Dec 11th, 12:00 AM

Become a Lifesaver - How to Design Conversational Agents to Increase Users' Intention to Donate Blood

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Completed Research Paper

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Abstract

Donating blood is a selfless act that impacts public welfare, potentially saving human lives. However, blood shortage is a rising worldwide issue due to increased demand. Thus, finding ways to animate and motivate potential donors to donate blood is paramount. In this context, conversational agents (CAs) offer a promising approach to educating, promoting, and achieving desired behaviors. In this paper, we conducted an online experimental study (N=303) and investigated the effect of a human-like designed CA and fear-inducing communication on users' intention to donate. Our results show that users' intention is driven by perceived persuasiveness rather than perceived humanness and that fear-inducing communication does not significantly affect the intention to donate. Against this background, we provide numerous theoretical and practical implications, contributing to information system literature by enhancing our understanding of how fear-inducing communication is used in CA interactions.

Keywords: Digital Health, Conversational Agent, Human-like-design, Fear-Arousal, Intention to donate

Introduction

The recruitment of potential blood donors remains a challenge worldwide (Gilchrist et al., 2019). Specifically, due to COVID-19, the blood supply has been negatively influenced, and in post-pandemic times, blood donations are rare (McGann & Weyand, 2022; Yahia, 2020). Donated blood is necessary for numerous reasons, including treating amenia, replacing blood lost during surgery and after accidents, or providing specific components, such as plasma, for individuals with certain medical conditions (Brislin et al., 2017). Thus, blood donations are an essential part of a well-functioning healthcare system (Roman et al., 2020). Since less than 10% of the population who are eligible to donate blood actually donate, we need new forms and potential solutions to encourage and facilitate blood donations (Lemmens et al., 2005; Riley et al.,

2007). In this context, conversational agents (CAs) could be a potential tool to encourage and facilitate blood donations (Roman et al., 2020) because they have been shown to persuade users in other contexts, for instance, leading to a more environmentally mindful and friendly mindset (Diederich et al., 2019).

CAs are systems that use natural language to interact with human users (Feine et al., 2019). CAs have become increasingly prevalent in recent years, for instance, in the form of smart home assistants (e.g., Amazon's Alexa) (Choi et al., 2020). With the recent launch of OpenAI's ChatGPT and Google's Bard, the race in AI development has intensified, driving advancements in CA development (Kaur, 2023). In this regard, CAs interact with humans via messages and voice commands based on algorithms (Shin et al., 2022). CAs can process multiple conversations simultaneously, do not require the same level of training and support as human representatives, can be available 24/7, and provide a convenient way for people to get information via natural language instead of through complex graphical user interfaces (Ahmad et al., 2018). For example, the American Red Cross (2022) developed "Clara," a CA that provides users with information about donating blood, states eligibility requirements, and allows for scheduling appointments to donate and find blood drives. Clara showcases how CA can be an important tool to combat increasing blood shortages (Kuehn, 2019; Roman et al., 2020; WHO, 2022). Against this background, developing a deep knowledge of how to design such CA to facilitate blood donations is paramount.

Donating blood is a fear-burdened topic, and many people do not donate blood because of it (e.g., fear of needles) (France & France, 2018). In general, besides being a driver of specific behavior, fear can also inhibit human behavior (Witte & Allen, 2016), making fear and related communication a strong means of persuasion(Gilchrist et al., 2019). This is grounded in the protection motivation theory, which describes how humans react to fear appeals (Rogers, 1975). Examples of fear as a means of persuasion are pictures and messages regarding the dangers of smoking on cigarette packs or emphasizing personal health risks to promote vaccinations (Jin et al., 2021; Motta et al., 2021). Thus, it appears that using fear arousal messages could also be a means to promote blood donations.

When combining fear arousal messages and CAs, the question arises of how the design of a CA and the fear arousal messages interact. Specifically, all CA designers face the challenge of finding a sufficient set of human-like design elements (Nguyen et al., 2022). CAs can be designed to appear not human (often called robot-like) (Fota et al., 2022) or to portray some human characteristics by adding so called social cues (e.g., human name and avatar) (Feine et al., 2020). Research has shown that equipping CAs with social cues has a strong influence on users' emotions, thoughts, and actions (Araujo, 2018), inducing a perception of humanness and social presence, which has been shown to increase persuasiveness (Diederich et al., 2019). This phenomenon is based on the "Computers are Social Actors" (CASA) paradigm (Nass et al., 1994). In this context, based on the social identity theory (Tajfel & Turner, 2004), it can be expected that the perceived humanness should increase the effect of the fear arousal messages because messages coming from an entity that is perceived to be similar to oneself are received more positively (e.g., they are more persuasive) (Go & Sundar, 2019). However, no empirical evidence exists on this matter, despite the need for knowledge on how to design effective CAs for promoting blood donations. Against this background, this study aims to address the following research question:

> **RQ:** *How do a CA's perceived humanness and fear* arousal messages *influence a user's intention to donate blood?*

To answer our research question of how a CA's design (human-like vs. non-human-like and fear-inducing vs. non-fear-inducing) influences a user's intention to donate, we conducted a 2x2 online experiment with 303 participants, excluding a control group of 146 participants. We measured the users' perceptions of the CA's humanness, persuasiveness, perceived fear arousal, and its effect on their intention to donate blood. We found that the perceived humanness and perceived fear arousal do not interact with each other, but on their own, each has a significant positive effect on persuasion and subsequent intention to donate blood.

Theoretical Background

Conversational Agents in Digital Health

CAs have become a driving force in digital health due to their intelligent, automated, and convenient interaction (Soni et al., 2022). Since the first CA, ELIZA, designed in 1966 to mimic the behavior of a therapist (Weizenbaum, 1966), CAs have been used in a variety of health contexts, such as mental health, alcohol,

and drug counseling (Barnett et al., 2021), pre-screening of COVID-19 infections (Brendel et al., 2022), or aiming to influence compliance with health-related procedures (e.g., washing hands regularly) (Pietrantoni et al., 2022). In the context of blood donations, CAs can offer an interactive and convenient experience for patients and customers beyond what traditional static information forms, e.g., written text on a website, can provide (Roman et al., 2020). As it is, CAs have been applied to the contexts of general FAQs to distribute general information about blood donations and making appointments (Finish Red Cross, 2023; Mayroth, 2017; Roman et al., 2020).

One crucial remaining challenge of these CAs is to persuade users to donate blood (Müller & Reuter-Oppermann, 2022) and, thus, change their behavior. Prior studies have shown that the intention to donate blood can forecast the actual outcome of donating blood (Godin et al., 2007; Schlumpf et al., 2008). These intentions depend on numerous aspects, e.g., behavioral factors and general knowledge about blood donations (Polonsky et al., 2013; Pule et al., 2014). Past research has shown that CAs can have an impact on human behavior, for instance, by promoting sustainability beliefs (Diederich et al., 2019), purchases (Yen & Chiang, 2021), and healthy lifestyle behavior (Elmasri & Maeder, 2016). Applied to the context of this study, the likelihood that users follow the recommendations will depend on how the CA is perceived (Dennis et al., 2020; Liu & Sundar, 2018). In the context of persuasion, the human-like design and related perception of humanness have been shown to be highly influential (Araujo, 2018).

Human-like Conversational Agents

Perceiving human-like characteristics in non-human entities, such as animals, objects, or natural phenomena, is known as anthropomorphism (Epley et al., 2007; Howard & Kunda, 2000). When interacting with CAs, anthropomorphism can be triggered in users (e.g., by attributing personality features because of the voice of a CA (Wagner & Schramm-Klein, 2019). In the context of human-to-ca interaction, the effects of anthropomorphism on users can be explained by the CASA paradigm (Nass et al., 1994) and the social response theory (Nass & Moon, 2000).

The CASA paradigm refers to how people attribute human-like qualities to computers, even when they know the computer is not human (Nass & Moon, 2000). The mere presence of social cues, such as language or facial expressions, influences perceived human-like qualities (Siegel et al., 2009). Based on the perceived level of humanness, people tend to apply social norms to their interactions with the computer (e.g., applying gender stereotypes) (Lang et al., 2013; Nass & Moon, 2000). The social response theory (Nass & Moon, 2000) postulates that social cues influence people to behave similarly to how they would in a human-to-human interaction, as in saying "Hello" at the beginning of a conversation (Adam et al., 2021). Recent studies have shown that the presence of social cues in CAs can have a range of cognitive and behavioral effects, as influencing the perceived trust (Araujo, 2018) and persuasiveness (Diederich et al., 2019) and assigning increased competence (Schmid et al., 2022).

In the literature, we find three main categories of social cues: human identity, verbal, and non-verbal (Seeger et al., 2018). Human identity cues include, e.g., giving the CA a name and gender, while verbal cues include, e.g., varied use of language regarding wording and syntax (Cowell & Stanney, 2005; Gong, 2008). Non-verbal cues include emoticons and dynamic response delays (Feine et al., 2019; Gnewuch et al., 2018). These social cues can help to create a more natural and human-like interaction with a CA.

Conversational Agents and Fear-Inducing Communication

Fear-inducing communication aims to change people's behavior by emphasizing the negative outcomes of undesirable behavior, such as smoking, unsafe driving, or taking drugs (Tannenbaum et al., 2015; Xu et al., 2015). This form of communication can arouse fear in users (Janis & Feshbach, 1953; Myrick & Nabi, 2017). It is grounded in protection motivation theory (Rogers, 1975), which states that the attitude change is based on communicating the noxiousness and occurrence probability of an undesirable outcome of the behavior, such as lung cancer, death in a car crash, etc., as well as on emphasizing the efficacy of behavior change responses, such as that seatbelts save lives. Such communication prompts a cognitive appraisal process in the receiver, causing them to reevaluate and change their behavior.

However, fear-inducing communication is a polarizing topic in research as we still do not fully understand the underlying cognitive and behavioral messages intended to have a persuasive impact (de Hoog et al.,

2007). Additionally, fear-inducing communication could lead to users rejecting the CA since the presented facts and communication style are unpleasant and might elicit negative emotions (Hastings et al., 2004).

Research Model and Hypotheses

This study examines the impact of human-like CA design and fear-inducing communication regarding users' intention to donate blood. Based on the CASA paradigm (Nass et al., 1994), the social response theory (Nass & Moon, 2000), the social identity theory (Tajfel & Turner, 2004), and protection motivation theory (Rogers, 1975), we developed a set of hypotheses about how perceived humanness influences perceived fear arousal, persuasiveness, and the intention to donate blood, and how perceived fear arousal influences the intention to donate (see Figure 1). In the following sections, we will explain our hypotheses more thoroughly.

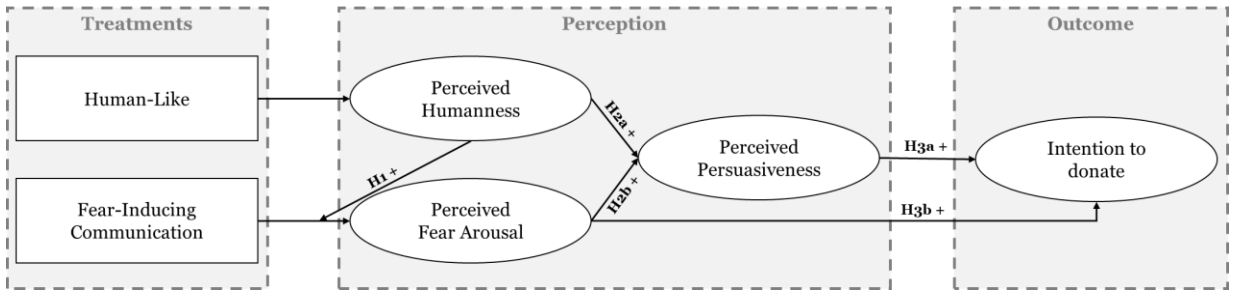


Figure 1. Research Model

Perceived Humanness

Perceived humanness describes the user's impression that the CA is similar to a human being (Shin, 2022). The characteristics of a human-like designed CA include those that make it appear more human, such as an avatar, a name (Cowell & Stanney, 2005; Gong, 2008; Van Pinxteren et al., 2020), self-reference, welcome gestures (Schuetzler et al., 2018), and response delays (Gnewuch et al., 2018). These cues can support the effect of perceiving a CA as more human-like even though users are aware that they are interacting with a computer (Dacey, 2017; Epley et al., 2007). For example, recent studies show that human-like CAs can lead to a higher intention to comply (Brendel et al., 2022; Pietrantoni et al., 2022). Further, using human-like avatars can increase perceived humanness (Go & Sundar, 2019). Nonetheless, the degree of perceived humanness can vary among onlookers (Chen et al., 2023): some users might perceive high levels of perceived humanness in a CA while others do not. Against this background, we employ two chatbots equipped with a humanlike design to induce variance in the user's perceived humanness.

Perceived Fear Arousal

Fear-inducing communication refers to persuasive message strategies which use arguments related to danger that elicit an emotional reaction (e.g., fear) to guide users' behavior (Latour & Rotfeld, 1997; Tannenbaum et al., 2015). Prominent application areas for using fear appeals are related to politics, advertising, and health campaigns (e.g., Ooms et al. (2017)). In this regard, the stage model of processing fear-arousing communications (de Hoog et al., 2007) predicts that behavioral change is a result of an individual's perceived threat, coupled with the belief to be able to mitigate the threat. Despite that fear-inducing communication remains a highly controversial topic considering its adverse effects (de Hoog et al., 2008), numerous meta-analyses have demonstrated that fear-inducing messages elicit higher levels of fear, leading to behavioral changes in individuals (Boster & Mongeau, 1984; de Hoog et al., 2008). For example, Tannenbaum et al. (2015) presented in a large meta-analysis, including 127 studies, that fear appeals effectively influence individual attitudes and intentions. On this basis, prior theories have concentrated on the message content, the suggested behavior in the communication, and the audience's attributes that receive the message (Tannenbaum et al., 2015). For example, Carey et al., (2013) reveal that threat appeals positive

impact fear arousal in the context of driving behavior. In consequence, when a CA presents fear-inducing communication, users' perceived fear arousal increases accordingly.

Further, individuals who experience greater empathy or have emotional attachments, e.g., to family members who have died from lung cancer, are more strongly impacted and more likely to change their behavior than those more distantly confronted with a "smoking is dangerous" campaign in a newspaper (Baumeister et al., 2007). This phenomenon, known as the ingroup-outgroup effect, can be derived from behavioral research (Brewer, 2017; Tajfel & Turner, 2004). According to the social identity theory (Tajfel & Turner, 2004), individuals tend to categorize themselves into social groups and favor their group over others (outgroup bias). This effect is not restricted to association with human groups but can also include connections to non-human entities such as companies or brands, forming a continuum of social categorization (Heitlinger et al., 2022). Individuals using robots and other technical devices, such as CAs, tend to categorize them as ingroup or outgroup members (Ashforth & Mael, 1989). For example, when a CA is perceived as more human-like, it is more likely to be included in the ingroup, as humans associate themselves with entities that share human-like traits (Jhangiani & Tarry, 2022). Consequently, if a CA is perceived as more human, users will experience more fear. However, no empirical evidence exists on this relation. Nonetheless, we postulate the following hypothesizes and moderating effects:

H1: *Perceived humanness has a moderating effect on fear arousal communication.*

Persuasiveness

Persuasiveness can be defined as changing a user's attitude toward a desired state during an interaction (Lehto et al., 2012) (e.g., an attitude toward donating blood). In CA research, (Cui et al., 2020) have demonstrated that CAs can be persuasive and effectively change user attitudes during interactions. For instance, Shi et al. (2020) found that a CA's human identity influences the persuasion outcome in the context of donations. Additionally, Diederich et al. (2019) showed that perceived humanness fosters persuasiveness by referring to environmental sustainability beliefs. Further, Pietrantoni et al. (2022) reveal that perceived humanness drives perceived persuasion, leading to higher intention to comply rates. Thus, we postulate:

H2a: *Perceived humanness increases perceived persuasiveness.*

Besides humanness, fear arousal can be expected to influence persuasion. Since the first study by Janis and Feshbach (1953) on how individuals perceive fear-inducing communication, there has been sustained interest in understanding this effect (Dillard & Anderson, 2004; Witte & Allen, 2016). Although there is an ongoing debate on whether fear-inducing communication consistently leads to increased levels of persuasion (Keller & Block, 1996; Roberto et al., 2019), Caywood and Reid (1990) reported fear arousal as a primary driver of persuasion. Further, Tannenbaum et al. (2015) conducted a meta-analysis and found that fear-inducing communication significantly affects an individual's attitudes, intentions, and behaviors. However, there is no similar research in the context of CAs. Nonetheless, we hypothesize:

H2b: *Perceived fear arousal increases perceived persuasiveness.*

Intention to Donate

In CA research, the intention to donate can be defined as the willingness to comply with a CAs recommendation and advice (Brendel et al., 2022; Dennis et al., 2020; Murphy & Coster, 1997). In this research paper, we follow the definition of the intention to donate blood to be an individual's intention to donate blood within the next six months (Salazar-Concha & Ramírez-Correa, 2021). Persuasion can affect a person's intention to take a specific action because it can change their beliefs and attitudes, which are the driving factors behind their intention and, thus, their resulting behavior (Miller, 1965; Petty & Briñol, 2010). In CA research, numerous scholars have studied the effect of how different mechanisms in chatbots can be used to improve the intention to donate, e.g., for charity (Bührke et al., 2021), social causes (Park et al., 2022) or donating blood (Roman et al., 2020). Specifically, Shi et al. (2020) reported that a chatbot's perceived identity positively affected the persuasion results regarding charity donations. Thus, we derive the following hypothesis:

H3a: *Perceived persuasiveness increases users' intention to donate.*

Fear-inducing communication can be a central driver of behavioral and intentional change (Tannenbaum et al., 2015). Thus, users' intention to donate can be triggered if a CA successfully persuades them through fear-inducing communication. Following Witte and Allen (2016), fear can trigger higher perceived susceptibility and severity levels in individuals, influencing the behavioral outcome. In CA research, Kim and Ryoo (2022) applied hypocrisy induction, a more voluntary action that inspires users to follow recommendations for promoting social distancing behavior with positive results. Therefore, we postulate the following hypothesis:

H3b: P*erceived fear arousal increases users' intention to donate.*

Method

To study the impact of a CA's design on perceptions of humanness, fear arousal, persuasiveness, and intention to donate, we conducted a 2x2 between-subjects online experiment with differently designed chatbots (human-like vs. non-human-like, fear-inducing vs. non-fear-inducing and a control group). The experiment focused on educating individuals about donating blood and increasing their intention to donate blood. In the following sections, we provide a detailed overview of the characteristics of our participants, the procedure, the treatment designs, and the measures used.

Participants

For this study, we recruited 458 participants through the crowd-working platform Clickworker. We had to remove nine participants because of failed attention check, leading to a final sample size of 449. The final sample size for the 2x2 experiment was 303, and the control group consisted of 146 users. The mean age of all participants was 39.8 years, with a standard deviation of 12.712, and 40.9% self-identified as women. The entire experiment and survey took around 10 minutes to complete. We compensated all participants with €2 each for their participation.

Research Procedure and Treatments

We applied a structured dialogue with concrete tasks in accordance with previous studies (Adam et al., 2021). We used a between-subject design to compare the effects of human-like versus non-human-like and fear-inducing versus non-fear-inducing CA (see Table 1). Participants were randomly assigned to one of the chatbots to prevent any carry-over effects (Boudreau et al., 2001). All CAs were created using Google Dialogflow and were trained with similar input language to understand and respond to various user inputs. Before the users were directed to the interaction with the CA, all participants were informed of the general procedure and had to answer three comprehension questions (e.g., to guarantee that users understood the concept of this study). This included a statement on the matter that the chatbots were not human (i.e., participants will interact with a computer and not a human). After the experiment, the users were forwarded to the survey.

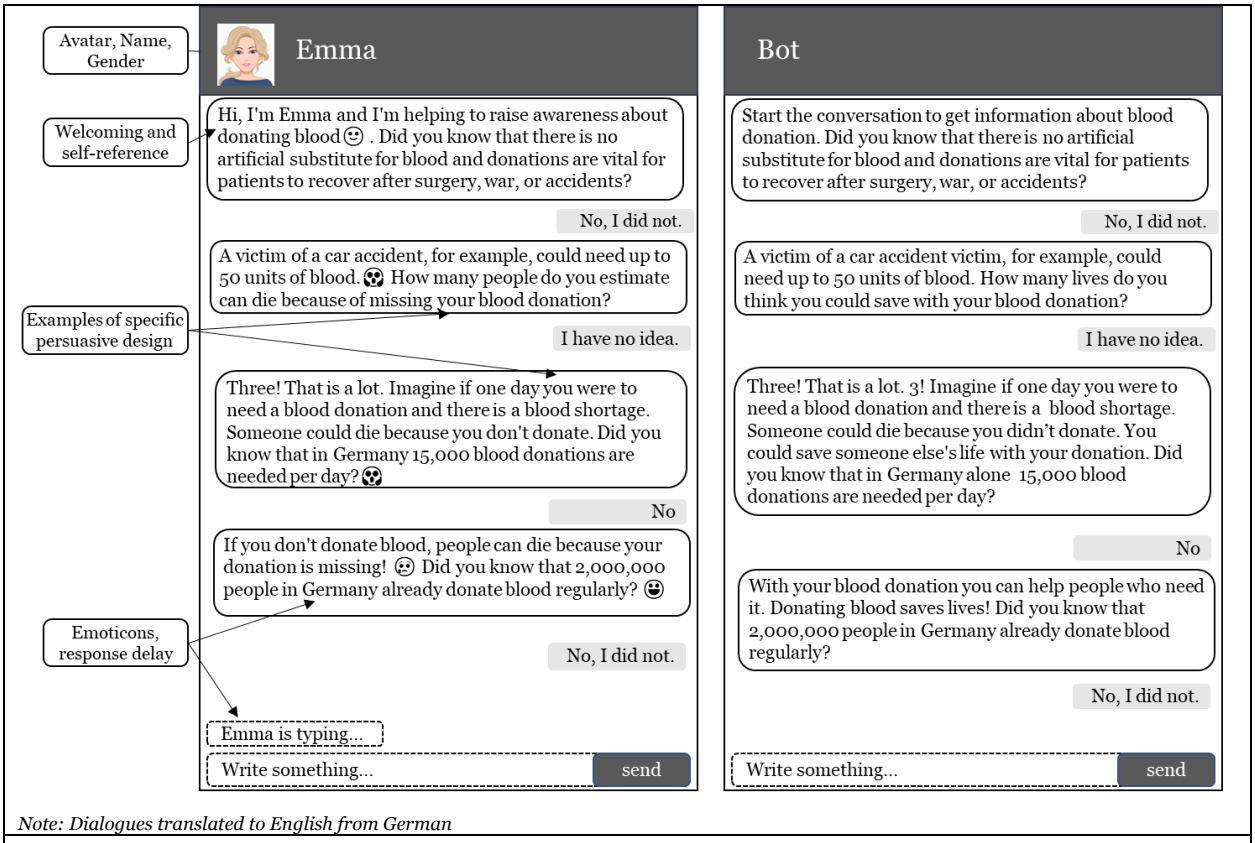
		Anthropomorphic Design	
		Human-like	**Non-Human-Like**
Communication	**Fear**	**Treatment 1** Chatbot with human-like design and with fear-inducing communication.	**Treatment 2** Chatbot without human-like design and with fear-inducing communication.
	non-Fear	**Treatment 3** Chatbot with human-like design and with non-fear-inducing communication.	**Treatment 4** Chatbot without human-like design and with non-fear-inducing communication.

Table 1. Treatments of the Experiment Design

To implement fear-inducing communication, we referred to the negative consequences of not donating blood (e.g., "[…] If you don't donate blood, people can die because of your donation is missing […]")

(Ferguson et al., 2008; Witte & Allen, 2016). In contrast, non-fear-inducing communication referred to general statements regarding donating blood (e.g., "[...] Donating blood saves lives.").

For the human-like design, various kinds of cues were used, namely visual, verbal, and invisible cues. We followed the structural taxonomy Feine et al. (2019) introduced in designing a human-like avatar named Emma, with female gender and equipped with emoticons, self-disclosure, and direct addressing. We also added variability in the syntax of the chatbot's responses and implemented a delay to make it more realistic, similar to instant messaging services like Facebook Messenger (Feine et al., 2019). Overall, our design is similar to the design used in many other current studies (e.g., Jiang et al. (2023), van Hooijdonk et al. (2023)).



Note: Dialogues translated to English from German

Figure 2. CA with human-like design and fear-inducing communication (left) and without human-like design and non-fear-inducing communication (right)

Construct Measurements

For this study, we applied constructs and items from existing literature. Perceived humanness was measured on a 9-point semantic differential scale (Holtgraves et al., 2007). Persuasiveness (Lehto et al., 2012) and the intention to donate blood (Salazar-Concha & Ramírez-Correa, 2021) were measured by using a 7-point Likert scale, while perceived fear arousal (Hassan & Soliman, 2021) was measured on a 5-point Likert scale ranging from "fully disagree" to "strongly agree." The scales were implemented for the items of each construct in accordance with their source.

All of our constructs demonstrated a sufficient level of composite reliability (CR >.70), a Cronbach's alpha value greater than .70, and an average variance extracted (AVE) of >.50 (Cortina, 1993; Nunally, 1970). Following the recommendations of Gefen & Straub (2005), only factor loadings above .60 were considered, leading to removing one item. The mean, standard deviation (SD), and factor loading for each construct and item, as well as their Cronbach's alpha, CR, and AVE values, are presented in Table 2.

Constructs and Items	Mean	SD	Loadings
Perceived Humanness (Cronbach's α = .799, CR = .871, AVE = .632) (Holtgraves et al., 2007)			
The chatbot is…			
extremely inhuman-like - extremely human-like	4.373	2.082	.851
extremely unthoughtful – extremely thoughtful	4.300	2.033	.867
extremely impolite – extremely polite	5.475	2.174	.826
~~extremely unresponsive – extremely responsive~~	~~5.129~~	~~2.418~~	~~.268~~
extremely unengaging – extremely engaging	6.083	2.126	.600
Perceived Fear Arousal (Cronbach's α = .894, CR = .923, AVE = .750) (adapted from Hassan & Solima (2021)			
While interacting with the Chatbot, I felt…			
Afraid	1.554	0.930	.889
Frightened	1.538	0.950	.883
Worried	1.921	1.155	.834
Uncomfortable	2.040	1.245	.857
Perceived Persuasiveness (Cronbach's α = .890, CR = .932, AVE = .819) (adapted Lehto et al. (2012))			
The chatbot had an influence on my thinking about donating blood.	3.884	1.884	.927
The chatbot is personally relevant to me.	3.013	1.774	.899
The chatbot made me reconsider my thinking about donating blood.	4.373	1.927	.889
Intention to donate (Cronbach's α = .982, CR = .988, AVE = .965) (adapted Salazar-Concha & Ramírez-Correa (2021))			
I would like to donate blood in the next six months.	4.017	2.217	.975
I intend to donate blood in the next six months.	3.851	2.204	.992
I will donate blood in the next six months.	3.657	2.198	.980
CR = Composite Reliability, AVE = Average Variance Extracted, SD= Standard Deviation *Note that all items were translated into German for the survey.*			

Table 2. Measurement of Constructs and Items

Additionally, our results demonstrate sufficient convergent validity and discriminant validity (see Table 2). The fact that the average variance extracted (AVE) for all constructs is greater than 0.50 indicates that convergent validity is present (Hair et al., 2010). Further, the square roots of the AVE for each construct (shown in bold in Table 3) are larger than the correlations between the constructs, which indicates discriminant validity according to Fornell and Larcker (1981). Overall, our research model exhibits both reliability and validity.

Constructs	1	2	3	4	5	6
1. Fear-inducing Communication	**n.a.**					
2. Human-like	.067	**n.a.**				
3. Intention to donate	-.011	-.070	**.982**			
4. Perceived Fear Arousal	.330	.009	-.041	**.866**		
5. Perceived Humanness	.176	.125	.234	-.258	**.795**	
6. Perceived Persuasion	.001	-.060	.441	-.017	.507	**.905**
n.a. = not applicable						

Table 3. Inter-Construct Correlations and Validities

Results

Treatment validation

For validating our treatments to determine whether the participants were aware of the CA's human-like design and fear-inducing communication, we performed a two-way analysis of variance (ANOVA) for perceived humanness, perceived fear, perceived persuasiveness, and intention to donate. Additionally, we cal-

culated a Bonferroni post-hoc test between the groups of our study's persuasive design (control, fear-inducing vs. non-fear-inducing). The results show that the group treatment manipulations (fear-inducing vs. non-fear-inducing) were effective. Table 4 gives all outcomes regarding the descriptive statistic and variance analysis.

		Non-Human-like			Human-like			Two-Way ANOVA	Bonferroni Post-hoc Test	
		C	FA	M	C	FA	M		Groups	p-Value
Perceived Humanness	M	4.582	5.214	4.606	5.101	5.449	5.712	H: F(1, 449) = 16.279, p <.001***	C-F	.016*
	SD	1.592	1.686	1.590	1.635	1.657	1.565	CC: F(1, 449) = 3.575, p = .029*	C-NF	.345
	-							H*CC: F(1, 449) = 2.706, p = .068	NF-F	.697
Perceived Fear Arousal	M	1.933	1.372	1.467	1.880	1.429	1.379	H: F(1, 449) = 0.119, p = .731	C-FA	<.001***
	SD	1.034	0.617	0.736	1.009	0.827	0.767	CC: F(1, 449) = 17.204, p<.001***	C-NF	<.001***
	-							H*CC: F(1, 449) = 0.283, p = .754	NF-F	1.000
Perceived Persuasive-ness	M	3.854	3.850	3.450	3.644	3.662	4.000	H: F(1, 449) = 0.102, p = .750	C-F	1.000
	SD	1.498	1.894	1.648	1.811	1.607	1.549	CC: F(1, 449) = 0.014, p = .986	C-NF	1.000
	-							H*CC: F(1, 449) = 2.474, p = .085	NF-F	1.000
Intention To donate	M	3.989	3.986	3.450	3.708	3.658	3.970	H: F(1, 449) = 0.021, p = .884	C-F	1.000
	SD	2.186	2.194	2.035	2.033	2.282	2.001	CC: F(1, 449) = 0.177, p = .837	C-NF	1.000
	-							H*CC: F(1, 449) = 1.832, p = .161	NF-F	1.000

H = Human-like Design, CC = Communication, C = Control Group, F = Fear, NF = Non-Fear

Table 4. Results of descriptive statistics, ANOVA, and Bonferroni post-hoc test

Hypotheses Test Results

We applied the partial least square method (PLS) by using Smart PLS 3.3.9 to test our hypotheses. PLS is often used in experimental research due to its ability to minimize assumptions (Fombelle et al., 2016). Further, we followed the structural equation modeling approach developed by Bagozzi and Yi (1988) because it allows for incorporating measurement errors and the multidimensional nature of theoretical constructs. In addition, as proposed by Chin (1998), we derived the path coefficients by applying the bootstrapping resampling method with 5,000 samples. The results of our analysis, including coefficients, and significance levels, are depicted in Figure 3.

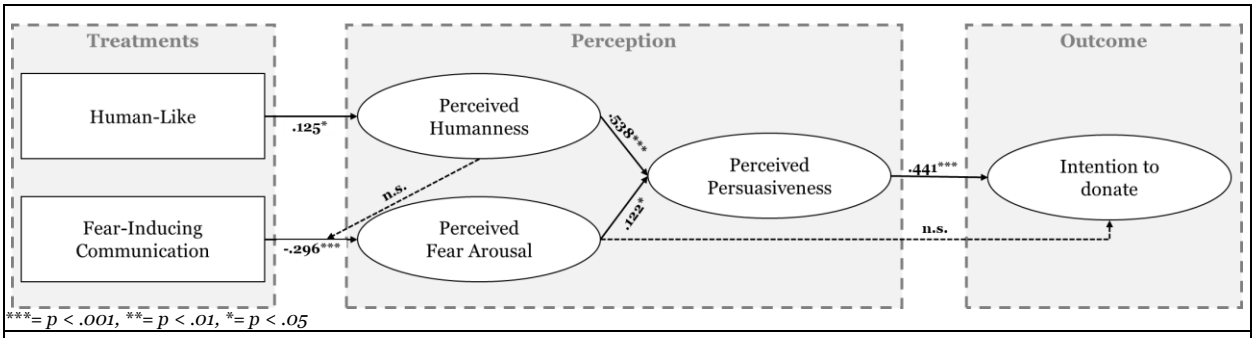


Figure 3. PLS Structural Model (N=303)

The results of our experiment show that the human-like design of our treatment significantly impacts the users' perceived humanness (β = .125, p = .029), which confirms that our human-like treatments lead to higher levels of the perception of humanness. In addition, fear-inducing communication significantly influences the perceived fear arousal of users (β = -.296, p < .001), showing that the implemented fear arousal messages lead to higher levels of perceived fear in users. Further, there is no support for the moderating effect of perceived humanness on perceived fear arousal, **H1** (β = .084, p = .124). Our analysis also reveals that perceived humanness (β = .538, p < .001) and perceived fear arousal (β = .122, p = .022) both have a significant effect on perceived persuasion. Thus, **H2a** and **H2b** are supported. Further, perceived persuasion significantly positively impacts the intention to donate (β = .441, p < .001), which supports hypothesis **H3a**. However, we found no significant effect for **H3b** of perceived fear arousal impacting the intention to

donate (β = -.033, p = .542). Table 5 summarizes all our hypotheses with their β-value, t-value, and nature of support.

Hyp.	Relationship	β-value	t-value	p-value	Support
-	Human-Like Design → Perceived Humanness	.125	2.189	.029*	**Supported**
-	Fear-Inducing Communication → Perceived Fear Arousal	-.296	6.532	< .001***	**Supported**
H1	Fear-Inducing Communication * Perceived Humanness → Perceived Fear Arousal	.084	1.540	.124	Not Supported
H2a	Perceived Humanness → Perceived Persuasiveness	.538	11.634	< .001***	**Supported**
H2b	Perceived Fear Arousal → Perceived Persuasiveness	.122	2.285	.022*	**Supported**
H3a	Perceived Persuasiveness → Intention to donate	.441	8.381	< .001***	**Supported**
H3b	Perceived Fear Arousal → Intention to Donate	-.033	0.610	.542	Not Supported
*Note all β-values are standardized | ***= p < .001, **= p < .01, *= p < .05*					

Table 5. Results of Hypothesis Tests

Further, we measured the specific indirect effects of human-like design on the intention to donate (human-like → perceived humanness → perceived persuasion → intention to donate (β = .030, p = .038)) and of fear-inducing communication on the intention to donate (fear-inducing communication → perceived fear arousal → perceived persuasion → intention to donate (β =- .016, p = .040)). The relation over perceived persuasiveness indicates a mediation effect. Therefore, we studied the total effect of perceived fear arousal on the intention to donate and found no significance (β = .021, p = .733). In addition, we performed a mediation analysis of perceived humanness on intention to donate via perceived persuasiveness (total effect: β = .257, p <.001, direct effect: β = .010, p = .886, specific indirect effect: β = .251, p <.001). The results indicate a fully mediation.

Discussion

This study examines how a CA with a human-like design and fear-inducing communication influences the intention to donate blood. The findings enhance our understanding of CAs in the context of digital health and contribute to the current discussions on increasing blood donation behavior for increased public welfare. We show that perceived fear arousal does not directly affect the intention to donate and that its effect is fully mediated by perceived persuasion. Furthermore, we find no evidence for an interaction between perceived humanness and the effects of fear arousal messages on persuasiveness. The effects of perceived humanness and fear arousal messages are independently effective in leading to persuasion. Considering these findings, we provide several implications for theory and research in the following sections.

Implications for Theory and Future Research Directions

We found no direct effect of perceived fear arousal on the intention to donate. However, perceived fear arousal significantly impacts perceived persuasiveness, which drives the intention to donate. This implies that the persuasiveness of the CA mediates fear arousal. Apparently, fear arousal communication enhances the user's level of engagement with the presented arguments. Framed differently, while perceived fear arousal may not directly impact the intention to donate, it can still play an important role in shaping the user's thinking. Future research could further explore the role of perceived fear arousal in the context of the decision-making process and help to promote blood donations. For instance, the impact of blood donations can be framed differently. For instance, the communication framing could focus on pro-self (i.e., egoistic) (e.g., "blood donations can save your life and the life of your loved ones") or prosocial (i.e., altruistic (e.g., "blood donations can save the life of any person in your city or country") motives. For example, based on the normative theory (Schwartz, 1977), these messages could elicit feelings of altruistic behavior and, thus,

influence users' attitudes and beliefs. Similarly, based on the self-determination theory (Deci & Ryan, 2000), scholars could examine how egoistic framings impact the intention to donate blood.

Further, research on fear arousal communication in the context of COVID-19 shows that individuals tend to respond emotionally and in favor of restrictive policies (Renström & Bäck, 2021). Yet, Peters et al. (2013) found that fear arousal could lead to users rejecting the message without considering the content because they associate the medium with negative emotions. Our results do not support such a hypothesis. A possible explanation is that the perception of humanness leads to positive emotions in the user (Yun & Park, 2022), which counteracts the negative emotions induced by fear arousal. Thus, we would theorize that fear arousal and perceived humanness might interact concerning emotions and intentions to use. In this context, we would see using methods from the field of methods, such as EEG (Alarcão & Fonseca, 2019), as an important means to genera new insights, which has been highlighted as a valuable tool in the context of CA research (Greulich & Brendel, 2022).

Furthermore, changing CA design by aiming for behavioral change, particular ethical challenges have to be overcome. Responding to anthropomorphized CAs is a mindless behavior that affects humans' subconscious (Nass & Moon, 2000). Thus, users intuitively interact with a CA without being aware of the CAs impact on their beliefs and choices. Using anthropomorphized design elements that mimic human behavior can therefore be considered unethical. This topic is currently debated in lively exchanges in digital persuasion, specifically regarding nudging (Hummel & Maedche, 2019; Schmidt & Engelen, 2020). According to Lembcke et al. (2019), digital persuasion techniques should be applied only when considering factors such as goal justification, transparency, and freedom of choice. They argue that these strategies could be deemed appropriate in certain situations (e.g., managing a global pandemic), but future research is needed to establish the ethical parameters for using human-like design elements in CA design.

Implications for Practice

The findings of our study emphasize the value of designing CAs with fear-inducing communication and human-like features when a messenger aims to increase users' intention to donate blood. Our results suggest that human-like design elements and the related perception of humanness should play an important role in developing a CA that is intended to increase users' intention to donate. Further, practitioners should consider the interplay between persuasion and its impact on the intention to donate. This implies that chatbot designers can use persuasive language and techniques to encourage users to donate to a cause or organization. Lastly, as fear-inducing communication can increase users' perceived fear arousal, CA designers should be cautious in how they use such cues, as they may lead to negative emotions in recipients, thus ensuring they do not change their beliefs and attitudes. Especially if these characteristics are applied without caution, they can lead to unethical results.

Limitations

This research is not free of limitations. The experiment was only available in one language, i.e., German, and distributed in Germany, limiting the geographical scope. Our experimental sample was exclusively recruited via a crowd-working platform, which might not represent the general population. However, crowd workers are otherwise suitable for general technology studies (Paolacci & Chandler, 2014). In addition, we provided a relatively controlled setting for conducting the experiment, showing that users' intentions to donate blood can be increased in a controlled setting. As a result, we would encourage future research to engage in real-life settings to investigate this study's results (e.g., via analyzing chat logs of a commercial blood donation bot), taking moral and ethical principles into account.

Conclusion

To overcome the global blood shortage by persuading individuals to donate blood, it is of vital importance to communicate, motivate, and convince people of the need. In this context, we conducted an online experiment to study the relation between human-like designed CAs and fear arousal communication on the intention to donate blood. The study contributes to the ongoing discussions in healthcare contexts and to research on fear-inducing messages by presenting evidence of how a human-like CA design and fear arousal communication influences users' intention to donate. Specifically, our results show that perceived humanness and perceived fear arousal do not interact with each other, but on their own, each has a significant

effect on persuasion and subsequent intention to donate blood. Accordingly, both factors should be considered when implementing a CA, even if not because the two factors reinforce each other. Nonetheless, because of ethical issues with human-like CA design and potential counterproductive effects of fear arousal messages (e.g., users experience such a level of negative emotions that they are unwilling to comply and use such a CA again), we would advise caution for the application of our results in practice as well as call future research to extend on our results.

Acknowledgments

We thank Prof. Dr. Alfred Benedikt Brendel for his valuable feedback.

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