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심리학석사 학위논문

# **Effects of Mind Perception on Social Support of Chatbots**

마음지각이 챗봇의 사회적 지지에 미치는 영향

2022년 8월

서울대학교 대학원  
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# Effects of Mind Perception on Social Support of Chatbots

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## **Abstract**

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Chatbots have the potential to provide social support to users and improve their psychological wellbeing. Nevertheless, how user perception of chatbots influences the effects of social support is not fully understood. This study first investigated whether chatbot social support can have a positive impact on users' stress management. Then, we examined whether mind perception in chatbots influenced the effectiveness of social support. In the experiment, the chatbot asked several questions about participants' interpersonal stress events, and by answering these questions, participants wrote down their stressful experiences. Depending on the experimental conditions, the chatbot additionally provided two different kinds of social support: informational support (i.e., relationship advice) and emotional support (i.e., empathy and encouragement). We found that satisfaction with support had a positive effect on dealing with stressful situations. We also revealed that providing emotional support reduced the extent to which participants perceived the chatbot messages as useful compared to prompting only the writing of their stressful experiences. Further, participants were less

satisfied with the support when they received emotional support rather than informational support from the chatbot. When participants perceived that the chatbot had a more humanlike mind, they were more satisfied with the support, and consequently perceived the support as more useful to resolve their stressful events. Our findings suggest that users might recognize the unique characteristics of chatbots and therefore expect different forms of support from that received by humans. In addition, the results show that users' satisfaction with social support and mind perception is important for understanding the effects of support from chatbots.

***Keywords*** : mind perception, social support, perceived social support, human-chatbot interaction

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## Chapter 1. Introduction

### 1.1. Social Support of Chatbots

*Social support* provides individuals with helpful resources to deal with problems through social interactions or relationships (Cohen, 2004; Hobfoll, 1988; Lin et al., 1979). It is divided into several subtypes based on resource characteristics, including *informational support* and *emotional support* (Cobb, 1976; Cohen, 2004; Cohen & Wills, 1985; House, 1981). Informational support is the provision of useful advice or information that helps resolve stressful events. Emotional support refers to expressing empathy, encouragement, and care, thereby facilitating individuals to feel loved and valued by the support provider. Social support has a positive effect on psychological health. For example, older cancer patients feel less depressed when they receive information about the prevention and treatment of the disease (Yang et al., 2021). In addition, when people believe that their family and friends care for them, their depression is reduced (Nasser & Overholser, 2005).

As Artificial Intelligence (AI) technologies have rapidly advanced in recent years, *chatbots*, AI agents that interact with users through natural written languages (Rapp et al., 2021), not only respond to users' requests, but also perform various social functions (Shum et al., 2018). Chatbots



performing these functions are referred to as *social chatbots* (Shum et al., 2018) and they attempt to satisfy users' social needs by engaging in daily conversations, building social relationships and emotional bonding, and providing social support (Shum et al., 2018; Ta et al., 2020). In addition, to compensate for the shortage of mental health workers and enhance the availability of mental health services, various mental health chatbots have been developed to provide social support to users (Vaidyam et al., 2019). For example, Woebot provides users with several Cognitive Behavioral Therapy (CBT)-based practices to manage their cognitive distortions and negative moods while expressing concern and encouragement (Fitzpatrick et al., 2017). Wysa, another mental health chatbot, empathizes with users' emotions and trains them in positive self-expression and emotional resilience skills (Inkster et al., 2018). Several studies have shown that social support from chatbots can improve psychological health (Fitzpatrick et al., 2017; Inkster et al., 2018; Ly et al., 2017; Mehta et al., 2021; Meng & Dai, 2021).

## 1.2. Stress-Buffering Model and Perceived Social Support

Social support fosters psychological health by mitigating the negative effects of stress. The *stress-buffering model* explains how social support reduces the harmful effects of stress (Cohen, 2004; Cohen & Wills, 1985). According to this model, individuals experience stress when they perceive that they cannot control a problem situation. Social support provides individuals with appropriate resources, encouraging them to consider situations as more controllable or promoting their self-esteem, which can reduce the negative effects of stress.

However, social support only relieves stress when it helps manage individuals' stressful situations, and the individuals are satisfied with the support (Cohen & Wills, 1985). This subjective satisfaction with support is a component of *perceived social support*. Perceived social support is related to the extent the recipients perceive that social support is available to them and are satisfied with the provided support (Sarason et al., 1990). Providing social support, which is related to *received social support* (Haber et al., 2007), does not always reduce the detrimental effects of stress. Several studies have revealed that the correlation between the received social support and the improvement of psychological health is not always positive (e.g., Bolger & Amarel, 2007; Frazier et al., 2003). Rather, perceived social support is more important for enhancing psychological health. Perceived social support predicts the effect of social support on mental health much better (e.g., Prati

& Pietrantoni, 2010; Wethington & Kessler, 1986).

Perceived social support is also important for investigating the effects of chatbots' social support on users' psychological health. Previous studies showed that a high availability of chatbots had positive effects on user's experience with social support (Brandtzæg et al., 2021; Narain et al., 2020; Ta et al., 2020). Further, Meng and Dai (2021) revealed that chatbots' social support can improve users' mental health by enhancing their satisfaction with the support.

In interactions with chatbots, the perceived support availability may be usually high since users can talk about their concerns and receive support from chatbots anytime and anywhere they want. Thus, to make chatbots' social support more helpful, the factors that influence users' subjective satisfaction with the support should be investigated.

### **1.3. Factors Influencing Social Support of Chatbots**

#### **Chatbot-Side Factors**

Various factors can influence users' satisfaction with chatbots' social support and, further, the effectiveness of support on users' mental health. Many previous studies have explored these factors through the contents of chatbots' messages that are effective in improving users' psychological health. For example, Meng and Dai (2021) found that chatbots' emotional support reduces users' worries more when they disclose their personal difficulties to

users. Liu and Sundar (2018) revealed that chatbots' supportive messages are favored more by users when chatbots provide information and empathetic expression, rather than providing information only. In addition, Urakami et al. (2019) found that showing interest in users, trying to help users, and expressing understanding of users' situations were positively perceived by users.

Other research has investigated which chatbot characteristics can induce positive effects on users' mental health. For instance, the non-human nature of chatbots can enable users to disclose their private issues comfortably as they are less concerned about being judged and having their secrets revealed (Brandtzæg et al., 2021; Greer et al., 2019; J. Kim et al., 2018; Ta et al., 2020).

### **Human-Side Factors**

Human-side factors can also affect chatbots' social support. For example, Loveys et al. (2022) revealed that users' interest for receiving emotional support from chatbot reduced when they preferred receiving support from a human rather than a chatbot. Kang and Wei (2018) demonstrated that users more positively perceived chatbots when they provided the same type of social support that the support users required. In addition, users' perception of chatbots can influence their social support. Researchers suggested a possibility that perceiving chatbots' minds could influence users' experience of chatbots' social support (Brandtzæg et al., 2021; Urakami et al., 2019).

Brandtzæg et al. (2021) suggested that users' belief that they are loved by chatbots may be important in inducing the positive effects of emotional support. In addition, Urakami et al. (2019) proposed that whether users consider AI agents machines or living entities may affect their perception of the agents' empathic expression.

To the best of our knowledge, no research has investigated how mind perception influences social support from chatbots. Liu and Sundar (2018) investigated how user perceptions of AI agents' abilities influence the effects of their empathic expressions. However, strictly speaking, they did not measure users' mind perception in "a specific chatbot", which was used in their experiment, but explored the perception of "overall robots". In addition, the study found that when users perceived chatbots as successfully recognizing, understanding feelings, and being sad, their negative impression of the chatbots increased. The authors explained that the emotional expression of chatbots could cause uncomfortable feelings for the users as they did not expect the chatbots to have abilities to feel emotions. However, this perception might be a result of the participants determining whether the chatbots' systems and algorithms accurately predicted human feelings and retrieved emotional phrases, rather than anthropomorphizing and attributing minds to them. In their experiments, participants just read conversation scenarios and typed text messages following the given instructions, which made them less likely to consider the experiment chatbot as a living entity.

Additionally, researchers have not discussed the effects of chatbot mind attribution on other types of social support, other than emotional support. This might be because, when chatbots provided emotional support, large individual differences in the effects of support occur (e.g., Brandtzæg et al., 2021; Urakami et al., 2019). However, mind attribution can also influence other types of social support, considering that social support is essentially based on social interaction (Cohen, 2004; Hobfoll, 1988; Lin et al., 1979), and therefore, support providers are expected to be mindful social entities.

Thus, in the current study, we explored whether users consider chatbots as mindful or mindless entities and whether this influences their perception of chatbots' social support.

#### **1.4. Mind Perception**

The entities can be perceived as mindful or mindless depending on the observers' perceptions (H. M. Gray et al., 2007; Yam et al., 2020). In other words, for the same entities, some believe they have minds, whereas others do not. In addition, their perceptions can change depending on the context and situation. For example, depending on individuals' motivations, some people consider AI agents as computers or machines, whereas others anthropomorphize AI agents and believe that they can have their own thoughts and feelings (Epley et al., 2007). Further, people are more likely to attribute humanness to robots when they have more humanlike faces,

including eyelids, nose, and a mouth (DiSalvo et al., 2002). In summary, whether a specific entity is thought of as having its own mind or not depends on the observers' perception; therefore, these concepts are referred to as *mind perception* (H. M. Gray et al., 2007; Yam et al., 2020).

People perceive the mind of a particular entity in two dimensions: *agency* and *experience* (H. M. Gray et al., 2007; K. Gray & Wegner, 2012). Agency is the ability to think and act with one's own volition, whereas experience is the ability to feel sensations, desires, and emotions. Researchers have explored the general perception of various entities and found that adult humans are perceived as having both high agency and experience, whereas dolls lack both (H. M. Gray et al., 2007; Jacobs et al., 2022). The higher the rate of an entity's agency and experience, the more human-like people perceive it. For AI agents, including chatbots, people perceive them as having a low-middle level of agency but lacking experience (H. M. Gray et al., 2007; Jacobs et al., 2022), but this perception can change depending on the context in which people observe or interact with AI agents. For instance, when people anthropomorphize AI agents, their perceived agency and experience can increase. *Anthropomorphism* refers to the process of attributing humanlike characteristics to nonhuman entities (Epley et al., 2007). Imbuing attributes of the human mind (e.g., thought, intention, desire, and emotion) is a core aspect of anthropomorphism (Epley et al., 2007). Accordingly, Yam et al. (2020) found that a robot's perceived agency and experience increase when

people anthropomorphize it. In addition, people perceived more agency and experience for the human-like robots that appeared in movies such as Wall-E of *Wall-E* and R2-D2 of *Star Wars* (Jacobs et al., 2022).

When non-human agents seem to act independently, people tend to anthropomorphize them by trying to understand how and why they behave that way (Epley et al., 2007). Moreover, in human-chatbot interactions, various chatbot characteristics can facilitate users to anthropomorphize them. For example, when chatbots have humanlike names and profile images, the anthropomorphic tendency of users increases (Go & Sundar, 2019). In addition, users tend to anthropomorphize chatbots more when they use humanlike language (Go & Sundar, 2019). Such as, by sending human-like messages that reflect users' previous messages (thereby enhancing message interactivity) (Go & Sundar, 2019; Schuetzler et al., 2020), and through response variability, expressing messages with the same meaning in various ways (e.g., Okay, Ok, I see) (Schuetzler et al., 2020). The tendency for anthropomorphism can also be enhanced by reducing the psychological distance of users from chatbots and showing chatbots' identities (Adam et al., 2021).

However, the tendency to anthropomorphize and ascribe mind attributes to chatbots can vary, depending on several individual factors (Epley et al., 2007; Waytz et al., 2010). For example, when people use human-related information to understand chatbots' state and behavior, they are more likely



to anthropomorphize them. In contrast, when individuals have knowledge of how the chatbot algorithm works, they can explain the chatbots' state and behavior using this knowledge, and are, consequently, less likely to anthropomorphize them. In addition, individuals are more likely to attribute humanness to chatbots when they want to understand and predict the chatbots' behavior, when they want to have social relationships with them, and when they like them. These findings suggest that users' mind perception of chatbots cannot be perfectly manipulated by implementing anthropomorphic cues in chatbots. Therefore, in this study, we considered mind perception a user variable and explored how mind perception influences chatbots' social support.

Several studies have shown that perceiving minds in AI agents has a positive impact on the interactions between humans and agents. For example, S. Lee et al. (2020) found that mind perception in a chatbot increased co-presence and closeness with the chatbot. Yam et al. (2020) showed that when users anthropomorphized a service robot, they perceived higher agency and experience abilities in the robot, which enhanced their overall satisfaction with the hotel where the robot worked. In addition, when users perceive an intelligent personal assistant to sense, think, and act with their own autonomy (i.e., ascribed mind attributes to the agent), they perceive the agent as more competent, which leads to a higher intention to continuously use the agent (Hu et al., 2021). Therefore, in the current study, we explored whether and

how mind perception influences user experience when chatbots provide social support.

### **1.5. Mind Perception and Social Support**

The mind perception of chatbots may influence user satisfaction with chatbots' social support and the effects thereof. Social support is a resource provided through "social interactions or relationships" (Cohen, 2004; Hobfoll, 1988; Lin et al., 1979). To reiterate, it is a helpful resource presented within social interactions or relationships provided by those who intend to help and care for the recipients (Hobfoll, 1988; Shumaker & Brownell, 1984), rather than informative articles or comforting phrases presented alone. Therefore, when users perceive chatbots as mindful entities who can have social interactions or relationships and provide sincere care, the social support provided in the interactions becomes more meaningful. In other words, social support is more effective when users perceive chatbots' minds and interact socially with them, considering them social entities.

Mind perception may influence chatbots' social support differently, depending on the type of support. Different abilities, such as rich information or high empathic intelligence, are related to each type of support. Therefore, mental perception is necessary for specific types of social support.

According to the stress-buffering model, informational support reduces the harmful effects of stress by encouraging individuals to reappraise stressful

situations (Cohen & Wills, 1985). It can suggest how to resolve stressful situations and how to view situations from different perspectives, as less serious and manageable (Cohen & Wills, 1985). Thus, to successfully mitigate the negative effect of stress, chatbots should provide users with helpful information related to their problem situations. Previous research has shown that users usually expect a chatbot to perform informational analysis and retrieval (Brandtzaeg & Følstad, 2017; J. Kim et al., 2018), which suggests that users recognize that chatbots are good at analyzing and then providing helpful information. Chatbots do not necessarily need to possess minds to perform these functions. Therefore, the effect of mind perception may not be relatively small in promoting the positive effect of chatbots' informational support.

In contrast, for the effects of emotional support, the stress-buffering model explains that emotional support directly counterbalances the negative effect of stress (Cohen & Wills, 1985). Emotional support encourages individuals to recognize that they are valuable and deserve acceptance, reducing the threat to their self-esteem (Cohen & Wills, 1985). To reduce the harmful effects of stress, individuals may have to feel that chatbots understand why they have specific thoughts and emotions and why they behave in a certain way and, further, sincerely accept them. This requires support providers to have mental attributes, such as thoughts, feelings, and desires. In other words, for emotional support to be effective, users may need

to anthropomorphize chatbots and perceive their minds. Previous studies have shown that users positively perceive the empathic expression of anthropomorphized agents (Bickmore & Picard, 2004; Brave et al., 2005). In addition, users who appreciated chatbots' empathic expressions reported feeling as if they were talking to a human (Brandtzæg et al., 2021; Fitzpatrick et al., 2017). Hence, the effect of mind perception may be relatively large in terms of promoting the positive effect of chatbots' emotional support.

## **1.6. The Current Study**

The present study explored how mind perception in chatbots influences the effects of social support. More specifically, we first investigated whether chatbots' social support had a positive impact on users' stress handling. For users' stress handling, we measured two variables: (1) *perceived usefulness of chatbot messages*: how much users perceive that the chatbot messages are useful; and (2) *stress reduction*: how much users' stress reduces after conversing with the chatbot. We not only measured stress reduction as in Meng and Dai (2021), but also examined perceived message usefulness because there is a possibility that, although chatbot messages are useful to users, they do not sufficiently relieve users' actual stress levels. The first hypothesis of this study was as follows:

**H<sub>1-1</sub>**: The perceived usefulness of the chatbot message increases when a chatbot provides social support.

**H<sub>1-2</sub>:** The extent of stress reduction increases when a chatbot provides social support.

We also examined whether perceived social support mediates the effect of social support on stress management, as Meng and Dai (2021) did. In the current study, among the aspects of perceived social support, we focused on satisfaction with the provided support. Since users were supposed to converse with our chatbot only once, it was not appropriate to examine the perceived availability of chatbots' support. Thus, in this study, perceived social support referred to the users' satisfaction with social support from chatbots.

**H<sub>2</sub>:** The effects of social support on the perceived usefulness of message and stress reduction are mediated by perceived social support.

After verifying the effects of chatbots' social support on stress management, we explored how their mind perception influences the effectiveness of social support. We investigated whether perceiving minds in chatbots affects perceived social support and the stress-handling effects of support when chatbots provide social support. This hypothesis was as follows:

**H<sub>3-1</sub>:** Users' mind perception of chatbots promotes the stress-handling effects of social support by improving perceived social support.

We then explored whether mind perception influences perceived social

support differently, depending on the type of social support. This hypothesis was as follows:

**H3-2:** The effect of mind perception on perceived social support is stronger when a chatbot provides emotional support rather than informational support.

## Chapter 2. Methods

### 2.1. Participants

A total of 163 individuals participated in this study. Seventy-six undergraduate students were recruited from the Seoul National University SONA System and received 1-course credit for their participation. Fifty-two participants were recruited from online communities of three Korean universities and one Korean company. They received a coffee coupon (equivalent to ₩5,000) for their participation; Thirty-five participants were recruited from Prolific (prolific.co) and received monetary compensation (£3.06).

Twenty-six participants were excluded from the analysis due to incomplete data. The final sample comprised 137 participants ( $n_{female} = 77$ ). The mean age was 23.28 ( $SD = 6.08$ ), ranging from 18 to 49 years. All the participants were Korean. Fifty-nine participants had experience using chatbots.

## 2.2. Experiment Design

We conducted an experiment using a between-subject design. The chatbot's social support was manipulated as follows: (1) no social support, (2) informational support, and (3) emotional support. In every experimental condition, the chatbot prompted participants to write down their stressful experiences by asking several questions to them. Specifically, they were asked what a stressful situation was about, what thoughts and emotions arose from the experience, how they behaved in the situation, how they would change their behavior, and how their emotions changed after conversing about the stressful event. In the informational or emotional support conditions, the chatbot provided informational or emotional support in addition to prompting the writing of stressful experiences. For informational support, the chatbot gave the participants relationship advice. It provided different advice depending on the phase of the interpersonal relationship: (1) building, (2) maintaining, and (3) ending. We created the chatbot's advice by referring to the *psychology of human relationships* (Kwon, 2017). For emotional support, the chatbot expressed phrases such as understanding participants' thoughts, emotions, and behaviors. It also expressed encouragement to participants. We adapted the emotional support content from Meng and Dai (2021). Table 1 presents examples of informational and emotional support.

Participants were randomly assigned to one of three conditions (42 participants in the no social support condition, 48 in the informational support



condition, and 47 in the emotional support condition). In the experiment, participants were asked to share their interpersonal stressful events with our chatbot, and it provided different types of social support depending on the assigned experimental condition.

**Table 1**

*Example of Informational and Emotional Support*

Social Support	Examples
Informational Support	<p><b>Building phase:</b> “In order to build and develop relationships well, it’s important to naturally find the time to meet up and talk to others”</p>
	<p><b>Maintaining phase:</b> “Talk about what you want with others. When you do it, be careful not to use emotional and demanding expressions with them.”</p>
Emotional Support	<p><b>Ending phase:</b> “It’s important to recognize that you are having a hard time right now, but it’s okay and you are going to be better as time goes on.”</p>
	<p><b>Building; Maintaining; Ending phase:</b> “Building relationships; maintaining good relationships; ending relationships is sometimes challenging stuff.”</p>
	<p><b>General:</b> “After listening to your thoughts, I</p>

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can understand why you felt [*Emotion Keyword*] in the situation. I would feel the same way as you.”

**General:** “You may have experienced a lot of stress, but you have also learned something from this situation. This experience will make you stronger!”

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### 2.3. Materials and Measurements

**Experiment Chatbot.** We built a script-based chatbot using Chatfuel (chatfuel.com) and integrated it into Facebook Messenger. Following predefined scenarios, our chatbot sent various messages that facilitated social interactions with participants and dealt with stressful events.

To encourage participants to anthropomorphize and attribute a humanlike mind to our chatbot, we utilized several anthropomorphic cues suggested by previous studies (Adam et al., 2021; Araujo, 2018; Go & Sundar, 2019; Gong, 2008; Schanke et al., 2021; Schuetzler et al., 2020). First, we tried to make our chatbot’s messages more humanlike and personalized by sending messages that reflected the contents of participants’ previous messages. We integrated the Dialogflow (dialogflow.cloud.google.com) AI system into our chatbot because it can train and predict the types and important components of user messages. We trained our chatbot to predict the types of stress events and emotions experienced by the participants.

We also used various other methods to attribute human-likeness to the chatbot. For instance, by expressing the same meaning in various forms of messages (e.g., Okay, Ok, I see). To make an impression that our chatbot typed messages in real-time, we added some delay (1s ~ 6s depending on the length of messages) and showed typing indicators (i.e., three dots) before sending messages. In addition, we used a humanlike image and name (Allen) for the chatbot. Lastly, our chatbot presented its identity using first-person singular pronouns.

In addition to imbuing human-likeness, in order to facilitate anthropomorphism, we tried to elicit social responses and reduce social distances by making the chatbot say “hello” and “goodbye” to participants and engage in small talk (i.e., asking about participants’ experience of chatbot usage).

**Perceived Usefulness of Chatbot Message.** To measure the extent to which participants perceived the chatbot messages as useful, we used items from Holmstrom et al. (2005) after translating them into Korean. The items were originally used for measuring “the perceived effectiveness of the helper’s behavior” in the study by Holmstrom et al. (2005). Participants were asked to rate each item on a 7-point Likert scale. Cronbach’s  $\alpha$  was .86. Example items included: “ineffective” - “effective” and “helpful” – “unhelpful.”

**Stress Reduction.** We used the Korean version of the Perceived Stress Scale (Cohen, 1988; J. Lee et al., 2012) to measure the extent to which participants perceived stress during their stressful events. We modified the items to assess perceived stress in a specific situation, as in Meng and Dai (2021). Participants were asked to recall one of their interpersonal stressful events and then rate each item on a 7-point Likert scale. We measured the perceived stress of participants before and after their conversation with the chatbot. The stress reduction score was calculated by subtracting the perceived stress score post-conversation from the pre-conversation score. Cronbach's  $\alpha$  for perceived stress of pre-conversation and post-conversation was .89 and .93, respectively. Example items included: "I felt upset" and "I felt that I was unable to control the situation."

**Perceived Social Support.** We used the Korean version of the Multidimensional Scale of Perceived Social Support (Shin & Lee, 1999; Zimet et al., 1988) to examine the extent to which the participants were satisfied with the chatbot's support. We changed the support source of the items to our chatbot and excluded eight items that were identical except for the support source (e.g., "My family really tries to help me" and "My friend really tries to help me"); inappropriate items for our experiment's context where participants interacted with our chatbot for the first time (e.g., "There is a special person who is around when I am in need"); and items related only

to a specific type of social support (e.g., “I get the emotional help and support I need from my family”). The final scale consisted of four items. Participants were asked to rate the extent to which they agreed with each item on a 7-point Likert scale. Cronbach’s  $\alpha$  was .81. Example items included: “Allen really tried to help me” and “I could talk about my problems with Allen.”

**Mind Perception in a Chatbot.** To assess the extent to which participants perceived a humanlike mind in the chatbot, we utilized five items (two items for agency and three items for experience) from S. Lee et al. (2020) and K. Gray and Wegner (2012) after translating them into Korean. Participants were asked to answer each item on a 7-point Likert scale. Cronbach’s  $\alpha$  was .90. Example items included: “I felt that Allen was able to think by itself” and “I felt that Allen had the capacity to feel pain.”

**Neuroticism.** People with high neuroticism react more sensitively to stressful events (Suls, 2001), making social support less effective. To measure and control for participants’ levels of neuroticism, we used the Korean version of the Big Five Inventory (John & Srivastava, 1999; S.-Y. Kim et al., 2010). We modified some items to make their meaning further identical to the original English items, as per W. Kim (2021). Participants were asked to indicate the extent to which they agreed with each statement on a 5-point Likert scale. Cronbach’s  $\alpha$  was .83. Example items included: “I see myself as someone

who is depressed, blue” and “I see myself as someone who get nervous easily.”

## **2.4. Procedure**

Participants were asked to participate in this study through their mobile devices because they had to converse with our chatbot through the Facebook Messenger application. After signing up for the study, participants received an online study link. The first page provided participants with a written description of the study. Only those who consented to participate were included in the study.

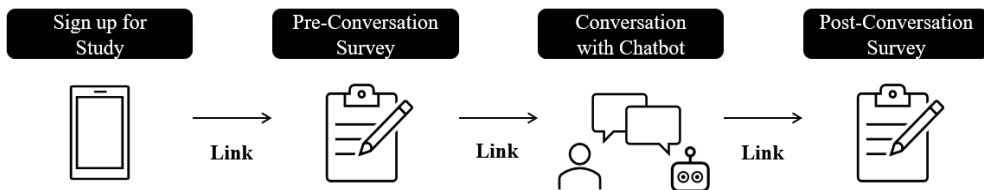
First, participants were asked to install the Facebook Messenger application and sign in to their Facebook accounts. Then, they were asked to answer the pre-conversation survey and were informed of the guidelines for chatting with the experiment’s chatbot. In the pre-conversation survey, participants’ perceived stress and personality were measured.

After submitting the survey, participants were given another link directing them to a conversation with the chatbot. The conversation scenario was as follows: (1) greeting, (2) engaging in small talk, (3) the chatbot’s self-introduction, (4) prompting participants to elaborate on their stressful event, (5) providing informational or emotional support (only in the informational or emotional support conditions, respectively), (6) asking whether participants would change their behavior and the extent to which they felt negative emotions changed, and (7) concluding the conversation.

At the end of the conversation, the chatbot sent a link to another survey. In the post-conversation survey, participants' perceived stress was re-measured. We also measured the perceived usefulness of the chatbot's messages, perceived social support, and mind perception. Finally, after investigating the participants' demographic information, the study was concluded.

**Figure 1**

*Overall Procedure of the Present Study*



## Chapter 3. Results

### 3.1. Effects of Social Support on Stress-Handling

We investigated whether social support positively affects users' stress management. Therefore, we examined whether each type of social support had a positive effect on perceived message usefulness and stress reduction.

#### 3.1.1. Effects of Social Support

**Perceived Usefulness of Chatbot Messages.** We conducted t-tests to examine the effects of informational and emotional support on the perceived usefulness of the chatbot messages. The extent of perceived message usefulness was not significantly different between the no social support and informational support groups ( $t(88) = -0.13, p = .89$ ). In contrast, the emotional support group perceived chatbot messages as less useful than the no social support group ( $t(87) = 2.20, p = .03$ ). The means and standard deviations of the perceived message usefulness are presented in Table 2.

**Table 2**

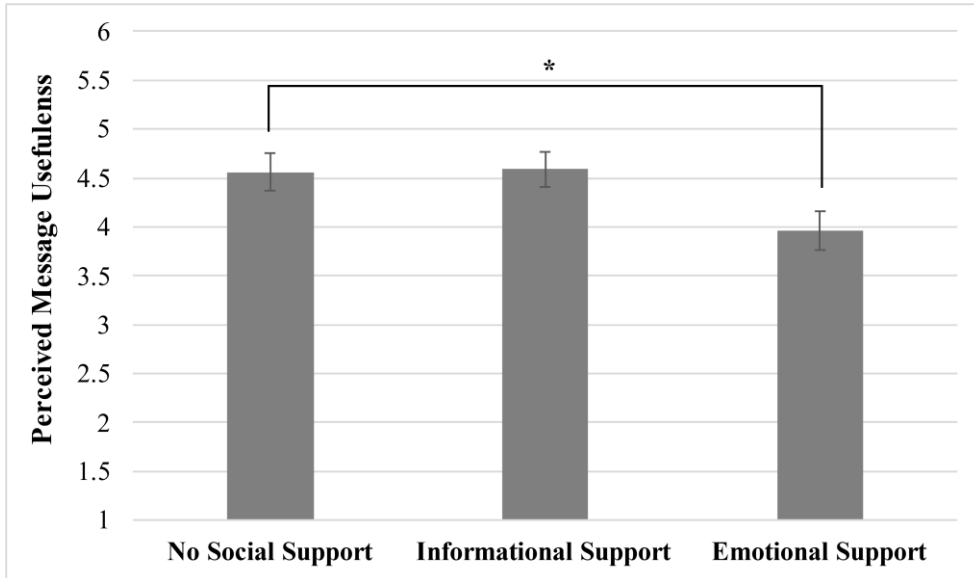
*Means and Standard Deviations of Perceived Message Usefulness*

	<i>M</i>	<i>SD</i>
No Social Support	4.56	1.22
Informational Support	4.59	1.23
Emotional Support	3.96	1.35



**Figure 2**

*The Effect of Social Support on Perceived Message Usefulness*



Note. \*  $p < .05$

**Stress Reduction.** We conducted ANCOVAs to investigate the effects of informational and emotional support on stress reduction while including neuroticism as a covariate. The extent of stress reduction was not significantly different between the no social support and informational support groups ( $F(1, 87) = 0.96, p = .33$ ). In addition, the extent of stress reduction was not significantly different between the no social support and emotional support groups ( $F(1, 86) = 1.16, p = .29$ ). The means and standard deviations of perceived stress are shown in Table 3.

**Table 3***Means and Standard Deviations of Perceived Stress*

		<i>M</i>	<i>SD</i>
No Social Support	Pre-Conversation Stress	4.38	1.08
	Post-Conversation Stress	4.01	1.38
	Stress Reduction	0.36	1.03
Informational Support	Pre-Conversation Stress	4.55	1.18
	Post-Conversation Stress	3.96	1.21
	Stress Reduction	0.59	1.11
Emotional Support	Pre-Conversation Stress	4.16	1.18
	Post-Conversation Stress	4.06	1.24
	Stress Reduction	0.1	1.12

**3.1.2. Mediation of Perceived Social Support**

**Perceived Usefulness of Chatbot Messages.** We conducted Hayes' PROCESS macros (Hayes, 2013) and linear regressions to investigate whether perceived social support mediated the effects of social support on perceived message usefulness. We conducted the analyses when the chatbot provided informational and emotional support, respectively. In each analysis, we coded the social support conditions as follows: *no social support* = 0, *informational support* = 1; *no social support* = 0, *emotional support* = 1.

Regarding the effects of informational support on perceived message usefulness, the indirect effect through perceived social support was not statistically significant ( $b = -0.03$ ,  $SE = 0.19$ , 95% CI = [-0.39, 0.37]). The effect of informational support on perceived social support was not statistically significant ( $b = -0.04$ ,  $p = .89$ ); however, perceived social support

significantly predicted perceived message usefulness ( $b = 0.72, p < .001$ ). The direct effect of informational support on perceived message usefulness was not statistically significant ( $b = 0.06, p = .73$ ). The total effect was not significant ( $b = 0.03, p = .90$ ).

**Table 4**

*Mediation Analysis for the Effect of Informational Support on Perceived Message Usefulness*

	<i>b</i>	<i>SE</i>	<i>p</i>		
X → M	-0.04	0.27	0.89		
M → Y	0.72	0.07	0.00		
X → Y (Direct Effect)	0.06	0.17	0.73		
X → Y (Total Effect)	0.03	0.26	0.90		
				<b>LLCI</b>	<b>ULCI</b>
X → M → Y	-0.03	0.19		-0.39	0.37

*Note.* Bootstrapped with 5,000 samples using a 95% confidence interval; LLCI, lower limit confidence interval; ULCI, upper limit confidence interval; X, informational support; M, perceived social support; Y, perceived message usefulness.

The indirect effect of perceived social support was not statistically significant for the effects of emotional support on perceived message usefulness ( $b = -0.26, SE = 0.21, 95\% CI = [-0.68, 0.17]$ ). The effect of emotional support on perceived social support was not statistically significant ( $b = -0.34, p = .22$ ); however, perceived social support significantly predicted the perceived usefulness of the message ( $b = 0.77, p < .001$ ). The direct effect

of emotional support on perceived message usefulness was not statistically significant ( $b = -0.34, p = .06$ ). However, the total effect was statistically significant ( $b = -0.60, p = .03$ ).

**Table 5**

*Mediation Analysis for the Effect of Emotional Support on Perceived Message Usefulness*

	<i>b</i>	<i>SE</i>	<i>p</i>	
X → M	-0.34	0.28	0.22	
M → Y	0.77	0.07	0.00	
X → Y (Direct Effect)	-0.34	0.17	0.06	
X → Y (Total Effect)	-0.60	0.27	0.03	
			<b>LLCI</b>	<b>ULCI</b>
X → M → Y	-0.26	0.21	-0.68	0.17

*Note.* Bootstrapped with 5,000 samples using a 95% confidence interval; LLCI, lower limit confidence interval; ULCI, upper limit confidence interval; X, emotional support; M, perceived social support; Y, perceived message usefulness.

Taken together, perceived social support has no mediating effect on the relationship between social support and perceived message usefulness. Social support did not significantly affect perceived social support; however, perceived social support enhanced perceived message usefulness. Emotional support negatively affected perceived message usefulness, whereas informational support had no significant effects.

**Stress Reduction.** We also conducted Hayes' PROCESS macros and linear regressions to examine whether the effects of social support on stress reduction were mediated by perceived social support while controlling for neuroticism. We conducted the analyses for each type of social support, and coded the social support conditions as follows: *no social support* = 0, *informational support* = 1; *no social support* = 0, *emotional support* = 1.

Regarding the effects of informational support on stress reduction, the indirect effect of perceived social support was not statistically significant ( $b = -0.01$ ,  $SE = 0.06$ , 95% CI = [-0.16, 0.10]). The effect of informational support on perceived social support was not statistically significant ( $b = -0.04$ ,  $p = .89$ ); however, perceived social support significantly predicted stress reduction ( $b = 0.20$ ,  $p = .02$ ). The direct effect of informational support on stress reduction was not statistically significant ( $b = 0.23$ ,  $p = .30$ ). The total effect was not statistically significant ( $b = 0.22$ ,  $p = .33$ ).

**Table 6***Mediation Analysis for the Effect of Informational Support on Stress Reduction*

	<i>b</i>	<i>SE</i>	<i>p</i>	
X → M	-0.04	0.27	0.89	
M → Y	0.20	0.09	0.02	
X → Y (Direct Effect)	0.23	0.22	0.30	
X → Y (Total Effect)	0.22	0.23	0.33	
			<b>LLCI</b>	<b>ULCI</b>
X → M → Y	-0.01	0.06	-0.16	0.10

*Note.* Bootstrapped with 5,000 samples using a 95% confidence interval; LLCI, lower limit confidence interval; ULCI, upper limit confidence interval; X, informational support; M, perceived social support; Y, stress reduction.

The indirect effect of perceived social support was not statistically significant for the effects of emotional support on stress reduction ( $b = -0.05$ ,  $SE = 0.06$ , 95% CI = [-0.20, 0.04]). The effect of emotional support on perceived social support was not statistically significant ( $b = -0.34$ ,  $p = .22$ ) and perceived social support had no statistically significant effect on stress reduction ( $b = 0.13$ ,  $p = .14$ ). Neither the direct effect ( $b = -0.20$ ,  $p = .38$ ) nor the total effect ( $b = -0.25$ ,  $p = .29$ ) of emotional support on stress reduction were statistically significant.

**Table 7***Mediation Analysis for the Effect of Emotional Support on Stress Reduction*

	<i>b</i>	<i>SE</i>	<i>p</i>		
X → M	-0.34	0.28	0.22		
M → Y	0.13	0.09	0.14		
X → Y (Direct Effect)	-0.20	0.23	0.38		
X → Y (Total Effect)	-0.25	0.23	0.29		
				<b>LLCI</b>	<b>ULCI</b>
X → M → Y	-0.05	0.06		-0.20	0.04

*Note.* Bootstrapped with 5,000 samples using a 95% confidence interval; LLCI, lower limit confidence interval; ULCI, upper limit confidence interval; X, emotional support; M, perceived social support; Y, stress reduction.

In summary, there were no mediating effects of perceived social support on the relationship between social support and stress reduction. Social support did not significantly affect perceived social support or stress reduction. Perceived social support significantly increased stress reduction only when the chatbot provided informational support.

## 3.2. Effects of Mind Perception on Social Support

We explored how mind perception in a chatbot influences the effectiveness of the chatbot's social support. In the current analysis, the effectiveness of social support was defined as the extent of perceived message usefulness and stress reduction when the chatbot provided informational or emotional support. Therefore, we only included data in the group conditions of informational and emotional support (except for the no social support group) and examined how mind perception affects perceived message usefulness and stress reduction when the chatbot provides social support.

### 3.2.1. Effects of Mind Perception

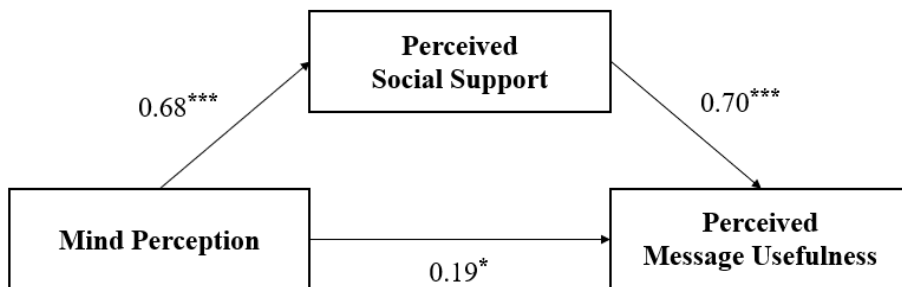
**Perceived Usefulness of Chatbot Message.** We conducted Hayes' PROCESS macros and linear regression to examine whether the effects of mind perception on perceived message usefulness were mediated by perceived social support. The indirect effect of perceived social support was statistically significant ( $b = 0.47$ ,  $SE = 0.10$ , 95% CI = [0.30, 0.68]). The effect of mind perception on perceived social support was also significant ( $b = 0.68$ ,  $p < .001$ ), and perceived social support significantly enhanced perceived message usefulness ( $b = 0.70$ ,  $p < .001$ ). The direct effect of mind perception on perceived message usefulness was statistically significant ( $b = 0.19$ ,  $p = .02$ ). The total effect was also statistically significant ( $b = 0.66$ ,  $p < .001$ ).



**Table 8***Mediation Analysis for the Effect of Mind Perception on Perceived Message Usefulness*

	<i>b</i>	<i>SE</i>	<i>p</i>	
X → M	0.68	0.07	0.00	
M → Y	0.70	0.09	0.00	
X → Y (Direct Effect)	0.19	0.08	0.02	
X → Y (Total Effect)	0.66	0.08	0.00	
			<b>LLCI</b>	<b>ULCI</b>
X → M → Y	0.47	0.10	0.30	0.68

*Note.* Bootstrapped with 5,000 samples using a 95% confidence interval; LLCI, lower limit confidence interval; ULCI, upper limit confidence interval; X, mind perception; M, perceived social support; Y, perceived message usefulness.

**Figure 3***Mediation Analysis for the Effect of Mind Perception on Perceived Message Usefulness*

*Note.* \*  $p < .05$ , \*\*\*  $p < .001$

**Stress Reduction.** We also conducted Hayes' PROCESS macro and linear regression to examine whether the effects of mind perception on stress reduction were mediated by perceived social support while controlling for neuroticism. The indirect effect of perceived social support was not statistically significant ( $b = 0.10$ ,  $SE = 0.10$ , 95% CI = [-0.09, 0.29]). The effect of mind perception on perceived social support was significant ( $b = 0.68$ ,  $p = <.001$ ); however, perceived social support did not significantly predict stress reduction ( $b = 0.15$ ,  $p = .24$ ). The direct effect of mind perception on perceived message usefulness was not statistically significant ( $b = 0.01$ ,  $p = .93$ ). The total effect was also not statistically significant ( $b = 0.11$ ,  $p = .20$ ).

**Table 9**

*Mediation Analysis for the Effect of Mind Perception on Stress Reduction*

	<i>b</i>	<i>SE</i>	<i>p</i>	
X → M	0.68	0.07	0.00	
M → Y	0.15	0.13	0.24	
X → Y (Direct Effect)	0.01	0.12	0.93	
X → Y (Total Effect)	0.11	0.09	0.20	
			LLCI	ULCI
X → M → Y	0.10	0.10	-0.09	0.29

*Note.* Bootstrapped with 5,000 samples using a 95% confidence interval; LLCI, lower limit confidence interval; ULCI, upper limit confidence interval; X, mind perception; M, perceived social support; Y, stress reduction

In summary, perceived social support has mediating effects on the

relationship between mind perception and perceived message usefulness. However, mind perception and perceived social support did not have significant effects on stress reduction.

### **3.2.2. Interaction Effects of Mind Perception and Support Type.**

We conducted a two-way ANOVA to examine whether the effects of mind perception on perceived social support varied depending on the type of social support offered by the chatbot. We divided the data into two categories (*More Mind Perception* and *Less Mind Perception*). If the mean score of the mind perception of the data was greater than the sample mean score of mind perception (2.91), the data were assigned to the *More Mind Perception* group; otherwise, they were assigned to the *Less Mind Perception* group.

The results showed that in perceived social support, the difference between informational and emotional support groups was marginally significant. The extent of perceived social support was higher when the chatbot provided informational support rather than emotional support ( $F(1, 91) = 3.79, p = .05$ ). Perceived social support was higher in the more mind-perception group than in the less mind perception group ( $F(1, 91) = 30.26, p < .001$ ). The interaction effects between the type of social support and mind perception on perceived social support were not statistically significant ( $F(1, 91) = 2.43, p = .12$ ). The means and standard deviations of perceived social support are shown in Table 10.

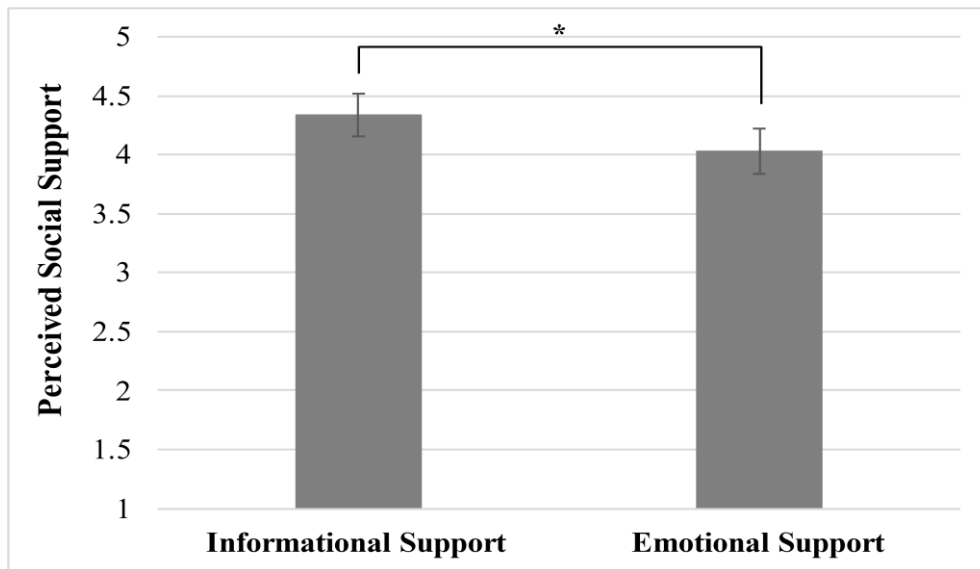
**Table 10**

*Means and Standard Deviations of Perceived Social Support*

	<i>M</i>	<i>SD</i>
Informational Support	4.34	1.24
Emotional Support	4.03	1.3
Less Mind Perception	3.52	1.16
More Mind Perception	4.9	0.97
Informational Support + More Mind Perception	4.85	1.08
Informational Support + Less Mind Perception	3.82	1.19
Emotional Support + More Mind Perception	4.94	0.87
Emotional Support + Less Mind Perception	3.23	1.08

**Figure 4**

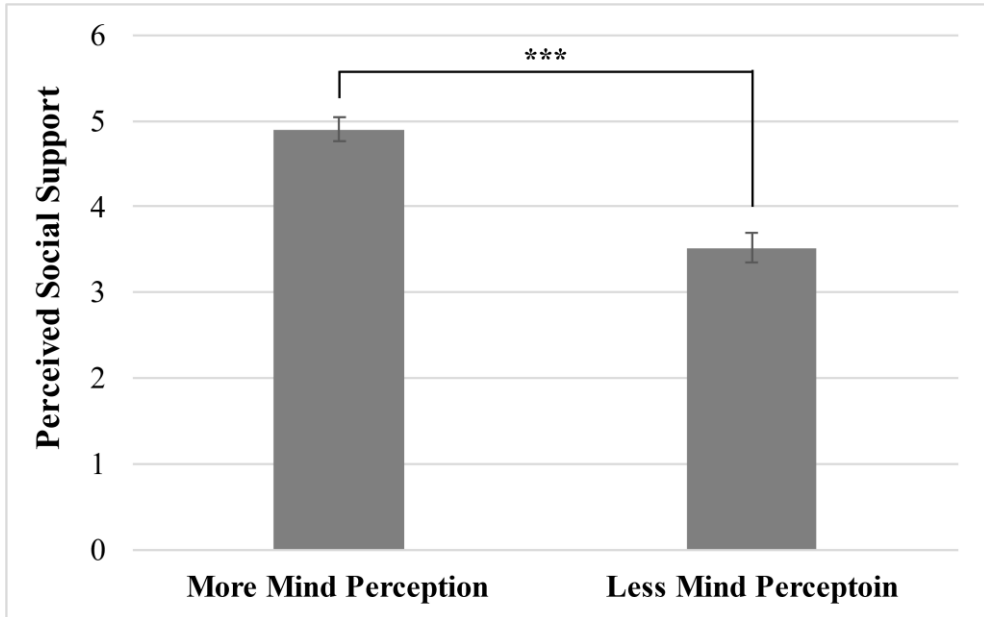
*The Effect of **Support Type** on Perceived Social Support*



Note. \*  $p < .05$

**Figure 5**

*The Effect of Mind Perception on Perceived Social Support*



Note. \*\*\*  $p < .001$

## Chapter 4. Discussions

### 4.1. Summary of Results

This study explored how the perception of chatbots' minds influences the effects of social support from chatbots. First, we attempted to verify the effectiveness of chatbots' social support. This was done by investigating whether chatbots' social support positively affected perceived message usefulness and stress reduction (**H<sub>1-1</sub>** and **H<sub>1-2</sub>**) and whether the positive effects were mediated by users' perceived social support (**H<sub>2</sub>**).

The results showed that the emotional support group perceived chatbot messages as less useful than the no social support group did. There was no significant difference in perceived message usefulness between the no social support and informational support groups. These findings suggest that prompting users to verbalize and write down their thoughts, feelings, and experiences can have sufficient positive effects on their stress handling. As previous studies suggested, writing about stressful experiences can promote an awareness of one's thoughts and feelings, which facilitates introspection and self-evaluation (Brandtzæg et al., 2021; Ta et al., 2020). Informational support might not have more positive effects than prompting only the writing of stressful events because the advice provided by our chatbot did not always fit the participants' situations. For informational support, we categorized participants' interpersonal stress events into three phases (building,

maintaining, and ending phases) and provided different informational support for each type of phase. However, the informational support for each phase was general advice applicable to all situations in the phase rather than customized to participants' exact situations. Therefore, informational support might not be appropriate for dealing with participants' stress events, which could reduce the positive effects of informational support on participants' stress handling.

In addition, there were no significant differences in stress reduction between the no social support and social support groups (both informational and emotional support groups). These results may indicate that the chatbot messages were useful; however, one-time, short interactions (approximately 5 min) with the chatbot were not sufficient to reduce participants' actual stress.

In the mediation analyses, there were no mediation effects of perceived social support on the relationship between social support and stress handling. However, perceived social support positively affected perceived message usefulness and stress reduction. The mediation effects might not be proven because informational and emotional support did not have sufficient positive effects on stress handling compared to prompting only the writing of stressful experiences. Our results suggest that perceived social support is also a critical factor in improving the effects of chatbots' social support, as revealed by Meng and Dai (2021).

Next, we explored how the mind perception of the chatbot influenced

the effectiveness of its social support. Specifically, we examined whether mind perception affected perceived social support and, consequently, perceived message usefulness and stress reduction (**H3-1**). We then explored whether the effect of mind perception on perceived social support varied depending on the type of social support (**H3-2**).

Our findings show that the mediation effect of perceived social support was significant only for the relationship between mind perception and perceived message usefulness. In other words, perceiving a mind in the chatbot improved perceived social support; however, perceived social support enhanced perceived message usefulness but not stress reduction. These findings suggest that mind perception can reinforce the stress-handling effects of social support by increasing the perceived social support. To reiterate, when users perceive chatbots as mindful entities, they are more satisfied with their social support, which further provokes the positive effects of support. Interactions with chatbots will be more meaningful when users treat them as mindful and social entities, as suggested by S. Lee et al. (2020), which can make them more likely to favor chatbots' social support. Nevertheless, perceived social support did not significantly relieve actual stress levels because the one-time, short interactions with the chatbot might be insufficient to provoke positive effects, as suggested above.

The informational group was more satisfied with support than the emotional support group. Taken together with the result that providing



emotional support reduced the positive effects of prompting the writing of stressful experiences, these findings suggest that chatbots' emotional support is not accepted by all users. This mirrors previous studies that found that not all users appreciate chatbots' emotional support and expression (Brandtzæg et al., 2021; Loveys et al., 2022; Urakami et al., 2019).

The interaction effects of mind perception and the type of social support were not statistically significant. Social support is based on social interactions and relationships with mindful entities (Cohen, 2004; Hobfoll, 1988; Lin et al., 1979), thus, whether users perceive minds in chatbots and consider them social entities may be important regardless of the type of support provided by the chatbots. However, a tendency for interaction between mind perception and type of support was also observed. When participants perceived that the chatbot had a much less humanlike mind, their satisfaction with emotional support decreased more sharply. In addition, the correlation between mind perception and perceived social support was stronger when the chatbot provided emotional support ( $r(45) = .79, p < .001$ ) over informational support ( $r(46) = .62, p < .001$ ), although the difference between the coefficients was not significant ( $z = 1.59, p = .11$ ). These results suggest that the effects of mind perception on perceived social support might vary depending on the type of social support; however, the effect size was not large enough to result in a significant difference. This non-significant result might be due to the skewed sample in our study. Most participants tended to perceive that the

chatbot lacked a mind (the sample mean score of mind perception was 2.91). More balanced data on the extent to which users ascribe mind attributes to chatbots may be needed to clearly determine the interaction effects.

## **4.2. Implications**

First, the current study revealed that not all users appreciate receiving emotional support from chatbots. Moreover, the study shows that helping users write down and reflect on their stressful experiences has positive effects. These results suggest that not all users want chatbots to provide the same form of support that humans usually offer.

According to the *Computers Are Social Actors (CASA)* paradigm, users mindlessly respond to computers socially and interact with them as if they were interacting with humans (Nass & Moon, 2000; Nass et al., 1994). In human interactions and relationships, humans usually express empathy and sympathy with each other; therefore, users may also want and expect AI agents to empathize with them when conversing. Previous research has shown that AI agents' empathic expressions have positive effects on users (Liu & Sundar, 2018; Meng & Dai, 2021).

However, because people nowadays have experience with various AI agents, understand their unique characteristics, and have knowledge of them, they have different expectations of the agents and, further, interact with them differently to how they interact with humans (Gambino et al., 2020). Several

studies, including our study, showed that empathetic expressions of AI agents could negatively affect users (Liu & Sundar, 2018; Stein & Ohler, 2017), which suggests that users might not favor agents that mimic human expressions of empathy and sympathy. Users might expect different forms of support from chatbots. For example, users expect and recognize AI agents to be non-judgmental because they are essentially machines, encouraging users to tell their innermost stories without fear, unlike when conversing with humans (Ta et al., 2020). Moreover, users recognize that AI agents lack emotions and expect agents to listen and react to their stories without becoming tired (J. Kim et al., 2018).

Thus, several user factors, including users' experience with chatbots, can influence the support they want and expect to receive from chatbots. To promote the positive effects of chatbots' social support, what expectations users have of chatbots, and, which user factors may affect the expectations, should be explored.

Second, our findings also show that user satisfaction with the provided support is important to investigate the effects of chatbots' social support. When dealing with social support in human interactions, researchers have distinguished received social support from perceived social support and have investigated its effects (e.g., Melrose et al., 2015; Norris & Kaniasty, 1996; Wethington & Kessler, 1986). Our results suggest that when assessing the effects of chatbots' social support, perceived social support should be

considered with received social support to have a deeper understanding of their effectiveness, as when investigating social support in human interactions.

Finally, our results reveal the importance of mind perception in promoting the positive effects of social support from chatbots. Furthermore, this study revealed the mechanism by which mind perception influences the effects of social support. Mind attribution can improve the effects of chatbots' social support by promoting perceived social support of users. Previous research has proposed that whether users perceive chatbots as mindful, living entities may influence their experience of social support (Brandtzæg et al., 2021; Urakami et al., 2019). By investigating how mind perception affects chatbots' social support, our study broadens the understanding of when and how the effects of chatbots' social support can be improved.

### **4.3. Limitations and Future Research**

The present study had some limitations. First, social support did not have a sufficient impact on resolving participants' stressful events. The informational support provided by our chatbot was general advice and not customized to participants' exact situations, which might have reduced the effects of the support. To investigate the effects of informational support more clearly, future studies must find ways to provide more customized informational support for participants' stress events and then explore the effects thereof. In addition, the social support used in our study lacked the

positive effect of reducing participants' actual stress levels, perhaps, because participants only had one time, short interactions with our chatbots. Therefore, future studies should explore whether chatbots' social support can improve the psychological well-being of users through longer and continuous interactions with supportive chatbots.

Second, our sample was biased towards the extent of mind perception. Most participants had low and middle levels of mind perception for the chatbot, which might have made it difficult to determine its effects. Future research should investigate the effects of mind ascription using more balanced data. In addition, the biased sample could have been caused by participants consciously responding to whether they perceived chatbots as having a mind. In other words, even if the participants implicitly felt that the chatbot was a mindful entity when they were interacting with it, they could consciously respond that they did not perceive one because chatbots essentially do not have "minds", as shown by Nass and Moon (2000). Therefore, future studies should explore how to measure the extent to which users implicitly perceive chatbots' minds and investigate the effects of implicit mind perception on their social support.

Finally, this experiment's chatbot sometimes predicted participants' emotions and situations incorrectly. Prediction failure may impair the positive effects of social support. To accurately examine the effect of social support, future studies should conduct experiments with more sophisticated prediction

algorithms or Wizard-of-Oz methods (Dahlbäck et al., 1993).

## **Chapter 5. Conclusion**

The present study explored whether social support of chatbots improves users' stress handling and how mind perception in chatbots influences the effectiveness of their social support. We found that perceived social support enhances perceived message usefulness and reduces stress. We also revealed that providing emotional support reduced perceived message usefulness compared to only prompting participants to verbalize and write down their stressful events. In addition, participants were less satisfied with the support when they received emotional support rather than informational support from the chatbot. Finally, we found that mind perception improved perceived social support and, consequently, promoted perceived message usefulness. These results suggest that nowadays users recognize chatbots' unique characteristics and thus expect different forms of social support from that received by humans. The results also show the importance of user satisfaction with social support and mind perception in understanding the effects of social support from chatbots. Future studies should be conducted with more effective social support, more balanced samples of the extent of mind perception, and more accurate chatbot recognition of users' stress experiences.

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## Appendix

### Appendix 1: Perceived usefulness of Chatbot Message (Holmstrom et al., 2005)

앞서 떠올린 스트레스 상황을 다루는 것에 있어 엘런의 메시지가 어땠는지 아래의 각 항목에 대하여 표시해 주세요.

효과적이지 않은	1	2	3	4	5	6	7	효과적인
도움이 되지 않는	1	2	3	4	5	6	7	도움이 되는
유익하지 않은	1	2	3	4	5	6	7	유익한
적절하지 않은	1	2	3	4	5	6	7	적절한

**Appendix 2: Perceived Stress (adapted from Cohen (1988) and J. Lee et al. (2012))**

앞서 떠올린 스트레스 상황에 대해서, 각 문항에 해당하는 내용을 얼마나 느끼는지 표시해 주세요.

1 전혀 그렇지 않다	2 대체로 그렇지 않다	3 약간 그렇지 않다	4 보통이다	5 약간 그렇다	6 대체로 그렇다	7 매우 그렇다
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1. 당황스럽다.
2. 상황을 통제할 수 없다는 느낌이 든다.
3. 신경이 예민해지고 스트레스 받는다.
4. 자신감을 느낀다.
5. 일이 내 생각대로 진행되고 있다는 느낌이 든다.
6. 상황을 처리할 수 없다는 생각이 든다.
7. 짜증을 잘 다스릴 수 있다.
8. 최상의 컨디션이라고 느낀다.
9. 화가 난다.
10. 어려운 일들이 너무 많이 쌓여서 극복하지 못할 것 같은 느낌이 든다.

**Appendix 3: Mind Perception (K. Gray & Wegner, 2012; S. Lee et al., 2020)**

엘런의 인상이 어땠는지 아래의 각 항목에 대하여 표시해 주세요.

1 전혀 그렇지 않다	2 대체로 그렇지 않다	3 약간 그렇지 않다	4 보통이다	5 약간 그렇다	6 대체로 그렇다	7 매우 그렇다
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1. 나는 엘런이 스스로 생각할 수 있다고 느꼈다.
2. 나는 엘런이 자신의 의지대로 행동할 수 있다고 느꼈다.
3. 나는 엘런이 의식이 있다고 느꼈다.
4. 나는 엘런이 고통을 느낄 수 있다고 느꼈다.
5. 나는 엘런이 두려움을 느낄 수 있다고 느꼈다.

**Appendix 4: Big Five Inventory (John & Srivastava, 1999; S.-Y. Kim et al., 2010)**

평소 본인의 성격과 가장 일치한다고 생각되는 것을 그 정도에 따라 대답해 주세요. "나는 나 자신이 이런 사람이라고 생각한다."

1 전혀 그렇지 않다	2 그렇지 않은 편이다	3 보통이다	4 그런 편이다	5 항상 그런 편이다
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1. 말이 많다.
2. 다른 사람의 흠을 잘 잡는다.
3. 맡은 일을 철저히 한다.
4. 마음이 우울하고 가라 앉았다.
5. 독창적이고 새로운 아이디어를 생각해낸다.
6. 보수적이다.
7. 다른 사람을 잘 도와준다.
8. 경솔할 때가 있다.
9. 느긋한 편이고, 스트레스를 잘 해소한다.
10. 여러 가지에 대하여 호기심이 많다.
11. 활기가 넘친다.
12. 다른 사람과 자주 다툰다.
13. 믿음직한 일꾼이다.
14. 잘 긴장하는 편이다.
15. 기발하고 생각이 깊다.
16. 매사에 매우 열심이다.
17. 너그럽다.

18. 무질서한 경향이 있다.
19. 걱정이 많다.
20. 상상력이 풍부하다.
21. 말수가 적은 편이다.
22. 믿음직스럽다.
23. 게으른 편이다.
24. 감정적으로 안정적이고 쉽게 동요하지 않는다.
25. 창의적이다.
26. 자기주장이 강하다.
27. 차갑고 냉담한 성격이다.
28. 인내심 있게 맡은 일을 끝까지 해낸다.
29. 변덕스러운 편이다.
30. 예술적, 미적 경험을 중시한다.
31. 가끔 부끄럼을 타고 감정을 숨긴다.
32. 사려 깊고 거의 모든 사람에게 친절하다.
33. 효율적으로 일을 처리한다.
34. 긴장된 상황에서도 침착하다.
35. 규칙적인 생활을 좋아한다.
36. 어울리기를 좋아하고 사교적이다.
37. 때로 다른 사람에게 무례하다.
38. 계획을 세워 일을 처리한다.
39. 쉽게 불안해 한다.
40. 생각하기를 즐긴다.
41. 예술에 대한 관심이 별로 없다.

- 42. 다른 사람과 협력하기를 좋아한다.
- 43. 쉽게 주의가 산만해진다.
- 44. 미술, 음악, 문학에 대한 세련된 감각이 있다.



## 국문 초록

챗봇은 사용자에게 사회적 지지를 제공하고 그들의 심리적 안녕감을 높일 수 있는 잠재성을 지니고 있다. 그럼에도 불구하고 챗봇에 대한 사용자 지각이 챗봇의 사회적 지지 효과에 어떠한 영향을 미치는지에 대한 이해는 아직 부족하다. 본 연구는 우선 챗봇의 사회적 지지가 사용자의 스트레스 관리에 있어 긍정적인 영향을 주는지 탐구하였다. 그 후 챗봇에 대한 사용자의 마음지각이 챗봇의 사회적 지지 효과에 영향을 미치는지 확인하였다. 실험에서 챗봇은 참여자의 대인관계 스트레스 상황에 대하여 질문하였고, 참여자는 챗봇의 질문에 답하며 본인의 스트레스 상황을 글로 적었다. 실험 조건에 따라 챗봇은 정보적 지지 (i.e., 대인관계 조언)와 정서적 지지 (i.e., 공감과 격려), 두 가지 종류의 사회적 지지를 추가적으로 제공하였다. 분석 결과, 사회적 지지에 대한 만족감은 참여자의 스트레스 대처에 긍정적인 영향을 주는 것으로 나타났다. 스트레스 경험을 적어보도록 독려만 한 것에 비하여, 챗봇이 추가적으로 정서적 지지를 제공하였을 경우, 참여자가 챗봇의 메시지를 유용하다고 지각하는 정도가 감소하였다. 또한 챗봇에게 정보적 지지보다 정서적 지지를 받았을 때, 지지에 대한 참여자의 만족도가 감소하였다. 참여자가 챗봇에게 보다 인간 같은 마음이 있다고 지각할 때, 지지에 대한 만족도가 증가하였고, 지지가 스트레스 상황을 다루는데 유용하다고 지각하는 정도 또한 증가하였다. 본 연구의 결과는

사용자가 챗봇 고유의 특성을 인지하고 있기 때문에 인간이 제공하는 것과는 다른 형태의 지지를 챗봇에게 기대한다는 것을 시사한다. 또한 챗봇의 사회적 지지 효과를 이해함에 있어, 지지에 대한 사용자의 만족감과 챗봇에 대한 사용자의 마음지각이 중요하다는 것을 보여준다.

**주요어** : 마음지각, 사회적 지지, 지각된 사회적 지지, 인간-챗봇 상호작용

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