

What Kind of Stories Should a Virtual Human Swap?

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Abstract. Telling stories is an important aspect virtual agents designed to interact with people socially over time. We describe an experiment designed to investigate the impact of the identity, presentation form, and perspective of a virtual storyteller on a human user who engages in a story-swapping activity with two virtual characters. For each interaction, the user was given 10 “ice-breaker” questions to ask a virtual character and respond to the character’s reciprocal request. Participants also filled out a post-interaction survey, measuring rapport with the character and impressions of the character’s personality. Results generally show that participants prefer characters who tell first person stories, however there were some interactions with presentation order. No significant preferences were established for the form or identity variables.

1 Introduction

Stories are pervasive in conversation between people [15]. They are often used to establish identity [2, 8], pass on cultural heritage [16], and build rapport [19]. Often stories are “swapped” when one conversational participant will reply to a story with another story. Indeed, [6] found that almost 1/4 of stories in casual conversation were presented in response to stories told by the other participant.

Stories have also been incorporated in virtual human systems (see Sect. 2). In creating or mining stories for a virtual human to tell, there are several considerations about what kinds of stories should be told, particularly considering the goals of building long-term rapport and a desire for people to keep interacting with the systems. We focus on issues such as how the story connects to the identity of the virtual human and presentation style. It is unclear how best to address these issues, as there are multiple, and occasionally conflicting desiderata proposed in the literature. We distill some of those desiderata into the following five principles:

1. **Be Human:** Virtual humans should be as much like humans as possible, and thus should project a fully human identity and tell human-centric stories.

2. **Talk About Yourself:** Tell first person stories, because they are more intimate, help the listener get to know the teller, and can act as *self-disclosure*. [22] describe how self-disclosure can play multiple roles in rapport management, including negative-self disclosure to boost interlocutors' face, inviting reciprocal self-disclosures, and revealing openness to being seen by the other.
3. **Be Real:** Stories should be authentic, or at least believable, or else they might trigger a backfire effect, where the teller is seen as inauthentic, and untrustworthy. False stories about the self, might make the listener think the teller is claiming credit that is not deserved. An obviously artificial agent might fall into this problem if it tells stories about human experiences.
4. **Be Interesting:** Novel and unusual stories are more exciting than everyday occurrences. So stories from a non-human perspective might be more interesting than standard human experiences.
5. **Don't Gossip:** Third person stories might seem like gossiping about someone else, if the stories are too personal, or possibly name dropping.

These principles may lead to conflicting ideas of optimal stories for a virtual human to tell. Principles 1 and 2 combine to say that a virtual human should tell first person stories with a human self-identity. On the other hand, Principle 3 gives reason to think it may be dangerous to rapport to tell such stories. Dropping principle 2 but keeping 1 could lead to a preference for third person stories about a real human that the virtual human knows. This might be contradicted by principle 5. On the other hand, keeping principle 2 and dropping principle 1 could lead to an agent telling first person stories about an identity as an artificial character, which might also be reinforced by principle 4. We review some prior work exploring these principles in the next section.

In order to explore these principles, we designed a set of virtual human agents who can engage in a simple form of story-swapping. Each of the agents can engage in simple interactions such as greetings and closings and can respond to a set of “ice-breaker” questions, that might be used on a first date or similar “get to know you” encounter. For these questions the agent’s answer includes a story. We created four character response sets, to have all combinations of identity (human or artificial) and protagonist (first person or third person). We also considered *embodiment type* as either Human (video recording of a real person telling the stories) or Virtual-Human (animated character telling the story), however we only recorded the human identity stories in video, yielding six different story-swapping system types. More details about the agents can be found in Sect. 3.

We also designed an experiment to try to explore the collective impact of the above principles on people who interact with the characters. Participants interact with two of the above systems in a “get to know you” scenario. We investigate the degree of reciprocal story-telling, and test the rapport participants feel toward the characters as well as their impressions of the character’s personality. The experimental design is described in Sect. 4. Results are presented in Sect. 5. We conclude in Sect. 6, with some thoughts and next steps.

2 Related Work

Several virtual agent systems have told, elicited or swapped stories. The SimSensei system [7] elicits extended narratives from users, in an attempt to recognize whether the user is suffering from psychological distress. Many systems feature agents that tell stories as part of an interaction establishing information about the character. Some of these have agents playing the roles of historical characters (e.g., [3] had an August Strindberg character, while [4] had a character portraying Hans Christian Andersen). Others include fictional characters from literature (e.g., [10]), or new characters (e.g., [13,17]). Stories have also been told as part of establishing a long-term relationship and influencing users to adopt behavioral change [14].

Perhaps the first system that allowed a kind of story-swapping with a virtual agent was [18], in which a child character Sam would alternate telling and listening to stories with children. [18] showed how children who interact with the Sam character both increase their stories' complexity and occasionally coach Sam. The analysis made a sharp contrast between conversation and storytelling as distinct activities, rather than telling stories within a conversation. The stories also tended to be "made up" rather than personal narratives.

[17] analyzed a corpus of interactions between museum visitors and a question-answering virtual human, Sergeant Blackwell, whose answers included some narrative responses. The analysis showed that a large percentage of questions to Blackwell included bibliographic and personal preference questions: almost 97% of the questions were on a human-centered view compared to only 3% of questions about the technology. Likewise, [13] noted that more than 1/3 of user questions in a museum pre-suppose treating the Max agent as human. These findings lend support for principle (1), and to some extent (2).

[1] also reported on interactions between museum visitors and virtual humans, and noted a lot of human-oriented questions, such as preferences and biography. These characters had artificial backstories, however, making jokes about their non-human characteristics, such as (computer) chips being their favorite food. The popularity of this system [21] might lend support for principle (4), as well as possibly (2) and (3).

[5] performed an experiment contrasting first vs. third person stories in a health-care application, where an agent told inspiring stories about weight loss, either about the agent (first person) or about someone else (third person). This study thus directly tested the contrasting principles (2) and (3). Participants in each condition answered questions about how much they "enjoy the stories that the counselor tells", "look forward to talking to the counselor", and "feel that the counselor is dishonest". [5] found that first person participants were more likely to talk to the agent and reported greater enjoyment; however there were no significant differences between the groups in the extent to which they looked forward to talking with the agent or felt the agent was dishonest. Moreover, newly recruited subjects use the system significantly more than participants who were already using the agent for weight-loss counseling before the study. These findings support principle (2) but fail to support principle (3). This work did not

use speech input to trigger virtual agent responses, did not elicit user stories, and did not explore the artificial identity option. [20] compare fictional (traveller from another planet) vs. realistic (artificial robot) identities for a Nao robot exercise coach. The identities were expressed as backstory that the coach would reveal about itself at various points in the interaction. [20] found no differences in ratings or activity levels between these two conditions, suggesting that principle (3) may not be so critical (or at least might be balanced by principle 4).

Concerning embodiment type, [12] compared video to animated characters in social interaction, and found that video avatars led to more co-presence than animated character avatars, though had no impact on satisfaction.

3 Story-Swapping Agents

As mentioned above, we created six versions of simple story-swapping agents. All were designed to engage with users in a simple “get to know you” dialogue, including reciprocal question answering. Four different sets of character dialogue were created, each being able to answer 20 “ice-breaker” questions, such as “Do you play sports”. We created two different characters, named Arnold and Arron, that differ in their perspective of the stories they tell. Arnold tells first person stories, while Arron tells third person stories about an acquaintance. Arnold and Arron were given similar ages and appearances.



Fig. 1. Virtual human Arron and Arnold; Human Arron and Arnold

For each character, there are two versions of the stories, one in which the character is portrayed as human (VH-Human), and having fully human experiences, and another (VH-VH) in which the character talks about an artificial identity, emphasizing being a computer generated character and unable to do things like eat or drink, but having experiences in a virtual world. For the human stories only (not the artificial identity), we also have video-recordings of people from the same demographic group playing Arron and Arnold (Human-Human). Figure 1 shows the four different embodiments. We thus have six different agents, considering character/perspective (Arnold/1st or Arron/3rd), identity (Human or Virtual Human) and embodiment presentation (Human Video or Virtual Human - but only for Human identity).

The following shows two different versions of Arnold’s response to the question of whether or not they have met a celebrity before. An example of one of Aaron’s stories is shown in Fig. 3.

VH-VH: *I have talked to some celebrities, but unfortunately I can’t really get an autograph or a picture to show my friends. I do have all of the conversation logs though, even from my first time ever talking to a celebrity, when I talked to Hines Ward, a former football player for the Pittsburgh Steelers. After hearing and reading so much about how shallow and elitist some celebrities are, I was pleasantly surprised to find Ward very down to earth and easy to talk to. He even missed his flight so he could talk longer. I guess he found it just as cool to be talking to a virtual human for the first time as I did talking to a celebrity for the first time.*

VH-Human or Human-Human: *I’m not huge into celebrities, but one time in college I saw a flyer that said that one of my childhood sports heroes, Hines Ward, was coming to do a signing on campus. I went and bought a football from the local sports store and headed over to the signing. There was a huge line, and as time went on I started to get worried that I wasn’t going to make it to him in time. Just as I was about to be up in line, I saw his agent come over and tell him they need to leave for the airport now, or they would miss his flight. I heard him say “There will be another flight, these people have been waiting for hours”. I went up and he not only signed my ball, but we were able to talk for a couple minutes since I was the last person in line. I was so impressed by what a genuine person he was, and for that reason I will never forget that day.*

Our agents were built using the Virtual Human Toolkit [11]. The architecture for the four virtual human embodiment agents is shown in Fig. 2a, while the architecture for the two video versions is shown in Fig. 2b. The natural language understanding and spoken answer parts are identical, the only differences being the way the embodied aspects were presented (Human video vs. Virtual Human).

4 Experimental Design

In order to shed light on the best design choices for virtual human stories in story-swapping dialogue, we recruited experimental participants to engage in dialogue with the six agents described in the previous section. 60 participants (38 males, 22 females) were recruited via Craigslist. We examined independent variables of perspective (1st vs. 3rd person), identity (human or virtual human), and presentation (human video or virtual human). We use a partial within-subjects design, where each participant talks to two virtual humans. We decided to look at perspective (1st vs. 3rd) within subjects, and to keep the identity and presentation variables the same for that subject. Thus each subject will have one conversation with Arron involving 10 questions, and one with Arnold with a different 10, in one of the three identity-presentation combinations (Human-Human, VH-Human, or VH-VH). To control for order effects, half of the participants first talked to Arnold, the 1st person character, while the other half first talked to Arron, the 3rd person character.

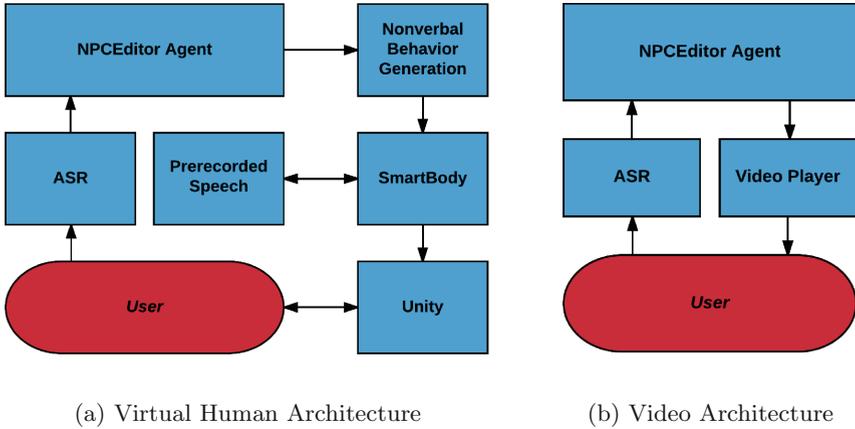


Fig. 2. System architectures

4.1 Metrics

The experiment consisted of a 3 (agent: VH-VH vs. VH-Human vs. Human-Human) × 2 (order: 1st then 3rd vs. 3rd then 1st) design. Our 60 participants were randomly assigned to one of these 6 cells (10 per cell).

We measured the following dependent variables for each interaction between a subject and virtual agent:

- a 9-item rapport scale
- a 6-item ancillary rapport scale
- two items on subjective sharing of personal information
- a set of 30 personality characteristics
- length of participant responses
- number of participant responses containing stories

We used the rapport scale from [9]. Specifically, participants answered 9 questions about the rapport they felt with the agent on scales ranging from 1 (not at all) to 5 (very much) such as “I felt I had a connection with my partner” and “I felt that my partner was interested in what I was saying.” As an ancillary measure of rapport, participants also answered other questions on the same scale such as : “How much rapport did you feel with your interaction partner?” Or “How close did you feel to your interaction partner?” Participants were also asked two items about the extent to which they shared personal information using the same 5-point scale scale: “How personal were your answers?” and “How much did you reveal about yourself in your answers?” Finally, for exploratory purposes, participants were asked to rate their interaction partner on 30 personality characteristics using bipolar scale from 1 to 5, with each endpoint reflecting the extreme of that personality characteristic (e.g., Compassionate to Aloof, Friendly to Unfriendly, etc.).

4.2 Protocol

After receiving a general explanation of the system and the procedure of the study, participants gave consent. As explained in the previous section, each participant was assigned to one of the six different conditions. Prior to starting the interaction with the agent, participants were given the set of questions that were supposed to be the topics of their conversation and 5 min to plan their answers. Each conversation consisted of a sequence of sub-dialogue episodes, like that shown in Fig. 3, which shows one participant interacting with the VH-VH version of Aaron.

Participant: What do you and your friends like to do?

Agent: Well me and the other virtual humans here are pretty busy most of the time talking to people like you, so we don't have time to do much else or hang out with each other. The humans we work with seem to do some pretty cool things with their friends, though. One of our researchers just got back from a back packing trip in the Tetons, and was telling me about how he got to watch the sun rise through the peaks each morning. He claimed it was one of the most beautiful things he have ever seen.

Agent: What about you?

Participant: What do me and my friends like to do? oh my goodness, well lets see ... most of the time me and my friends just come over to my house and play some old Nintendo.. That's right you heard me right! The old classic Nintendo! I got over fifteen games it's been a lot of fun. You know, booze ... stuff like that ... umm ... but on a regular day when there is a little bit of money in the pocket we tend to go to movies or we go camping ... lets see the other day we had a little barbecue. But sometimes you just gotta do what you can with what you have, right? Either way, whenever you have good company it's gonna be a good time. That's what I always say.

Fig. 3. Example of exchange between Aaron (3rd person VH-VH) and participant

After going through all the questions, participants were asked to fill out a questionnaire with the subjective items about their experience with the agent. Then, participants went through the same procedure with the second character.

5 Results

We analyzed these dependent variables: the Rapport Scale, our ancillary rapport scale, disclosure of personal information, and finally each of the 30 personality characteristics items. On each of these measures, we conducted a 2 (perspective: 1st person vs. 3rd person) \times 2 (order: 1st then 3rd vs. 3rd then 1st) \times 3 (agent: human-human, VH-VH, vs. VH-human) mixed ANOVA with order and agent as between-subject factors, and perspective as a within-subjects factor. Considering the Rapport Scale, there was only a marginally significant main effect of perspective, $F(1, 53) = 3.21$, $p = .08$, such that users experienced greater rapport with the 1st person agent ($M = 3.61$, $SE = 0.09$) than with the 3rd person

agent ($M = 3.42$, $SE = 0.09$). However, this effect was qualified in an interaction with “agent” condition ($F(2, 53) = 3.76$, $p = .03$). As can be seen in Fig. 4, the effect of users experiencing greater rapport with the 1st person agent than with the 3rd person agent only appears when the agent has a human backstory (VH-human and human-human). No other effects or interactions approached significance ($F_s < 1.12$, $p_s > .33$).

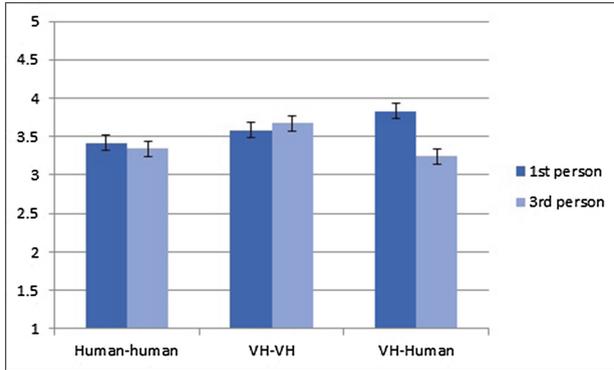


Fig. 4. Interaction of perspective and agent on the rapport scale.

For our ancillary rapport measure, we also found a main effect of perspective, $F(1, 53) = 4.44$, $p = .04$, again such that users experienced greater rapport with the 1st person agent ($M = 3.41$, $SE = 0.12$) than with the 3rd person agent ($M = 3.10$, $SE = 0.12$). However, the interaction with agent condition did not approach significance $F(1, 53) = 1.95$, $p = .15$, nor did any of the other effects or interactions reach statistical significance ($F_s < 1.52$, $p_s > .23$). Considering the disclosure of personal information, there was a significant main effect of perspective, $F(1, 53) = 6.88$, $p = .01$, such that participants share more personal information with the 1st person agent ($M = 3.92$, $SE = 0.12$) than with the 3rd person agent ($M = 3.65$, $SE = 0.14$). No other effects or interactions approached significance ($F_s < 0.79$, $p_s > .45$).

Turning to exploratory analysis of personality characteristic items, several were found to have significant or marginal effects. First, for rating of the personality characteristic of “rude”, there was only a marginally significant main effect of perspective, $F(1, 53) = 3.33$, $p = .07$, such that users rate the agent as less rude with the 1st person agent ($M = 1.66$, $SE = 0.10$) than with the 3rd person agent ($M = 1.89$, $SE = 0.11$). However, this effect was qualified in a marginal interaction with “agent” condition ($F(2, 53) = 2.94$, $p = .06$). As can be seen in Fig. 5a, again the effect only appears when the agent has a human backstory (VH-human and human-human). No other effects or interactions approached significance ($F_s < 1.08$, $p_s > .31$).

Second, for rating of the personality characteristic of “aloof”, there was a significant main effect of perspective, $F(1, 53) = 5.58$, $p = .02$, such that users

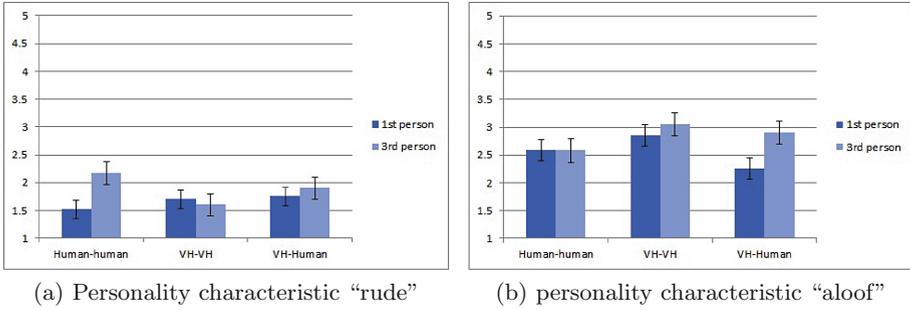


Fig. 5. Interaction of perspective and agent on personality characteristics.

rate the agent as less aloof with the 1st person agent ($M = 2.56, SE = 0.11$) than with the 3rd person agent ($M = 2.84, SE = 0.12$). However, this effect was qualified in a marginal interaction with "agent" condition ($F(2, 53) = 2.57, p = .086$). As can be seen in Fig. 5b, it appears that this time, the effect only appears with a VH (VH-human and a trend for VH-VH, but not with human-human). No other effects or interactions approached significance ($F_s < 1.57, ps > .22$).

Third, for rating of the personality characteristic of "non-threatening", there was only a marginally significant interaction between perspective and order ($F(1, 53) = 3.65, p = .06$). As can be seen in Fig. 6a, it appears that the 3rd person agent is only perceived as more threatening when users interact with the 1st person agent beforehand. No other effects or interactions approached significance ($F_s < 1.38, ps > .25$).

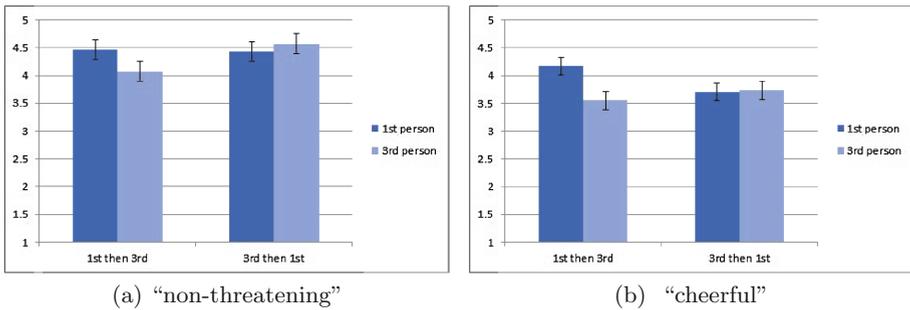


Fig. 6. Interaction of perspective and order on personality characteristics.

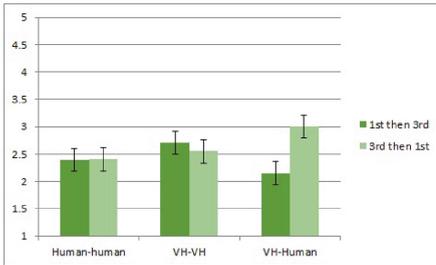
Likewise, for rating of the personality characteristic of "cheerful", while there was a significant main effect of perspective, $F(1, 53) = 4.28, p = .04$, such that users experience the 1st person agent as more cheerful ($M = 3.94, SE = 0.12$) than the 3rd person agent ($M = 3.64, SE = 0.12$), there was also a significant interaction with order ($F(1, 53) = 5.30, p = .03$). As can be seen in Fig. 6b, it

appears that the 1st person agent is only perceived as more cheerful when they interact with it before the 3rd person agent. No other effects or interactions approached significance ($F_s < 0.57, ps > .46$).

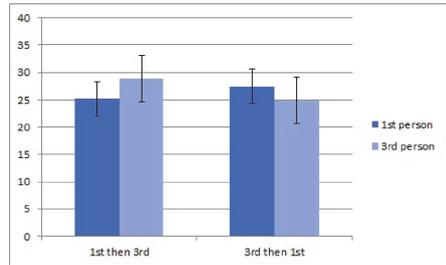
Next, for rating of the personality characteristic of “trustworthy”, there was only a significant main effect of perspective, $F(1, 52) = 5.67, p = .02$, such that users experience the 1st person agent as more trustworthy ($M = 3.95, SE = 0.13$) than the 3rd person agent ($M = 3.55, SE = 0.16$). No other effects or interactions approached significance ($F_s < 1.61, ps > .21$).

For rating of the personality characteristic of “passive”, there was only a marginally significant main effect of agent, $F(1, 53) = 3.33, p = .087$, such that users rate the agent as less passive when it has a human backstory (human-human $M = 2.13, SE = 0.17$ and VH-human $M = 2.05, SE = 0.17$) compared to when it has an artificial backstory ($M = 2.55, SE = 0.17$). No other effects or interactions approached significance ($F_s < 0.58, ps > .56$).

For rating of the personality characteristic of “unsympathetic”, there was a significant main interaction of agent by order, $F(2, 53) = 3.22, p = .048$. As depicted in Fig. 7a, in the VH-human condition, participants overall rated both agents as more unsympathetic when they interact with the 3rd person agent before the 1st person agent. As the three-way interaction with perspective (3rd vs. 1st person) did not reach significance ($F(2, 53) = 2.63, p = .11$), this figure displays means collapsed across 1st person agent and 3rd person agent. Indeed, no other effects or interactions were statistically significant ($F_s < 2.63, ps > .11$).



(a) Interaction of agent and order on characteristic “unsympathetic”.



(b) Interaction of perspective and order on the length participant talked

Fig. 7. Ordering effects.

There were no significant effects or interactions approached significance for the other personality characteristic items ($F_s < 2.72, ps > .11$).

Additionally, we conducted a 2 (perspective: 1st person vs. 3rd person) × 2 (order: 1st then 3rd vs. 3rd then 1st) × 3 (agent: human-human, VH-VH, vs. VH-human) mixed ANOVA on the length of time participants talked to the agent. There was only a significant interaction of perspective and order, $F(1, 45) = 4.02, p = .05$. As can be seen in Fig. 7b, participants talked longer with

whatever agent they spoke to second. No other effects or interactions approached significance ($F_s < 0.66, p_s > .52$).

Finally, we conducted chi-square tests to determine if agent condition impacted whether or not participants were more likely to tell a story to the agent in response to his question. Across responses to all questions, agent condition never had a significant effect on the likelihood of telling a story ($\chi^2_s < 7.86, p_s < .10$).

6 Conclusions

In summary, like [5], we see a general preference for first person over third person stories, even though there were differences in the type of interaction (spoken rather than typed) and activity (story-swapping rather than stories motivating exercise), and considering also variations in presentation. Agents who told 1st-person stories led to users reporting that they felt greater rapport, that they shared more information, and saw the agent as less rude, less aloof, less threatening, more cheerful, and more trustworthy than the agent who told third person stories. Some of these results appeared only in the VH-Human condition (which is most similar to the agent in [5]). Given that the agents, subjects, dialogue genre, and measures were all different from the previous study, we see this as reinforcement of principles (1) and (2)- that human-like first person stories should be told by a virtual human, in order to engage human users. Likewise, we fail to find any support for Principle (3), that would discourage human-like first person stories as deceitful.

On the other hand, we do not see differences in objective measures of user reactions to the stories in dialogue, and many of the findings occur in only some of the conditions, so it may also be fine to tell third person stories or have a non-human backstory identity, as long as the stories are interesting and approachable.

It is also interesting that users talked more with the second agent, regardless of whether it was a first or third person perspective. This seems to indicate that users are “warming up” to this style of interaction, and not yet bored with it after the first batch of 10 questions.

The study presented here is still an exploratory analysis, and should be followed up in order to fully verify the tentative conclusions on agent design. There are many ways in which we would like to follow up this study. One way is to vary the within-subjects variables (e.g. human vs. virtual human identities). It would also be good to look at gender effects (all of our agents were males, who interacted with both male and female subjects) and other subject matter for the stories and main task. It would also be interesting to look at agents that have a greater repertoire of subdialogue types (looking at different participants initiating topics and stories being introduced in ways other than as a response to a direct question), and including agents who tell a mix of both first and third person stories, where appropriate.

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