Persuasive agents

Unraveling the persuasive potential of conversational agents

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CHAPTER 3

Privacy concerns in chatbot interactions

Chatbots are increasingly used in a commercial context to make product- or service-related recommendations. By doing so, they collect personal information of the user, similar to other online services. While privacy concerns in an online (website-) context are widely studied, research in the context of chatbot-interaction is lacking. This study investigates the extent to which chatbots with human-like cues influence perceptions of anthropomorphism (i.e., attribution of human-like characteristics), privacy concerns, and consequently, information disclosure, attitudes, and recommendation adherence. Findings show that a human-like chatbot leads to more information disclosure, and recommendation adherence mediated by higher perceived anthropomorphism and subsequently, lower privacy concerns in comparison to a machine-like chatbot. This result does not hold in comparison to a website; human-like chatbot and website were perceived as equally high in anthropomorphism. The results show the importance of both mediating concepts regarding attitudinal and behavioral outcomes when interacting with chatbots.

Through advances in artificial intelligence and machine learning, conversational agents in the form of text-based chatbots become more and more important for companies and brands to make product-, or service-related recommendations (Følstad et al., 2018). Chatbots interact with their users through natural language, and can provide guidance in a conversational manner (Griol et al., 2013; Zarouali et al., 2018). The conversational interaction in combination with human-like cues are crucial characteristics of such chatbots. Because of these characteristics, users might be more likely to attribute human-like characteristics to them (i.e., perceive them as anthropomorphic; Epley et al., 2007; Kim & Sundar, 2012) . While this might lead users to appreciate the dialog and enjoy the interaction (Chung et al., 2020; Ischen et al., 2019), they also need to share personal information with the chatbot to receive a valuable recommendation. By doing so, the company that hosts the chatbot collects data of their users, who are possibly not aware of this data collection. In this regard, chatbots might also enhance privacy concerns users might have when interacting with digital technologies (Dinev & Hart, 2006). While we know from previous research that users are concerned about their online privacy when using websites (e.g., Boerman et al., 2018), also having downstream effects on e.g., self-disclosure (Bol et al., 2018), users' privacy concerns might differ for chatbots, especially when conveying a human-like appeal.

Therefore, this study investigates to what extent privacy concerns in chatbot interactions are related to users' attitudes and recommendation adherence, and furthermore, to what extent users feel comfortable sharing personal information with a human-like chatbot in comparison with a machine-like chatbot, or a website. The research question guiding this research is: To what extent do human-like characteristics of a chatbot influence perceived anthropomorphism, privacy concerns, and consequently, information disclosure, attitudes, and recommendation adherence?

Hereby, building on social response theory and previous research on informational privacy, this study aims to examine anthropomorphism and privacy concerns as sequential underlying mechanisms possibly explaining these outcomes. This study contributes to our understanding of chatbots in a digital communication environment in exploring how human-like attributes influence users' perceptions of the communication entity (chatbot and website) and their behavior when interacting with them. In examining the concept of privacy concerns, this study not only extends research in the field of human-machine-communication but has societal implications. While the protection of online privacy is widely discussed, the acceptance of chatbots and related implications for privacy still need to be studied. It plays an increasingly important role to uncover whether and, if so, how human-like cues influence privacy concerns, and how aware users are that their data is being used. This specific context

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has to be addressed by companies using this technology as well as by policy makers to protect users' privacy.

THEORETICAL BACKGROUND

Perceived anthropomorphism

Anthropomorphism is the attribution of human-like characteristics to non-human entities (Epley et al., 2007). This can be mindful, i.e., the conscious evaluation of humanness, as well as mindless, i.e., attributing human-like characteristics without realizing, such as being friendly or sociable (Kim & Sundar, 2012). Go and Sundar (Go & Sundar, 2019) differentiate three types of cues that can suggest humanness among chatbots (mindful as well as mindless). These are visual cues, such as the use of human-like figures; identity cues, such as human-associated names; and conversational cues, such as the mimicking of human language, i.e., acknowledging responses. The authors find effects of conversational cues on attitudes and behavioral intentions, and further, interaction effects for the three types of cues. A combination of the anthropomorphic cues as used in a human-like chatbot is expected to have the ability to influence mindless evaluations of humanness in particular, both in comparison to a machine-like chatbot without these anthropomorphic cues, and in comparison to a more traditional form of digital medium like an interactive website (Araujo, 2018). We do not expect differences between a machine-like chatbot and an interactive website. This is because both, website and machine-like chatbot include interactive elements (e.g., people must disclose some personal information by answering questions) that might create a similar perception of anthropomorphism (Ischen et al., 2019).

Subsequently, we examine three different outcomes. Firstly, level of comfort with information disclosure will be studied. Information disclosure in this context is the amount of true information customers reveal about themselves for a purchase decision online, e.g., providing personal details (Bol et al., 2018). Level of comfort with information disclosure refers to user perceptions, i.e., to what extent they feel like having disclosed private or intimate information about themselves. Secondly, we will study attitudes towards the entity giving the recommendation, in this case the chatbot/ website. The third outcome variable is recommendation adherence, i.e., the willingness to purchase the recommended product. We expect perceived anthropomorphism to positively influence all three outcome variables. In accordance with social response theory, stating that humans respond similarly to technology imbued with human-like characteristics as they respond to humans (Nass & Moon, 2000; Reeves & Nass, 1996),

Go and Sundar (Go & Sundar, 2019) showed that attitudes and behavioral intentions can be influenced by the social connectedness induced by anthropomorphism. Secondly, based on brand relationship theory, users and brands can engage in relationships similar to interpersonal relationships, leading to positive brand responses (Fournier, 1998; van Noort & Willemsen, 2012). Similarly, interacting with a human-like chatbot created by a company can mimic interpersonal communication, positively influencing information disclosure, attitudes, and recommendation adherence. Therefore, we propose the following hypothesis:

> **H1.** Receiving a product recommendation from a human-like chatbot leads to more (a) information disclosure, (b) positive attitudes towards the medium, and (c) recommendation adherence mediated by higher perceived anthropomorphism than receiving a product recommendation from a machine-like chatbot or an interactive website.

Privacy concerns

Privacy concerns in a marketing context can be defined as "the degree to which a consumer is worried about the potential invasion of the right to prevent the disclosure of personal information to others" (Baek & Morimoto, 2012; Westin, 1967). To make recommendations, online services collect personal information. Personal information can amongst others be collected by direct requests to disclose this information. These direct requests might induce privacy concerns (Wottrich et al., 2017). Previous research by Følstad et al. (2018) showed that customers have a concern for privacy and security when it comes to interactions with chatbots, i.e., they have a need to be provided with a secure online service. As the conversation with a chatbot is a rather new phenomenon, users might be more aware of these direct requests, inducing more privacy concerns. We expect privacy concerns to negatively influence information disclosure. While, as stated in the "privacy paradox", perceived privacy risks do not automatically translate into not disclosing information online (Barnes, 2006; Dienlin & Trepte, 2015), several scholars found privacy concerns and information disclosure to be related (Baruh et al., 2017). For example, Dinev and Hart (2006) found a negative relationship between privacy concerns and the willingness to provide personal information for internet-based transactions. Furthermore, privacy concerns are an important antecedent for the acceptance of mobile chatbots (van Eeuwen, 2017), and might thus be related to users' attitudes. Thirdly, users see privacy concerns as a reason to not shop online (Hassanein & Head, 2007). Hence, we expect privacy concerns to also influence recommendation adherence negatively. However, since we cannot formulate a direction of how human-like cues influence privacy concerns, we propose the following research question:

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RQ1. Does receiving a product recommendation from a human-like chatbot lead to more, or less (a) information disclosure, (b) positive attitudes towards the medium, and (c) recommendation adherence mediated by higher privacy concerns than receiving a product recommendation from a machine-like chatbot or an interactive website?

Sequential mediation of perceived anthropomorphism and privacy concerns

Lastly, we are interested in the relationship between perceived anthropomorphism and privacy concerns in a chatbot context. On the one hand, we argue that a chatbot that is perceived as highly anthropomorphic can enhance privacy concerns, when asking to disclose personal information. A human-like chatbot as a communication entity might be perceived as more personal and less anonymous, inducing more privacy concerns than a machine-like chatbot or a website (Guzman, 2019; Sundar & Nass, 2000). On the other hand, this feeling of communicating with an actual communication partner might also lead to less privacy concerns, because users might experience a closer connection to the human-like chatbot, increasing the willingness to use it as a companion (Birnbaum et al., 2016). Research in the health context showed that a chatbot was evaluated positively in comparison to e.g., search engines by adolescents, especially regarding more sensitive questions (Crutzen et al., 2011). Due to these contradictory findings, we propose a research question about the sequential mediating effects of perceived anthropomorphism and privacy concerns:

RQ2. Does receiving a product recommendation from a human-like chatbot lead to more, or less (a) information disclosure, (b) positive attitudes towards the medium, and (c) recommendation adherence sequentially mediated by perceived anthropomorphism and privacy concerns than receiving a product recommendation from a machine-like chatbot or an interactive website?

METHOD

Design and sample

An experimental between-subjects design with three conditions (type of entity: human-like chatbot vs. machine-like chatbot vs. website) was implemented. Recruited through the Dutch online panel PanelClix, 231 participants took part in the study. Participants' age ranged from 18 to 73 (M = 41.83, SD = 14.01), 48.5% were female (51.5% male); 51.6% indicated to have a high educational level (38.9% middle, 9.5% low).

Procedure

Randomly assigned to the groups, participants interacted with either the website ($n_{website}$ = 73), the machine-like ($n_{machine-like}$ = 85), or the human-like ($n_{human-like}$ = 73) chatbot to obtain a recommendation for the (fictitious) health insurance company "ZorgPlus" (engl. "CarePlus"). Several questions about demographics (i.e., age, gender, place of residence), preferences (i.e., current health insurance company, importance of customer service and travel behavior, budget), and two intrusive questions (i.e., legal residence in the Netherlands and number of sexual partners in the previous six-month) were asked, that participants could answer as they wish. Afterwards, participants filled in a questionnaire measuring the dependent variables, mediators, and control variables.

Stimuli

An interactive website was developed that gave a recommendation for a health insurance after participants filled in personal information.[1] Furthermore, two chatbots were created for this study using a conversational agent research toolkit for experimental research developed by Araujo (2019). The human-like version of the chatbot introduced itself with a name ("Sam"); displayed a visual of a cartoon-like customer service agent, similar to Verhagen et al. (2014); and used human conversational cues, i.e., acknowledged the responses of the participants (e.g., "gotcha", "I noted down your gender"). In the machine-like version, the chatbot did not carry a human-like name (it was called ChatbotX), similar to Araujo (2018); displayed a neutral visual of a dialog bubble, similar to Go and Sundar (2019); and only asked questions without acknowledging previous answers. An example of the human-like chatbot is given in Figure 1, and the full transcript of the interaction is provided in Appendix A.

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[1] Similar to (Ischen et al., 2019), conference presentation is available upon request to the first author.
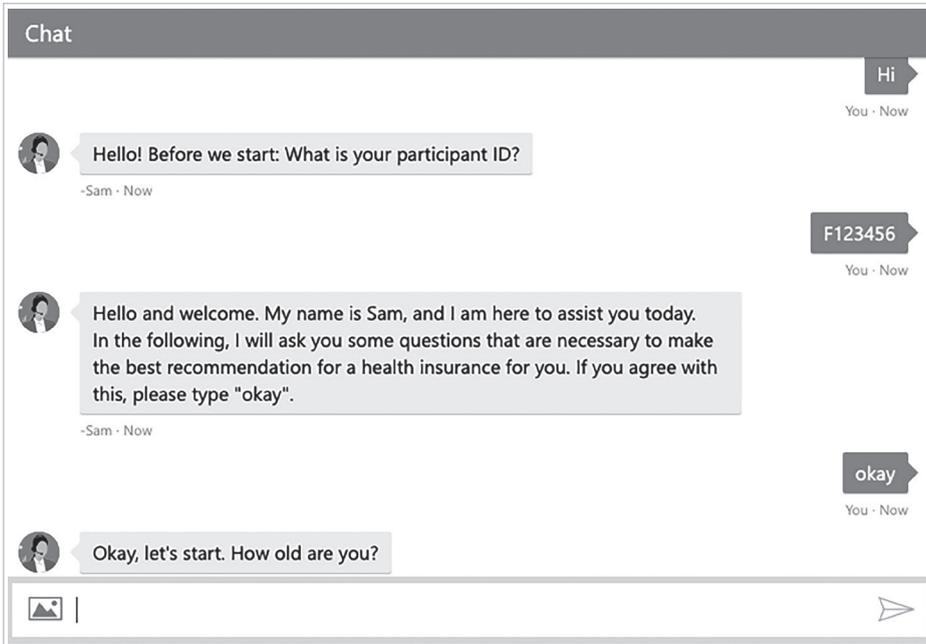
Figure 1. Stimulus Material Human-like Chatbot

Measurements

Mediators

We measured *mindless anthropomorphism* with four items on a 7-point-Likert-scale adapted from Kim and Sundar (2012), e.g., "I perceived the chatbot/website as sociable" (1 = strongly disagree, 7 = strongly agree). [2]*Privacy concerns* were measured with four items on a 7-point-Likert-scale including "It bothers me that this chatbot asks me for this much personal information" (1 = strongly disagree, 7 = strongly agree) adapted from Xu et al. (2008). While the original scale was developed to measure privacy concerns as a trait, we adapted the measurement to assess privacy concerns regarding the specific interaction participants engaged in.

Outcome variables

Level of comfort with information disclosure was measured with four items adapted from Croes and Antheunis (2019; Ledbetter, 2009), e.g. "I felt comfortable disclosing personal information during the interaction" (1 = strongly disagree, 7 = strongly agree).

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[2] Furthermore, we measured mindful anthropomorphism with three items on 7-point semantic differential scales (Powers & Kiesler, 2006). A univariate analysis of variance showed no significant main effect of type of entity on mindful anthropomorphism (F(2, 227) = 1.16, p = .314).

Attitude towards the chatbot/website was measured with items adapted from Becker-Olsen (2003). Five semantic differential scale items were used e.g., "I think the chatbot/website is good/bad". To measure *recommendation adherence,* we used four items on a 7-point-Likert-scale adapted from Dabholkar and Sheng (2012) including "Imagine you are considering a new health insurance: It is very likely that I would buy the recommended insurance" (1 = strongly disagree, 7 = strongly agree).

Control variables

Besides age, gender, and education, we measured familiarity (with the chatbot/website, and with health insurances) with two items on a 7-point-Likert-scale adapted from Zhou, Yang & Hui (2010). Furthermore, we measured power usage (Marathe et al., 2007), belief in machine heuristic (Sundar & Kim, 2019), and enjoyment (Hassanein & Head, 2007) as control variables. Scale reliabilities and mean values of the relevant scales are displayed in Table 1 and a list of all items is provided in Appendix B.

Randomization check

A randomization check showed that participants did not differ across groups in terms of *age, gender, education, power usage, enjoyment, belief in machine heuristic,* and *familiarity with health insurances.* Significant differences were found for *familiarity with the medium* ($F(2, 228) = 15.79$, $p < .001$). Participants were significantly less familiar with chatbots ($M_{machine-like} = 4.49$, $SD = 1.37$, $M_{human-like} = 4.36$, $SD = 1.40$) than with ($M_{websites} = 5.47$, $SD = 1.12$). Familiarity with the medium was included as a co-variate in the subsequent analyses.

Table 1 Scale Reliability

Scale	Cr. Alpha	M	SD
Mindless anthropomorphism	.91	4.55	1.21
Privacy Concerns	.91	4.20	1.28
Information Disclosure	.89	4.24	1.15
Attitudes	.92	4.45	1.20
Recommendation Adherence	.83	3.56	1.01
Familiarity Medium	.83	4.76	1.39

RESULTS

We performed serial multiple mediation analyses (model 6), using the PROCESS macro for IBM SPSS version 25 (Hayes, 2012). We used bootstrapping (5,000 bootstrap samples) to obtain bias-corrected 95% confidence intervals for the indirect effects of the independent variable *type of entity* on *information disclosure, attitudes,* and *recommendation adherence* through the mediators *mindless anthropomorphism* and *privacy concerns.* All paths for the full model are shown in Figure 2 and the corresponding coefficients are displayed in Tables 2-4. Separate path analyses were performed for the three dependent variables. The independent variable *type of entity* is multicategorical. We use the category *human-like chatbot* as the reference category, since we are primarily interested in the comparison human-like chatbot vs. machine-like chatbot, and human-like chatbot vs. website (Hayes & Preacher, 2014). Additionally, we also compared machine-like chatbot and website using the category *machine-like chatbot* as the reference category.

Information disclosure
Perceived anthropomorphism and information disclosure
Firstly, we compared human-like chatbot to machine-like chatbot. As shown in Table 2, there is a significant direct effect of type of entity on mindless anthropomorphism (path a1). The human-like chatbot is perceived as higher in anthropomorphism than the machine-like chatbot. The specific indirect effect of type of entity on information disclosure through mindless anthropomorphism is significant (effect = -.20, *SE* = .08, CI = -.37, -.06), indicating that the human-like chatbot is perceived as higher in anthropomorphism than the machine-like chatbot, leading to more information
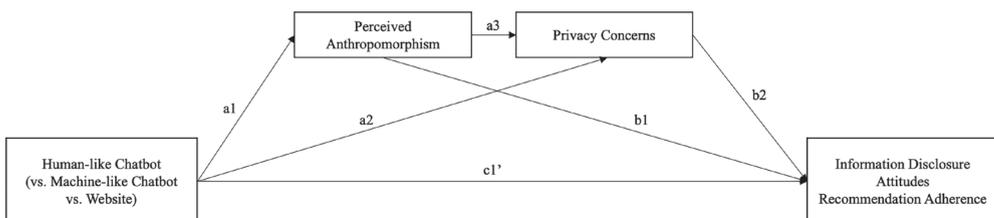

Figure 2. Serial mediation model

disclosure. Secondly, comparing the human-like chatbot and the website, no significant effect on perceived anthropomorphism (path a1) is found, both are equally high in anthropomorphism. The specific indirect effect of type of entity on information disclosure through mindless anthropomorphism is not significant (effect = -.12, *SE* = .07, CI = -.28, .01), indicating no mediating effect of anthropomorphism. Additionally, we also compared machine-like chatbot and website, showing no significant effect on perceived anthropomorphism. The specific indirect effect of type of entity on information disclosure through mindless anthropomorphism is not significant (effect = .08, *SE* = .07, CI = -.06, .22).

Privacy concerns and information disclosure
Firstly, we compared human-like chatbot to machine-like chatbot. There is no significant direct effect of type of entity on privacy concerns (path a2). The specific indirect effect on information disclosure through privacy concerns is not significant (effect = .07, *SE* = .07, CI = -.06, .21). Secondly, comparing the human-like chatbot and the website, no significant effect on privacy concerns (path a2) is found. The specific indirect effect on information disclosure through privacy concerns is also not significant (effect = .08, *SE* = .29, CI = -.29, .02). Thirdly, comparing machine-like chatbot and website, there is a significant direct effect on privacy concerns. Furthermore, the specific indirect effect of type of entity through privacy concerns is significant (effect = -.20, *SE* = .08, CI = -.36, -.06), indicating a mediating effect. The website induced higher privacy concerns than the machine-like chatbot, leading to less information disclosure.

Perceived anthropomorphism, privacy concerns, and information disclosure
Firstly, we tested a serial multiple mediation (including perceived anthropomorphism, and privacy concerns) comparing human-like chatbot and machine-like chatbot. The specific indirect effect of type of entity on information disclosure through both, mindless anthropomorphism and privacy concerns is significant (effect = -.04, *SE* = .02, CI = -.09, -.01). The human-like chatbot is perceived as higher in mindless anthropomorphism than the machine-like chatbot, leading to less privacy concerns, and consequently more information disclosure. Secondly, testing a serial multiple mediation comparing human-like chatbot and website, the specific indirect effect of type of entity on information disclosure through both, mindless anthropomorphism and privacy concerns is not significant (effect = -.03, *SE* = .02, CI = -.07, .001). Thirdly, testing a serial multiple mediation comparing machine-like chatbot and website, the specific indirect effect of type of entity on information disclosure through both,

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mindless anthropomorphism and privacy concerns is not significant (effect = .02, *SE* = .02, CI = -.01, .05).

Attitudes

Perceived anthropomorphism and attitudes

The same type of analysis was conducted for attitudes as the outcome variable, as shown in Table 3. Firstly, we compared human-like chatbot and machine-like chatbot. The specific indirect effect through mindless anthropomorphism is significant (effect = -.33, *SE* = .11, CI = -.56, -.11), indicating that the human-like chatbot is perceived as higher in anthropomorphism than the machine-like chatbot, leading to more positive attitudes. When comparing the human-like chatbot and the website, the specific indirect effect through mindless anthropomorphism is not significant (effect = -.20, *SE* = .11, CI = -.43, .01). Lastly, comparing machine-like chatbot and website, the specific indirect effect through mindless anthropomorphism is also not significant (effect = .13, *SE* = .12, CI = -.10, .36).

Privacy concerns and attitudes

When comparing human-like chatbot and machine-like chatbot, the specific indirect effect through privacy concerns is not significant (effect = .01, *SE* = .02, CI = -.01, .06). The same holds for the comparison human-like chatbot and website (effect = -.02, *SE* = .03, CI = -.09, .02); and machine-like chatbot and website (effect = -.04, *SE* = .03, CI = -.11, .02).

Table 2 Path coefficients sequential mediation explaining information disclosure

	Human-like chatbot vs. machine-like chatbot	Human-like chatbot vs. website	Machine-like chatbot vs. website
a1	-.51** (.18)	-.32 (.19)	.20 (.18)
a2	-.20 (.20)	.37 (.21)	.56* (.20)
a3	-.24** (.07)	-.24** (.07)	-.24** (.07)
b1	.39*** (.05)	.39*** (.05)	.39*** (.05)
b2	-.35***(.05)	-.35***(.05)	-.35***(.05)
c1'	-.10 (.13)	-.02 (.14)	.08 (.14)

Note. *p = .05. **p < .005. ***p < .001; controlled for familiarity with medium

Perceived anthropomorphism, privacy concerns, and attitudes

When testing a serial multiple mediation comparing human-like chatbot and machine-like chatbot, the specific indirect effect of type of entity on attitudes through both, mindless anthropomorphism and privacy concerns is not significant (effect = -.01, *SE* = .01, CI = -.03, .004). The same holds for the serial multiple mediation models comparing human-like chatbot and website (effect = -.01, *SE* = .01, CI = -.02, .003); and machine-like chatbot and website (effect = .003, *SE* = .004, CI = -.004, .03).

Recommendation adherence

Perceived anthropomorphism and recommendation adherence

We tested the models for recommendation adherence as the outcome variable, as shown in Table 4. Firstly, we compared human-like chatbot to machine-like chatbot. The specific indirect effect through mindless anthropomorphism is significant (effect = -.16, *SE* = .06, CI = -.29, -.05), indicating that the human-like chatbot is perceived as higher in anthropomorphism than the machine-like chatbot, leading to more recommendation adherence. When comparing the human-like chatbot and the website, the specific indirect effect through mindless anthropomorphism is not significant (effect = -.10, *SE* = .06, CI = -.22, .01). Lastly, comparing machine-like chatbot and website, the specific indirect effect through mindless anthropomorphism is not significant (effect = .06, *SE* = .06, CI = -.05, .19).

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Table 3 Path coefficients sequential mediation explaining attitudes

	Human-like vs. machine-like	Human-like vs. website	Machine-like vs. website
a1	-.51** (.18)	-.32 (.19)	.20 (.18)
a2	-.20 (.20)	.37 (.21)	.56* (.20)
a3	-.24** (.07)	-.24** (.07)	-.24** (.07)
b1	.64***(.05)	.64***(.05)	.64***(.05)
b2	-.07 (.05)	-.07 (.05)	-.07 (.05)
c1'	.15 (.14)	.10 (.15)	-.05 (.15)

Note. *p = .05. **p < .005. ***p < .001; controlled for familiarity with medium

Privacy concerns and recommendation adherence

When comparing human-like chatbot and machine-like chatbot, the specific indirect effect through privacy concerns is not significant (effect = .03, *SE* = .03, CI = -.02, .09). When comparing the human-like chatbot and the website, the specific indirect effect through privacy concerns is not significant (effect = -.05, *SE* = .04, CI = -.13, .01). Comparing the machine-like chatbot and the website, the specific indirect effect through privacy concerns is significant (effect = -.07, *SE* = .04, CI = -.17, -.004). The website induces higher privacy concerns than the machine-like chatbot, leading to less recommendation adherence.

Perceived anthropomorphism, privacy concerns, and recommendation adherence

When testing a serial multiple mediation comparing human-like chatbot and machine-like chatbot, the specific indirect effect of type of entity on information disclosure through both, mindless anthropomorphism and privacy concerns is significant (effect = -.02, *SE* = .01, CI = -.04, -.002). The human-like chatbot is perceived as higher in anthropomorphism than the machine-like chatbot, leading to less privacy concerns, and consequently more recommendation adherence. When testing the serial multiple mediation comparing the human-like chatbot and the website, the specific indirect effect of type of entity on information disclosure through both, mindless anthropomorphism and privacy concerns is not significant (effect = -.01, *SE* = .01, CI = -.03, .0008). The same holds for the comparison machine-like chatbot and website (effect = .01, *SE* = .01, CI = -.01, .02). A summary of the results is given in Table 5.

Table 4 Path coefficients sequential mediation explaining recommendation adherence

	Human-like vs. machine-like	Human-like vs. website	Machine-like vs. website
a1	-.51** (.18)	-.32 (.19)	.20 (.18)
a2	-.20 (.20)	.37 (.21)	.56* (.20)
a3	-.24** (.07)	-.24** (.07)	-.24** (.07)
b1	.32*** (.06)	.32*** (.06)	.32*** (.06)
b2	-.13** (.05)	-.13** (.05)	-.13** (.05)
c1'	.25 (.14)	.30 (.16)	.05 (.15)

Note. *p = .05. **p < .005. ***p < .001; controlled for familiarity with medium

Table 5 Summary of results

Hypothesis/RQ	Human-like vs. machine like chatbot	Human-like chatbot vs. website	Machine-like chatbot vs. website
H1: Human-like chatbot → perceived anthropomorphism → information disclosure/attitudes/ recommendation adherence	Supported. Human-like chatbot leads to more information disclosure, positive attitudes and recommendation adherence mediated by higher perceived anthropomorphism in comparison to machine-like chatbot.	Not supported. Differences in anthropomorphism between human-like chatbot and website not significant.	Differences in anthropomorphism between machine-like chatbot and website not significant.
RQ1: Human-like chatbot → privacy concerns → information disclosure/attitudes/recommendation adherence	Not supported. Differences in privacy concerns between human-like chatbot and machine-like chatbot not significant.	Not supported. Differences in privacy concerns between human-like chatbot and website not significant.	Website induced higher privacy concerns than machine-like chatbot, leading to less information disclosure, and less recommendation adherence. No mediating effect on attitudes.
RQ2: Human-like chatbot → perceived anthropomorphism → privacy concern → information disclosure/attitudes/recommendation adherence	Partially supported. Human-like chatbot leads to higher information disclosure, and recommendation adherence mediated by higher anthropomorphism and lower privacy concerns than machine-like chatbot. No mediating effect on attitudes.	Not supported, no sequential mediation.	No sequential mediation.

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DISCUSSION AND CONCLUSION

This study investigated the extent to which chatbots' human-like characteristics influence perceived anthropomorphism, users' privacy concerns, and consequently, information disclosure, attitudes, and recommendation adherence. Firstly, we showed that a chatbot using human-like cues leads to higher mindless anthropomorphism than a chatbot not using these cues. Thus, people indeed attribute human-like character- istics such as friendliness or socialness to a chatbot.

Interestingly, mindless anthropomorphism was at the same level for the human-like chatbot and for the website. This result is puzzling, because it shows that interactive websites are (equally) able to convey a human-like appeal. This is in line with previous research showing no differences in, or even higher perceptions of anthropomorphism for websites than for chatbots (Ischen et al., 2019; Whang, 2018). One possible explanation could be the source orientation. In the website condition, participants might have responded towards a source behind the website (company, programmer etc.), thus did not see the chatbot as an entity, but saw the "human behind", leading to higher perceived anthropomorphism. Another possible explanation is that users might change their "reference category" when interacting with a chatbot. While evaluating technology when comparing websites to one another, users might compare a chatbot with a human communication partner (including how a human would act), thus changing their expectations towards the chatbot. One important aspect might also be the familiarity with the medium. Users are more familiar with websites than with chatbots, which might have given them a sense of comfort already (Zajonc, 2001). In this study, we found a significant difference in mindless anthropomorphism between the machine-like chatbot and the website when *not* controlling for familiarity. Participants might have given lower scores for friendliness or socialness for the machine-like chatbot because they were less familiar with the medium.

Furthermore, this research shows that the outcomes information disclosure, and recommendation adherence are indeed influenced by privacy concerns, supporting previous findings (Hassanein & Head, 2007; van Eeuwen, 2017). The sequential mediation including perceived anthropomorphism and privacy concerns shows that a human-like chatbot in this study is higher in perceived anthropomorphism, leading to less privacy concerns and subsequently, more comfort with disclosure, and more recommendation adherence. Users might experience a closer bond with a human-like agent than with a machine-like agent (Birnbaum et al., 2016). This might be because a human-like chatbot acknowledges users' answers, e.g., the chatbot in this study indicated that it "noted the answer down". This might have been perceived as less

invading then just submitting it "somewhere" without knowing where the information ends up. No mediation was found for the comparison of human-like chatbot and website. These findings complement and extend a recent study (Sundar & Kim, 2019) showing that users were more likely to reveal information to a machine-like interface than to a sales associate. Based on a machine-heuristic, users perceive a machine-like source as less biased. While these findings are based on source characteristics, our study focuses on message characteristics. Future research should investigate the interplay of these two elements.

Additional analyses with a comparison of machine-like chatbot and website showed no influence of perceived anthropomorphism, but a direct effect on privacy concerns (while this direct effect is not significant for the other comparisons). This shows that a website is significantly higher in privacy concerns than a machine-like chatbot and that privacy concerns directly mediate information disclosure, attitudes, and recommendation adherence. Further research should thus investigate different underlying mechanisms apart from anthropomorphism.

Concluding, this study enriches our understanding of privacy concerns in a chatbot context in showing the sequential influence of perceived anthropomorphism and privacy concerns on users' behavioral intentions.

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APPENDIX A

Table A1 Transcript of the interaction

Chatbot Human-Like	Chatbot Machine-Like	Website
Hello! Before we start: What is your participant ID?	What is your participant ID?	Hello and welcome. This health insurance service is here to assist you today. In the following you will be asked some questions that are necessary to make the best recommendation for a health insurance for you.
Hello and welcome. My name is Sam, and I am here to assist you today. In the following, I will ask you some questions that are necessary to make the best recommendation for a health insurance for you. If you agree with this, please type "okay".	Hello and welcome. This health insurance chatbot service is here to assist you today. In the following you will be asked some questions that are necessary to make the best recommendation for a health insurance for you. If you agree with this, please type "okay".	What is your participant ID?
Okay, let's start. How old are you?	How old are you?	How old are you?
Thanks for telling me you age. What is your gender?	What is your gender?	What is your gender?
Gotcha! Could you provide me with the first four digits of your postcode?	What are the first four digits of your postcode?	What are the first four digits of your postcode?
Thanks, I noted down your postcode. Are you a legal resident in the Netherlands?	Are you a legal resident in the Netherlands?	Are you a legal resident in the Netherlands?
Thank you for providing this information. Now we move on to some other questions. Could you please tell me the name of your current health insurance company?	What is the name of your current health insurance company?	What is the name of your current health insurance company?
Great, thanks for letting me know! Now I would like to ask you some questions about your preferences. How important is customer service to you? Is it very important or not so important?	How important is customer service to you? Is it very important or not so important?	How important is customer service to you? Is it very important or not so important?

Great, thanks for letting me know! Now I would like to ask you some questions about your preferences. How important is customer service to you? Is it very important or not so important?

I see. Do you travel abroad a lot?

Thanks for your answer, I noted it down. To get an understanding of whether you belong to a special risk group, I would like to know whether you had multiple sexual partners in the last six months?

Thanks for answering this personal question. Lastly, I would like to know the budget you are willing to pay for your health insurance. Is it (1) less than 100 Euro, (2) between 100 and 300 Euro, or (3) more than 300 Euro per month?

Thanks for providing your personal details and your preferences. I will now calculate the best choice for you. This will take a few seconds. If you agree with this, please type "okay".

I have calculated the best choice for you and recommend having a look at the insurances of ZorgPlus. This company might be ideal for your demographic and fits your needs and preferences best.

Thanks for your time and goodbye! To continue, you will need a conversation code, this code is |CONVERSATIONCODE|.

How important is customer service to you? Is it very important or not so important?

Do you travel abroad a lot?

We would like to get an understanding of whether you belong to a special risk group. Did you have multiple sexual partners in the last six months?

What is the budget you are willing to pay for your health insurance? Is it (1) less than 100 Euro, (2) between 100 and 300 Euro, or (3) more than 300 Euro per month?

Thanks for providing your personal details and your preferences. The best choice for you will now be calculated. This will take a few seconds. If you agree with this, please type "okay".

The best choice for you is now calculated. It is recommended having a look at the insurances of ZorgPlus. This company might be ideal for your demographic and fits your needs and preferences best.

Thanks for your time and goodbye! To continue, you will need a conversation code, this code is |CONVERSATIONCODE|.

How important is customer service to you? Is it very important or not so important?

Do you travel abroad a lot?

We would like to get an understanding of whether you belong to a special risk group. Did you have multiple sexual partners in the last six months?

What is the budget you are willing to pay for your health insurance? Is it (1) less than 100 Euro, (2) between 100 and 300 Euro or (3) more than 300 Euro per month?

Thanks for providing your personal details and your preferences. The best choice for you will now be calculated.

The best choice for you is now calculated. It is recommended having a look at the insurances of ZorgPlus. This company might be ideal for your demographic and fits your needs and preferences best.

Thanks for your time and goodbye! To continue, you will need a conversation code, this code is |CONVERSATIONCODE|. Please don't forget to click on submit.

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APPENDIX B

Table B1 Measurements

Familiarity with chatbots/websites	1. Interacting with a chatbot/website is very familiar to me. 2. I am very knowledgeable about interacting with a chatbot/website
Familiarity with health insurances	1. Health insurances are very familiar to me. 2. I am very knowledgeable about health insurances.
Mindless anthropomorphism	I perceived the chatbot/website as… 1. Likeable 2. Sociable 3. Friendly 4. Personal
Privacy concerns	1. It bothers me that this chatbot/website asks me for this much personal information. 2. I am concerned that this chatbot/website is collecting too much personal information about me. 3. I am concerned that this chatbot/website may keep my personal information in a non-accurate manner. 4. I am concerned about submitting information to this chatbot/website.
Level of comfort with information disclosure	1. I felt like I could be personal during the interaction. 2. I felt comfortable disclosing personal information during the interaction. 3. It was easy to disclose personal information in the interaction. 4. I felt like I could be open during the interaction.
Attitudes towards chatbot/website	I think the chatbot/website is… 1. Bad – good 2. Unfavourable – favourable 3. Unsatisfactory – satisfactory 4. Positive – negative 5. Liked - disliked
Recommendation adherence	1. I would purchase the recommended insurance. 2. I don't think I would ever buy this insurance. 3. I would definitely follow the recommendation in the near future. 4. It is very likely that I would buy the recommended insurance.