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ARE YOU FEELING HAPPY? THE EFFECT OF EMOTIONS ON PEOPLE'S INTERACTION EXPERIENCE TOWARD EMPATHETIC CHATBOTS

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ABSTRACT

People may experience emotions before interacting with automated agents to seek information and support. However, existing literature has not well examined how human emotional states affect their interaction experience with agents or how automated agents should react to emotions. This study proposes to test how participants perceive an empathetic agent (chatbot) vs. a non-empathetic one under various emotional states (i.e., positive, neutral, negative) when the chatbot mediates the initial screening process for student advising. Participants are prompted to recall a previous emotional experience and have text-based conversations with the chatbot. The study confirms the importance of presenting empathetic cues in the design of automated agents to support human-agent collaboration. Participants who recall a positive experience are more sensitive to the chatbot's empathetic behavior. The empathetic behavior of the chatbot improves participants' satisfaction and makes those who recall a neutral experience feel more positive during the interaction. The results reveal that participants' emotional states are likely to influence their tendency to self-disclose, interaction experience, and perception of the chatbot's empathetic behavior. The study also highlights the increasing need for emotional acknowledgment of people who experience positive emotions so that design efforts need to be designated according to people's dynamic emotional states.

Keywords: emotion, affect, empathy, human-computer interaction, automated agent, design for automation

1. INTRODUCTION

In the era of pandemics, many essential activities have been brought online, including working, learning, and gathering. Due to advancements of artificial intelligence, conversational agents, or chatbots, have been broadly used in the virtual environment to support human activities [1–4]. Chatbots simulate natural human conversations and give instant pre-set feedback. Chatbots are utilized in the workplace to assist team collaboration [5], to

improve workers' quality of life and work productivity [4], and to reduce caregivers' workloads in clinical practice [6]. Similar to interpersonal interaction, a trustworthy relationship between humans and intelligent agents lays a foundation for user reliance on agents and collaborative decision-making by the human-agent teams [7,8].

When exploring the human-agent relationship, the Computers Are Social Actors (CASA) paradigm indicates that people may apply the social norms of human relationships when interacting with automated agents [9,10]. Research has been focusing on designing automated agents to comply with social rules and to understand people thereafter. Understanding another individual involves understanding what it feels like to be that person – in short, it entails empathy. Design for empathy has received much attention from the engineering design community and has recently been valorized in the field of Human-Computer Interaction (HCI). To enhance user experience when interacting with automated agents, researchers examine different design strategies and find anthropomorphism as one of the effective approaches [11,12]. Engineering designers implement anthropomorphism by embedding inanimate products with human-like features, for example, facial expression, voice tone, and personality [13].

While chatbots, or other automated technologies, are designed to be more understanding or empathetic, the existing literature lacks deep knowledge of how human emotional states affect their interaction experience with agents that present social behavior. Users may experience emotions before interacting with automated agents to seek for information and support. The emotional states could alter users' psychological capacity and their ability to identify with the feelings of another. Therefore, participants of different emotional states potentially recognize and perceive chatbots' empathetic behavior in different ways [8].

In this paper, we investigate if emotional states of participants influence their perception of chatbot's empathetic behavior. We adopt a biographic memory task to manipulate participants' affect prior to the interaction and test to see if affect

can influence their perception of the chatbot and consequently, self-disclosure and satisfaction of the human-chatbot interaction.

This paper is organized as follows: Section 2 provides a review of the influence of affect, empathy and disclosure in design-related or chatbot-related fields. Section 3 lists our proposition and hypotheses. Section 4 describes the experiment method, and how we prepared the experiment. Data and analysis are in Section 5, and discussion of the results in Section 6. Finally, Section 7 includes the conclusion and plan of future work.

2. BACKGROUND

2.1 Affect

Affect prescribes an individual's subjective feelings in a given context [14]. Humans constantly experience affects in everyday life. Research has shown that affects can significantly impact human cognitive processes and particularly how people process information in a social context [15,16]. For example, individuals are more likely to attend to affect-congruent concepts [17–19]. Therefore, the affective state that people experience influence how they interact with others through activities such as socialization and prosocial behavior [20,21].

Affect, or emotion, is an essential component in engineering design. Layered emotional profiles evoked by products can elicit “wow-experience” [22] and drive product adoption, retention, and continued use [23–25]. Beyond influencing user behavior, emotions facilitate design activities – exposure to positive affect can help designers generate more design ideas [26].

Despite the significance of affect in shaping social interactions, design research on automated social agents has not paid much attention to its effect. Research shows the influence of emotional states on user trust formation towards an automated voice agent [8], whereas an in-depth exploration of agent behavior and its interaction with affect is needed.

2.2 Empathy in Design

Empathy refers to “reactions of one individual to the observed experiences of another” [27,28]. It plays a critical interpersonal and societal role, enabling sharing of experiences, needs, and desires between individuals and promoting prosocial behavior [28,29]. Over the past decades, researchers from various fields found empathy to be related to improved patient satisfaction in healthcare [29,30], responsible leadership [31, 32], and high-quality customer service [33,34].

Empathy has been well examined by the design community [27,35,36]. Empathy is shown to help designers better contextualize a design problem [27,37], understand the needs of users from different backgrounds [38], and perform individual and team design ideation [37].

Similarly, in HCI research, Wright and McCarthy identify empathy as an emerging trend involving attempts to more deeply understand and interpret user experiences [39]. They review a variety of empathy-building activities and consider empathy a commitment to forming relationships and accountabilities beyond understanding. While empathy is needed when going from designing for practical functions to designing for personal

experiences in private contexts, researchers propose the design strategy of “being with” rather than “being like” other social actors in interaction [40,41]. The goal of mutual sensemaking, first-person narratives, and shared accountability highlights the opportunities of dynamic interaction design based on users' current states and missions.

2.3 Self-Disclosure

Self-disclosure is a process in which people let others know about themselves, which typically involves sharing information about oneself [42]. Self-disclosure is the starting point for individuals to build mutual understandings, and thus is fundamental for relationship development in both online and offline contexts [43,44].

Studies have found that self-disclosure significantly impacts workplace relations [45], relational intimacy on social media [44], and the success of romantic relationships in online dating [46]. Since self-disclosure entails sharing of private information and feelings, it indicates one's willingness to trust and be understood by the other party [47,48] as well as the intention to build a deeper relationship. Because self-disclosure can enhance social relationships and social support, it is repeatedly shown to be positively associated with lower anxiety levels and better mental health [49–51].

Self-disclosure of emotions to a chatbot can generate positive influence on people's psychological states in a way similar to interacting with a human counterpart [52,53]. Given the significance of self-disclosure, it is important to promote the behavior when designing automated agents to offer social and psychological support for people. In the design community, studies have shown that self-disclosure of chatbots can improve humans' disclosure of their feelings as a result of reciprocity, which in turn increases people's trust in the chatbot and enjoyment of the interaction [1,54,55]. Nevertheless, much remains unknown about how other features of the automated agents can influence human self-disclosure. The current study thus fills the gap by investigating how empathetic chatbots may influence human self-disclosure and, more importantly, whether this effect is contingent on human affect.

3. PROPOSITION AND HYPOTHESIS

Showing empathy promotes interpersonal connections and potentially, the interaction between users and chatbots. We hypothesize that the empathetic behavior of chatbots can increase users' self-disclosure and satisfaction with the chatbot.

Affect has the potential to change people's subconscious attitudes and their attitudes may influence their perception of the social cues. We hypothesize that people experiencing a positive affect during interaction will exhibit a more positive attitude towards the agent and accordingly higher self-disclosure and satisfaction level compared to the ones who are neutral (control) or negative in affect.

In addition, we investigate if human affect and chatbot's empathy have an interaction effect on users' perception, self-disclosure, and satisfaction towards the chatbot.

H1: Interactions with a chatbot that provides empathetic responses result in higher levels of participants' (a) self-

disclosure and (b) satisfaction, compared to a non-empathetic chatbot.

H2: Participants who experience more positive emotions will display higher levels of (a) self-disclosure and (b) satisfaction, compared to participants who are less positive.

H3: Participants who experience more positive emotions and interact with an empathetic chatbot result will display higher levels of (a) self-disclosure and (b) satisfaction, compared to those who are less positive and interact with a non-empathetic chatbot.

4. EXPERIMENT DESIGN

4.1 Experiment Procedure



FIGURE 1: EXPERIMENT PROCEDURE

The experiment consists of four steps (Figure 1). At the beginning of the experiment, participants filled out a survey about their initial attitudes towards automated systems in general. Then, participants were introduced to the purpose of the study and prompted to share their experience by the following statement:

“We’re collecting data from students to help redesign the student advising and improve students’ experience. To begin with, we’d like to hear about your recent experience in this semester.”

As the affect manipulation, participants were randomly assigned to one of the three affect conditions (i.e., positive, neutral, or negative) to describe the best thing, the chore, or the worst thing that happened to them this past week. Right after the self-reflection, participants were asked to rate their feeling of recalling the experience on a 9-point scale.

Then, participants were introduced to the chatbot and randomly assigned to interact with either the empathetic or non-empathetic chatbot. The chatbot greeted the participants and asked about their year in school, academic program, and general experience. Participants inputted their responses using free text. During the interaction, the empathetic chatbot acknowledged participants’ feelings when emotions were expressed in the conversation. The non-empathetic chatbot delivered neutral responses such as “Thank you for answering” regardless of the expressions. The interaction ended when participants answered all the pre-determined questions.

When participants finished interaction, they were prompted to rate their feeling again and to fill out a post-interaction survey about their attitude towards the chatbot that they interacted with.

4.2 Affect Manipulation

The manipulation followed the method developed by Emich et al. based on a well-validated biographic memory task [56,57]. Participants were randomly assigned to the positive, neutral (control), or negative affect manipulation. Participants being assigned to the positive affect manipulation were asked to

“describe the best thing that happened to you this past week in a few sentences below.” The positive manipulation encouraged participants to recall more activated, promotion-focused positive emotions. Participants receiving the negative affect manipulation were asked to “describe the worst thing that happened to you this past week in a few sentences below.” This negative manipulation activated prevention-focused negative emotions such as stress and anxiety. Finally, participants completing the neutral affect manipulation (control) were asked to “describe the last chore you did (e.g., dishes, vacuuming) in a few sentences below.” This control activity has been shown to induce neutral affect by slightly dampening people’s normally positive state to a neutral level [56]. Studies have repeatedly shown that people’s affective states and behavior are significantly and consistently influenced after the manipulation [56,57].

4.3 Human-Chatbot Interaction

The interaction between participants and the chatbot was administered through an online customer service platform. The chatbot interface mimics messaging threads on mobile phones (Figure 2). The chatbot behavior was mimicked using a wizard-of-oz method and following a pre-determined script to control the experiment. The chatbot first introduced itself with a gender-neutral name, Alex, and the purpose of interaction. Then, it asked how participants would like to be addressed, as well as their school year, program, and courses being taken for the semester (Figure 2). After participants got familiar with the chatbot, the chatbot started to ask about their recent academic experience. The chatbot also probed the participants to provide more details if participants’ answers were brief as shown on the right in Figure 2. The number of probes was limited to two to ensure that participants had the same number of opportunities to share the detail of their experience across conditions.

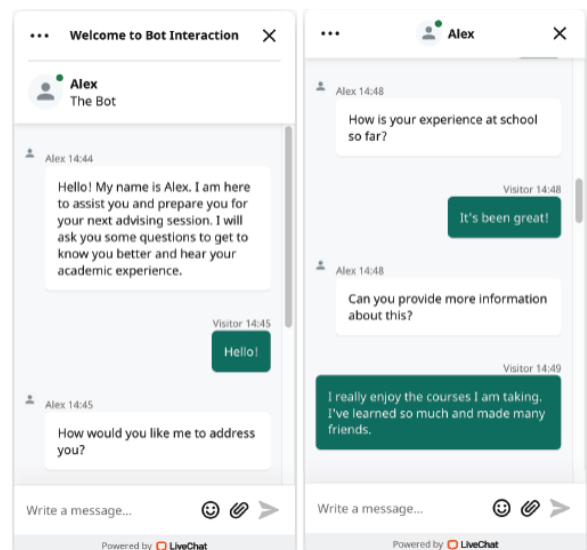


FIGURE 2: CHATBOT INTERFACE FOR GREETING (LEFT) AND ASKING ABOUT RECENT EXPERIENCE (RIGHT)

When participants expressed emotions, the empathetic chatbot acknowledged the emotions and delivered empathetic

feedback. For example, the empathetic chatbot sent well-validated empathetic statements such as “I am glad to hear that” when recognizing positive experiences and “I am sorry to hear that” for negative experiences [5]. In contrast, the non-empathetic chatbot delivered non-emotional responses including “got it” and “thanks for answering” (Figure 3). The probing questions, feedback and concluding statements are shown in Table 1. Since it is a wizard-of-oz experiment, the authors sensed and justified the emotions expressed by the participants, according to the existing dictionaries of emotional words.

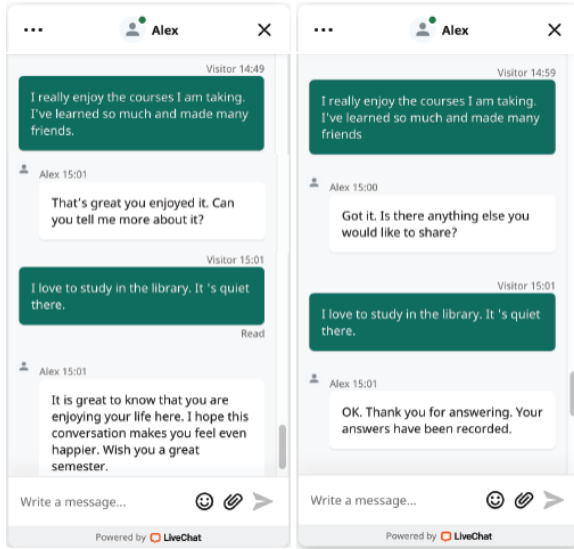


FIGURE 3: COMPARISON OF EMPATHETIC CHATBOT (LEFT) AND NON-EMPATHETIC CHATBOT (RIGHT)

4.4 Measuring Metrics

We recorded both participants’ textual input and self-reported affect and attitudes. The initial attitude toward automated products was measured via a multiple-item survey at the beginning of the study. Before the interaction, participants’ written reflections of experience (i.e., the affect manipulation) and their affective state right after the manipulation were

recorded. A 9-point scale for measuring emotional state was adopted from the original study, with 1 for “sad”, 5 for “neutral” and 9 for “happy” [56,57]. During the interaction, textual conversations between the participants and the chatbot were recorded to assess participants’ level of self-disclosure and affect. Particularly, the number of words written by the participants was chosen as the metric to assess *self-disclosure*, assuming that participants who were willing to self-disclose would share more information about themselves to the chatbot. Interaction duration was not presented because the number of words was considered a more accurate measure for the hypotheses at hand.

After the interaction, participants were surveyed about their perceived emotional acknowledgment, empathy, effort, helpfulness, liking, and satisfaction of the chatbot using the established metrics [58]–[60]. These metrics were applied because prior research suggests that empathetic expressions may increase interpersonal liking and satisfaction as people perceive the empathetic party to have invested effort in acknowledging their emotions [58]. Each metric was measured by a multiple-item survey. For each survey question, participants rated how much they agreed with the corresponding statement, e.g., “when the chatbot notices my emotions, it will bring it up”. The questions use a five-point scale, with 1 for “strongly disagree” and 5 for “strongly agree”. The complete scales used in the study can be found in the Appendix. They also reported their demographic information.

5. RESULTS AND ANALYSIS

Thirty-three students from a small private US university participated in the study. A lottery was drawn every ten participants and the lottery winners were awarded 15 U.S. dollars each. The experiment was administered fully online. Five participants did not finish the experiment. Two participants who spent more than twice of average duration (38 mins) were also excluded for analysis. In total, 26 valid samples were analyzed in the study. Thirteen participants were male, 12 are female, and 1 self-reported to be non-binary. The number of participants in each condition is shown in Table 2.

TABLE 1: PROBING QUESTION, FEEDBACK RESPONSE, AND CONCLUDING STATEMENT OF CHATBOT

	Empathetic chatbot		Non-empathetic chatbot
	Positive emotions detected	Negative emotions detected	
Probing for details	I am listening. Can you tell me more about it?		Could you provide more information about this?
Feedback (One of the options)	- I am glad to hear that. - That sounds exciting. - That’s great you enjoyed it.	- I hear you. - I am sorry to hear that. - That must be a difficult time. - I hope it gets better.	- Thank you for sharing. - Got it.
Probing for more experience	Is there any other experience you would like to share with me? I am here for you.		Is there anything else you would like to share?
Concluding	It is great to know that you are enjoying your life here. I hope this conversation makes you feel even happier. Wish you a great semester.	I share your feelings. I hope this conversation makes you feel better. Wish you a great semester.	OK. Thank you for answering. Your answers have been recorded.

TABLE 2: NUMBER OF PARTICIPANTS IN EACH CONDITION

	Positive	Neutral	Negative	Total
Empathetic	4	5	6	15
Non-Emp.	4	4	3	11
Total	8	9	9	26

5.1 Summary of Metrics

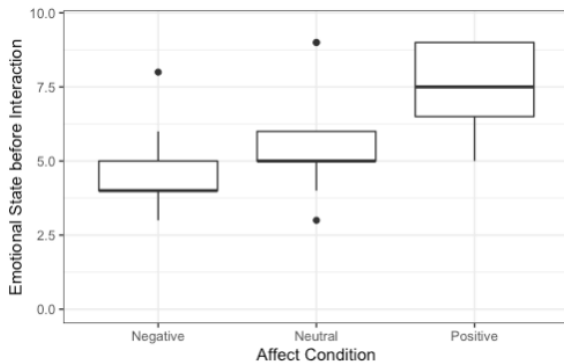
The initial attitude towards the automated systems is tested to be homogenous across groups (Sum of square = 0.60, $p = 0.44$). Each of the perceived emotional acknowledgment, empathy, effort, helpfulness, likeliness, and satisfaction of the chatbot was measured by a multiple-item questionnaire on a five-point scale. To prepare for the analysis, the metrics were tested for reliability using Cronbach's alpha. Due to the high reliability ($\alpha > 0.85$) shown in Table 3, the scores of multiple-item questionnaires for each metric are aggregated into mean values of each participant.

TABLE 3: SUMMARY STATISTICS OF METRICS

	Emotional acknowledgment	Empathy	Effort
α	0.89	0.93	0.95
M	3.34	3.81	3.92
SD	0.88	1.01	0.98
	Helpfulness	Liking	Satisfaction
α	0.94	0.95	0.91
M	3.50	3.48	3.44
SD	0.87	1.14	1.14

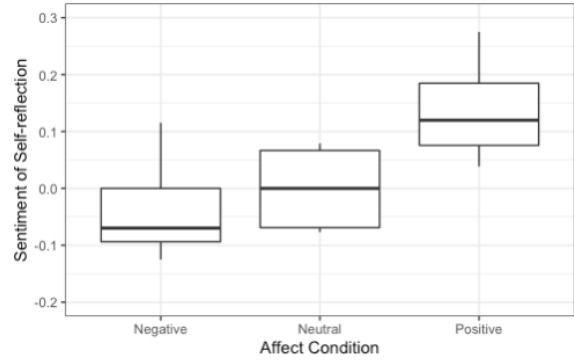
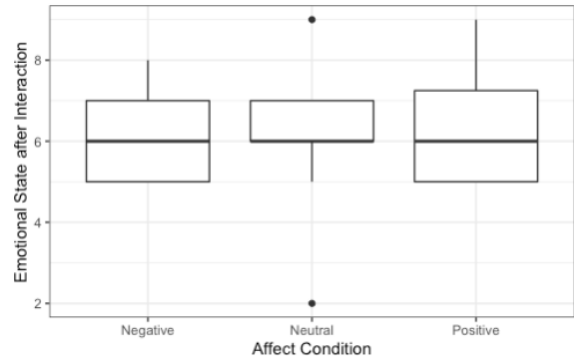
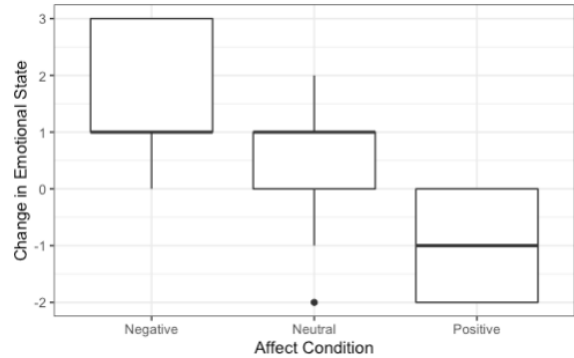
5.2 Effect of Affect Manipulation

The effect of the affect manipulation (positive = 1, neutral = 0, negative = -1) is tested using the generalized linear regression model. The manipulation shows a significant effect (coeff. = 1.29, $p = 0.00^*$) on the self-reported emotional states prior to interaction as shown in Figure 4.

**FIGURE 4: EMOTIONAL STATE BEFORE INTERACTION**

We also used the SentimentAnalysis library in R [61] to assess the sentiment on the written input during the affect manipulation when participants self-reflect on their best thing, chore, or worst thing of the past week. The sentiment was assessed on a scale from -1 to 1. The prime has a significant effect on sentiments of self-reflection (coeff. = 0.08, $p = 0.00^*$)

as shown in Figure 5. The results demonstrate the effectiveness of the affect manipulation.

**FIGURE 5: SENTIMENT OF SELF-REFLECTION DURING MANIPULATION****FIGURE 6: EMOTIONAL STATE AFTER INTERACTION****FIGURE 7: CHANGE IN EMOTIONAL STATE BEFORE AND AFTER INTERACTION**

The result shows no statistical difference in participants' self-reported emotional states after interacting with the chatbot (Figure 6). Yet, accounting for the significant difference in prior-interaction emotional states, affect has a significant effect on the change in emotional states prior and post the interaction (coeff. = -1.21, $p = 0.00^*$) shown in Figure 7. Particularly, the participants completing the positive affect manipulation and showing more positive emotions prior to the interaction become less positive after the interaction. In contrast, emotional states of the participants being negatively manipulated shift in the positive

direction. This result suggests that the effect of chatbot interaction on human affect may depend on people's emotional state prior to the interaction, which is, the more negative the mood people experience, the more positive the impact of interacting with a chatbot on their emotion.

5.3 Effect of Chatbot's Empathetic Behavior

The effect of chatbot's empathetic behavior is tested to have a significant main effect on the perceived emotional acknowledgment (coef. = 0.82, $p = 0.02^*$) and a marginal effect on the perceived empathy (coef. = 0.80, $p = 0.06$). Moreover, there is an interaction effect of the affect manipulation and chatbot empathy.

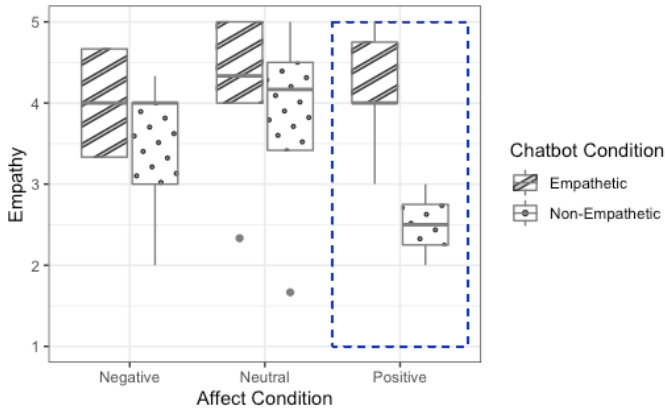


FIGURE 8: PERCEIVED EMPATHY OF CHATBOT

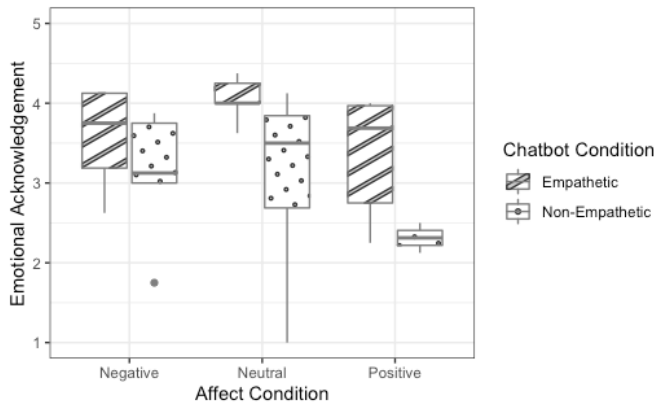


FIGURE 9: PERCEIVED EMPATHY OF CHATBOT

As highlighted in Figure 8, interacting with the empathetic chatbot has a significant effect on the perceived empathy (coef. = 0.38, $p = 0.00^*$) for participants in the positive affect condition. Among the participants completing the positive affect manipulation, those interacting with a non-empathetic chatbot rate the chatbot to be less empathetic compared to those interacting with an empathetic chatbot. This difference is not significant for the neutral and negative affect conditions. A similar pattern is observed for the emotional acknowledgment (Figure 9), but the effect is not significant. This suggests that people who experience positive emotions are more sensitive to

the social cues of chatbots and may have a higher expectation for chatbots' empathetic behavior.

5.4 Chatbot Interaction Process

Chatbot empathy has no significant effect on participants' self-disclosure, or the number of words written by the participants during the interaction. Yet participants' self-reported higher satisfaction towards the empathetic chatbot (coef. = 1.00, $p = 0.03^*$) shown in Figure 10. Participants in the empathetic chatbot condition were more satisfied ($M = 3.80$, $SD = 0.96$) than those in the non-empathetic condition ($M = 2.94$, $SD = 1.23$). The chatbot condition also has a marginal effect on perceived helpfulness (coef. = 0.64, $p = 0.08$), but no effect on effort or liking. Therefore, H1a is rejected and H1b is supported.

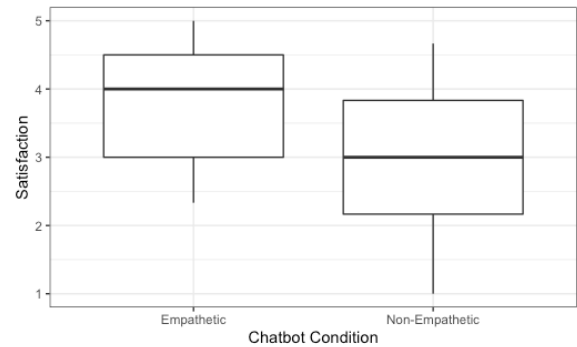


FIGURE 10: SATISFACTION OF CHATBOT

Accounting for the potential change in affect during the interaction shown in Section 5.2, the sentiments of participants' textual input are analyzed using Linguistic Inquiry and Word Count (LIWC) and Natural Language Processing with Python (NLTK) toolkits to accurately measure participants' emotional states *during* the interaction [62,63]. The sentiment was assessed on a scale from -1 to 1. There is no significant main effect of the affect manipulation or chatbot conditions on participants' sentiments during the interaction. Yet, interacting with an empathetic chatbot has a significant effect on participants' sentiments in the neutral condition (coef. = 0.07, $p = 0.01^*$), shown in Figure 11.

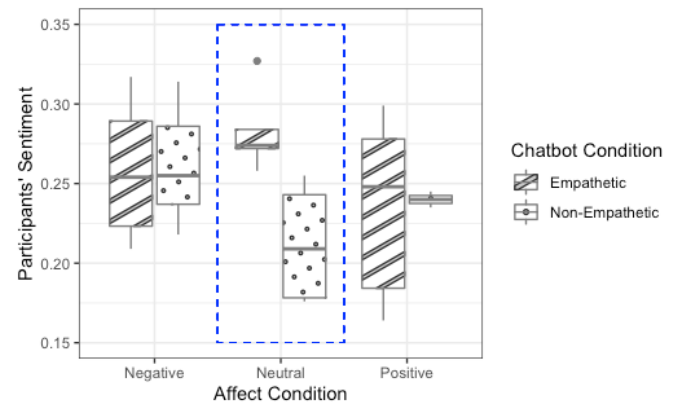


FIGURE 11: PARTICIPANTS' SENTIMENT DURING INTERACTION

This shows that if participants enter the chatbot interaction without experiencing a positive or negative affect, the effect of the chatbot's behavior is more salient on changing participants' emotions. Participants with neutral emotions prior to the chatbot interaction are more likely to experience positive emotions when the chatbot is empathetic ($M = 0.28$, $SD = 0.03$) versus when it is not ($M = 0.21$, $SD = 0.04$). This finding suggests that people's emotional states are less likely to be altered by the chatbot's empathetic behavior during the interaction if they experience emotions, regardless of the valence of the emotion. The empathetic cues sent by the chatbot are only more likely to impact people's emotions if the participants are not experiencing any emotions.

Participants' emotional states during the interaction have a marginally significant effect on self-disclosure (coef. = 8.46, $p = 0.08$), as well as the self-reported satisfaction (coef. = 439.17, $p = 0.09$). Thus, H2 are marginally supported.

The interaction between the chatbot empathetic condition and participants' emotional states is tested to have no significant main effect on self-disclosure or satisfaction using a generalized regression model. So H3 is rejected.

6. Discussion

The current study examines how people's affective state and chatbot's empathetic behavior together shape their interaction experience with and attitudes toward chatbots. Whereas the design community has started to advocate for empathetic agents, it remains unclear how empathetic behavior by automated agents may interact with people's affective state to impact their interaction experience, and perception of the agents. We argue this is a critical limitation in existing research because when more automated agents are designed to provide social and emotional support [12,64], it is unrealistic to assume that people never experience any emotions prior to the interaction.

The results of our study offer empirical support for our proposition by showing that participants' affect, which was effectively manipulated, are carried over into their interaction with the chatbot and moderate the impact of the chatbot's behavior on participants' experience and attitudes. To begin with, participants' affective states influence how they feel about their interaction with the chatbot in general. Regardless of whether the chatbot is empathetic or not, people's emotional state is changed by the chatbot interaction in a linear pattern – the more positive the person is prior to their interaction with the chatbot, the more likely their affect is going to go towards the negative direction. Yet people who experience negative emotions before they are interacting with a chatbot are likely to feel brighter after the interaction. This finding suggests that chatbot may be an effective tool for emotional support when people are in a negative affective state. However, it may not make people feel better if they are already feeling good. The finding aligns with the observation of chatbot usage in customer service.

People's emotional state may also alter how they respond to chatbot's empathetic behavior. In particular, a positive affect prior to the chatbot interaction seems to make people more

sensitive to the empathetic cues sent by the chatbot, compared to other affective states. This effect may be related to the result described in the previous paragraph: since people who are positive in affect are more sensitive to chatbot's empathetic behavior, they may have higher expectations of what the chatbot can satisfy them emotionally. If the chatbot cannot meet this expectation, they may feel disappointed as a result. In contrast, people who are in a negative state before interacting with the chatbot may feel happier because they engage in social interaction. However, interestingly, people who experience emotions seem to be pre-occupied with their emotions during the interaction, and only those who are neutral in emotions respond to the chatbot's empathetic expressions in the communication.

Together, the design implication of our findings is that for chatbots to be more effective in offering support, it is necessary to analyze and detect people's emotional states when they initiate the interaction. This can be done by asking specific questions and conducting automated sentiment analysis to people's initial communication to the chatbot. More importantly, people who express positive affect may have higher expectations for what the chatbot can offer and need stronger empathetic responses from the chatbots. However, what kind of empathetic behavior can satisfy the emotional needs of those who are in a positive affect awaits further research.

There are several limitations of this study. First, it is a wizard-of-oz experiment, where two researchers played the role of chatbot and were responsible for recognizing emotions. Although human may perceive emotions more accurately than computer algorithms after training and practice trials, human researchers' perception may be subjective. In addition, due to the context of this study, all participants were students, and they are all affiliated with the same university; additional scenarios that allow studying a general population would be ideal. Due to the same constraint, we collected 26 valid responses. We acknowledge that the statistical power of the regression models can be improved with a larger sample size.

7. Conclusion and Future Work

In this study, we manipulated participants to experience positive, neutral (control), or negative emotions before their interaction with an automated agent, a chatbot, which provides either empathetic or non-empathetic responses in conversations. We measured participants' self-reported emotional states before the interaction, amount of self-disclosure and sentiments expressed in conversations, as well as post-interaction attitudes toward the chatbot.

We find that the empathetic chatbot using first-person narratives and recognizing people's emotions leads to higher user satisfaction compared to the non-empathetic chatbot. The result aligns with the existing literature [12,64,65]. The empathetic behavior, that incorporates emotional cues, makes people feel more positive when they're not emotional; this effect diminishes when people have strong emotions already.

The study confirms the benefit of incorporating emotional cues in design for automation. People's emotional needs are generally transferred from interpersonal relationships to user-

computer interaction [9,10]. The empathetic behavior improves user satisfaction and even makes people feel more positive if their mental capacity is not occupied by any strong emotions.

In addition, the study highlights the importance of assessing people's emotions prior to user-chatbot interaction and providing design strategies accordingly. The results show that participants' affect can influence their interaction with the chatbot and perception of the chatbot's performance. People who feel more positive are more likely to disclose and more satisfied with chatbots. Meanwhile, people who feel more positive may have more emotional needs and automated agents may need to spend more time and effort echoing their feelings. In contrast, people who feel sad or angry may feel better by simply interacting with an agent. The interaction itself distracts them from thinking of an unpleasant experience.

After validating the effectiveness of the affect manipulation and chatbot's empathetic behavior in this study, we are working on building a fully automated chatbot that recognizes emotional cues and represents various social behavior. We also plan to generate more versatile scenarios beyond academic advising. With a fully automated chatbot and general scenarios, we will scale the study and recruit more participants from a more general population on a crowdsourcing platform. To expand the existing work [7,8], we will also investigate the human-agent trust that will be developed through social interaction and influenced by various affects.

This study shows the impact of agent empathetic behavior and people's affect on their interaction with the automated agent and post-interaction perception. Many chatbots have been designed to facilitate human activities and researchers gravitate towards fulfilling the needs of people who experience negative emotions, including frustration and anxiety [1,2,6]. The finding of this study suggests the opposite – overlooking the emotional needs of people with positive emotions can harm the user experience significantly. Therefore, a more dynamic and emotion-specific design strategy for automated agents is much needed. We encourage designers to pay close attention to people's affect and incorporate this element into the design framework for automation, so that automated agents can provide sufficient support at appropriate times and in an effective manner for more collaborative human-agent teams.

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APPENDIX

Emotional Acknowledgement

Five-point scale: strongly disagree (1) to strongly agree (5)

1. When the chatbot notices my emotions, it will bring them up.
2. When the chatbot sees that I am experiencing an emotion, it will mention it.
3. The chatbot does NOT refer to my emotions (reverse-coded).
4. When the chatbot sees that I am feeling an emotion, it does NOT say anything about it (reverse-coded).

Empathy

Five-point scale: strongly disagree (1) to strongly agree (5)

1. The chatbot was warm toward me.
2. The chatbot showed compassion for me.
3. The chatbot was sympathetic toward me.

Effort

Five-point scale: strongly disagree (1) to strongly agree (5)

1. This chatbot is willing to spend attention on me during our interaction.
2. This chatbot is willing to spend effort on me during our interaction.
3. This chatbot is willing to spend time on me during our interaction.
4. This chatbot is willing to spend energy on me during our interaction.
5. This chatbot is willing to spend resource on me during our interaction.

Helpfulness

Using the scales below, how would you describe the chatbot?

1. Not helpful at all (1) / Not helpful (2) / Neutral (3) / Helpful (4) / Very helpful (5)
2. Not useful at all (1) / Not useful (2) / Neutral (3) / Useful (4) / Very useful (5)

Liking

Five-point scale: strongly disagree (1) to strongly agree (5)

1. The chatbot is likeable.
2. I liked the chatbot.
3. I would enjoy spending time with the chatbot.
4. I dislike the chatbot (reverse-coded).

Satisfaction

Five-point scale: strongly disagree (1) to strongly agree (5)

1. I enjoyed this conversation.
2. I thought this conversation was engaging.
3. I had an interesting conversation with this chatbot.