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Designing User Engagement With Text-Based Chatbots

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Abstract

A chatbot is a computer program that interacts with humans via auditory or textual methods and is increasingly being adopted to various everyday practices. Although the use of chatbots is increasing, there is little known about the specific chatbot characteristics that influence its user engagement. The aim of this study was to assess how different chatbot characteristics influence the user's perceptions towards chatbots and, ultimately, relate to user engagement. There were three main goals. The first goal was to assess if different types of response latency are associated with higher levels of perceived humanness. The second goal was to assess if higher levels of social presence can be associated with the inclusion of small talk to a conversation. The third goal was to investigate if the perceived humanness and social presence of chatbot mediate user engagement. For this experiment four chatbots were created using the Facebook Messenger platform. Each chatbot was randomly assigned to the participant. Overall, 196 participants took part in this online experiment. In all conditions, participants answered one Perceived Humanness question and completed the Social Presence questionnaire and the User Engagement Scale. Results show that higher levels of social presence and perceived humanness are associated with higher levels of user engagement with chatbots. Incorporating small talk in a conversation was associated with higher levels of social presence. No significant differences could be obtained between the groups with different response latencies. This research suggests that in order to achieve a higher user engagement with chatbots, chatbot developers should focus more on the creation of a socially oriented communication style, instead of making the chatbot appear as a human-like entity.

Keywords: chatbot, response latency, small talk, perceived humanness, social presence, user engagement.

The Rise of Chatbots

Over the past several decades artificial intelligence (AI) has gained more public attention than ever before. This does not come as a surprise, since AI has been used in a wide range of areas like video games, smart cars, medical diagnosis, fraud detection, education and online customer support. In terms of the latter, chatbots are already becoming the new reality of today's businesses as a means to provide online customer support (Choo, 2016).

A chatbot (also referred to as a conversational agent, conversational interface or simply a bot) is a computer program which interacts with humans via auditory or textual methods. The very first chatbot Eliza operated from a simple command-line. Since then chatbots have become significantly more sophisticated. Nowadays, some conversational agents have audio or visual interfaces, incorporated an avatar (Coniam, 2008) or even use a sophisticated natural conversational language - artificial intelligence (Shawar & Atwell, 2005). However, the majority of chatbots still operate as its predecessor - via text input and text-line response.

In particular, these text based chatbots are increasingly used by businesses due to their comparatively ease of implementation. It is currently estimated that there are over 30,000 text based chatbots running on the Facebook Messenger platform, a number that is steadily increasing (Constine & Perez, 2016).

As chatbots are becoming more and more common in people’s everyday life, it becomes more important to understand how people interact with chatbots, and to seek to improve this type of communication (Norman, 2009). It has been noted that not all chatbots that we might encounter today are able to facilitate meaningful and satisfying communication with people (Jenkins, 2011). A majority of the current text-based chatbots do not use natural language processing. Chatbot developers program and design chat dialogues themselves using script dialogues (Pereira, Coheur, Fialho & Ribeiro, 2016). Therefore it becomes

important to provide chatbot creators with better knowledge about how specific chatbot characteristics influence the user's perception of chatbots. Furthermore, since the majority of chatbots are used for enterprises, where customer engagement with the service or a product is a key success metric (O'Brien & Toms, 2008), it also important to investigate chatbot characteristics that facilitate user engagement with the chatbot.

Thus the importance to study how specific chatbot characteristics might influence the user's perception of the chatbot is due to two reasons. First, from the theoretical perspective it would provide us with enhanced knowledge about human-chatbot interactions. Second, the knowledge gained in this area would facilitate chatbot developers with effective design guidelines when creating scripted dialogues.

Creating humanness of the chatbot via response latency

One of the most interesting aspects of human-computer interaction is the tendency for users to perceive computers as having human-like attributes (Dautenhahn, Ogden & Quick, 2002; Persson, Laaksolahti & Lönnqvist, 2000). According to the Media Equation theory (Reeves & Nass, 1996), people tend to perceive and treat computers as if they were real human-beings. These theoretical implications seem to apply to chatbots as well. Research in conversational agents suggest that specific characteristics of a chatbot convey higher perceptions of its humanness (Holtgraves, Ross, Weywadt & Han, 2007; Schuetzler, Grimes, Giboney & Buckman, 2014; ter Maat, Truong & Heylen, 2010). Such suggestions imply that better knowledge about these characteristics could facilitate chatbot designers in creating more human-like chatbots. One of such characteristics is considered to be the response latency (Ter Maat, Troung & Heylen, 2010). Response latency is the time it takes for the user to receive a response from the chatbot. A chatbot can be designed to have various types of response latencies. For example, a chatbot can have static response latency where chatbot replies to a user after a fixed amount of time (e.g. 1 seconds or 2 seconds). Such response

latency is assumed to be more machine like, because it does not take into account the length of the sent message (Ter Maat, Troung & Heylen, 2010). Contrary to that, a chatbot can have a dynamic response latency, where the time it takes for the chatbot to respond relies on the number of characters in the sent message. Theoretically, such response latency is more humanlike, as it is more similar to actual human typing behaviour (Ter Maat, Troung & Heylen, 2010). Finally, a chatbot can have no response latency, which means that chatbot sends a message immediately after the input from the user is received.

Previous research has shown that response latency influences user perceptions of the chatbot's personality (Ramsey, 1966; Holtgraves, Ross, Weywadt & Han, 2007). For example, Holtgraves, Ross, Weywadt and Han (2007) in their experiment showed that the bot that responded quickly compared to when it responded slowly was perceived higher on urgency and conscientiousness. Although the research did not investigate the direct link between response latency and perceived humanness, it nevertheless suggests that manipulations with response latency could play a role in the perception of a bot's humanness.

Moving beyond characteristics that might induce higher perceptions of chatbot humanness, other researchers investigated whether perceived humanness has any implications to the overall user experience with chatbots. For example, Lee (2010) showed that human-voiced computer interfaces were evaluated as more positive compared to machine-voiced computer interfaces. Such findings are important, because they suggest that by seeking to understand chatbot characteristics that create perceptions of its humanness, chatbot developers can create not only more human-like bots, but more importantly more positive experiences with their users.

Creating social presence of the chatbot via small talk

Another important aspect in human-computer interaction is media richness. The Media Richness Theory (Otondo, Scotter, Allen & Palvia, 2008) explains that communication

media, such as video calls, emails or chatbots, differ in their ability to produce information (i.e. information richness). For example, emails cannot reproduce visual social cues such as facial expressions or body language and thus is a less rich type of communication media compared to video calls, where facial expressions and body movements can be transmitted easily. Furthermore, this theory suggests that richer communication media allows communicators to experience more social presence (Biocca & Levy, 1995; Otondo, Scotter, Allen & Palvia, 2008).

Social presence is a construct which describes the degree of awareness and involvement of communication partners and interpersonal relationship during their interaction (Fulk, Steinfield, Schmitz & Power, 1987). Perceived humanness and social presence might seem as similar concepts, however, the difference between them is that social presence can occur even if a person perceives the computer as a machine-like entity.

Research in information systems and human-computer interaction show that design elements of computer systems might influence the conveyance of social presence (Bickmore & Picar, 2005; Lee & Nass, 2003; Verhagen, van Nes, Feldberg & van Dolen, 2014). Verhagen, van Nes, Feldberg and van Dolen (2014) showed that a conversational agent that conveys feelings of sociable and sensitive human contact (social-oriented communication style) will facilitate higher degrees of social presence. Furthermore, they showed that such a communication style elicits more social presence compared to a task-oriented communication style. In a conversation a social-oriented communication style entails conversational cues of personality, friendliness, empathy and support. Meanwhile a task-oriented communication style focuses on a well-structured and goal-oriented conversation. It has been argued that a social communication style used by conversational agents can enhance the feeling of being together (i.e. social presence).

One of the major elements of social-oriented communication style is small talk. In its essence, small talk creates a bond of union between communication partners (Malinowski, 1994) and thus is a concept that has been initially introduced in the field of human communication. An example of small talk could be a compliment given to a user (e.g. *Well done!*), a request for an opinion (e.g. *Do you like the weather today?)* or an expressed agreement (e.g. *You are right*). Empirical work in computer systems suggests that a social-oriented communication style might facilitate a feeling of social presence for the user (Verhagen, van Nes, Feldberg & van Dolen, 2014), therefore, incorporating small talk into a chatbot conversation might have a similar effect. Such suggestions are important, because they propose that text-based chatbots which cannot produce any visual social cues, can nevertheless enhance their communication richness by incorporating small talk.

User engagement

As discussed, social presence and perceived humanness are two important aspects that might influence the user's perception towards chatbots. When designing chatbots, however, such changes in user perceptions are important as long as they ultimately facilitate higher user engagement with chatbots. This is especially important for enterprises, where customer engagement with the product (i.e. chatbot), demonstrates its overall quality and success (O'Brien & Toms, 2008).

According to Sutcliffe (2010) user engagement explains the reason why users feel more attracted to use certain applications over others. User engagement describes the positive experiences and interactions between a human and a computer system. Some researchers are equating user engagement with user satisfaction (Quesenbery, 2003), but other studies show that it is more than that (O´Brien & Toms, 2013). User engagement is a quality of user experience, characterized by attributes of perceived usability, novelty, aesthetics and focused attention (O´Brien & Toms, 2013). Previous chatbot studies suggest that there are reasons to

believe that the human aspect of a chatbot produces more positive interactions with the user (Lee, 2010). For example, Lee (2010) showed that when a computer uses recorded human speech, compared to a synthesized or machine-voiced computer system, users perceived it as more positive. Furthermore, users agreed with the human-voiced computer's input more than with the machine-voiced input. Although the research was performed with auditory conversational agents, these findings nevertheless suggest that the more human-like the chatbot's input is, the more positively it is perceived by users. Such findings are important, because they suggest that chatbot designers can create not only human-like bots, but more importantly, more engaging experiences with their users. However, all these assumptions should be tested with text-based chatbots as well.

In addition to that, empirical studies show that a social-oriented communication style enhances feelings of social presence and is ultimately related with higher levels of satisfaction (Bickmore & Cassell, 2000; Qiu & Benbasat, 2009). However, these studies used virtual conversation agents that have a virtual appearance and thus are richer form of communication media. Therefore it is important to test if such findings hold up in text-based chatbots (which are less rich communication media). To test these assumptions is important, because results could reveal important conversational characteristics of chatbots that can facilitate higher user engagement.

Chatbots

For this study four chatbots were created. Since no artificial intelligence components (e.g. natural language processing) were built into the chatbots, the script dialogues were created (Pereira, Coheur, Fialho & Ribeiro, 2016) for all four chatbots. The same script dialogue was used in order to make the different response latency groups comparable. An example of this scripted dialogue, used to test the different response latency conditions, can be found in Appendix A.

The small talk chatbot was created based on dialogue acts that enable social-oriented talk in conversations with chatbots (Bickmore & Casell, 2000; Klüwer, 2011). Thereby small talk was designed using the following elements: request information (i.e. “Can I ask you a few questions about yourself?”, “Do you have anything planned for next weekend?”), compliment (i.e. “That is indeed an interesting choice”), positive feedback (i.e. “Nice!”, “It was nice to chat with you!”). Conversations with such chatbots were designed to facilitate slightly longer conversations with participants, compared to the other chatbots that did not contain small talk. An example of a dialogue between the user and the chatbot using small talk, can be found in Appendix B.

Hypothesis

Hypothesis 1*: Users interacting with the chatbot that contains dynamic response latency experience more perceived humanness compared to users who interact with the chatbot that has (a) static response latency and (b) no response latency.*

Previous research has shown that the response latency influences the user’s perception of a chatbot’s personality (Ramsey, 1966; Holtgraves, Ross, Weywadt & Han, 2007). Hence, response latency might play a role in perceptions of a bot’s humanness as well. Assuming that response latency resembles human behaviour (i.e. shorter length messages results in shorter response latency and vice versa), it was expected that users will perceive the chatbot with a dynamic response latency as more human-like, compared to interacting with bots that have a static (i.e. fixed-time reply) and no response latency (i.e. replies without any delay).

Hypothesis 2: *Users interacting with the chatbot that contains small talk experience more social presence than those who interact with the bot that contains no small talk.*

A study with virtual agents (Verhagen, van Nes, Feldberg & van Dolen, 2014) showed that a social-oriented communication style elicits more social presence compared to users engaged in a task-oriented communication style. However, the study used a virtual

conversation agent that has a virtual appearance, thus it is important to investigate if this can be applied to text-based chatbots as well. Considering that small talk is one the major elements of a social-oriented communication style (Bickmore & Cassell, 2005), it was expected that communication with a text-based chatbot will provide more feelings of social presence compared to users who engage in conversations without small talk.

Hypothesis 3: *Feelings of social presence of the chatbot can mediate user engagement with the chatbot.*

Research suggests that conversational interfaces that convey higher feelings of social presence will facilitate higher levels of satisfaction with such computer systems (Bickmore & Cassell, 2000; Verhagen, van Nes, Feldberg & van Dolen, 2014). Therefore it was expected that users who feel more social presence with a chatbot will also be more engaged with such conversational interfaces.

Hypothesis 4: *Perceived humanness of the chatbot can mediate user engagement with the chatbot.*

Previous chatbot studies suggest that there are reasons to believe that the humanness aspect of a chatbot produces more positive interactions with the user (Lee, 2010). Studies in embodied agents also supported such claims showing that a more human-like conversational interface provides more positive reactions from the user (van Vugt, 2008). However, these studies were implemented with embodied agents which have a physical body within that environment. These agents are richer in their communication as they can employ the same verbal or non-verbal means as humans do: they can express themselves using body language, facial expressions and voice tone. In this study a text-based chatbot was used which mainly conveys information through textual cues. Thus this study investigated whether the same results for user engagement could be applied to text-based chatbots.

Methods

Design

The experiment was as a double-blind randomized design with four between-subject conditions; the four different groups: the fixed response latency group, the dynamic response latency group, the small talk group and the neutral group. The neutral group was used as a control group for both conditions of response latency and a small talk condition, because it contained a neutral response latency and no small talk. This experiment design was chosen, because it allowed to make effective comparisons between the different response latency conditions and between the two small talk conditions.

All four experiment conditions employed one of the following four chatbots: a chatbot with a fixed response latency, a chatbot with dynamic response latency, a chatbot with small talk and a chatbot with no small talk and no response latency (neutral condition). The chatbots were created in the Facebook Messenger platform and were randomly assigned to the participant.

Independent variables. The independent variables were response latency (nominal measurement) and small talk (nominal measurement). The experimental conditions represented manipulations of the two independent variables.

Dependent variables. The main dependent variables were perceived humanness (interval level), social presence (interval level) and user engagement (interval level). The measures of these dependent variables were derived from the post-interaction questionnaires.

Control variables. The control variables were gender (men, woman; nominal level), age groups (18-29 years old, 30-49 years old, 50-65 years old and 65+ years old; ordinal level), previous experience with chatbots (yes or no; ordinal level) and computer use behavior (beginner, intermediate, advanced; ordinal level).

Participants

196 people participated in the study. However, 5 participants were excluded because there was not enough data to analyze. Ten participants indicated that they faced technical issues during the conversation with one of the chatbots, thus they were also excluded. Overall the data of 181 participants was used for data analysis. Participants were 43.6% male and 56.4% female aged 18 to 65 years (18 - 29 years 77.3%; 30 – 49 years 19.3% and 50 – 65 years 3.3%). Overall 53% of the participants had previous experience with chatbots, meanwhile the other 47% used a chatbot for the first time.

All of the participants were recruited through the external organisation by the means of online advertising. Inclusion criteria for participation in the study included an age of more than 18 years old and a Facebook Messenger account. The organisation had clear instructions to avoid mentioning that the experiment was about chatbots as this would have biased the general outcome (Holtgraves, Ross, Weywadt & Han, 2007; Schuetzler, Grimes, Giboney & Buckman, 2014). The organisation was informed to recruit around 200 participants; the number was consistent with previous similar studies (Lee & Naas, 2003; Verhagen et al., 2014). Participation was compensated – 15 vouchers (worth €10) were raffled among retainees.

Apparatus

All four chatbots were developed prior to the experiment. Consistent with already existing chatbots on the Facebook Messenger platform, the script dialogue for different response latency groups and a neutral group (see Appendix A) included three main parts: (1) welcoming part, (2) gift suggestion part with multiple selection questions and (3) goodbye part. Meanwhile, the script dialogue for the chatbot containing small talk (see Appendix B) had four main parts: (1) welcoming part, (2) small talk part, (3) gift suggestion part together with some small talk and (4) goodbye part.

All four chatbots were independently controlled by a software program that determines how to respond to the input of the participant.

General procedure

The experiment was performed online. A workflow application and predefined interaction script guided participants through all of the experimental setup. All four chatbots (one for each experiment condition) were available online and participants were able to access and chat with one of them using Facebook Messenger (by activating a link included in the instructions).

Participants' activities were ordered as follows: (1) information letter with instructions; (2) informed consent; (3) task description; (4) chat-task; (5) perceived humanness question; (6) social presence questionnaire; (7) user engagement questionnaire; (8) a general information survey; (9) debriefing. The total duration of the study was not longer than 15 minutes.

Informed consent. Based on the American Psychology Association´s ethics code (2002) the participants were informed about their right to decline to participate in the research and possibility to withdraw at any time. Also participants were informed that their conversations with the chatbot was coded anonymously. The contact information of the researcher was provided in case participants had additional questions about the research. Full informed consent can be found in Appendix C.

Deception. A deception about human chat interaction was used. The deception allowed to assess the perceived humanness of the chatbot by making participants receptive to the idea that their chat partner might be a human. This is consistent with previous studies in chatbots (Schuetzler, Grimes, Giboney & Buckman, 2014). The deception use in this study has been approved by the Psychology Research Ethics Committee of Leiden University.

Debriefing. In the debriefing the following information was provided (to read the full debriefing see Appendix D): the nature of the research, participants´ special role in the study and the main educational aspects of the research. Also, participants were informed about the nature and aim of the deception that was used in the study. It was indicated that deception was important to assess their perceptions of the chatbot's humanness by making them receptive to the idea that their chat partner might be a human.

Chat-task. The chat-task was specifically developed to match the nature of the chatbots that were used in this study. The chatbots acted as a gift-advisor which, by a means of an online conversation, helped find a gift according to the needs of the user. The chat-task was meant to facilitate an assessment of the user's perceptions and feelings towards the chatbot.

The chat-task was executed as follows. Before a start of the chat with the chatbot, participants were given task instructions. Written instructions informed participants that they were to access the bot using Facebook Messenger (a link to Facebook Messenger was provided for those who did not have it) and to engage in a 3 minute chat with the bot (participants were able to chat for periods longer and shorter than 3 minutes). They were asked to imagine a situation where they were looking for a gift for someone close to them (e.g. their son, daughter, brother or sister, etc.) who is 1-17 years old. They needed to think of his or her age and main interests (e.g. sports, brain games, outdoor activities, etc.). Users were informed that the task was completed once they found a gift and clicked on the button "Found". If they were not able to find a gift, or disliked the gifts suggested by the chatbot, participants could click on one of the other buttons: "Can't find" or "Stop the chat" (all of these buttons were presented altogether after the display of suggested gifts). Participants were informed, however, that the gift suggestions should not be taken too strictly and that the main goal was to focus on the general chat experience.

After reading the task instructions, participants were asked to click on a link which redirected them to the chatbot. To begin a chat, users needed to click on a button labelled "Get Started". Then the chatbot, which was ran by a scripted dialogue, started the chat. To answer these questions, users either responded by clicking on buttons or by typing-in their replies in the text box. The chat-task was completed once the user found a gift and clicked on "Found". The chatbot thanked them for the conversation and said goodbye. Finally, the bot provided users a link to the survey.

Measurements

Perceived Humanness question. The index of perceived humanness consists of one item and is used in gaming, text-based chatbots and embodied agents (Ijaz, Bogdanovych & Simoff, 2011). The perceived humanness question measures the degree to which a user perceives a conversational agent as a human-like entity (see Appendix E). The component was coded ordinally on a scale of 1–6. The higher the score, the lower the level of perceived humanness. The wording of this questions was changed to not give away that the participant was conversing with a chatbot.

Social presence questions (Lee et al., 2006). Originally the questions of social presence were developed in the field of human-robotics interaction, where social presence is defined as "a psychological state in which the virtuality of experience is unnoticed" (Lee, 2004; p. 32). Since in the present study the concept of social presence is used in the same manner, it was decided to use these questions in this study as well. The wording of the questions, however, was modified to fit the chatbot environment for this study, i.e., the word "AIBO" was replaced with "chat partner".

The social presence index was composed of seven items where participants were asked to indicate their feelings when they were communicating with the chatbot (see

Appendix E). The total scale score was computed as the average value of its items (coded ordinally on a scale of 1–10).

User Engagement Scale. A measure of user engagement was obtained using a multidimensional User Engagement Scale (UES; O'Brien & Toms, 2010) which assesses the engagement of software applications. Originally the scale was developed in the e-shopping domain, but has been widely used in search systems, social networking applications, games, etc. This scale is a 31-item self-report questionnaire (see Appendix F). The questionnaire is composed of six dimensions: aesthetic appeal, perceived usability, felt involvement, focused attention, novelty and endurability. The wording of the UES was modified to fit the chatbot environment for this study, i.e., the word, "shop" or "shopping" was replaced with "chat" or "chatting" and "website" was replaced with "chat partner".

Participants were asked to rate 31 items on a seven point numerical scale as to how much they agreed with them (1=strongly disagree, 2=disagree, 3=disagree somewhat, 4=undecided, 5=agree somewhat, 6=agree, 7=strongly agree). It is important to note that the original UES used a five-point numerical scale, but later it was recommended to use a seven point Likert scale due to the concern that it "it would not be sufficiently sensitive in this context because of people not wishing to use the extreme ends of the scale" (O'Brien & Cairns, 2015; p. 417).

User engagement is indicated by the combined average score of all six dimensions (focused attention, perceived usability, aesthetics, endurability, novelty and felt involvement) over the 31 questions (coded ordinally on a scale of 1–7). To test the hypothesis, only the total scores of user engagement were analysed.

Analysis

All analyses were conducted using IBM SPSS Statistics 21. The data from the research participants on all variables was complete. This resulted in nine variables: (1)

condition with the dynamic response latency, with static response latency and neutral response latency, (2) condition with and without small talk, (3) level of perceived humanness (PH), (4) level of social presence (SP), (5) level of user engagement (UE), (6) gender, (7) age group, (8) computer use behavior and (9) previous experience with chatbots.

Variable 1 was computed as a nominal variable with 3 levels: dynamic response latency, static response latency and neutral. Variable 2 was computed as a nominal variable with 2 levels: small talk and neutral. Variable 3 was computed as an ordinal variable. Variables 4 and 5 were computed as interval variables. Variable 6 was computed as a nominal variable with 2 categories: men and women. Variable 7 was computed as an ordinal variable with 4 categories or age groups: 18-29 years old, 30-49 years old, 50-65 years old and 65+. Variable 8 was computed as an ordinal variable with 3 categories: beginner, intermediate and advanced. Finally, variable 9 was computed as an ordinal variable with 2 categories: yes and no. The descriptives of control variables within all four experiment groups can found in the table below (Table 1).

Table 1. *Descriptive statistics of the control variables within all four experiment groups.*

	Four groups of participants							
	Fixed RL group (N=45)		Dynamic RL group (N=48)		Small talk group (N=45)		Neutral group (N=43)	
Variables	N	%	N	%	N	%	N	%
Gender								
Male	27	60.0	20	41.7	11	24.4	21	48.8
Female	18	40.0	28	58.3	34	75.6	22	51.2
Age groups								
18-29	33	73.3	39	81.3	36	80.0	32	74.4
30-49	12	26.7	8	16.7	4	8.9	11	25.6

50-65	-	-	1	2.1	5	11.1	-	-
Computer use behavior								
Beginner	-	-	7	14.6	2	4.4	-	79.1
Intermediate	23	51.1	18	37.5	31	68.9	34	20.9
Advanced	22	48.9	23	47.9	12	26.7	9	-
Previous experience with chatbots								
Yes	27	60.0	32	66.7	16	35.6	21	48.8
No	18	40.0	16	33.3	29	64.4	22	51.2

Outliers. First, multivariate outliers were tested using boxplots. No significant outliers were found.

Internal consistency reliability. To assess the internal consistency of the measurement scales, Cronbach's Alpha's were checked. Reliability of the Perceived Humanness Scale was not checked, because this scale consists of only one question. The Social Presence Scale (α =0.907) and User Engagement Scale (α =0.950) were highly reliable showing high between-subject variability. Since both reliability estimates are higher than 0.7, the scales were further used in the analysis.

Construct validity of the two subscales was tested using factor analysis. Perceived Humanness was not tested, because it consists of one question. First, the factorability of seven Social Presence items was examined. An examination of the Kaiser-Meyer Olkin measure of sampling adequacy suggested that the sample was factorable (KMO=0.868). The factor loads in components matrix were all over 0.5, supporting the inclusion of each item in the scale. Second, the factorability of 31 User Engagement items was tested. An examination of the Kaiser-Meyer Olkin measure of sampling adequacy suggested that the sample was factorable (KMO=0.913). The factor loads of the five items were over 0.3, suggesting

minimal significance of these items. To make the results more comparable with other studies, it was decided to keep the items in the scale.

The descriptive statistics of all independent variables across all four experiment conditions can be found in the table below (Table 2).

Table 2. *Descriptive statistics of all independent variables across all four experiment conditions.*

	Dependent variables														
Conditions	**Social Presence**					**User Engagement**					**Perceived Humanness**				
	N	M	SD	Min	Max	N	M	SD	Min	Max	N	M	SD	Min	Max
Fixed RL	45	5.29	1.91	1.00	9.14	45	4.00	0.97	1.58	5.81	45	1.67	0.98	1	5
Dynamic RL	48	5.86	2.16	1.29	9.71	48	4.14	0.99	1.9	6.16	48	2.00	1.11	1	5
Small talk	45	6.47	1.7	2.0	9.14	45	4.77	0.93	2.42	6.32	45	2.16	1.33	1	6
Neutral	43	5.51	1.29	3.0	8.71	43	4.36	0.69	2.77	5.68	43	1.63	0.76	1	4

Normal distribution. Normality of each of the dependent variables for each group of the independent variable was tested. The Shapiro-Wilks test for PH was significant, indicating non-normality of the data ($p < 0{,}001$). Normal Q-Q plots confirmed the non-normality of this data.

Meanwhile for SP and UE almost all Shapiro-Wilks tests were not significant, indicating normality of the data. Only one Shapiro-Wilks test was significant: the mean of SP in the small talk group (variable 2, hypothesis 2), p = 0,016. However, all normal Q-Q plots showed a normal distribution of the dependent variables. Therefore, it was concluded that both dependent variables (SP and UE) have a normal distribution.

Results

Hypothesis 1*: Users interacting with the chatbot that contains dynamic response latency experience more perceived humanness compared to users who interact with the chatbot that has (a) static response latency and (b) no response latency.*

Due to a non-normality of the dependent variable of PH, a non-parametric test was chosen. To compare the medians of all three Response Latency (RL) conditions, Kruskal-Wallis test was used. Boxplots indicated similar distribution in all three groups.

A Kruskal-Wallis test showed that there was no statistically significant difference in PH between the different response latency conditions, $\chi2(2)= 3.433$, $p = .180$, with a mean rank PH score of 63.32 for fixed condition (*Mdn* = 1.67, *SD* = 0.98), 76.20 for dynamic condition (*Mdn* = 2.00, *SD* = 1.11) and 65.33 for neutral condition (*Mdn* = 1.63, *SD* = 0.76).

Hypothesis 2: *Users interacting with the chatbot that contains small talk experience more social presence than those who interact with the bot that contains no small talk.*

To test Hypothesis 2, an independent samples t-test was used. To test assumptions for homogeneity of variances a Levene's test was used. Levene's test indicated equal variances ($F = 2.66$, $p = 0.107$), thus assumptions for homogeneity of variances were met. An independent samples t-test on SP as dependent variable and small talk in control condition as independent variable indicated that SP scores were significantly higher in the small talk condition (*M* = 6.47, *SD* = 1.70) than in neutral condition (no small talk) (*M* = 5.51, *SD* = 1.2), $t(86) = 2.964$, $p < 0.001$.

Hypothesis 3: *Feelings of social presence of the chatbot can mediate user engagement with the chatbot*

Both the Social Presence Scale and the User Engagement Scale are normally distributed. Therefore, to assess the relationship between SP and UE, a Pearson correlation coefficient was computed. There was a positive correlation between the two variables, $r = 0.774$, $N = 181$, $p < 0.001$. Thus higher levels of SP were associated with higher levels of UE and lower levels of SP were associated with lower levels of UE. A scatterplot summarizes the results (Figure 1).

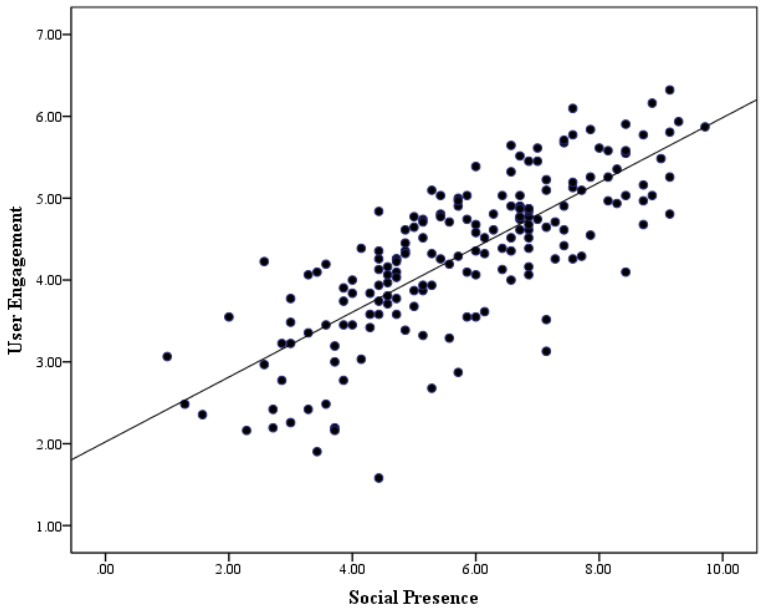

Figure 1. Relationship between scores on UE scale and SP scores.

Hypothesis 4: *Perceived humanness of the chatbot can mediate user engagement with the chatbot.*

The Perceived Humanness Scale is non-normally distributed. Therefore, to assess the relationship between PH and UE, a Spearman correlation coefficient was computed. There was a positive correlation between the two variables, $r = 0.490$, $N = 181$, $p < 0{,}001$. Thus

higher levels of PH were associated with higher levels of UE. Meanwhile lower levels of PH were associated with lower levels of UE. A scatterplot summarizes the results (Figure 2).

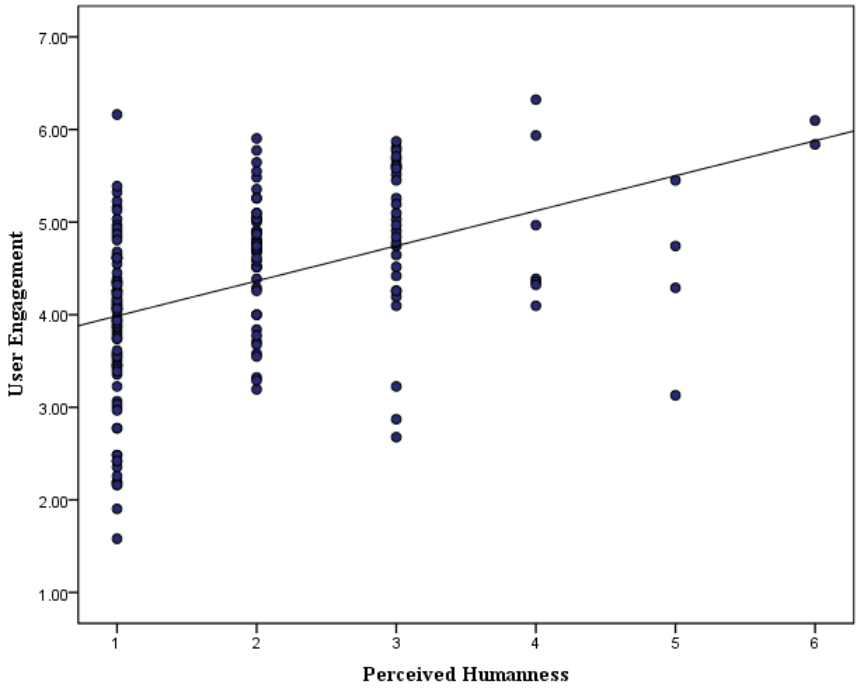

Figure 2. Relationship between scores on UE scale and PH score.

Control variables: *Predicting UE from control variables*

In addition to the main hypothesis testing, control variables were tested to make sure that the independent variables (PH and SP) were the only factors causing a change in the dependent variable (UE). A multiple regression analysis was conducted with UE as a dependent variable and SP, PH and age, gender, computer skills and previous chatbot experience with chatbots as independent variables. Two models were created. In model one, the effect of control variables (gender, age, computer skills and previous chatbot experience with chatbots) on UE was tested. In model two, addition to control variables, PH and SP were

included. Since the independent variable of PH is at its core ordinal, in this analysis it was treated as continuous. This is the reason why this regression was completed.

The multiple regression analysis assumptions were checked. First, a linearity assumption was checked. A scatterplot revealed a somewhat linear relationship between all variables. Second, four outliers were found and removed since multiple linear regression is sensitive to outlier effects. Third, the assumption of independent errors was tested with the Durbin-Watson test. The data met the assumption of independent errors (Durbin-Watson value = 1.824). Fourth, multicollinearity was checked using Variance Inflation Factor. The independent variables (PH and SP) were not multicollinear, because VIF was less than 2. Finally, assumptions for normally distributed residuals and homoscedasticity were checked. The scatterplot of standardized residuals showed that the data met the assumptions of homoscedasticity and normally distributed residuals.

A hierarchical regression was conducted with the mean of UE as dependent variable and gender, age, computer skills and previous experience with chatbots as control variables. A multiple linear regression was calculated to predict UE based on SP and PH. The results of the regression indicated the two predictors explained 59.8% of the variance ($R^2 = 0.603$, $F(2, 174) = 146.862$, $p < 0.001$). It was found that only SP significantly predicted UE ($\beta = 0.373$, $p < 0.001$), whereas PH did not ($\beta = 0.067$, $p = 0.177$).

Table 3. *Hierarchical regression of UE on gender, age, computer skills and previous experience with chatbots.*

	B	*SE*	β	t	*p*	R^2	ΔR^2
Model and variables							
Model 1						0.099	0.099
Gender	0.284	0.147	0.153	1.931	0.055		
Age	-0.016	0.166	-0.007	-0.099	0.921		

Computer skills	-0.176	0.157	-0.092	-1.119	0.265		
Bot experience	-0.341	0.147	-0.184	-2.325	0.021		
Model 2						0.626	0.527
Gender	0.071	0.097	0.038	0.731	0.466		
Age	-0.009	0.107	-0.004	-0.082	0.934		
Computer skills	-0.094	0.102	-0.049	-0.916	0.361		
Bot experience	-0.210	0.095	-0.113	-2.201	0.029		
Perceived Humanness	0.066	0.047	0.077	1.406	0.162		
Social Presence	0.355	0.028	0.706	12.719	0.000		

Results show that in the first model only previous experience with chatbots predicted UE. The same applies to the second model, where previous experience with chatbots predicted UE. Also, in the second model SP predicted UE. Finally, the first model, where only control variables were included, predicted only 7,7% of the variance of UE. Meanwhile the second model, where all study variables were included, predicted 61,2% of the variance of UE.

Discussion

In the current study four different chatbots were designed and used to assess how different chatbot characteristics influence the user's perceptions towards chatbots and ultimately relate to users engagement. There were three main goals. The first goal was to assess if different types of response latency were associated with higher levels of perceived humanness. The second goal was to assess if higher levels of social presence could be associated with the inclusion of small talk to the conversation. The third goal was to investigate if the perceived humanness and social presence of chatbot mediate user engagement.

The first hypothesis stated that users interacting with the chatbot that contains dynamic response latency experience more perceived humanness compared to users who

interact with the chatbot that has static response latency and no response latency. The results showed that there is no significant difference in perceived humanness between the different response latency conditions. Participants that interacted with the chatbot that had a dynamic response latency did not experience more perceived humanness compared to participants that interacted with the chatbot with a static response latency. Likewise, participants that interacted with the dynamic response latency chatbot did not experience more perceived humanness compared to the users that interacted with the chatbot without any response latency.

The results suggest that response latency of the chatbot does not impact people's perceptions about how human-like a chatbot is. This finding does not support previous studies which showed that different types of response latencies evoke different perceptions about chatbots (Holtgraves, Ross, Weywadt & Han, 2007; ter Maat, Truong & Heylen, 2010). For example, ter Maat, Truong and Heylen, (2010) showed that different kinds of personality traits (i.e. agreeableness and assertiveness) were associated with different kinds of response latencies. Their study assumed that if people assign different personality traits to chatbots (based on manipulation with different response latencies), they will also assign different levels of humanness to them. A chatbot that replies to a user after a fixed time, despite the length of the message - should be perceived as less human-like, compared to a chatbot that replies each time differently, based on the length of the message (if a message is longer - it replies slower, if a message is shorter - it replies quicker). The present research, however, does not support such assumption. On the other hand, this research suggests that people do not necessarily need to perceive a chatbot as a human-like entity in order to assign personality traits to it. However, this research did not directly tested such assumptions, therefore future studies should research this.

One reason of the negative result of the present study could be the used measurement for perceived humanness. Since this study used one question to measure perceived humanness, it is likely that it simply was not sufficient to assess users' perceptions. Thus future studies should consider different ways to measure perceived humanness (e.g. longer questionnaires which do not explicitly ask the user to rate a chatbot as a human or as a computer, but use more subtle questions instead). Another reason of the negative result could be that the experiment was completed online. It is likely that some users experienced Internet connection disturbances which might have affected response latencies of the chatbot. Although the participants were asked to indicate technical issues during their participation in the experiment, it is likely that some users did not indicated such issues. Thus future studies should consider lab-based settings to test manipulations with different chatbot response latencies.

The second hypothesis stated that users interacting with the chatbot that contains small talk will experience more social presence than those who interact with the bot that has no small talk. The results showed that social presence was significantly higher in a "small talk" condition compared to a "neutral" condition. Participants that interacted with the chatbot using small talk felt significantly more social presence compared to participants that interacted with the neutral chatbot (chatbot without small talk).

This result supports previous studies (Verhagen, van Nes, Feldberg & van Dolen, 2014) indicating the important role of small talk in conversational interfaces. This finding is important, because it demonstrates that a more social communication style can enrich text-based chatbots, which are generally a poor communication medium. According to the Media Richness Theory (Otondo, Scotter, Allen & Palvia, 2008), the richer communication media is, the more effective it is, and therefore it allows communicators to experience more social presence. However, this research suggests that even less rich

communication media, such as text-based chatbots, can have higher social presence if it includes a small talk. Future studies, however, should investigate this further. For example, it could be tested whether user characteristics (e.g. user personality type or cognitive capabilities) have any effect on their experiences of social presence when the small talk is incorporated in a chatbot.

The third hypothesis stated that higher social presence of the chatbot will mediate user engagement with the chatbot. The results showed that increases in social presence were correlated with increases in user engagement. In an exploratory analysis, a simple linear regression confirmed that social presence significantly predicted user engagement. In conclusion, participants' feelings of social presence of the chatbot predicted user engagement with the chatbot. This indicates that social presence is an important factor related to engagement with the chatbot.

This finding supports previous studies which suggested that social dialogues and thus social presence is important for higher user satisfaction with communication media (Bickmore & Cassell, 2000; Qiu & Benbasat, 2009). The Media Richness Theory (Otondo, Scotter, Allen & Palvia, 2008) also supports this idea, because higher levels of social presence are important for effective communication. This finding suggests that to create engaging conversations with the users, chatbot practitioners should focus on the creation of social dialogues and facilitation throughout the conversations with the users.

The last hypothesis stated that higher perceived humanness of the chatbot will mediate user engagement with the chatbot. The results showed a positive correlation between perceived humanness and user engagement. However, in an exploratory analysis, a simple linear regression revealed that perceived humanness did not predict user engagement significantly. Thus, the hypothesis was rejected.

As mentioned previously, a reason of the negative result could be the Perceived Humanness question that was used in this study. As one question might not be sufficient to test the users' perceptions towards chatbot humanness, future studies should focus on developing more thorough tools to measure users' perceptions.

Conclusion

The aim of this study was to assess how different chatbot characteristics influence the user's perceptions towards chatbots and how they ultimately relate to user engagement. Overall, the findings of this study suggest that in order to achieve higher user engagement with chatbots, chatbot developers should focus more on the creation of a socially oriented communication style instead of making the chatbot appear as a human-like entity. From the theoretical perspective, the results of this study suggest that that even less rich communication media, such as text-based chatbots, can have higher social presence if it includes small talk. From a practical perspective, the results suggest that when creating script dialogues for text-based chatbots, chatbot developers should include small talk in order to enhance user engagement with the chatbot. As a suggestion, chatbot developers could familiarize themselves with sets of dialogue acts that create small talk in chatbots. For example, Klüwer (2011) has developed dialogue acts with short descriptions and examples which can easily be adopted to different types of chatbots.

Future studies should make an attempt to investigate social presence more in-depth, for example whether individual user characteristics, such as personality type or cognitive capabilities, have any effect on the experience of social presence.

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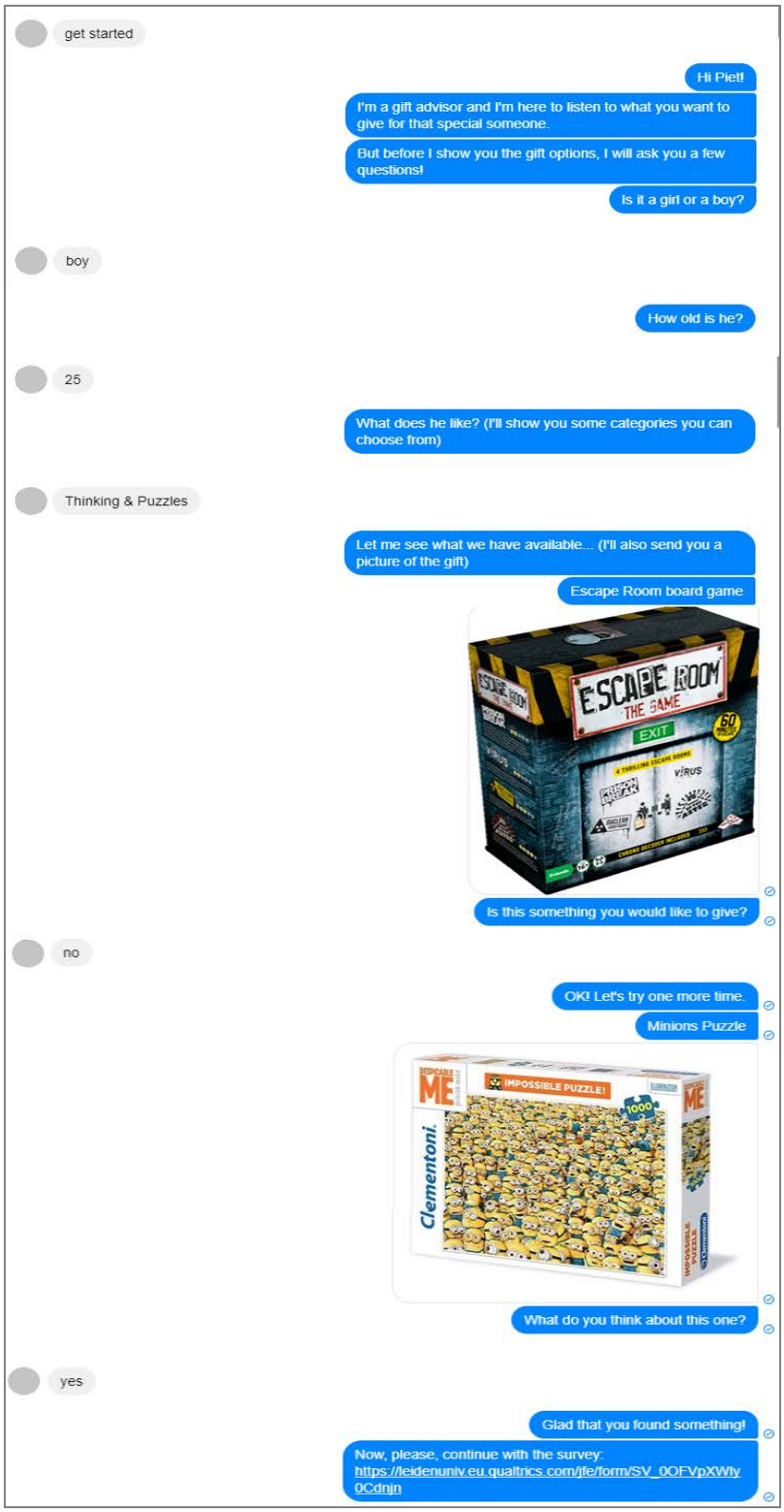
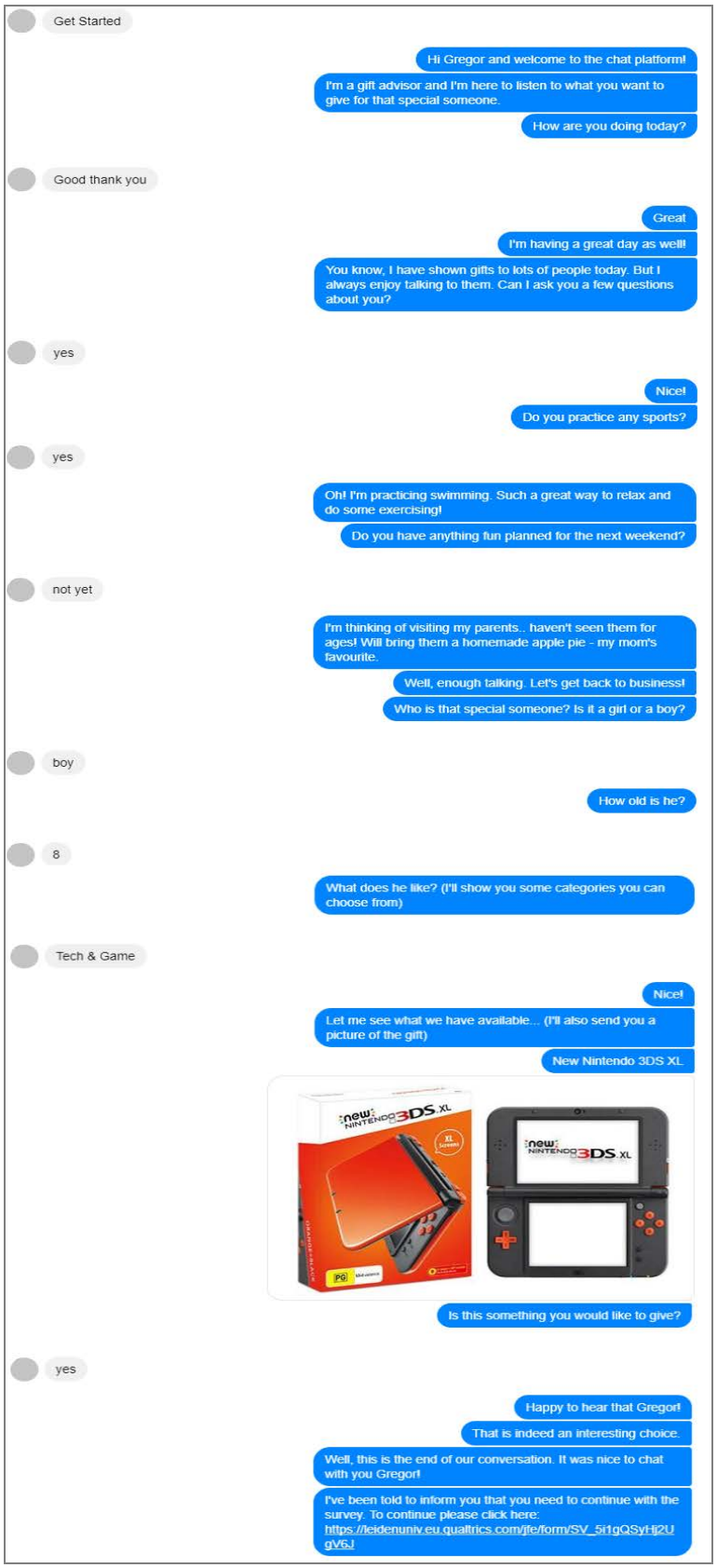
Appendix A

Example of a chat with the gift advisor in different response latency conditions and no small talk condition



Appendix B

Example of a chat with the chatbot in small talk condition



Appendix C

The informed consent

Universiteit Leiden
The Netherlands

Before you start this study we need to check that we have your informed consent to participate. Please read the information below and tick the box if you consent with it.

Informed Consent

In this study we will test design elements of chatbots and how users interact with them. The study will take about 10 minutes. You will search for a kid's gift while interacting with either a computer or a human via chat on Facebook Messenger. During the chat you will be asked for more details regarding the gift. Your goal is to focus on the general chat experience. Do not worry if you can not find the gift you are looking for.

Your participation is completely anonymous and voluntarily. All of the information collected today will be kept in complete confidentiality and all responses will be processed in coded form only. We are not interested in any one participant's responses by themselves. Rather, we are interested in the general responses of all participants when they are combined together. In order to complete the task you need to log into your Facebook Messenger account, however, we do not store any information from the chat nor do we get any access to your Facebook information.

You can be compensated for your time by winning a gift voucher of €10. In order to participate in the raffle and win a voucher, please indicate your email after the completion of the questionnaire.
By giving consent you agree with the following statements.

- I have read about the study purpose. I have had sufficient time to decide whether or not I participate.
- I am aware that participation is completely voluntary. I know that I can decide at any moment not to participate or to stop. I do not need to provide a reason for that.
- I am aware that my participation is completely anonymous and voluntarily. All of the information collected today will be kept in complete confidentiality and all responses will be processed in coded form only.
- I am aware that no information from the chat will be stored. Also no access to my personal Facebook information will be received. My responses are processed anonymously.
- I give consent to use my data for the study purposes mentioned in this page.

Any questions?

Remarks or complaints afterwards can be directed towards the senior researcher:
Pascal Haazebroek
phaazebroek@fsw.leidenuniv.nl

Best regards,

Kristina Katkutė
krist.katkute@gmail.com

Appendix D

The debriefing

Universiteit Leiden
The Netherlands

Debriefing

The aim of this study was to test the perceived humanness and social presence in chatbots and their effect on user engagement with the chatbot. Perceived humanness means that when interacting with a computer people tend to see them as humans. For example people tend to think that they are chatting with a human when they use a chatbot even when they have been told that it is computer software. Social presence means that when interacting with technology people feel as if the technological medium (in this case the chatbot) does not exist. Thus they can completely emerge in the virtual experience.

In this study we have informed you that you will chat with either a computer or a human. We would like to tell you that this was only used to make participants receptive to the idea that their chat partner might also be a human. We adopted this approach so that participants would not be focused on the idea that they are chatting only with a computer. This allowed us to test whether the chatbot can to some extent be perceived as a human. We hope that you understand that this misleading aspect of the study was included for an important reason.

In this study we expect to find that:

(1) When the chatbot replies similar to a human being, it will be perceived as more human-like (so when the the shorter messages of the chatbot will be displayed quicker and longer messages will be displayed after a longer time, people will perceive such chatbot as more human-like).

(2) When the chatbot has been designed with social talk it will give more feelings of social presence (so when the chatbot asks more personal questions about people and provides more replies to their responses, it will give them an increased feeling of social presence).

(3) People that perceive the chatbot as human, and have an increased feeling of social presence, will be more engaged and eager to chat with such chatbots.

Your contribution was important to understand what constitutes an engaging experience with the chatbot. This knowledge can be effectively applied to the design process and development of future chatbots.

If you have any questions, remarks or complaints you can be directed towards the senior researcher:

Pascal Haazebroek
phaazebroek@fsw.leidenuniv.nl

Appendix E

Perceived Humanness Question and Social Presence Questionnaire

Perceived Humanness Question

You have just chatted with the gift advisor. With which of the following sentences do you agree? Please select one.

My chat partner was…

- ○ Definetely Human
- ○ Probably Human
- ○ Not Sure, but guess Human
- ○ Not Sure, but guess Computer
- ○ Probably Computer
- ○ Definetely Computer

Social Presence Questionnaire

Select an answer on a scale of 1 to 10.

1. How much did you feel as if you were interacting with an intelligent being?

2. How much did you feel as if you were accompanied with an intelligent being?

3. How much did you feel as if you were alone?

4. How much attention did you pay to the gift advisor?

5. How much did you feel involved with the gift advisor?

6. How much did you feel as if the gift advisor was responding to you?

7. How much did you feel as if you and the gift advisor were communicating to each other?

Appendix F

User Engagement Scale

Please answer to what extent do you disagree or agree with the statements below:

1. I lost myself in this chatting experience.
2. I was so involved in my chatting experience that I lost track of time.
3. I blocked out things around me when I was chatting.
4. When I was chatting, I lost track of the world around me.
5. The time I spent chatting just slipped away.
6. I was absorbed in my chatting task.
7. During this chatting experience I let myself go.
8. I was really drawn into my chatting task.
9. I felt involved in my chatting task.
10. This chatting experience was fun.
11. I continued to chat out of curiosity.
12. The content of the chat platform incited my curiosity.
13. I felt interested in my chatting task.
14. Chatting on this chat platform was worthwhile.
15. I consider my chatting experience a success.
16. This chatting experience did not work out the way I had planned.
17. My chatting experience was rewarding.
18. I would recommend chatting with this gift advisor to my friends and family.
19. This chat platform is attractive.
20. This chat platform was aesthetically appealing.
21. I liked the graphics and images used in this chat platform.
22. This chat platform appealed to my visual senses.
23. The screen layout of this chat platform was visually pleasing.
24. I felt frustrated while chatting with this gift advisor.
25. I found this chat platform confusing to use.
26. I felt annoyed while chatting.
27. I felt discouraged while chatting.
28. Using this chat platform was mentally taxing.
29. This chatting experience was demanding.
30. I felt in control of my chatting experience.
31. I could not do some of the things I needed to do on this chat platform.