Understanding the Negative Aspects of User Experience in Human-likeness of Voice-based Conversational Agents

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ABSTRACT

With advances in artificial intelligence technology, Voice-based Conversational Agents (VCAs) can now imitate human abilities, sometimes almost indistinguishably from humans. However, concerns have been raised that too much perceived similarity can trigger threats and fears among users. This raises a question: Should VCAs be able to imitate humans perfectly? To address this, we explored what influences the negative aspects of user experience in human-like VCAs. We conducted a qualitative exploratory study to elicit participants' perceptions and feelings of human-like VCAs through comparable video prototypes of human–agent conversation and human–human conversation. We discovered that the dialogues of the human-likeness outside of the expressed purpose of a VCA and expressions pretending to come from a human identity could lead to negative experiences with VCAs. Based on our findings, we discussed design directions for overcoming potential issues of human imitation.

CCS CONCEPTS

• **Human-centered computing → Empirical studies in interaction design**.

KEYWORDS

Voice-based Conversational Agents, Intelligent Agents, Human-likeness, Voice User Interface Design

ACM Reference Format:
Hyeji Kim, Inchan Jung, and Youn-kyung Lim. 2022. Understanding the Negative Aspects of User Experience in Human-likeness of Voice-based Conversational Agents. In *Designing Interactive Systems Conference (DIS '22), June 13–17, 2022, Virtual Event, Australia.* ACM, New York, NY, USA, 10 pages. https://doi.org/10.1145/3532106.3533528

1 INTRODUCTION

Voice-based conversational agents (VCAs) have expanded the horizons of human–agent interactions by performing multi-turn conversations with the ability to remember previous conversations beyond command and control [53]. VCAs not only perform various tasks such as shopping [56] and reservation booking [30] but can also communicate with users through social interactions regarding personal issues [68] or small talk [7]. As VCAs are positioned as a social role, replicating natural human interactions and building close relationships has become a crucial strategy in their design. Thus, researchers have explored the use of realistic human social behaviors by incorporating the mechanics of human conversation in VCAs that communicate with natural language [43]. In addition, increasing the human-likeness has been accelerated by incorporating human qualities into VCAs to strengthen their ability to bond with users. With the goal of imitating humans [65], Artificial Intelligence (AI) researchers have developed AI models that achieved near-human performance on a wide range of natural language processing tasks [42]. The growth of technologies has led to the introduction of systems such as Google Duplex [24], which implemented VCAs of sufficient sophistication to be able to mimic a human caller by placing phone calls to businesses and engaging in natural conversation on behalf of users. Their findings suggest the possibility of developing VCAs that can engage in natural conversations with humans.

Considering the potentially negative user experiences that might result from indiscreet imitations of humans by automated systems, numerous researchers have maintained that human-likeness in human–agent interactions should be reconsidered. First, the high similarity of machines to humans may be perceived as a threat [69]. Blurring the boundaries between humans and machines in this way may be considered to diminish humans' uniqueness, leading to the perception that machines are a threat to humans [21]. Additionally, excessive anthropomorphism of machines could trigger a fear of losing control to the machines [63]. Therefore, considerable uncertainty remains regarding whether a VCA capable of realistically imitating human-like conversations could reliably provide positive user experiences. In this regard, it can be necessary to question the previous paradigm of VCA design based on human imitation and consider the design of VCAs differently.

This study aims to investigate what influences negative experiences of communicating with VCAs that are insufficiently differentiated from humans. To explore user experiences with human-like VCAs, we collected the perceptions and feelings of participants who watched human-human and human-VCA video prototypes presenting the same scenarios to compare those two situations. The findings of this study suggested that human-likeness, which pretends to possess human identity or is not relevant to the purpose of the use, could degrade the user experience. Therefore, we discussed design directions for VCA design that do not simply aim to imitate humans naïvely. It is anticipated that our discussion will

DIS '22, June 13–17, 2022, Virtual Event, Australia

ACM ISBN 978-1-4503-9358-4/22/06…$15.00
https://doi.org/10.1145/3532106.3533528

help designers and developers elicit more creative ideas beyond merely imitating human conversation.

2 RELATED WORK

2.1 Human-likeness in Human–Agent Interaction

According to the Computers-Are-Social-Actors (CASA) paradigm, people tend to respond mindlessly to computers as if they treat humans [50]. Humans might not merely apply computers to social rules but also prefer to interact with computers in the same way they interact with other people [49]. From this point of view, designing agents should respond to the behavioral tendencies of humans on behalf of users' adjustments of behaviors [6]. Previous studies have shown effective strategies that enable agents to socially interact with the rules in human society by imbuing agents with human qualities such as intelligence, empathy [14, 33], and politeness [27]. Designing such human-like agents could encourage users to anthropomorphize nonhuman agents, which may increase social connection between the user and the agent [19, 56]. Empirical evidence has reported that the users' anthropomorphism of a human-like agent could have a beneficial effect on trust [47, 67], interpersonal closeness [46], and usefulness [11]. Thus, further attempts to exploit the positive effects of human imitation have accelerated to achieve a high degree of human-likeness [58].

However, the significant increase in the degree of anthropomorphism perceived by the users could sometimes be ineffective or even counterproductive. When users' high expectations of the agents' capabilities set by human-likeness [16, 37] are not satisfied, they show great disappointment [39, 54] or even abandon communication [28]. In addition, users were offended by machines that were similar to humans but subtly different from complete human beings. Mori et al. [44] proposed a theory about the uncanny valley in which a graph of the relationship between the robot's degree of resemblance to a human being and familiarity to the robot draws a valley shape. According to this theory, as the robot's appearance and behavior become similar to that of humans, the familiarity increases and then falls rapidly at a certain point. Furthermore, when the robot's appearance and behavior reach a state that cannot be distinguished from that of humans, the familiarity rebounds and increases to levels higher than previous levels.

Even if an agent becomes indistinguishable from a human due to technological advances, it may still be challenging to obtain a high preference from users. For instance, Bartneck et al. [5] suggested an uncanny cliff model by modifying uncanny valley theory based on the results that users preferred toy robot pictures over real human ones. Thus, they insisted that developing highly human-like agents should be reappraised. Other studies have uncovered that agents with a high level of human-likeness can be seen as a threat to humans [45]. For example, Ferrari et al. [21] proposed *"the threat to distinctiveness hypothesis"* that individuals could feel threatened when there is too much perceived similarity between agents and humans due to blurred boundaries between the two. Individuals may also feel afraid that humans could be deprived of control by human-like agents with only media descriptions and general world-beliefs, even if they did not experience it directly [66]. As such, although a machine's high degree of similarity beyond human distinction can induce a negative user experience, numerous AI technologies are rapidly being developed to mimic human abilities. From these studies, we can see that design research is needed that focuses on user experience for new technologies that are chasing behavior realism. Therefore, our study aims to investigate users' negative feelings about the human-likeness of agents that are difficult to distinguish from humans.

2.2 Human-like Design of VCAs

Voice, the communication medium for VCAs, is an essential biosocial attribute that defines humans [51] and utilizes communication skills through language use, which are unique human qualities [26]. As such, VCAs that use human language to exchange related responses [23] can recognize and express human linguistic and non-verbal characteristics [20], so the VCAs are sufficiently fluent to be considered as social beings by users [1]. Previous studies have focused on human-like characteristics, including emotion [39], humor [39], gender [35], and personality [8, 23, 32, 48] that can be designed for social bonding between humans and VCA. In particular, to respond to users' negative emotions that can arise from a high degree of human-likeness, researchers tried to find an appropriate balance between humans and machines by examining the extent to which the human-like characteristics of VCA can suitably mimic humans. For example, Jung et al. [31] proposed the concept of hypothetical characteristics, VCA physiological states modeled on human health conditions, and explored the user experiences they can induce. They revealed that it could be unacceptable for VCAs to imitate all kinds of human health conditions but natural for VCAs to mimic physical states pertinent to at least the human external body parts. Chan et al. [13] argued that the level of human-likeness in a synthesized voice should not be too high to prevent impersonation attacks when designing VCAs with kin voices (voices of friends and family). In addition, researchers also took a strategic approach to methodically regulate the degree of humanness depending on their design objective [41].

Although several user experience studies have been conducted to imitate human characteristics within an acceptable range, user experience research that explores diverse design directions that are not constrained by specific human characteristics has received scarce attention. Hence, to unfold new design opportunities for VCAs, our study intends to examine what can give users negative experiences of human-like VCAs.

2.3 VCA Design beyond Human Imitation

Previous studies have recognized the necessity for novel designs of VCA beyond human imitation. For instance, Aylett et al. [2] criticized that human mimicry in speech technology is regarded as an ultimate objective for naturalness. Through several examples of speech synthesis, they recommend that designers seek provocative designs for speech technology against mimicry objective. In addition, Kim et al. [34] pointed out that naturalness in VCAs is a quality that offers a positive experience according to the context, differing from existing notions of being human-like. They suggested that intrinsic machine characteristics such as high speed or accuracy can be designed to enhance naturalness. Further, empirical studies have discussed how conversations with VCA should be considered

differently from human conversations due to inherent differences between the two conversations [54]. Clark et al. [15] explored how users describe human–agent conversations in functional terms in contrast to human–human conversations. Thus, they claim that human–agent conversations should be designed as a new paradigm with its own rules.

However, it has remained unclear what should be considered not to imitate humans in VCA design. Therefore, our study explores the user's perceptions and feelings about the human-likeness of VCAs that can carry out conversations that are indistinguishable from humans. In addition, we discuss potential design directions beyond just human imitation.

3 METHODS

Our study aims to explore the negative aspects of user experiences in conversations with VCAs that are indistinguishable from humans. To investigate negative feelings concerning these VCAs, we conducted an exploratory user study to elicit participants' perceptions and feelings using comparable video prototypes [10, 64] of human–VCA and human–human conversations. The purpose of these video prototypes was to stimulate reflections, [36] rather than evaluate the design of conversational scenarios [25]. Therefore, we explored user experience using video prototypes to evoke participants' perceptions and feelings.

3.1 Video Prototyping

This study focuses on the high level of human-likeness in VCAs that can produce conversations indistinguishable from those between humans to explore future design directions. We adopted a video prototype to investigate user experience by demonstrating a future VCA [64]. In addition, we selected a video format that does not require active interaction by participants to allow for a comparison of the *same* conversation flows from two different interlocutors. Thus, we employed video prototypes made of two different images of interlocutors using the same voice file to investigate the feelings of participants who perceived a difference between a human and a VCA (see Figure 1).

We started creating scenarios by considering three types of conversational agents—virtual companions, task-focused agents, and intelligent assistants—to explore user experience in conversations with VCAs used for various purposes." To achieve the high degree of human likeness required in this study, we considered scenarios that felt as much like a human conversation and ensured that technical feasibility did not limit conversational capabilities. Thus, we referred to the dialogue scripts of two external resources (advertisements dealing with product concepts and films related to future VCAs' roles). We developed a total of six scenarios by applying these two resources to each of the three agent types (see Table 1).

Because each interlocutor is guided as a VCA or human for the same voice file, we modified the scenarios to feel natural in both situations. Professional voice actors recorded scenarios relating to the interlocutors' profiles. Consequently, six voice files were recorded, and twelve videos, each about one minute in length, were developed by combining the recorded voice files and the images suitable for each interlocutor.

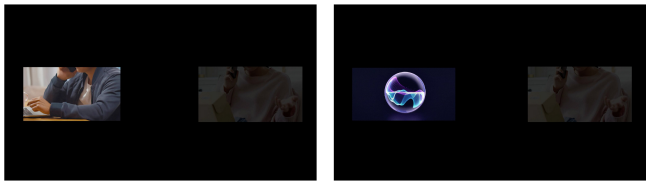

Figure 1: A scene of video prototypes; VCA–human (left) and human–human (right).

3.2 Participants

We distributed a screening survey of VCA users through online communities of universities in South Korea. The survey asked about factors that can influence VCA perception (level of familiarity with AI technology and degree of VCA preference), current attitudes to VCAs (the degree to consider VCAs as friends), the VCA products they have used before (such as voice assistants, AI customer services, and social bots), and demographic information (gender, age, and major). To understand participants' perceptions of VCAs, we ensured a selection that maximized the diversity of factors related to the user's attitude and perception. Therefore, participants were

Table 1: Summary of scenarios. Each scenario was named the abbreviation, shown in bold. The full scenarios are described in supplementary materials.

	Virtual Companions	Task-focused Agents	Intelligent Assistants
Scenarios based on Advertisements	**CA**: A male friend (VCA) calls a woman who sent him several concerns via text first to comfort her.	**TA**: A customer calls a family restaurant to make a reservation, and inquiries about the employee (VCA).	**AA**: A secretary (VCA) informs an office worker who came to work in the morning.
Scenarios based on Films	**CF**: A female friend (VCA) faces a man (through camera) and asks him if he is interested in her.	**TF**: A customer who has difficulty applying discounts due to a lack of card performance acts authoritatively by calling a center counselor (VCA).	**AF**: A friend (VCA) reads the text message of a blind date offer on behalf of a man. She recommends this offer to him.

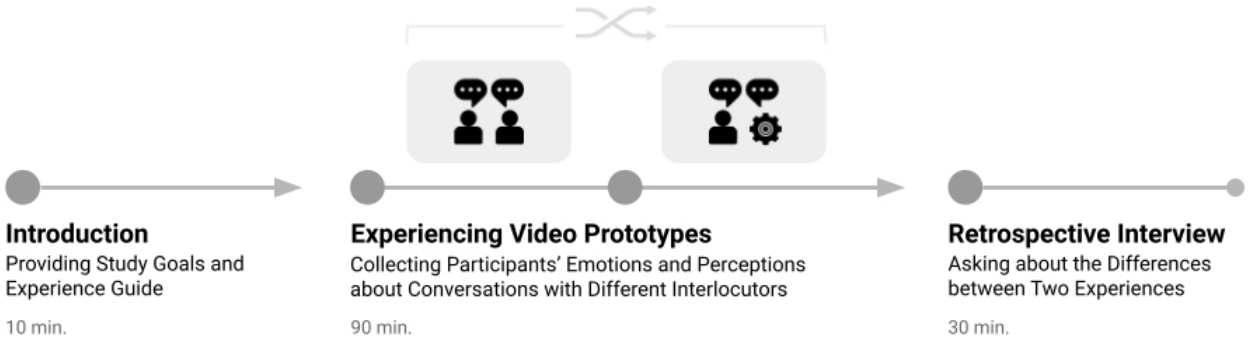

Figure 2: Overall study process.

diverse in their level of familiarity with AI technology (M = 2.9, SD = 1.0 on a 5-point Likert scale), degree to consider VCAs as friends (M = 2.75, SD = 1.4), and degree of VCA preference (M = 3.4, SD = 1.0). We recruited participants until data saturation was reached [40]. A total of 12 participants (five females and seven males) were invited, all of whom had experiences with at least two different VCA products. Participants were proficient with new digital technologies, and had an average age of 23.8 (MAX = 28, MIN = 20, SD = 2.6) (see Table 2).

3.3 Procedure

Prior to the study, all participants e-signed the consent form for participation approved by our university's Institutional Review Board (IRB). We conducted two hours of online study per participant using Zoom software, an online conference platform, to limit direct encounters during the COVID-19 pandemic situation. Figure 2 illustrates the overall process of our exploratory user study.

3.3.1 Introductory session. This session used a slideshow to guide the participants through the study objectives. We presented the study goal as the exploration of user experiences with human-like VCAs. In addition, we asked participants to share their previous experiences with VCAs based on the responses collected in the screening survey. We then asked them to focus on emergent feelings while watching video prototypes.

3.3.2 Observation session. This session aimed to investigate what feelings and perceptions arise as participants experience video prototypes with human–human and human–VCA conversations. Before participants watched the video prototypes, we described contextual information and the interlocutor's identity (human or VCA) for both randomly chosen scenarios. We asked participants to share their thoughts and feelings aloud while watching the video prototypes. First, we played the video prototype to the end without pause; then, we paused after each utterance. Under these settings, we collected participants' comments concerning each utterance and the overall flow of a continuous conversation. We repeated the process with the same scenarios after changing the identity of one interlocutor (VCA or human). To minimize any influence by order of interactions on the data collection, half of the participants watched the video prototype of the VCA first, whereas the other half watched the prototype of the human first. The study sequence and video prototype scenarios provided for each participant are counterbalanced (see Table 2).

3.3.3 Retrospective interview. We prepared this session to clarify the differences in participants' experiences according to the subjects of speech. We provided participants with scenario scripts of two video prototypes, and assessed their negative feelings toward the VCAs. In addition, we asked them whether they felt the same emotions toward the human interlocutor. Finally, we asked participants about their expectations and concerns regarding highly human-like VCAs.

3.4 Analysis

All sessions were recorded and transcribed for a total of 24 hours of video transcripts that were re-organized by scenario. We qualitatively analyzed the re-organized data sets using thematic analysis [9]. To derive patterns of the negative aspects of user experience with human-like VCAs, three HCI researchers with experience in conducting qualitative data analyses performed open coding [61]. The lead author who conducted the interviews examined the data sets and then extracted the initial codes. All researchers repeatedly went through the codes until consensus was reached. We further refined the codes through axis coding, considering the three agent types and participant information. In the following section, we present the results of our analysis.

4 FINDINGS

This section reports four factors that influenced negative feelings such as shame, fear, irritation, and repulsion toward the human-likeness of VCAs based on the qualitative data. Participants expressed negative feelings toward VCAs pretending to possess a human identity and mimicking human expressions not relevant to their intended purpose. Our findings indicate how we should reconsider the aspect of human-likeness in VCAs to avoid indiscreet human imitation.

4.1 Words Simulating the Body and Mind of a Human

Our designed scenarios included VCA utterances that could represent the existence of a human body or mind, such as eating food, wearing clothes, or liking someone. Many participants (P1, P2, P4,

Table 2: Participants' demographics with study settings.

No.	Sex	Age	Major	Friendship with VCAs	Scenarios	Study Sequence (first start)
P1	M	20	Physical Education	Impossible	CA, TF	Human
P2	M	21	Electrical Engineering	Impossible	AA, CF	Human
P3	M	24	Mechanical Engineering	Impossible	CA, AA	VCA
P4	F	27	Tax Accounting	Possible	CA, TA	Human
P5	F	23	Clothing	Possible	CF, AF	VCA
P6	M	23	Industrial Design	Possible	AA, TF	VCA
P7	F	23	Materials Engineering	Impossible	TA, CF	Human
P8	M	21	Brain Engineering	Possible	TA, CF	VCA
P9	F	25	Computer Engineering	Impossible	CA, AF	VCA
P10	F	24	Sociology	Possible	AA, AF	Human
P11	M	28	Computer Engineering	Impossible	TF, TA	VCA
P12	M	27	Chemical & Biomolecular Engineering	Impossible	AF, TF	Human

P5, P7, P8, P11) could not accept the expressions that indicate a human body or emotions within a VCA. They felt discomfort toward VCAs pretending to be human. Even P5, who could consider a VCA a friend, would reconsider her relationship due to the disparate utterances:

> **VCA (CF)**: "If we go out, I would like to wear a dress."
> "When the VCA say something unrealistic like this, I rather realize that this guy is a machine and have doubts. Can I be his friend? Because this is a contradictory." (P5)

Some participants (P2, P4, P5, P10) felt fear when imagining the existence of a body or emotions for the VCA. For instance, when a non-embodied VCA attempted body-related speech, participants imagined a body that does not exist. This image could cause a fear:

> **VCA (CA)**: "My heart hurts for you. I wish I could give you a hug."
> "It is a bit scary to hear that a VCA who does not exist might come and hug me." (P1)

In addition, the participants expressed more fear toward the idea that VCAs can feel genuine emotions. They were frightened, given that they should respect the machine:

> "(if the VCA possesses real feelings) I am scared that I have to care about VCA's feelings." (P2)

From this anxiety, participants had expectations toward VCAs revealing their mechanical aspects in their communications.

> "No matter how closely VCAs can be implemented to humans, I hope this VCA leaves some mark that can express that it is just an AI machine, not a human" (P10)

A VCA failing to acknowledge its true identity may not only be perceived as inappropriate by the participants, but also seen as a threat to the distinction between humans and VCAs.

However, there were situations in which the VCA's expressions were positively received, and the participants felt comfortable when the mimicry was definitely recognized with the purpose of facilitating communication. For example, the excessive friendliness of a VCA, who does not possess feelings, was perceived as appropriate during a restaurant reservation inquiry:

> "It is expressing that it wants to approach humans without aversion. Should I call it effort? It is admirable considering the effort, which is appreciated." (P7)

When a VCA evidently served its purpose, the mimicry of human-like identity cues elicited positive responses.

These findings indicate that users could be frightened when the boundary that distinguishes humans from VCAs that imitate human identity is blurred. This could be attributed to repulsion in response to a machine that may be perceived as threatening the uniqueness of humans [21]. Therefore, VCAs could be designed to possess distinctive machine-like features to avoid further repulsion.

4.2 Independent Expressions against Users

In our video prototypes, VCAs could express their own opinions or emotions independent of the user's. The participants' recognition of these independent expressions varied based on whether they perceived the VCA as a friend. We separated the participants into two groups by their response to the 'degree to consider VCAs as a friend' question from the screening survey. Two participants (P8, P9) changed their response after watching the video prototypes (see Table 2).

First, participants who considered VCAs as friends (P4, P5, P8, P10) experienced discomfort when confronting VCAs with different

opinions or ideas. For example, participants were uncomfortable when the VCA did not seem to accept human opinions. It seems that they still perceive VCAs as machines developed to serve humans, even when talking to a VCA as a friend:

> **Human**: "That is excessive interference."
> **VCA (AF)**: "I did?"
> "I am the judge. I disliked when the machine said, 'so what?'. [...] Of course, I am not going to swear at a VCA, but do I have to be considerate of a VCA? I might buy this for my convenience." (P5)

Participants also expressed discomfort with the expressions by which VCAs revealed their own independent feelings. They were concerned about social stress they had experienced before in human relations:

> "I think that negative emotions in each other lead to anger in human communication. I do not want to fight with machines by adding to those functions. People who need this kind of VCA friend might be using it to get comfort due to stress in their relationships with humans. It is not good to suffer further stress while talking to a VCA." (P8)

The participants who thought of VCAs as potential friends tended to assign social reactions in human relationships such as fights, being considerate, or apologizing, to expressions from the VCAs. However, they were unwilling to respond according to cultural norms to a machine developed to serve humans with specific purposes.

In contrast, participants who did not consider VCAs as friends (P1, P2, P9, P11, P12) viewed themselves as always dominant. They did not consider any action as necessary on their part, even in response to feelings expressed by the machine. These participants sought to regain a sense of dominance over the VCA through strict control, and considered such behavior justifiable. For instance, some participants noted their decision to shut off a VCA's power supply in response to its undesirable behaviors:

> "(If the VCA gets angry or sulky) I will shut it off because I do not have to respond to its sentiments; the VCA does not possess feelings." (P1)

Participants who did not consider the VCA a friend claimed that the use of disrespectful remarks was not a problem because the VCA has no feelings and does not suffer emotional harm. They thought that they could use aggressive expressions that would be concerning or problematic for humans, as the VCA did not have the initiative in the relationship. For instance, P9 addressed freedom of expression towards the VCA:

> "People are real and they can leave if I am rude but a VCA is always there for me [...] Since I don't leave anywhere, so I guess, I do not mind saying anything." (P9)

The recognition of not having to conform to cultural norms and expectations allowed the participants to behave as they desired without concerns regarding ethical issues.

VCAs could be eventually recognized as machines set to perform specific tasks for humans, even though users may consider them as friends. The findings of this study show that users may experience discomfort when expressions of intent from a VCA do not match their original purpose. Therefore, designers could consider developing the scope for VCAs' social dialogues according to intended purpose.

4.3 Direct Mention of Using User Information

Most participants had positive expectations toward the VCAs' use of AI technology to help improve convenience using the participant's own information. However, many participants (P2, P5, P9, P10, P12) felt negative emotions when the VCA carelessly collected or mentioned their information even if it is public one:

> **VCA (AF)**: "I saw on Instagram that you just recently got out of a relationship. Why don't you go on a date?"
> "There are some parts I do not want this machine to know. So, it can be uncomfortable if the VCA, who knows all (of my public information), approaches me in a friendly manner and tells me about my information." (P5)

The participants were already aware that the VCA could discover certain information; however, the uncertainty about the VCAs' capabilities could induce discomfort:

> "Robots are already looking our information, but we can't tell that. That's why I do Instagram while they are pretending not to know about me but it's a little creepy that the robot shows that it knows a lot about me." (P12)

As in the situation where P10 mentioned being afraid of the VCA (*"When it turns out that this VCA is accumulating a lot of information about me"*) the fact that the VCA's autonomous information searching and storage abilities were directly revealed through speech could induce fear in the user.

Some participants (P2, P5, P8, P10) felt pressured when the VCA, which was recognized as having high analytical abilities, revealed that it is observing humans:

> **VCA (CF)**: "Are you attracted to me? You give me indications that you are."
> "The AI has good analytical skills. That means that it is highly accurate, so I feel as if it sees through me." (P2)

Participants also noted their discomfort during the conversations, which was associated with having acted out of self-consciousness in defense of a human-observing VCA:

> "It is already uneasy to converse with a friend who analyzes me accurately and states its conclusions out loud. It feels as if I can no longer be myself and I would rather hide." (P5)

Revealing the VCA's use of personal information during a conversation could unintentionally induce participants to adjust their words and actions by provoking their sense of self-consciousness.

Our findings show that users might feel pressured by a highly autonomous and exceptional conversational counterpart with access to their personal information. In addition, the VCA could endanger

an individual's sense of autonomy, even when utilizing publicly available personal information. Therefore, VCAs should be designed with less uncertainty when mentioning their capabilities to access user information.

4.4 Style of Speech Irrelevant to Purpose of Use

A variety of pragmatic markers that operate beyond the limits of a conversational clause enable more complex expressions concerning the interlocutor's intentions and attitudes [52]. For example, words or phrases such as "wow," "I think," "actually," "so," "well," and "um" are included in interjections, discourse markers, hedges, and stance markers to form a style of dialogue [12]. Our data reveal that participants could negatively perceive VCAs whose styles of speech use pragmatic markers outside its original purpose. In accordance with the two contexts of conversation, namely social and transactional, the participants had different expectations.

In a social context, participants expected the VCA to act as a machine that successfully performs specific functions such as comforting and showing empathy to users, rather than to replace a human friend. Therefore, some participants (P1, P2, P4, P9) showed a repulsion to pragmatic markers that were irrelevant to the VCA's expected function. For example, the participants accepted hesitant speech as an individual habit when the interlocutor was human. In contrast, the VCA's words could be interpreted differently from their original intentions:

> **VCA (CA)**: "No matter what, you… you deserve to be happy. Do not forget that."
> "Emotionally easy sentences can come out well among friends, but I feel like what I am hearing here is not sincere." (P9)

In a transactional context, participants anticipated the VCA serving specific tasks in a natural but efficient manner. Some participants (P2, P3, P8, P11) felt uncomfortable with extended, time-consuming expressions because they expected efficient conversations with short task execution times while communicating smoothly. The participants who wanted rapid answers felt frustrated when the VCA frequently used markers or extended speech.

> **Human**: "Is it possible to make a reservation [...] tomorrow at 7pm?"
> **VCA (TA)**: "Ah, sure. Hold on a second. [...] Ah, that time is fully booked."
> "I do not need filler words like that. It is a waste of time." (P11)

However, pragmatic markers that increase the diversity of utterances and sensitivity could be practical when they do not reduce efficiency in the transactional context. Some participants (P7, P8, P11) mentioned that they could accept short and intermittent filled pauses such as "well" and "ah.":

> "I think it would be too cold if the VCA only talked about the necessary information. It may feel natural if it uses some filler words. But it might be better to reduce the frequency a little." (P8)

Our findings indicate that users may consider a human-like speech style as extraneous when it uses pragmatic markers that are not appropriate for the VCA's intended purpose. Therefore, developers should consider how to design speech markers that are suitable for VCA use specifically.

5 DISCUSSION

In this study, we found what factors lead to the negative feelings toward the human-likeness in VCAs. Our findings detail users' negative experiences that may be encountered when the goal of VCA development is to generate a level of speech that is difficult to distinguish from that humans. Participants did not want VCAs to imitate human identity beyond their original purpose designed to help human convenience. They considered VCAs as machine that should prioritize users' needs, rather than attempt to become social equals. Based on these findings, this section proposes design directions for VCAs to overcome potential human imitation issues. Furthermore, we discuss how VCAs should be designed in the context of user perception of machines designed with the specific purpose of supporting humans. Therefore, our discussion could provide new inspiration for practitioners who develop technology that mimics how humans communicate, and design VCAs that convey delicate human nuances, intentions, and emotions.

5.1 VCAs That Express Themselves as Machines by Revealing Machine-like Characteristics

As noted by other studies that examined the threat to human uniqueness posed by AI [21, 69], the act of imitating human identity while concealing any inherent mechanical characteristics was identified as a potential threat in this study. The boundary between machines and humans could be reinforced by supporting the recognition of agents that exhibit mechanical properties as out-group members [66]. Furthermore, when a user is aware that they are communicating with a machine, machine-like properties such as randomness and objectivity could result in positive and reliable determinations from users [62]. To achieve such advantages, designs that seek to reveal the unique properties of machines should be explored.

We found that although users expressed fears regarding VCAs pretending to be humans, they responded positively when they recognized that a VCA—as a machine—was imitating human characteristics to perform tasks for their benefit. When expressions of human-like characteristics by VCAs are not directly related to functions performed on behalf of users, those expressions can be replaced by machine-like characteristics to help users perceive the agent as a machine. Some studies have attempted to design machine-like characteristics for elements that typically express human identities such as gender-less voices [17] or synthesized sounds that are intended to seem mechanical [3]. These attempts indicate that designing VCAs to exhibit machine-like characteristics may help avoid reflecting harmful social stereotypes [55].

The design of machine-like characteristics requires many potential directions of research. For example, we could consider replacing expressions that imitate human experiences with new stories that reflect machine-like characteristics. To design novel stories for VCAs that exclude human mimicry, we need to creatively explore VCAs. In prior studies, researchers explored design opportunities by

considering what machines would need for [22]. In addition, designers could identify machines' distinct abilities through becoming a machine itself and experiencing robot functions [18]. Accordingly, designers will be able to create VCA's own stories from the VCA's perspective beyond human imitation. Designers also need to remember that even if VCAs reveal their machine characteristics, they should ultimately aim to improve the user experience. In this sense, VCAs should be designed as human-intelligible and straightforwardly controllable.

5.2 VCAs That Interact Socially within the Purpose of Use

Humans are constantly influenced by social pressure, and tend to act according to their expectations of others to form optimal interpersonal relationships [4, 57, 60]. People observe others to understand their intentions and emotions, and control themselves by being attentive to how others perceive their behavior [38, 59]. Therefore, the resultant response is natural when a speech is given that implicitly requests or demands a particular response according to cultural norms. Our findings show that participants who consider VCAs to be their friends intended to behave according to cultural norms in response to the VCA's independent expressions, but they were simultaneously unwilling to react to VCAs in that circumstance. This may be because participants retained their perception of the master–servant relationship [15, 29] even when they considered the VCAs their friends. Thus, our findings suggest that VCAs should provide social interaction while emphasizing their purpose as machines.

In addition, we found that VCAs' utterances could make users feel uncomfortable when lacking clear relevance to the purpose of VCA use. The participants expected VCAs to engage in social conversations to perform functions expected of friends such as comforting and empathizing, rather than outright replacing human friends. Therefore, VCAs should express clear purposes that reflect their relationships with humans as machines designed and operating to perform a specific set of functional tasks rather than exhibiting the high autonomy of human conversation in social interaction. Because current artificial intelligence for social conversation typically aims to imitate humans or continue conversations for as many exchanges as possible [58], conversational agents' autonomy may be increased indiscriminately. In contrast, the autonomy of VCAs could be limited by the goal of providing only conversations clearly related to their specific design purpose.

The high autonomy to users may also prove problematic. VCA designs that seek to process all common social conversational conventions may exhibit problems such as negative verbal disinhibition [14]. In our findings, some participants were willing to use aggressive expressions that deviate substantially from the social norms of civil interaction, as they perceived the VCAs as emotionless and unable to be harmed. To address the indiscriminate autonomy of users, VCA should be designed for specific purposes that provide benefits to human users.

6 LIMITATIONS

There are several limitations to this study that should be considered when interpreting its findings. First, our participant samples cannot be considered representative of all VCA users. While our participants, all in their twenties, met the preconditions of our study, users in younger or older age groups could report different feelings and perceptions toward human-like VCAs. As our user study was conducted only in South Korea, future studies in other countries will be valuable to explore potential cultural differences in feelings and perceptions. These aspects of age and culture can be meaningful to explore in future research. Second, although the use of video prototypes is appropriate when comparing the same conversation flows from two different interlocutors, our observations were not derived from the participants' direct interactions with the VCAs. In further studies, an in-situ survey of people's negative responses to the high human-likeness of VCAs may need to be considered.

7 CONCLUSION

This study investigated users' negative feelings toward the human-likeness of VCAs to explore design directions against the indiscreet imitation of humans. We conducted an exploratory user study using comparable human–VCA and human–human conversation prototypes. Participants manifested their perceptions and feelings toward the video prototypes with different interlocutors, and reflected upon these differences during an interview. Our findings indicate that users expect VCAs to be used as machines rather than replacements for humans. Based on these findings, we suggest new design directions that would make VCAs distinguishable from humans and perform social actions according to their purpose. We hope that this study can inspire both designers and developers so that VCAs can remain with us as machines that help humans with their own identity beyond human imitation.

ACKNOWLEDGMENTS

This work was supported by the National Research Foundation of Korea (NRF) grant funded by the Korea government (MSIT) (No.NRF-2021R1A2C2004263).

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