I'm Not Upset–I Get It: Effects of Co-workers' Stress Cues on Help-seekers' Social Diction and Empathy in Telecommuting

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Highlights

• Help-seekers adjust their diction to be more empathic and tactful
when they perceive co-workers as stressed.
• Help-seekers experience less negative emotional shifts when rejected by stressed rather than relaxed co-workers, suggesting empathy towards stressed individuals.
• MIM software could boost workplace empathy by enabling stress
status sharing, albeit with caution for relaxed status displays.
• For privacy and reduced stigmatization, using subtle haptic vibrations could effectively signal users' negative or sensitive **emotional states.**

I'm Not Upset–I Get It: Effects of Co-workers' Stress Cues on Help-seekers' Social Diction and Empathy in Telecommuting

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Abstract: In both remote and physical work environments, it is commonplace for help-seeking messages to be rejected by other colleagues. This paper investigates how signifying co-workers' stress status would influence the social diction and empathy of help-seekers in the specific context of rejection. 36 participants were recruited to perform help-seeking tasks with virtual co-workers via a professional mobile messaging application (Trillian). Their device was tailored with a vibrotactile mechanism (TacStatus), which could signify different emotional states of the co-workers: no-cue, relaxed, normal, and stressful. Independent sample Friedman nonparametric tests were conducted to analyze the social diction and empathy of the participants in their messages for help-seeking and responses to the co-workers' rejection. This study revealed that stress cues have observable impacts on the social diction and empathy of help-seekers. Stressful and relaxed cues were found to evidently shape the social diction of help-seekers. When confronted with negative cues, such as stressfulness, help-seekers tended to exhibit positive emotions after been rejected. On the other hand, when faced with a relaxed co-worker, the help-seeker felt disappointed and unaccepted after being rejected. This study attempts to reveal the mechanism through which stress cues influence professional mobile messaging interactions and collaboration. The findings could provide valuable implications for the design of socio-emotional cues in the context of mobile instant messaging.

Keywords: socio-emotional cues; stress; social diction; empathy; telecommuting

1. Introduction

In the post-COVID-19 era, Mobile Instant Messaging (MIM) has become widely utilized for telecommuting, with an increasing number of employees choosing it as their primary communication method (Bahri et al., 2020; Bardram & Hansen, 2004; Cameron & Webster, 2005; Danninger et al., 2006). Some newly developed MIM software has introduced the user status setting function, enabling users to indicate their work, study, and personal life statuses, thereby providing a certain level of social awareness during communication. With the development of telecommuting software, users can now display their emotional signals (Egger et al., 2019; Jiang et al., 2020) in addition to traditional activity states such as 'Available' [+], 'Urgent Only' [!], 'On leave' [@], and

'Do Not Disturb' [-]. In a collaborative environment, individuals have distinct roles, resulting in a range of requests for assistance from their coworkers (Thacker & Stoner, 2012). In practice, it is not uncommon for help-seeking messages to be turned down by fellow colleagues. Furthermore, these rejections can evoke negative emotions when help-seekers perceive them as distressing or as discomforting (Yin & Smith, 2021). However, it remains underexplored whether, or how signifying emotional status of the coworkers would impose differential impacts on help-seekers' responses associated with rejection.

Research has demonstrated that in remote computer-supported collaborative work, individuals frequently share socio-stress cues and actively seek information about their partners' emotions (Eligio et al., 2012). Socio-emotional cues such as happiness, interest, hopefulness, excitement, feeling challenged, frustration, and annoyance have a positive impact on remote work collaboration. Biehl et al. (2010) and Peek et al. (2009) have highlighted the influence of socio-emotional cues on communication strategies and work atmosphere among colleagues, enabling individuals to engage in appropriate communication and provide assistance based on others' emotional states. When one receives socio-emotional cues, one can initiate contact in the right manner, at the right time, and in the appropriate context (Antila et al., 2011; Hassib et al., 2017; Tsetserukou & Neviarouskaya, 2010). Danninger et al. (2006) indicated that in situations where the other party is angry or anxious, asynchronous communication methods like voice messages or emails can be used effectively. However, when socio-emotional cues from the other party are unavailable, social strategies cannot be adjusted promptly (Burgoon et al., 1996; Wang et al., 2017). McKenna and Bargh (2000) suggested that the absence of vocal cues or visual cues such as facial expressions can lead to misunderstandings when interpreting emails or simple text messages.

The aforementioned studies underscore the significant importance of stress cues in social communication (Barsade, 2002; Locke & Horowitz, 1990). Huang et al. (2015) observed that displaying the socio-emotional cues of residents in a community can foster better mutual understanding and enhance intimacy among community members. Sauppé and Mutlu (2014) found that simulating facial expressions through emotional gaze positively impacts communication in cooperative scenarios. Van Kleef and De Dreu (2010) discovered that when faced with angry partners in team cooperation, subjects exhibited a lower willingness to cooperate and decreased creativity. Friedman et al. (2004) pointed out that negotiators generally hold a negative perception of angry opponents and display reluctance to continue interactions. Graham et al. (2008) suggested that expressing negative emotions such as anxiety, worry, fear, and sadness during social interactions can help improve interpersonal relationships.

As mentioned above, most current studies primarily focus on assessing the impact of stress cues on subjective experiences using questionnaires and interviews. However, quantitative studies investigating the influence of stress cues on MIM diction strategies and user empathy are rather limited. In cases of seeking assistance being rejected, researches are typically centred on psychological counselling scenarios (Bohns, 2016; Crisan et al., 2022; Yin & Smith, 2021). Existing studies on help-seeking also focused on hierarchical relationships (Thacker & Stoner, 2012). Yet, research on the impact of stress cues on subjective experiences after rejection is in scarcity. Hence, the main goal of this study is to investigate the social diction and empathy of the help-seekers in the specific context of rejection. We have chosen the cues of Relaxed, Normal, and Stressful as independent variables, while focusing on social diction and user empathy as dependent variables. Specifically, this study aims to investigate the following aspects:

- The impact of stress cues on the social diction used by help-seekers in a telecommuting environment with MIM.
- The potential empathetic response elicited in help-seekers by the relaxed potential helpers after rejection.
- The level of understanding experienced by help-seekers when facing stressful potential helpers after rejection.

Our primary research goal is to examine the effects of stress cues within the context of rejection, not the methods of displaying these cues. However, we utilized haptic display to communicate stress cues, drawing from existing research on haptic communications. Many current studies focus on visually representing user states in MIM interactions (Fabri & Moore, 2005; Fabri et al., 2005). Examples include HeartChat (Hassib et al., 2017), GamIM (Pong et al., 2014), and KinChat (Wang et al., 2017), which visually convey user heart rate, emotions, or facial expressions. In recent years, haptic communication has gained research attention. For instance, Digital touch (Mitchell et al., 2020), Tactile Emoticon (Jewitt et al., 2020), Mediated-Social-Touch (Wei et al., 2022), VibEmoji (An et al., 2022), Tactile-Emoji (Zhang et al., 2018), ComTouch (Chang et al., 2002), Feelabuzz (Tünnermann et al., 2014), and FlexN-Feel (Singhal et al., 2017) incorporate pressure vibration modules into communication devices to facilitate emotional communication.

Haptic communications are advantageous in representing varied emotions with subtlety and tacitness. Jewitt and Price (2019) investigated the interaction between family members during museum exploration using touch-based displays, which generates new ways of experiencing. Salminen et al. (2012) indicated that tactile stimulations could enrich the interpretation of speech as more arousing and dominant. Price et al. (2022) pointed out that in diverse social scenarios such as casual or

workplace communications, emotional information can be effectively conveyed through various haptic attributes, including temperature, pressure, and vibration. Raisamo et al. (2022) suggested that in social and emotional scenarios, users could benefit from mediated touch. Touch is often seen as a mediator of personal information in intimate settings (Jewitt et al., 2021), partially due to that haptic cues uniquely afford an implicit, indirect, momentary (hence relatively more comfortable) way for people to communicate their vulnerability. Therefore, we believe haptic communication can be appropriate to represent (especially negative) emotional status in the work context.

Inspired by prior research, we thereby incorporated a tactile vibration mechanism called TacStatus to display the co-worders' emotional status on an existing professional MIM application called Trillian. The vibrotactile patterns have been designed based on heart rate data that can be gathered from off-the-shelf digital devices (e.g., smartwatches or mobile phones), to notify users of an important type of socio-emotional status: stressfulness. Namely, by touching a peer worker's avatar on the MIM interface, a vibrotactile pattern will be rendered by the mobile phone to convey the peer worker's stress status, which can be one of the three: being relaxed, normal, or stressful. Users could also set their stress status invisible, which is also included in our experimental study and referred to as the condition of 'no-cue'. TacStatus is implemented in a real-life office environment, enabling participants to request assistance from virtual users exhibiting different stress states.

2. Materials and Methods

2.1 Participants

A total of 36 participants are recruited as help-seekers for this study, comprising 18 men and 18 women who are all right-handed users. The participants' age ranges from 22 to

36 years (Mean = 28.4, SD= ±5.2), and they all have extensive experience using this software MIM. They reported that they typically remained actively online on MIM applications for over 10 hours each day. The participants were familiar with conventional haptic notifications or vibrotactile feedback from mobile devices, whereas, they had little experience with specialized haptic displays or devices. Additionally, all participants were in good health and had no sensorial impairments. A compensation of €15 per person per hour is provided as a reward for their participation.

2.2 Instruments and Test Environments

2.2.1 Overview

As shown in Figure 1, we integrated a tactile vibration display called TacStatus with an existing professional MIM application called Trillian on the smartphone to notify users of co-workers' emotional status. Trillian is a professional MIM application that features a typical interface design similar to popular MIM platforms like WhatsApp and Facebook Messenger. However, it is more often used in work contexts such as business or clinical settings. Trillian was selected to establish an ad-hoc professional MIM setting to minimize the influences of the participants' previous MIM experience on the present experiment, as none of them had used Trillion before. The proposed approach involves a virtual environment accompanied by four virtual colleagues. Users in reality can effectively discern the stress states of their virtual colleagues via the vibrotactile patterns when touching a colleague's avatar, which could be no-cue (no vibrotactile cue), relaxed, normal, and stressful. This perception is achieved before the conversation through tactile interaction with the avatars representing the virtual colleagues. By organizing information based on different stress states, users can effectively communicate with one another within the virtual environment. For instance, if users

seek assistance from their colleagues in telecommunication, they can initiate the interaction by first checking their colleague's stress cues through a touch interaction.

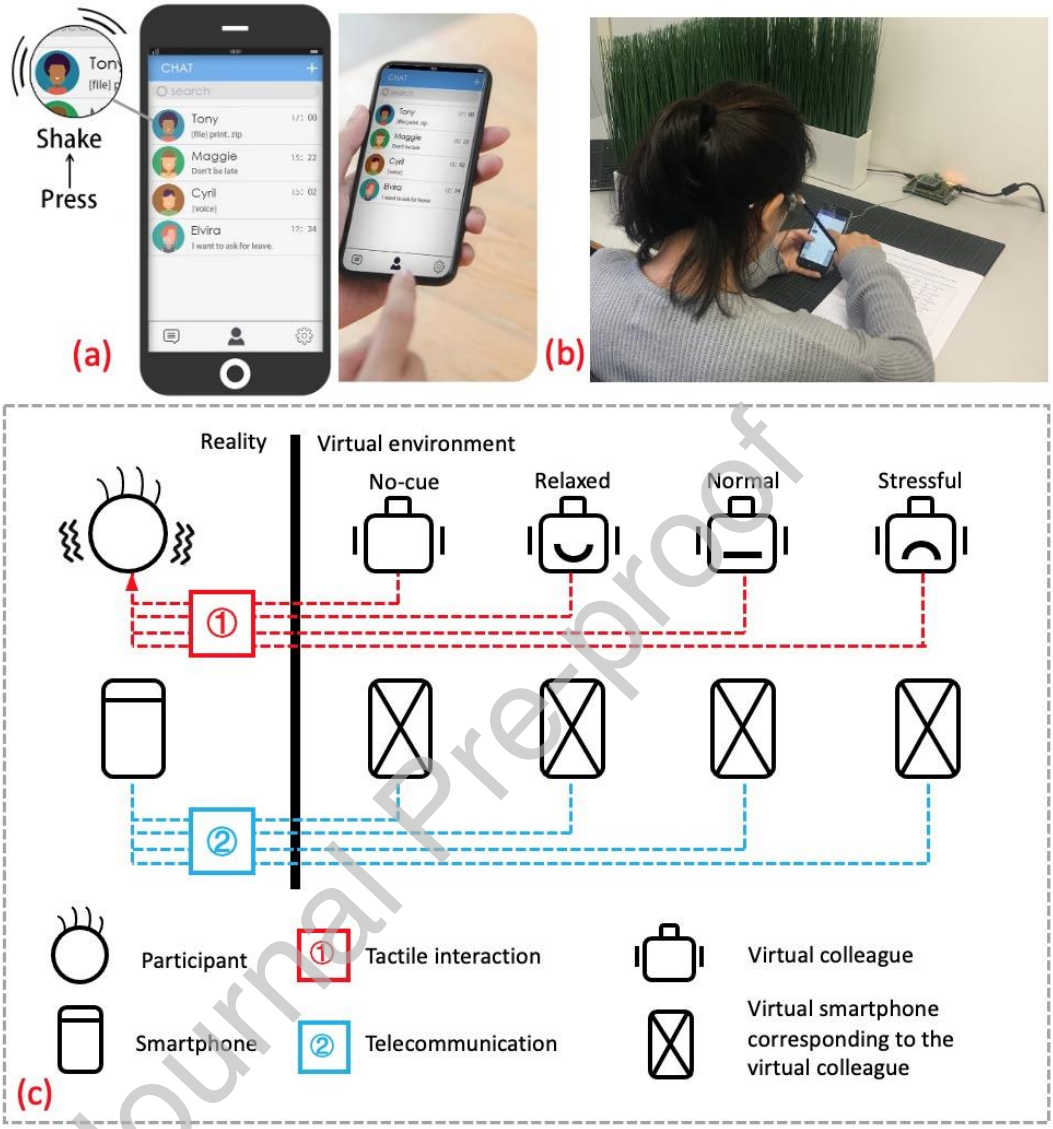

Figure 1. Test environment: (a) an MIM interface with avatars of virtual colleagues; (b) a participant in the experiment; (c) each participant first touches the virtual colleague's avatars to perceive the haptic stress cues of the colleagues including no-cue, relaxed, normal, or stressful (see red dashed lines), and then the participant communicates with the virtual colleagues to seek assistance (see the blue dash lines).

Each participant would first touch the avatars of the four virtual colleagues in the interface of Trillian on the smartphone, see Fig 1(a). The photo of a participant during

testing is shown as Fig 1(b). In this manner, the participant could perceive the four vibration patterns associated with the stress cues including no-cue, relaxed, normal, and stressful. This procedure, namely the tactile interaction, is represented as the red dash line in Fig 1(c). After the perception of stress cues, the participant would communicate with the four virtual colleagues to seek assistance. This procedure, namely the telecommunication, is represented as the blue dash line in Fig 1(c).

2.2.2 Haptic Components of the Prototype

The prototype of TacStatus consists of an Arduino microcontroller, and a rectangular linear resonant actuator (LRA) motor which is connected to the back of the smartphone. In this study, we used a separate LRA motor only for the ease of prototyping and modification, whereas the designed vibrotactile patterns could also be rendered on the built-in LRA motors of current mainstream smartphones.

2.2.3 Input and Output Devices

The smartphone used is the Apple iPhone SE with a 4.7-inch touchscreen (1334x750 pixel resolution), which is one of the mainstream smartphone screen sizes. HD cameras and laptops are deployed to record MIM communication scenes and participants' interaction behaviors.

2.2.4 Patterns of the Stress Cues

It should be noted that the vibration patterns associated with different stress cues are generated through the synthesis and transformation of the user's heartbeat and breathing acoustic signals under different stress states. This approach is based on our previous study (Zhang et al., 2018) which showed that the tactile expressions derived from breathing patterns could be intuitively perceived by users and naturally associated

with the different emotional states. As depicted in Figure 2, an audio file is initially created by recording the heartbeat and breathing corresponding to three stress states (relaxed, normal, and stressful) in the work environment. Each audio file has a duration of 4 seconds and contains two layers of heartbeat and breathing sounds. In the case of a stressful state, it induces shortness of breath and an increased heart rate. Therefore, the synthesized 4-second audio signal for stressful comprises eight heartbeat sounds and three breath sounds. Conversely, the synthesized signal for the relaxed state consists of only one breathing and three heartbeat sounds. Using the aforementioned method (Zhang et al., 2018), vibration modes corresponding to the three different stress cues are obtained. Prior to sending a request, individuals can perceive these distinct vibration patterns by touching the avatar image of a person and then formulate their diction for the textual request in light of the stress cues they perceive.

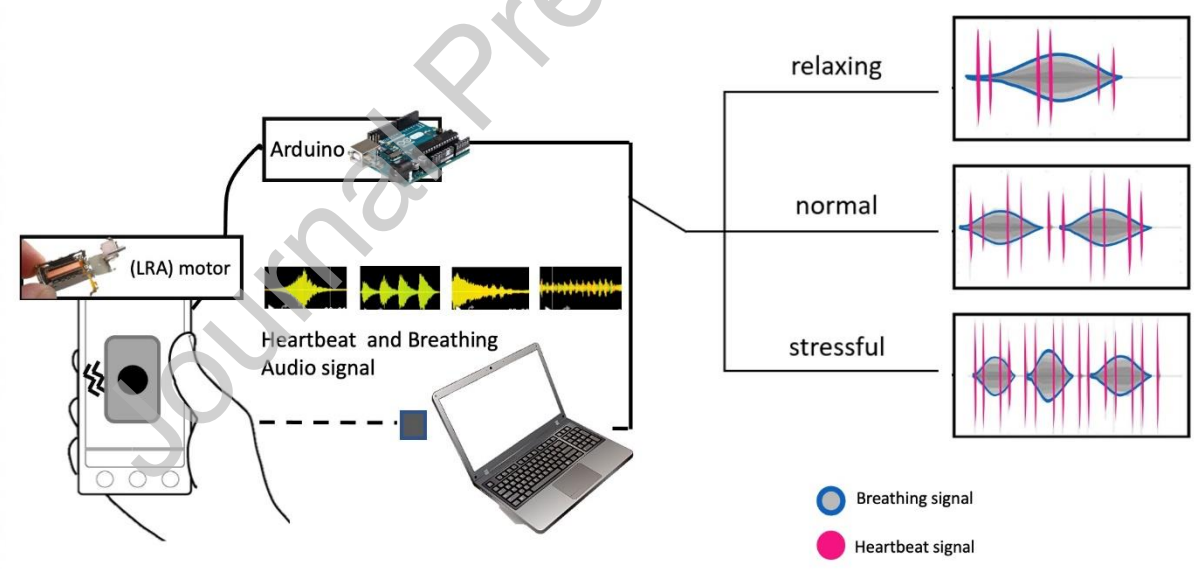

Figure 2. Design principles, the high-frequency signal corresponds to the heartbeat, and the low-frequency signal corresponds to the breathing.

2.3 Experimental Design

The experiment utilizes different stress cues (relaxed, normal, and stressful, no-cue) as

independent variables for the help-seekers. The study incorporates two dependent variables, namely the help-seekers' employment of social diction strategies and their empathy scores.

The social diction strategy encompasses four elements, as depicted in Table 1: the number of *greeting* texts, the number of *emojis*, the number of *sorry* texts, and the number of *thanks* texts. Greeting texts are the ones that open the chat before making a direct request; for instance, they could involve inquiries into the conversation partner's current/recent status or general well-being, discussions regarding the weather, friendly expressions of concern, or other starters that are not related to the request. Examples and descriptions of other three elements are listed in Table 1.

We initiate our analysis by segmenting the original messages into '*sentence units*', which we define as: distinct segments of text that (a) express a complete thought and (b) are separated from other segments by punctuations (comma, colon, semicolon, period, question mark, exclamation mark). Following this segmentation, each sentence unit is assessed to determine if it falls into one, multiple, or none of the three predetermined categories: *greeting* text, *sorry* text, and *thanks* text (see Table 1 for the definitions of these categories). Subsequently, we conduct a tally for each of these three categories to measure their occurrence. In addition, another facet of our analysis is focused on the usage of *emojis*, for which we straightforwardly count the quantity. To ensure the reliability and accuracy, two coders were employed to independently tally the diction elements and cross-check the results based on the above operational rules. The two coders reached full agreement in their categorization results. A few examples of how the four diction elements were counted are provided in Figure 3.

Table 1 Help-seekers' social diction strategies.

Elements	Examples	Descriptions
Greeting text	How's it going? Are you busy now?	Conversation starters or inquiries not directly related to the help request to open the chat.
Emoji text	🙏 😄 🤝 😭	Nonverbal symbolic components to lighten the mood and make the request more polite.
Sorry text	Excuse me. I'm sorry. Terribly sorry.	To apologize for interrupting the partner or taking their time.
Thanks text	Thank you so much. I appreciate it.	To thank the partner for their efforts and time.

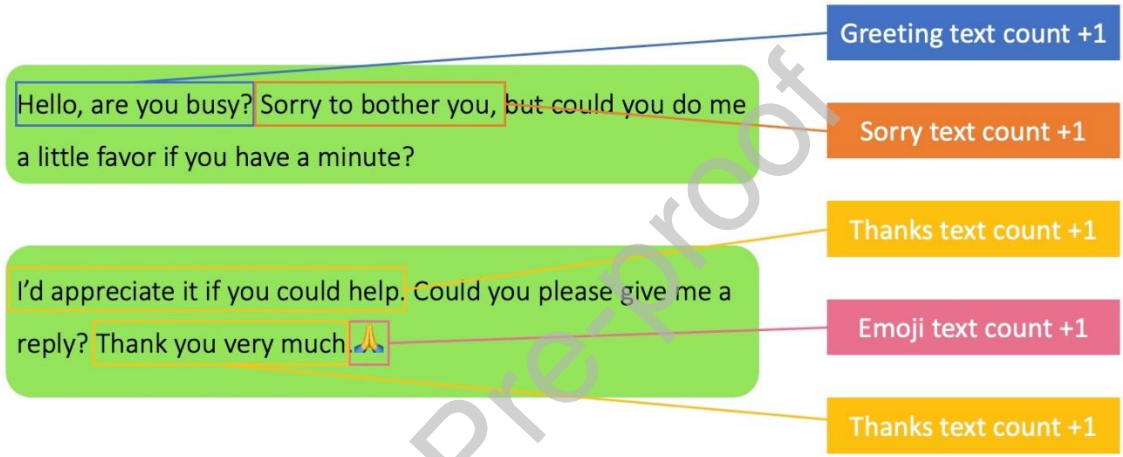

Figure 3. Scheme of the counting principle of each element.

The empathy scores are assessed using three Likert scale questionnaires. The first questionnaire Q1 involves a 5-point Likert question: "I attempt to empathize with the person's situation," where a score of 1 indicated strong disagreement and a score of 5 indicated strong agreement. Questionnaire Q2 utilizes a 9-point self-assessment emotion questionnaire (Kosti et al., 2019) to measure the Valence, Arousal, and Dominance of subjective emotions of the participants. Q3 is a 5-point Likert scale to evaluate the statement: "I can comprehend the reasons behind this person's response," with a score of 1 denoting strong disagreement and a score of 5 representing strong agreement. To be noted, to control the variables and obviate the potential biases cause by the participants' existing social relationships with their co-workers, the study utilized a Wizard-of-Oz design (Riek, 2012). In this setup, participants, acting as help-seekers,

interacted with four virtual co-workers as potential helpers (played by a researcher remotely according to a script), rather than with their real-life colleagues.

3. Tasks and Procedures

3.1 Experimental Tasks

The task was designed to simulate a scenario where a user encounters work-related difficulties and seeks assistance from four virtual colleagues. These virtual colleagues are deliberately placed in different stress states, all of whom respond with rejection after receiving the help request. The objective of the study is to examine the variations in social diction strategies and empathy displayed by help-seekers.

To ensure the methodological rigor of the experiment, the following limitations are implemented. Firstly, to mitigate the potential impact of personal affinity and gender on communication, the four virtual colleagues are assigned gender-neutral names: Nan Li, Lin Wang, Xin Liu, and Meng Zhang. Participants are explicitly informed that they have limited personal relationships with all four virtual colleagues. Secondly, to minimize any influence stemming from the content of the job request, participants are instructed to send requests to their virtual colleagues to attend a 40-minute Brainstorming meeting, scheduled two hours later. This is an emergency request that happens on short notice because the people who are originally scheduled to participate couldn't join the brainstorming session, but the meeting is important and the other people involved couldn't change the time, so four people have to be found on short notice to join. Thirdly, to measure a baseline and familiarize the participants with the experimental process, the no-cue state is first assigned to Nan Li. Then, to counterbalance the effects from the order of experiencing three stress cues (relaxed, normal, and stressful), these cues are assigned to Lin Wang, Xin Liu, and Meng Zhang

following a Latin square sequence. Following the submission of their requests, participants receive a standardized response stating from each virtual colleague, "Sorry, I am unable to assist you."

3.2 Experimental Procedures

As shown in Fig 4, the experiment comprises two tasks: sending the first help request message (Task 1), and sending the reply after receiving the rejection (Task 2). After each task, the participants were asked to finish the 5-point Likert questionnaires. We then conducted a semi-structured interview to to uncover the participants' reasons behind their questionnaire ratings. The experiment requires approximately 40 minutes to complete.

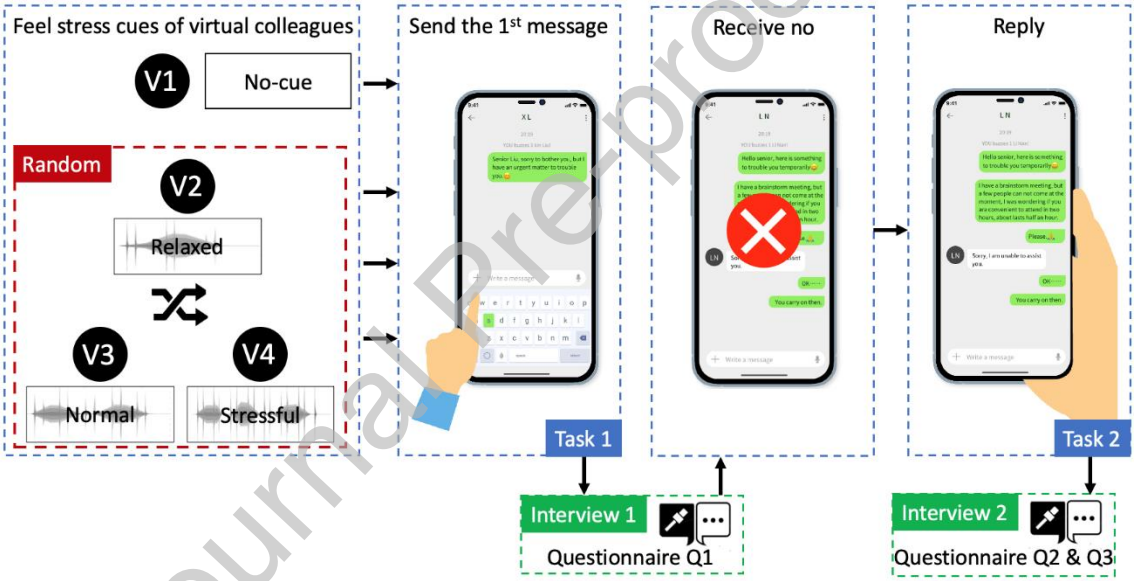

Figure 4. Experimental Procedures.

Initially, participants are provided with an explanation regarding the study's objectives, the experimental procedure, and the interactive task. They are then given a 15-minute training session to familiarize themselves with the vibration patterns associated with different stress cues. Each participant practices the task multiple times in a randomized loop until they could readily distinguish among three distinct vibration patterns representing different stress states: relaxed, normal, and stressful.

Next, participants interact with four virtual colleagues to experience the corresponding stress states including no-cue, relaxed, normal, and stressful. For Task 1,

participants employ varied social diction strategies to send help-requesting messages. There are no restrictions on the number of messages or word count, and all textual elements, including text, letters, punctuation, emoji text, and other content are recorded for further analysis. Following this task, participants complete questionnaire Q1 and participate in a semi-structured interview.

Subsequently, participants receive responses from their virtual colleagues, and they proceed to respond to these messages in Task 2. Same as Task 1, there are no limitations on the number of messages or word count, and all textual components in the messages, are recorded. Participants then complete questionnaires Q2 and Q3, along with engaging in the second interview. Illustrations of Task 1 and Task 2 from the participant 13 are given in Figure 5 as an example.

Figure 5. The messages by participant 13 in the Task 1 and Task 2

4. Results

In this within-group experiment, we aimed to compare social diction, empathy, and subjective emotion across four conditions facing different stress cues: no cue, relaxed cue, normal cue, and stressful cue. Firstly, the quantitative data, including the number of greeting text, emojis, sorry text, and thanks text, and the responses to questionnaires Q1-Q3 were assessed for normality using the Shapiro-Wilk test. Given the non-normal

distribution of all measures, we then conducted a Friedman test. When significance was observed, post-hoc nonparametric paired Wilcoxon tests were employed to identify specific condition differences.

4.1 Social Diction

During the experiment, the messages from Task 1 and Task 2 were recorded. We extracted four textual elements from these messages (greetings, emojis, apologies, and thanks) as the quantitative data for statistical analysis. A Friedman test indicated significant differences in the usage of greeting text ($\chi^2(2)=12.612$, $p=0.006$), emojis ($\chi^2(2)=8.171$, $p=0.043$), sorry text ($\chi^2(2)=24.934$, $p<0.001$), and thanks text ($\chi^2(2)=9.0231$, p=0.029) across the different stress cues. Table 2 summarizes the results of social diction strategies.

Table 2 The results of the Social Diction strategies in four conditions

Measures		Conditions			
Number of textual elements		No Cue *Mean(SD)*	Relaxed *Mean(SD)*	Normal *Mean(SD)*	Stressful *Mean(SD)*
Greeting text	Mean (SD)	1.94 (0.84)	1.89(0.71)	1.81(0.71)	2.36(0.93)*
	Sig	***0.002***	***0.004***	***0.023***	---
Emoji text	Mean(SD)	1.61(1.68)	1.94(1.84)*	1.3(1.90)	1.14(1.10)
	Sig	*0.31*	---	***0.022***	***0.022***
Sorry text	Mean	0.53(0.91)	0.39(0.87)	0.31(0.67)	0.97(1.21)*
	Sig	***0.009***	***0.001***	***0.001***	---
Thanks text	Mean	0.31(0.52)	0.28(0.45)	0.50(0.61)*	0.2(0.57)
	Sig	***0.035***	***0.021***	---	***0.046***

In terms of greeting text, the participants used the most greeting text (2.36±0.93) in their help-request messages to a colleague under the stressful condition, significantly more than no-cue (1.94± 0.84, $p=0.002$), relaxed cue (1.89±0.71, $p=0.004$) and normal cue (1.81±0.71, $p=0.023$) conditions. Regarding emojis, the participants used significantly more emojis when communicating with a colleague under relaxed

conditions (1.94±1.84) compared to normal cue (1.3±1.90, p=0.022) and stressful cue (1.14±1.10, p=0.022) conditions. The usage of emoji was notably lower when interacting with a stressed colleague, almost 40% less than when interacting with a relaxed colleague.

For sorry text, the expression of apologies in messages with a stress cue (0.97±1.21) was significantly higher than the no-cue condition (0.53±0.91, p=0.009), relaxed cue condition (0.28±0.45, p=0.001), and normal cue condition (0.31±0.67, p=0.001). Lastly, the results indicated that the use of thanks text was most frequent in the normal cue condition (0.50±0.60), which is significantly higher than no-cue (0.3± 0.52, p=0.035), relaxed cue (0.28±0.45, p=0.021), and stressful cue (0.28±0.57, p=0.046) conditions.

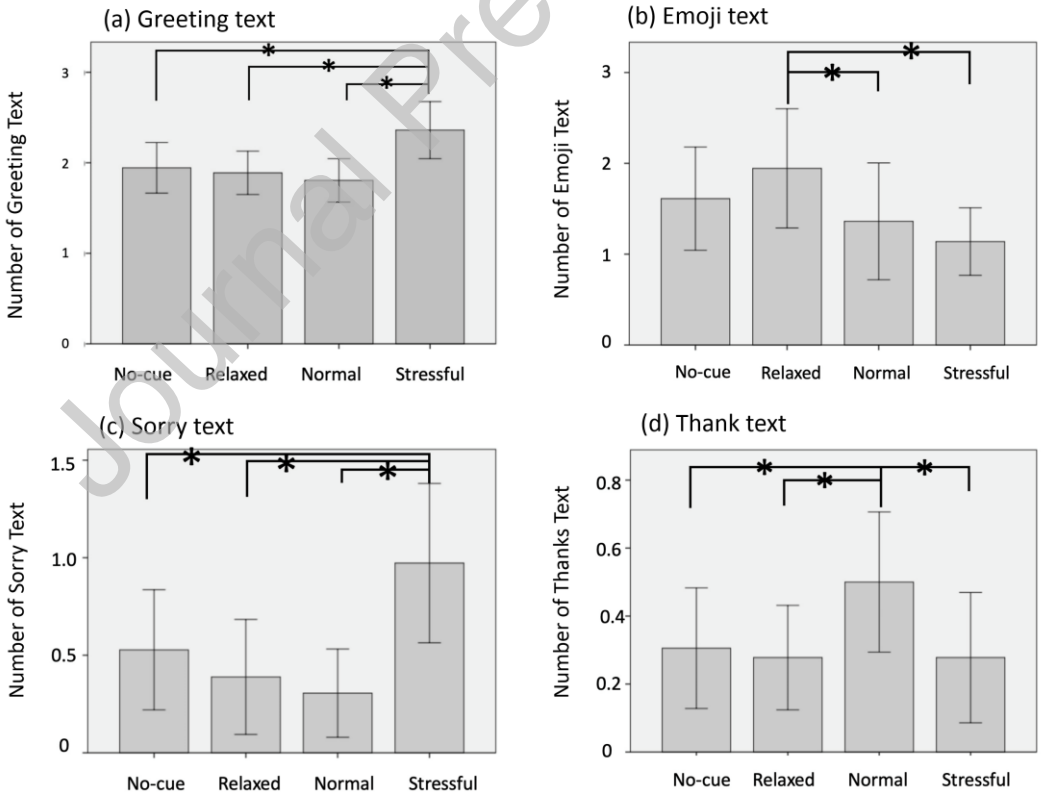

Figure 6. The measures of social diction under different stress cues.

4.2 Empathy and Subjective Emotion

After sending the first help-request message to the colleague (Task 1), the participants answered the questionnaire Q1, which assesses their ability to imagine how they would feel in the person's situation. As shown in Figure 7(a), a significant difference in empathy was observed based on the condition of stress cues, $\chi^2(2)=10.614$, $p=0.014$. When experiencing the stressful cue of the colleagues, the participants showed significantly greater empathy (4.37±0.66) compared to the no-cue condition (3.83±1.02, $p=0.005$). The participants answered questionnaire Q2 and Q3 after completing T2 tasks. Empathy measured by questionnaire Q3 varied significantly with the condition of stress cue, as indicated by Figure 7(b), $\chi^2(2)=29.174$, $p<0.001$. When receiving a rejection, the participants showed significantly higher empathy towards the colleagues who had a cue of stressful status (4.44±0.62) than of no-cue (2.33±1.08, $p<0.001$), relaxed cue (1.89±1.02, $p<0.001$) or normal cue (2.72±1.32, $p<0.001$).

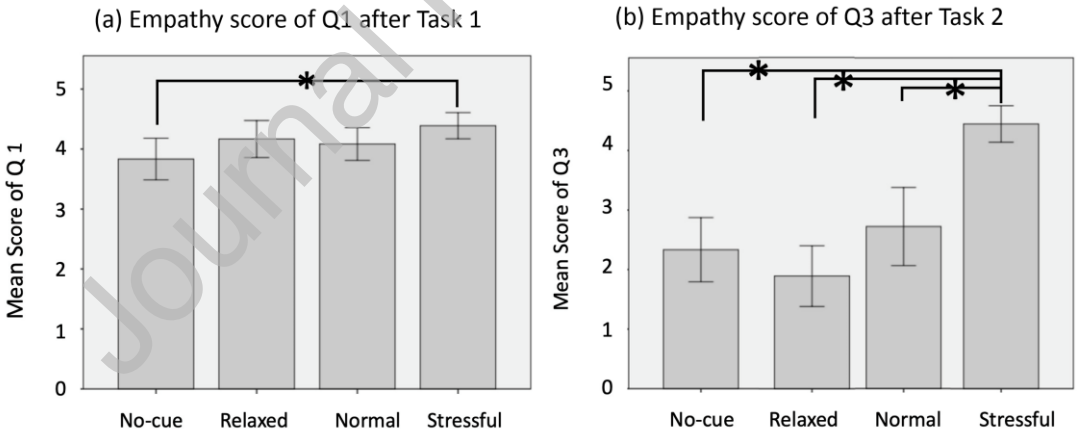

Figure 7. Results of questionnaire Q1 and Q3 measuring “Empathy”

The questionnaire Q2 (Kosti et al., 2019) was used to quantify the subjective emotions, namely valence, arousal, and dominance. The results showed that, after receiving a rejection of their request for help, there was a significant difference in self-

perceived ‘valence’ depending on which type of stress cue was experienced by the participants, $\chi^2(2)=16.265$, $p=0.001$. As shown in Fig 8, the valence for stressful cue (5.06±1.26) is significantly higher than no-cue (3.44±1.29, $p= 0.005$) and relaxed cue (3.17±1.53, $p=0.001$). There is no significant difference in arousal and dominance of the subjective emotion among the four conditions.

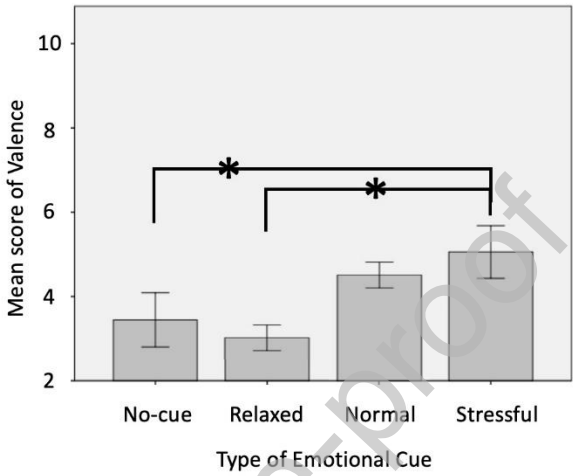

Figure 8. Results of Q2-Valence of "Subjective Emotion".

5. Discussions

This study results addressed three questions: (1) Whether and how help-seekers employ different social diction strategies when faced with partners exhibiting different stress states in remote work requests; (2) Whether and how the partners’ varying stress states may influence the levels of positivity elicited in help-seekers; (3) Whether and how the partners’ stress states would influence how understandable the help-seekers feel about a rejecting response. Analysing the experimental results of help-seeking tasks in a mobile instant messaging environment involving four virtual colleagues, we discover significant differences in social diction strategies. The stress cues also exhibited different influences on participants' empathic feelings. These findings contribute to

understanding the mechanisms through which different socio-emotional cues impact MIM communication strategies and empathy.

5.1 Stressful and relaxed cues stimulate varied social diction strategies.

When remotely communicating using MIM, coworker's socio-emotional cues can have a significant impact on the help-seekers' textual phrasing strategies. Help-seekers can exert control over the emotional expression in their texts, such as through the use of capital letters, emoticons, or message length (Byron & Baldridge, 2005; Riordan & Kreuz, 2010). In this study, we find that nearly all participants exhibit differentiated texting patterns when exposed to different stress cues from the four virtual colleagues, aligning with the Emotion Activation-Selection-Integration (EASI) model (Sheth et al., 2011; Van Kleef, 2009; Wang et al., 2017). Stress cues can trigger emotional responses in receivers, subsequently influencing their behaviors. When confronted with the stressful cue, help-seekers utilize more preparatory statements, with 50% more occurrences compared to the normal state, potentially intended to alleviate the partner's tension and facilitate a more relaxed atmosphere for the help-seeking request. This behavior can be explained by Visser et al. (2013), suggesting that individuals tend to infer helplessness in others when facing their sadness or other stress-related emotions, leading to helpful behaviors. When confronted with the relaxed cue, help-seekers employ emojis the most (M=1.94), which is 40% higher than when facing the stressful cue, indicating a more casual and relaxed tone in their phrasing. *"Facing the Relaxed state, I also feel relaxed, and I express my sense of relaxation through emoji (P3)."* When faced with the stressful cue, help-seekers exhibit the highest frequency of expressing apologies (M=0.97), which is nearly equal to the total occurrences in the other three groups. *"I added phrases like 'I'm sorry' and 'I apologize' to increase the politeness level of my request (P8) (P29)."* Additionally, help-seekers expressed

gratitude the most frequently when faced with the normal cue (M=0.50). This may be because help-seekers perceive a higher likelihood of agreement in the normal state compared to the stressful state but without the certainty associated with the relaxed state. Simultaneously, the results of Q1 (the questionnaire before help requests being rejected) support this conclusion, as help-seekers display the lowest empathy scores when facing the no-cue (M=3.81), indicating less perspective-taking. Help-seekers demonstrate the highest empathy scores when faced with the stressful cue (M=4.37), stating, *"If there are no stress cues, I won't try to speculate on the choices made by the other person. I simply express my purpose" (P10)*. Overall, in the absence of cues (No-cue), help-seekers' social diction strategy typically tend to be relatively neutral. However, the stressful and relaxed cues can effectively stimulate varied patterns in help-seekers' social diction strategies.

5.2 Rejections from stressful co-workers are more likely to be understood.

When help requests are rejected, virtual colleagues in a stressful state are more likely to be understood, induce less negative feelings in help-seekers, and receive greater empathy. Firstly, the results from Figure 9 indicate that, after rejection, help-seekers exhibit the highest empathy scores when facing the stressful cue (M=4.5). In contrast, help-seekers demonstrate the lowest empathy scores when facing the relaxed cue (M=1.83). Graham et al. (2008) provide a possible explanation, suggesting that expressing negative emotions can convey one's needs to others and facilitate greater interpersonal support. For instance, fear and anxiety cues communicate a need for avoidance, while sadness cues indicate a need for assistance. Therefore, expressing negative emotions in suitable contexts can help individuals signal trust and elicit responses. Secondly, the results of Q2 show that, after rejection, help-seekers experience the highest level of valence when facing the stressful cue (M=5.61). This

could be attributed to the fact that individuals feel better about themselves when they notice the negative emotions of others and provide support for their needs. The resulting sense of trust and helpfulness should promote intimacy and friendliness. This behavior is supported by Van Kleef and De Dreu (2010) who found that conveying different stress cues (such as anger and happiness) in negotiation scenarios had varying effects on negotiation behaviors. Compared to opponents with neutral expressions, participants make lower demands and larger concessions to opponents displaying anger, while they make higher demands and smaller concessions to opponents displaying happiness. Therefore, when facing a stressful partner, participants are more likely to make greater concessions when perceiving the partner's distressed emotions.

5.3 Rejection from relaxed co-workers trigger negative effects.

Furthermore, an interesting result is obtained from Q2. After rejection, help-seekers exhibit the lowest level of valence when facing the relaxed cue (M=3.17). In fact, many participants indicated that such behavior would impact their friendliness towards the person, making them reluctant to engage in future collaborations and even expressing their dissatisfaction directly in their message responses. Paradoxically, positive emotions can trigger negative effects (Newcombe & Ashkanasy, 2002), possibly due to the potential inconsistency between the underlying "agreement and rejection" experienced by the help-seekers. In face-to-face interactions, rejecting someone often involves a sad expression and a subdued tone, which can mitigate the help-seeker's negative emotions and maintain satisfaction with the social relationship (Kafetsios et al., 2017). However, in MIM communication, where stress cues are lacking, the simple rejection approach employed by the relaxed partner inevitably diminishes the satisfaction of social interactions (Eligio et al., 2012).

In summary, when faced with a stressful partner, help-seekers tend to feel more positive and are less inclined to turn negative when receiving negative responses. However, due to heightened expectations, a negative response from a relaxed partner can lead to feelings of discouragement. A possible explanation for this is that the relaxed cues raise the help-seekers' expectations, aligning with the concept of psychological expectancy effects (Park et al., 2010).

5.4 Future design implication: boosting workplace empathy by enabling appropriate sharing of stress status, albeit with caution for the display of relaxed status.

This study provides some interesting implications for the design of MIM software. To enhance social empathy in a work context, MIM software might consider affording the option of sharing the status of being stressed. On the other hand, while being cautious about displaying the status of relaxed. Furthermore, in order to create a greater sense of privacy and minimize potential stigmatization, developers could consider utilizing subtle haptic vibration patterns as signifiers of users' negative or sensitive emotional states. Sharing of stress status could be helpful to increase co-workers' empathy (Xue et al., 2023). Our research has provided empirical evidence to support the methodology of stress-sharing and to provide guidance for designing such a stress-sharing approach. This approach could subtly communicate these emotions, offering a perceived increase in privacy and may reduce any feelings of stigmatization associated with openly displayed emotional states.

5.5 Limitations

There are some limitations that need to be explicate. In order to control variables and obviate potential biases from participants’ existing workplace social dynamics, this

study adopted virtual co-workers and thereby lacks of a naturalistic, longitudinal setup. The next step for future research is to consider conducting experimental studies in a more complex real-world environment over a relatively longer period of time. The current setup also lacks of naturally unfolding dialogues with virtual co-workers, since the testing scenario has been only focused on rejection. Future research could mobilize Large Language Model based agents to evaluate help-seekers' responses and experiences in richer or more complicated help-seeking scenarios. Furthermore, due to the limited range of participants' demographics, the current study only included participants aged 22 to 36 years. In future research, it would be valuable to include users aged above 36 to uncover the influence of age and past experiences on MIM interactions, thereby responding to the globally aging society and the increasing needs for age-appropriate technology within and beyond workplaces.

6. Conclusions

In both telecommuting and in-person work environment, it is commonplace for help-seeking messages to be rejected by other colleagues. This paper investigates the social diction and empathy of the help-seekers in the specific context of rejection. This study designs and evaluates TacStatus, which allows users to obtain their partners' stress cues in advance through haptic feedback when seeking work assistance in MIM. The stress cues include no-cue, relaxed, stressful, and normal. The study explores the differences in social diction strategies and empathy exhibited by users being rejected by virtual colleagues with different stress cues.

The findings of this study indicate that displaying users' stress cues in MIM software is crucial to support users in communicating strategically and enhancing mutual understanding among them. When faced with the stressful cue, help-seekers employ more preparatory statements, with 50% more occurrences compared to the

normal state. When faced with the relaxed cue, help-seekers use emoji text the most, with a 40% increase compared to the stressful cue. Help-seekers expressed apologies most frequently when facing the stressful cue, with the number of occurrences almost equaling the total of the other three groups. Stressful and relaxed stress cues are more effective in eliciting variations in help-seekers' social diction strategies.

Moreover, individuals are more inclined to use relaxed, tactful, or non-stigmatizing language when communicating with partners exhibiting negative emotions, and when receiving negative responses, 80% of users expressed their willingness to forgive. The study explored the positive impact mechanism of negative stress cues on MIM interaction, providing targeted insights for the design of MIM software and understanding user psychology. Consequently, it can enhance software satisfaction and communication effectiveness.

Appendix

User interview samples when facing different stress cues after rejection.

No-cue First of all, I don't know if he is interested, and second, I don't know if he is busy, so I don't try to understand. I guessed that the other party might be busy right now, so I did not have great expectations, and my mood did not fluctuate greatly. Because I don't know his state, and I don't know why the other party rejected me, so I can only keep understanding and keep smiling. I don't know what the other person's situation is, so I politely ended the conversation. I didn't feel anything inside. I thought it was normal.
Relaxed He rejected me in such a short and direct way that I couldn't accept it. I was a little unhappy, so I used ellipses to indicate negative emotions. He didn't give me a reason so I just replied "It doesn't matter!!!" Three words for anger and surprise! I sent "question" emoji and more negative words. Ask the reason for rejecting me. I couldn't understand, so I replied "OK.. Excuse me "to show indifference.
Normal I will try to get him to help me again. Thanks for his reply anyway. I don't quite understand why he turned me down. I had certain expectations of him. I don't know why he refused, tell him to find someone else, put pressure on him.

I feel that the relationship between us is not so good, his rejection makes me a little angry.
Stressful He is supposed to be busy, so I can understand him and reply to the repetition of "OK OK", which represents a greater understanding. It's understandable. The man may want to help but he's under pressure. Asking for help and being rejected is normal, especially if the other person is in a bad mood. When I reply, I encourage the other person. I understand the rejection. I replied "sorry", showing full understanding.

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