioned the r-agent would make for a more interesting experience (e.g. "*fun*", "*engaging*", "*interactive*", "*interesting*").

Real vs. Not Real - Four participants associated the r-agent with "something real":

E.g. "*It seems more real, with more personality*".

On the other hand, five participants described the interaction with the v-agent as if talking to somebody on TV, or interacting with a TV, or a computer, or a tutorial: "*The robot is more real… the screen is like a tutorial […]. The robot is …. More verbal… interactive… more interesting*".

Surprise - Twenty six of the participants gave their first thoughts regarding their experience. Of those, about half of them (12) mentioned they were surprised by the agent, its capabilities, or the scenario: "*I thought it was going to be more mechanical*". It seems the capabilities of the agent surpassed the participants' expectations: *"I was surprised how well he understood me", "It's so funny! It does a lot more than I thought!", "I wasn't expecting it to be that smart!".*

Participants were asked about the point when they were marking the exam paper and the agent was in interruption/social talk mode, and whether the interruptions were annoying. Of seventeen participants that interacted with the v-agent, 7 did not find it annoying, 2 found it distracting and 6 found it annoying. In the case of the r-agent, 15 participants replied: 13 did not find it annoying, 2 found it distracting and only 1 of them found it annoying.

Participants were asked about the final mistake of the agent. Overall 23 participants pointed out the mistake to the agent ("*But this box says Trash*"), 10 for the r-agent and 13 for the v-agent. Eight participants put the paper in the indicated box without questioning the agent (5 r-agent, 3 v-agent). Unlike the response to interruptions, there were no significant differences. One person for each embodiment mentioned it was funny, some participants mentioned they trusted the agent (six participants for the v-agent and 7 for the r-agent): "*He knows better".*

Some participants justified the agent's mistake, blaming themselves or others (5 participants for the v-agent and 3 for the r-agent), e.g.: "*somebody had put the wrong label to the box*", "*somebody might have changed the location of the mail*", "*Paul might call his mailbox Trash*". Two of those who found it annoying (one for each embodiment) saw a malicious intention: "*It lied to me to piss me off*".

The use of human characteristics of the participants when describing their interaction was also similar in the two embodiments: "*She was absorbed with the videos*", "*The voice sounded sincere*". Participants were specifically asked whether they changed the way they talked to the agent compared to how they talk to people. Of 19 interacting with the v-agent, 4 said they did not change their way of talking and 13 said they did. The most mentioned changes were that they spoke more clearly (4 participants), more slowly (4 participants) and with simpler sentences (4 participants). Only 7 participants interacting with the r-agent reported changing their speech.

5 DISCUSSION

As reported above participants expressed a clear preference for the robotic embodiment when presented with the 2 different choices (v-agent and r-agent). It is at first sight curious that this clear preference for a physical embodiment is not reflected in any of the analysed questionnaire data. One possible explanation is that participants compared the agent with their initial expectation or mental model of it. About half of the participants who expressed their initial impressions commented they had been surprised by the agent, the scenario or the interaction; they didn't expect what they found. Many of them commented on the agent surpassing their initial expectations. This might have been reflected in the questionnaire results, very positive in general and independent of the embodiment.

However, when confronted with the idea of an alternative agent, they were able to picture what the interaction would have looked like with the new agent, compared to the experience of the agent they had interacted with. We can only speculate whether this preference for the robot would have held up if they could have actually seen and interacted with the alternative embodiment. It is possible that the fact that they did not actually see or experience the alternative embodiment biased them towards the robot, their imagination imbuing robots with more attractiveness compared to virtual agents.

Another possible explanation for this disparity is that the participants' strongest impressions were influenced by the immersive task and experience of having a dialogue with an artificial intelligence. Since neither the task nor the dialogue differed between embodiments, these factors might have simply overshadowed the effect of embodiment on the participants.

Significantly less annoyance was caused by the r-agent's interruptions compared to those of the v-agent, as expressed in the interviews. This corresponds with our hypothesis that users would tolerate more inappropriate behaviour by the r-agent. However, this is once again in contrast with our questionnaire results, which did not show significant differences across embodiments in the measures related to the interruptions (friendly and disturbing). It is possible that these adjectives were not ideal candidates in order to gauge participants' tolerance. After all, one can be friendly but still annoying and disturbing could have been interpreted in its alternative meaning of weird / creepy.

There is a significant difference in the number of participants who changed their speech when interacting with the agent, compared to talking to a human. Seven participants who interacted with the r-agent changed it, compared to 13 in the case of the v-agent. This evidence supports our hypothesis that the embodiment influences the user's mental model of the communicative capabilities of the agent. Moreover, as in [10], people tailored the way they communicate with the agent to account for performance of the agent so far. This is just the case for the r-agent group.

6 CONCLUSION

Previous studies in embodied agents have shown an overall preference for physical robots over virtual agents. In this paper, we have further investigated the effect of the embodiment in shaping the user's behaviour and attitude towards the agent. Taking this objective and previous work into account, a scenario and agent behaviours were designed and built. Social talk, averted attention, and an occasional mistake were included in the behaviour of the agent.

We chose a Between-Group experiment design. Results from the interview analysis show a clear preference for interacting with the physically embodied rather than on-screen agent if offered that possibility. Subjects also talked to the robot more naturally, closer to the way they would talk to a human being. Together with the physical and social presence being one of the most mentioned advantages of the robotic embodiment, the findings indicate that the physical existence of the agent makes for more natural interaction.

Otherwise, however, the differences found between the embodiments were relatively minor with the overwhelming number of factors analysed not differing across conditions. We suggest this is due to the participants' strong involvement in a task context. When their interaction with the companion has a reason and is not merely serving the satisfaction of curiosity about technology, embodiment factors seem to move to the background. Only when given time to reflect and taken out of the task context as in our post interviews embodiment differences come to the foreground. Based on this hypothesis we would expect to see much stronger differences in a similar experiment that is stripped of the task. For our work on migration this implies that it is important for a migrating companion to engage users in tasks in order to downplay embodiment differences and appear as a consistent identity in different bodies.

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